Autumn Scheme of Learning

Year 4

#MathsEveryoneCan

2020-21

White Rose Maths

New for 2020/21

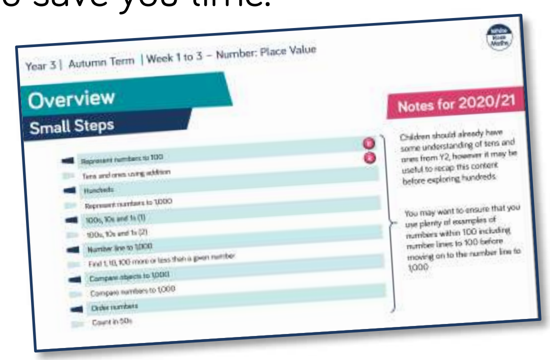
2020 will go down in history. The world has changed for all of us.

We want to do as much as we can to support children, teachers, parents and carers in these very uncertain times.

We have amended our schemes for 2020/21 to:

- ★ highlight key teaching points
- ★ recap essential content that children may have forgotten
- ★ flag any content that you might not have covered during the school closures period.

We hope these changes will add further value to the schemes and save you time.



Lesson-by-lesson overviews

We've always been reluctant to produce lesson-by-lesson overviews as every class is individual and has different needs. However, many of you have said that if blended learning becomes a key feature of school life next year, a weekly plan with linked content and videos could be really useful.

As always, we've listened! We've now produced a complete lesson-by-lesson overview for Y1 to Y9 that schools can use or adapt as they choose. Each lesson will be linked to a free-to-use home learning video, and for premium subscribers, a worksheet. This means that you can easily assign work to your class, whether they are working at home or in school.

Inevitably, this lesson-by-lesson structure won't suit everyone, but if it works for you, then please do make use of this resource as much as you wish.

Teaching for Mastery

These overviews are designed to support a mastery approach to teaching and learning and have been designed to support the aims and objectives of the new National Curriculum.

The overviews:

- have number at their heart. A large proportion of time is spent reinforcing number to build competency
- ensure teachers stay in the required key stage and support the ideal of depth before breadth.
- ensure students have the opportunity to stay together as they work through the schemes as a whole group
- provide plenty of opportunities to build reasoning and problem solving elements into the curriculum.

For more guidance on teaching for mastery, visit the NCETM website:

https://www.ncetm.org.uk/resources/47230

Concrete - Pictorial - Abstract

We believe that all children, when introduced to a new concept, should have the opportunity to build competency by taking this approach.

Concrete – children should have the opportunity to use concrete objects and manipulatives to help them understand what they are doing.

Pictorial – alongside this children should use pictorial representations. These representations can then be used to help reason and solve problems.

Abstract – both concrete and pictorial representations should support children's understanding of abstract methods.

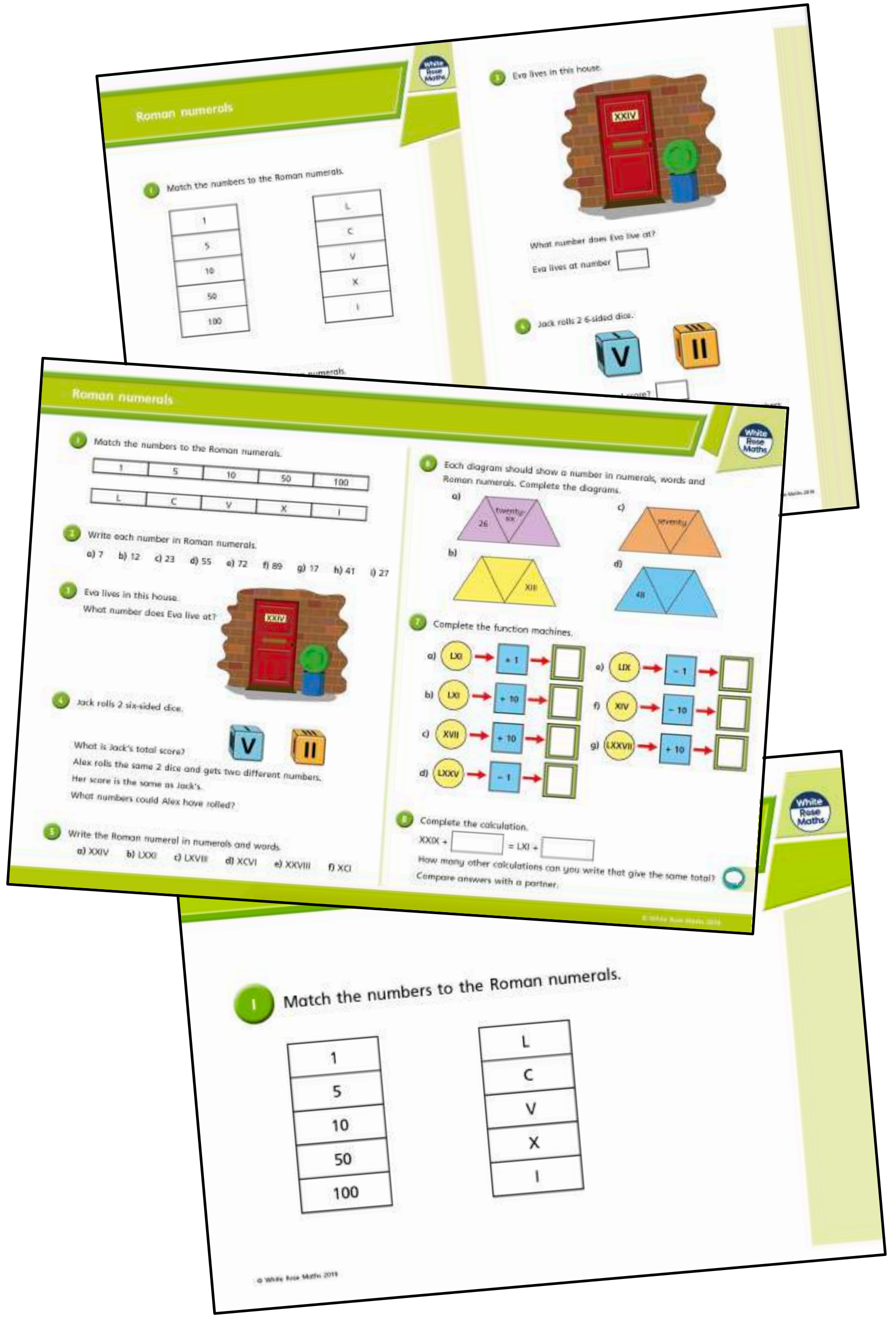
Need some CPD to develop this approach? Visit www.whiterosemaths.com for find a course right for you.

Supporting resources

We have produced supporting resources for every small step from Year 1 to Year 11.

The worksheets are provided in three different formats:

- Write on worksheet – ideal for children to use the ready made models, images and stem sentences.
- Display version – great for schools who want to cut down on photocopying.
- PowerPoint version – one question per slide. Perfect for whole class teaching or mixing questions to make your own bespoke lesson.

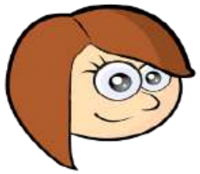


For more information visit our online training and resources centre resources.whiterosemaths.com or email us directly at support@whiterosemaths.com

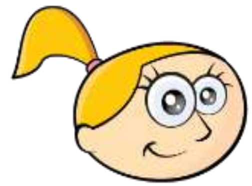
Meet the Characters

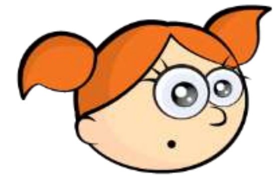
Children love to learn with characters and our team within the scheme will be sure to get them talking and reasoning about mathematical concepts and ideas. Who's your favourite?


Teddy


Rosie


Mo


Eva


Alex


Jack


Whitney


Amir


Dora


Tommy


Dexter


Ron


Annie

<table>
<tr><th></th><th>Week 1</th><th>Week 2</th><th>Week 3</th><th>Week 4</th><th>Week 5</th><th>Week 6</th><th>Week 7</th><th>Week 8</th><th>Week 9</th><th>Week 10</th><th>Week 11</th><th>Week 12</th></tr>
<tr><td>Autumn</td><td colspan="4">Number: Place Value</td><td colspan="3">Number: Addition and Subtraction</td><td colspan="2">Measurement: Length and Perimeter</td><td colspan="3">Number: Multiplication and Division</td></tr>
<tr><td>Spring</td><td colspan="3">Number: Multiplication and Division</td><td>Measurement: Area</td><td colspan="4">Number: Fractions</td><td colspan="3">Number: Decimals</td><td>Consolidation</td></tr>
<tr><td>Summer</td><td colspan="2">Number: Decimals</td><td colspan="2">Measurement: Money</td><td colspan="2">Measurement: Time</td><td>Statistics</td><td colspan="2">Geometry: Properties of Shape</td><td colspan="2">Geometry: Position and Direction</td><td>Consolidation</td></tr>
</table>

White Rose Maths

Autumn - Block 1

Place Value

Overview

Small Steps

- Represent numbers to 1,000 (R)
- 100s, 10s and 1s (R)
- Number line to 1,000 (R)
- Round to the nearest 10
- Round to the nearest 100
- Count in 1,000s
- 1,000s, 100s, 10s and 1s
- Partitioning
- Number line to 10,000
- Find 1, 10, 100 more or less (R)
- 1,000 more or less
- Compare numbers

Notes for 2020/21

We begin by encouraging spending time on numbers within a 1,000 to ensure they are secure on this knowledge before moving into 10,000.

Using equipment or digital manipulatives may help children increase their understanding.

Overview

Small Steps

- Order numbers
- Round to the nearest 1,000
- Count in 25s
- Negative numbers
- Roman numerals to 100

Notes for 2020/21

Work on Roman Numerals has been moved to the end of the block as we believe it is important for children to be secure with our own number system before exploring another.

Numbers to 1,000

Notes and Guidance

In this small step, children will primarily use Base 10 to become familiar with any number up to 1,000

Using Base 10 will emphasise to children that hundreds are bigger than tens and tens are bigger than ones.

Children need to see numbers with zeros in different columns, and show them with concrete and pictorial representations.

Mathematical Talk

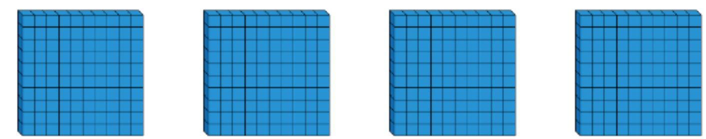
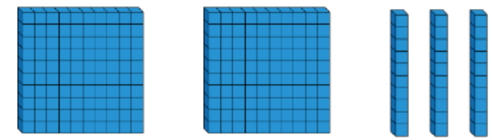
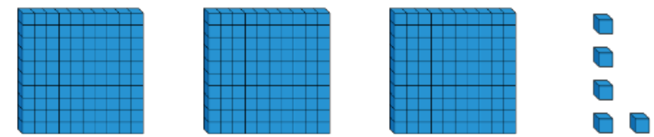
Does it matter which order you build the number in?

Can you have more than 9 of the same type of number e.g. 11 tens?

Can you create a part-whole model using or drawing Base 10 in each circle?

Varied Fluency

- Write down the number represented with Base 10 in each case.

Representation	Number
	
	
	

- Use Base 10 to represent the numbers.

700 120 407 999

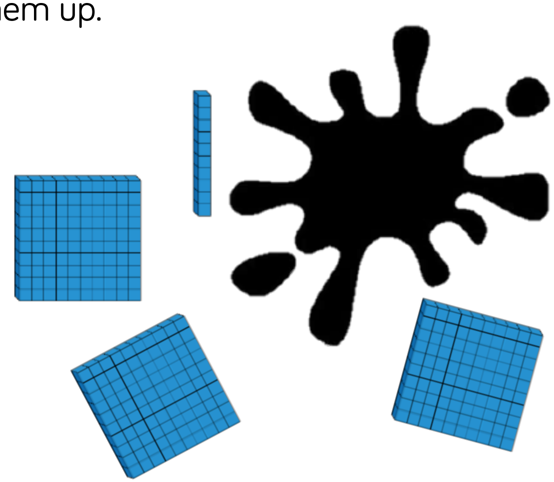
- Mo is drawing numbers. Can you complete them for him?

246 390 706

Numbers to 1,000

Reasoning and Problem Solving

Teddy has used Base 10 to represent the number 420. He has covered some of them up.



Work out the amount he has covered up.

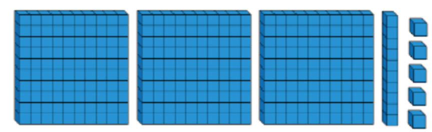
How many different ways can you make the missing amount using Base 10?

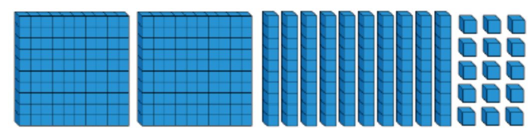
110 is the missing amount.

Possible ways:

- 1 hundred and 1 ten
- 11 tens
- 110 ones
- 10 tens and 10 ones
- 50 ones and 6 tens etc.

Which child has made the number 315?

Dora 

Mo 

Explain how you know.

Dora and Mo have both made the number 315, but represented it differently.

3 hundreds, 1 ten and 5 ones is the same as 2 hundreds, 10 tens and 15 ones.

100s, 10s and 1s (1)

Notes and Guidance

Children should understand that a 3-digit number is made up of 100s, 10s and 1s.

They read numbers shown in different representations on a place value grid, and write them in numerals.

They should be able to represent different 3-digit numbers in various ways such as Base 10 or numerals.

Mathematical Talk

What is the value of the number shown on the place value chart?

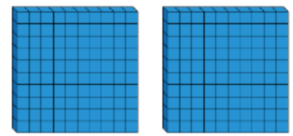
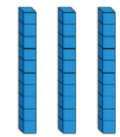
Why is it important to put the values into the correct column on the place value chart?

How many more are needed to complete the place value chart?

Can you make your own numbers using Base 10? Ask a friend to tell you what number you have made.

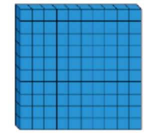
Varied Fluency

- What is the value of the number represented in the place value chart?

Hundreds	Tens	Ones
		

Write your answer in numerals and in words.

- Complete this place value chart so that it shows the number 354

Hundreds	Tens	Ones
		

Represent the number using a part-whole model.

- How many different ways can you make the number 452?
  Can you write each way in expanded form? (e.g. 400 + 50 + 2)

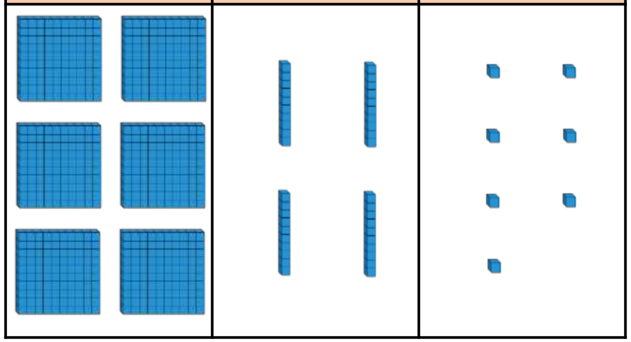
  Compare your answer with a partner.

100s, 10s and 1s (1)

Reasoning and Problem Solving

R

Hundreds	Tens	Ones



Eva

The place value grid shows the number 467

Is Eva correct? Explain your reasoning.

What do you notice about the number shown?

Possible answers:

I disagree because there are six hundreds, four tens and seven ones so the number is 647.

I notice that 647 and 467 have the same digits but in a different order so the digits have different values.

5 0 3

Using each digit card, which numbers can you make?

Use the place value grid to help.

Hundreds	Tens	Ones

Compare your answers with a partner.

The numbers that can be made are:

- 503
- 530
- 305
- 350
- (0)35
- (0)53

Number Line to 1,000

Notes and Guidance

Children estimate, work out and write numbers on a number line.

Number lines should be shown with or without start and end numbers, and with numbers already placed on it.

Children may still need Base 10 and/or place values to work with as they develop their understanding of the number line.

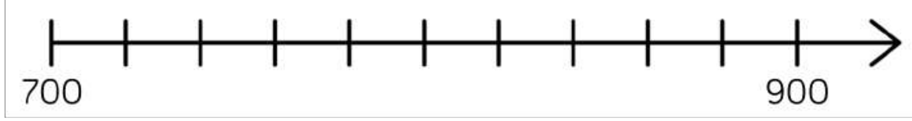
Mathematical Talk

What is the value of each interval on the number line?
Which side of the number line did you start from? Why?
When estimating where a number should be placed, what facts can help you?
Can you draw a number line where 600 is the starting number, and 650 is half way along?
What do you know about the number that A is representing? A is more/less than ________
What value can A definitely not be? How do you know?

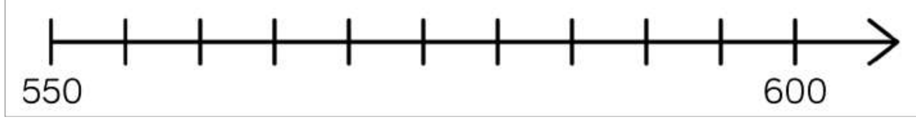
Varied Fluency

R

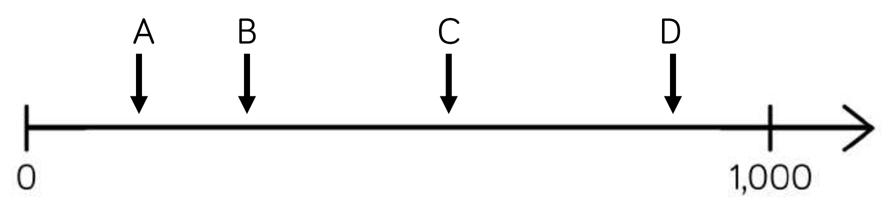
- Draw an arrow to show the number 800



Draw an arrow to show the number 560



- Which letter is closest to 250?

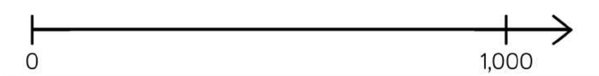


- Estimate the value of A.

Number Line to 1,000

Reasoning and Problem Solving

Estimate where seven hundred and twenty-five will go on each of the number lines.



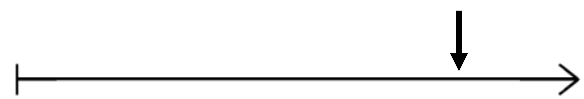
Explain why it is not in the same place on each number line.

725 is in different places because each line has different numbers at the start and end so the position of 725 changes.

All three of the number lines have different scales and therefore the difference between 725 and the starting and finishing number is different on all three number lines.

If the arrow is pointing to 780, what could the start and end numbers be?

Find three different ways and explain your reasoning.



Example answers:

Start 0 and end 1,000 because 500 would be in the middle and 780 would be further along than 500

Start 730 and end 790

Start 700 and end 800

etc.

Round to the Nearest 10

Notes and Guidance

Children start to look at the position of a 2-digit number on a number line. They then apply their understanding to 3-digit numbers, focusing on the number of ones and rounding up or not.

Children must understand the importance of 5 and the idea that although it is in the middle of 0 and 10, that by convention any number ending in 5 is always rounded up, to the nearest 10

Mathematical Talk

What is a multiple of 10?

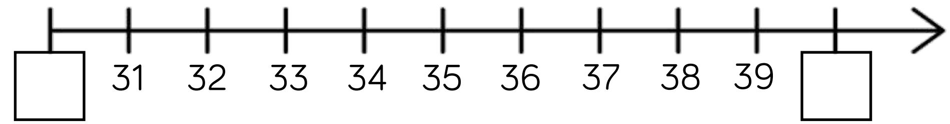
Which multiples of 10 does ____ sit between?

Which column do we look at when rounding to the nearest 10? What do we do if the number in that column is a 5?

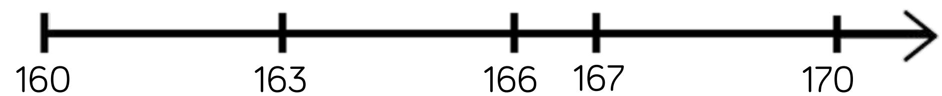
Which number is being represented? Will we round it up or not? Why?

Varied Fluency

- Which multiples of 10 do the numbers sit between?

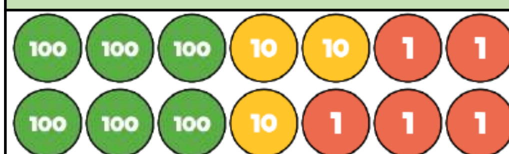


- Say whether each number on the number line is closer to 160 or 170?



Round 163, 166 and 167 to the nearest 10

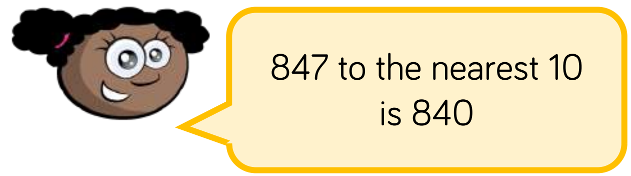
- Complete the table:

Start number	Rounded to the nearest 10
	
851	
XCVIII	

Round to the Nearest 10

Reasoning and Problem Solving

A whole number is rounded to 370 What could the number be? Write down all the possible answers. 370	365 366 367 368 369 370 371 372 373 374
Two different two-digit numbers both round to 40 when rounded to the nearest 10 The sum of the two numbers is 79 What could the two numbers be? Is there more than one possibility?	35 + 44 = 79 36 + 43 = 79 37 + 42 = 79 38 + 41 = 79 39 + 40 = 79

Whitney says:  Do you agree with Whitney? Explain why.	I don't agree with Whitney because 847 rounded to the nearest 10 is 850. I know this because ones ending in 5, 6, 7, 8 and 9 round up.

Round to the Nearest 100

Notes and Guidance

Children compare rounding to the nearest 10 (looking at the ones column) to rounding to the nearest 100 (looking at the tens column.)

Children use their knowledge of multiples of 100, to understand which two multiples of 100 a number sits between. This will help them to round 3-digit numbers to the nearest 100

Mathematical Talk

What's the same/different about rounding to the nearest 10 and nearest 100? Which column do we need to look at when rounding to the nearest 100?

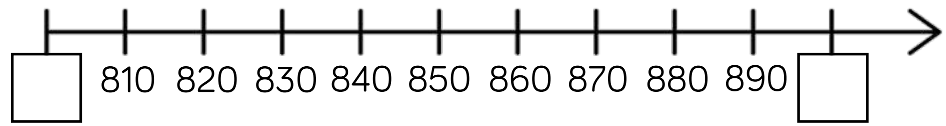
Why do numbers up to 49 round down to the nearest 100 and numbers 50 to 99 round up?

What would 49 round to, to the nearest 100?

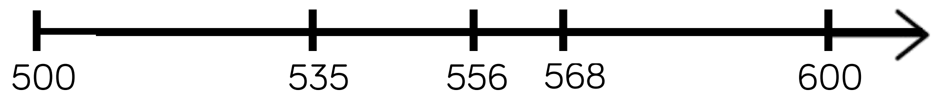
Can the answer be 0 when rounding?

Varied Fluency

- Which multiples of 100 do the numbers sit between?



- Say whether each number on the number line is closer to 500 or 600.



Round 535, 556 and 568 to the nearest 100
Use the stem sentence: _____ rounded to the nearest 100 is _____ .

- Complete the table:

Start number	Rounded to the nearest 100
400 50 7	
994	
XLV	

Round to the Nearest 100

Reasoning and Problem Solving

Always, Sometimes, Never Explain your reasons for each statement. • A number with a five in the tens column rounds up to the nearest hundred. • A number with a five in the ones column rounds up to the nearest hundred. • A number with a five in the hundreds column rounds up to the nearest hundred.	Always – a number with five in the tens column will be 50 or above so will always round up. Sometimes – a number with five in the ones column might have 0 to 4 in the tens column (do not round up) or 5 to 9 (round up). Sometimes –a number with five in the hundreds column will also round up or down dependent on the number in the tens column.

When a whole number is rounded to the nearest 100, the answer is 200 When the same number is rounded to the nearest 10, the answer is 250 What could the number be? Is there more than one possibility?	245, 246, 247, 248 and 249 are all possible answers.
Using the digit cards 0 to 9, can you make whole numbers that fit the following rules? You can only use each digit once. 1. When rounded to the nearest 10, I round to 20 2. When rounded to the nearest 10, I round to 10 3. When rounded to the nearest 100, I round to 700	To 20, it could be 15 to 24 To 10, it could be 5 to 14 To 700, it could be 650 to 749 Use each digit once: 5, 24, 679 or 9, 17, 653 etc.

Count in 1,000s

Notes and Guidance

Children look at four-digit numbers for the first time. They explore what a thousand is through concrete and pictorial representations, to recognise that 1,000 is made up of ten hundreds.

They count in multiples of 1,000, representing numbers in numerals and words.

Mathematical Talk

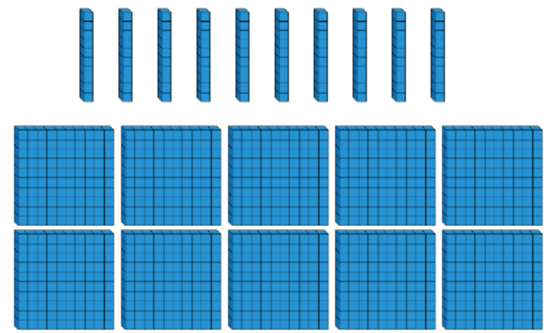
How many hundreds are there in one thousand?
How many hundreds make _____ thousands?

How is counting in thousands similar to counting in 1s?

When counting in thousands, which is the only digit to change?

How many sweets would there be in ___ jars?

Varied Fluency



____ tens make ____ hundred.

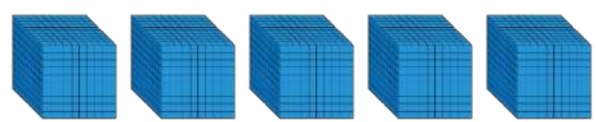
____ hundreds make ____ thousand.

How many sweets are there altogether?

1,000 1,000 1,000

There are three jars of ____ sweets.
There are ____ sweets altogether.

What numbers are represented below?



Count in 1,000s

Reasoning and Problem Solving

Always, Sometimes, Never

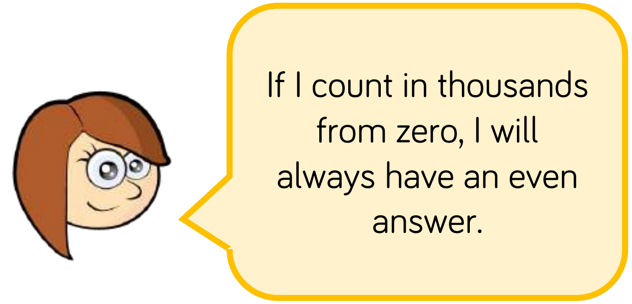
- When counting in hundreds, the ones digit changes.
- The thousands column changes every time you count in thousands.
- To count in thousands, we use 4-digit numbers.

Never, when counting in hundreds, the ones digit always stays the same.

Always, the thousands column changes every time you count in thousands.

Sometimes, to count in thousands, we use 4-digit numbers.

Rosie says,



True or false?
Explain how you know.

True, because they all end in zero, which are multiples of 10 and multiples of 10 are even.

1,000s, 100s, 10s and 1s

Notes and Guidance

Children represent numbers to 9,999, using concrete resources on a place value grid. They understand that a four-digit number is made up of 1,000s, 100s, 10s and 1s.

Moving on from Base 10 blocks, children start to partition by using place value counters and digits.

Mathematical Talk

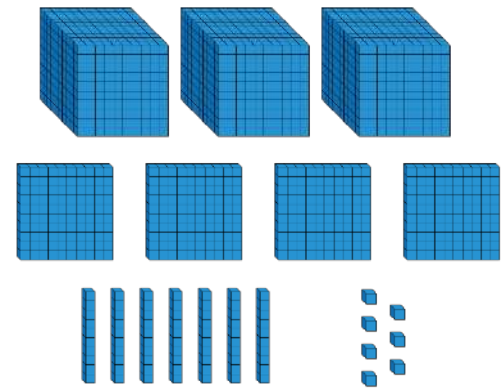
Can you represent the number on a place value grid? How many thousands/hundreds/tens/ones are there?

How do you know you have formed the number correctly? What could you use to help you?

How is the value of zero represented on a place value grid or in a number?

Varied Fluency

- Complete the sentences.

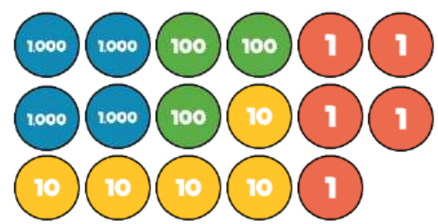


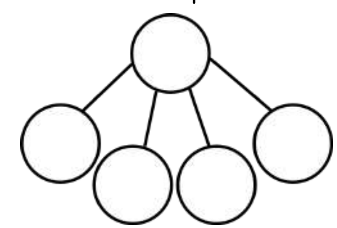
There are _____ thousands, _____ hundreds, _____ tens and _____ ones.

The number is _____ .

___ + ___ + ___ + ___ = ___

- Complete the part-whole model for the number represented.





- What is the value of the underlined digit in each number?

6,983   9,021   789   6,570

Represent each of the numbers on a place value grid.

1,000s, 100s, 10s and 1s

Reasoning and Problem Solving

Create four 4-digit numbers to fit the following rules: • The tens digit is 3 • The hundreds digit is two more than the ones digit • The four digits have a total of 12	Possible answers: 3,432 5,331 1,533 7,230
Use the clues to find the missing digits. ☐ ☐ ☐ ☐ The thousands and tens digit multiply together to make 36 The hundreds and tens digit have a digit total of 9 The ones digit is double the thousands digit. The whole number has a digit total of 21	4,098

Partitioning

Notes and Guidance

Children explore how numbers can be partitioned in more than one way.

They need to understand that, for example, 5000 + 300 + 20 + 9 is equal to 4000 + 1300 + 10 + 19
This is crucial to later work on adding and subtracting 4-digit numbers and children explore this explicitly.

Mathematical Talk

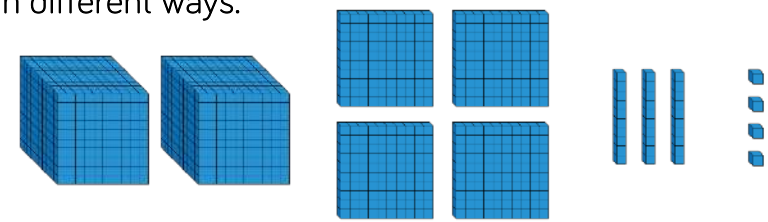
What number is being represented?

If we have 10 hundreds, can we exchange them for something?

If you know ten 100s are equal to 1,000 or ten 10s are equal to 100, how can you use this to make different exchanges?

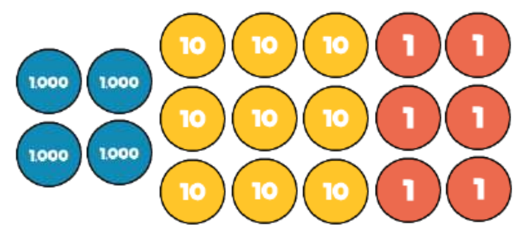
Varied Fluency

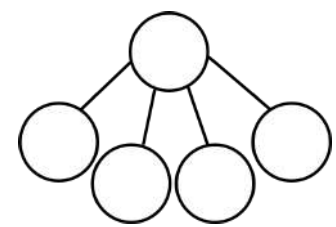
- Move the Base 10 around and make exchanges to represent the number in different ways.



2000 + 400 + ☐ + 4
1000 + ☐ + ☐ + 14
1000 + 1300 + ☐ + ☐

- Represent the number in two different ways in a part-whole model.





- Eva describes a number. She says,
  "My number has 4 thousands and 301 ones"
  What is Eva's number?
  Can you describe Eva's number in a different way?

Partitioning

Reasoning and Problem Solving

Which is the odd one out?

3,500 | 3,500 ones

2 thousands and 15 hundreds | 35 tens

Explain how you know.

35 tens is the odd one out because it does not make 3,500, it makes 350

Jack says:

My number has five thousands, three hundreds and 64 ones.

My number has fifty three hundreds, 6 tens and 4 ones.

Amir says:

Who has the largest number? Explain.

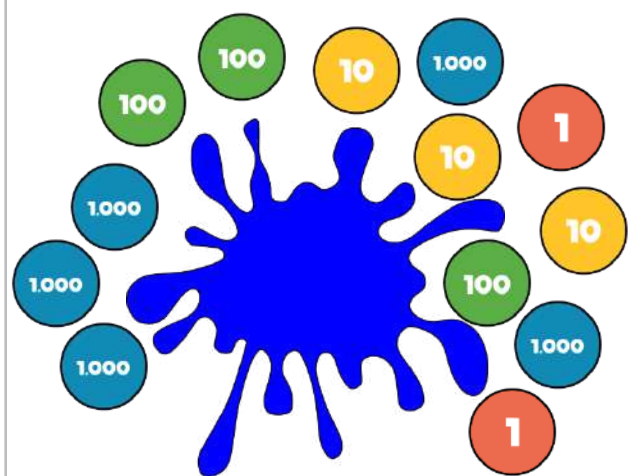
They both have the same number because 53 hundreds is equal to 5 thousands and 3 hundreds. Jack and Amir both have 5,364

Some place value counters are hidden.

The total is six thousand, four hundred and thirty two.

Which place value counters could be hidden?

Think of at least three solutions.



Possible answers:

One 1,000 counter and one 100 counter.

Ten 100 counters and ten 10 counters.

Eleven 100 counters.

White Rose Maths

Number Line to 10,000

Notes and Guidance

Children estimate, label and draw numbers on a number line to 10,000

They need to understand that it is possible to count forwards or backwards, in equal steps, from both sides.

Number lines should be shown with or without start and end numbers, or with numbers already placed on it.

Mathematical Talk

Which side of the number line did you start from? Why?

When estimating where a number should be placed, on a number line, what can help you?

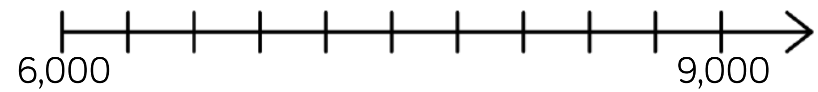
Can you use your knowledge of place value to prove that you are correct?

When a number line has no values at the end, what strategies could you use to help you figure out the missing value? Could there be more than one answer?

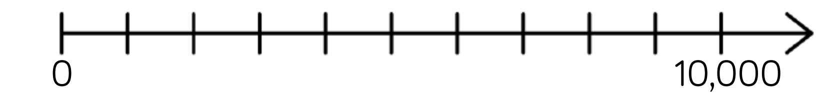
Varied Fluency

- Draw arrows to show where the numbers would be on the number line.

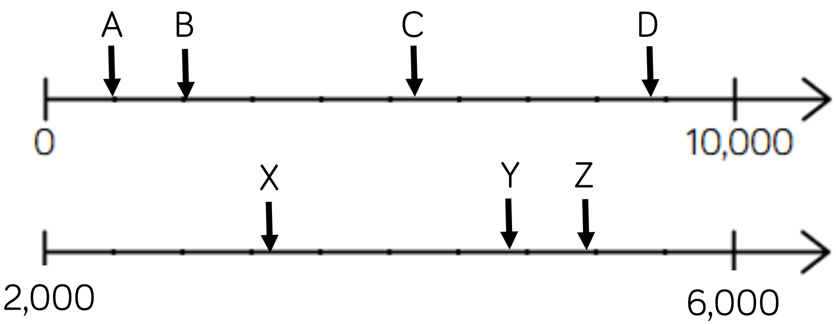
8,750



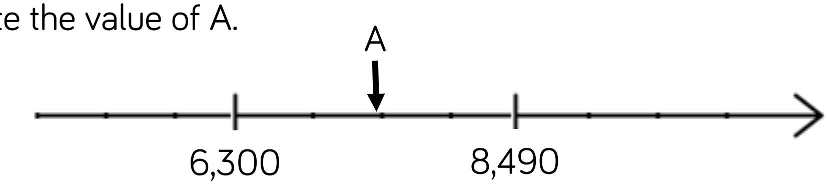
4,100



- Estimate the value of each letter.



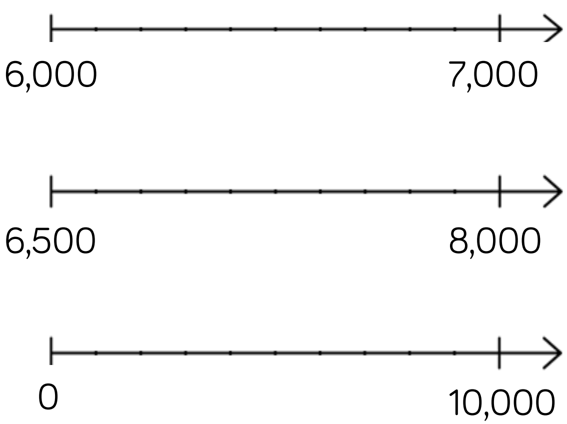
- Estimate the value of A.



Number Line to 10,000

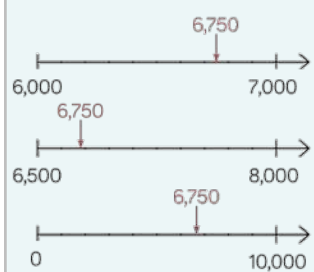
Reasoning and Problem Solving

Place 6,750 on each of the number lines.

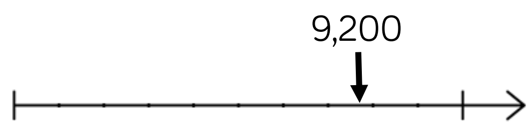


Are they in the same place on each line? Why?

No, each line has different numbers at the start and end so the position of 6,750 changes.



If the number on the number line is 9,200, what could the start and end numbers be?
Find three different possible answers.



Possible answers:

8,400 – 9,500
5,000 – 10,000
9,120 – 9,920

White Rose Maths

1, 10, 100 More or Less

Notes and Guidance

Building on children's learning in Year 2 where they explored finding one more/less, children now move onto finding 10 and 100 more or less than a given number.

Show children that they can represent their answer in a variety of different ways. For example, as numerals or words, or with concrete manipulatives.

Mathematical Talk

What is 10 more than/less than ____?

What is 100 more than/less than ____?

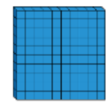
Which column changes? Can more than one column change?

What happens when I subtract 10 from 209?
Why is this more difficult?

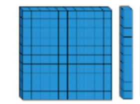
Varied Fluency

R

Put the correct number in each box.


10 less

[ ]
Number


10 more

100 less

[ ]
Number

100 more

Show ten more and ten less than the following numbers using Base 10 and place value counters.

550 724 302

Complete the table.

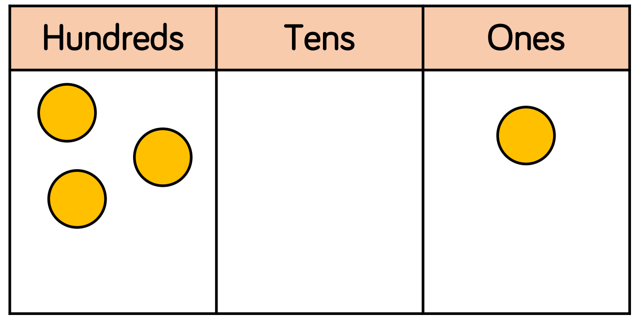
100 less	Number	100 more
		
		

1, 10, 100 More or Less

Reasoning and Problem Solving

10 more than my number is the same as 100 less than 320 What is my number? Explain how you know. Write your own similar problem to describe the original number.	The number described is 210 because 100 less than 320 is 220, which means 220 is 10 more than the original number.
I think of a number, add ten, subtract one hundred and then add one. My answer is 256 What number did I start with? Explain how you know. What can you do to check?	The start number was 345 because one less than 256 is 255, one hundred more than 255 is 355 and ten less than 355 is 345 To check I can follow the steps back to get 256

A counter is missing on the place value chart.



What number could it have been?

Possible answers:
401
311
302

1,000 More or Less

Notes and Guidance

Children have explored finding 1, 10 and 100 more or less, in Year 3. They now extend their learning by finding 1,000 more or less than a given number.

Show children that they can represent their answer in a number of ways, for example using place value counters, Base 10 or numerals.

Mathematical Talk

What is 1,000 more than/less than a number?
Which column changes when I find 1,000 more or less?

What happens when I subtract 1,000 from 9,209?

Can you show me two different ways of showing 1,000 more/less than e.g. pictures, place value charts, equipment.

Complete this sentence: I know that 1,000 more than _____ is _____ because … I can prove this by _____ .

Varied Fluency

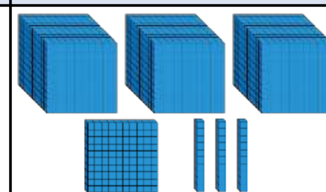
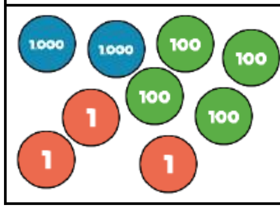
Fill in the missing values.

9,523 + 10 = ☐

☐ + 3,589 = 3,689

3,891 + ☐ = 4,891

Complete the table.

1,000 less	Number	1,000 more
		
		

Find 1,000 more and 1,000 less than each number.

5,000 7,500 2,359 8,999

Use concrete resources to prove you are correct.

1,000 More or Less

Reasoning and Problem Solving

Complete the missing boxes:

4,896 → + 1,000 → [ ]

3,784 → [ ] → 2,784

[ ] → − 1,000 → 986

4,896 → + 1,000 → 5,896

3,784 → − 1,000 → 2,784

1,986 → − 1,000 → 986

10 less than my number is 1,000 more than 5,300. What is my number?

Can you write your own problem similar to this?

6,310

Jack says:

When I add 1,000 to 4,325, I only have to change 1 digit.

Is he correct?
Which digit does he need to change?

Yes, he is correct. He will need to change the thousands digit (4).

Fill in the boxes by finding the patterns:

3,210		1,210	
3,110			
			6,010

210, 1,210, 2,210, 3,210, 3,110, 3,010, 2,910, 4,010, 5,010, 6,010

Compare 4-digit Numbers

Notes and Guidance

Children compare 4-digit numbers using comparison language and symbols to determine/show which is greater and which is smaller.

Children should represent numbers using concrete manipulatives, draw them pictorially and write them using numerals.

Mathematical Talk

Which two numbers are being represented?

Do you start counting the thousands, hundreds, tens or ones first? Why?

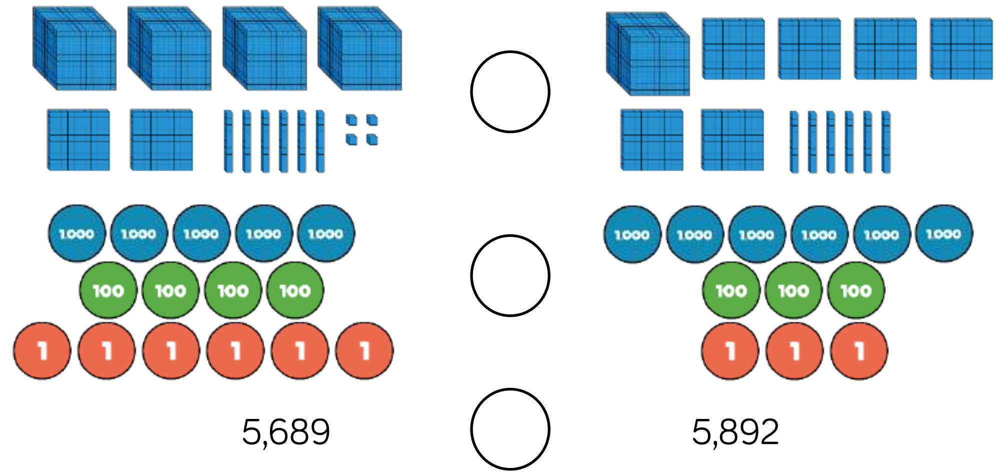
Which column do you start comparing from? Why?

What strategy did you use to compare the two numbers? Is this the same or different to your partner?

How many answers can you find?

Varied Fluency

- Complete the statements using < , > or =



5,689 ◯ 5,892

- Circle the smallest amount in each pair.

Two thousand, three hundred and ninety seven	3,792
6,000 + 400 + 50 + 6	6,455
9 thousands, 2 hundreds and 6 ones	9,602

- Complete the statements.

1,985 > ___

4,203 < 4,000 + ___ + 4

Compare 4-digit Numbers

Reasoning and Problem Solving

I am thinking of a number. It is greater than 3,000, but smaller than 5,000 The digits add up to 15 What could the number be? Write down as many possibilities as you can. The difference between the largest and smallest digit is 6. How many numbers do you now have?	I have 13 numbers: 3,228 3,282 3,822 4,560 4,650 4,506 4,605 3,660 3,606 3,147 3,174 3,417 3,471
Use digit cards 1 to 5 to complete the comparisons: 564☐ < ☐73☐ 2☐38 > 23☐5 You can only use each digit once.	Possible answer: 5641 < 5732 2438 > 2335

Order Numbers

Notes and Guidance

Children explore ordering a set of numbers in ascending and descending order. They reinforce their understanding by using a variety of representations.

Children find the largest or smallest number from a set.

Mathematical Talk

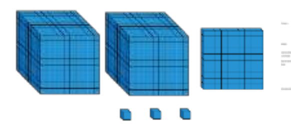
Which number is the greatest? Which number is smallest? How do you know?

Why have you chosen to order the numbers this way?

What strategy did you use to solve this problem?

Varied Fluency

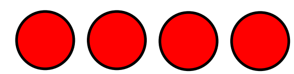
- Fill in the circle using $<$, $>$ or $=$

2,764 ◯  ◯ XXVII

- Here are four digit cards: 4 0 5 3

Arrange them to make as many different 4-digit numbers as you can and put them in ascending order.

- Rearrange four counters in the place value chart to make different numbers.



1000s	100s	10s	1s

Record all your numbers and write them in descending order.

Order Numbers

Reasoning and Problem Solving

Alex has ordered five 4-digit numbers. The smallest number is 3,450, and the largest number is 3,650

All the other numbers have digit totals of 20

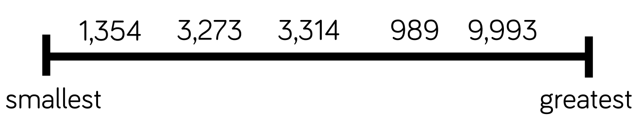
What could the other three numbers be?

3,476

3,584

3,593

What mistake has been made?

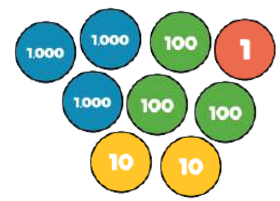


The number 989 is in the wrong place. A common misconception could be that the first digit is a high number the whole number must be large. They have forgotten to check how many digits there are in the number before ordering.

Put these amounts in ascending order.

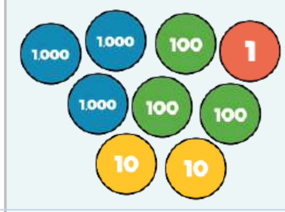
Half of 2,400

LXXXVI



LXXXVI

Half of 2,400



Put one number in each box so that the list of numbers is ordered smallest to largest.

1000s	100s	10s	1s
1	1		3
1		2	7
1	2	5	
1		5	9
1	3	8	
1		1	5

Can you find more than one way?

Possible answer:

1000s	100s	10s	1s
1	1	1	3
1	1	2	7
1	2	5	0
1	3	5	9
1	3	8	4
1	4	1	5

Round to the Nearest 1,000

Notes and Guidance

Children build on their knowledge of rounding to the nearest 10 and 100, to round to the nearest thousand for the first time.

Children must understand which multiples of 1,000 a number sits between.

When rounding to the nearest 1,000, children should look at the digits in the hundreds column.

Mathematical Talk

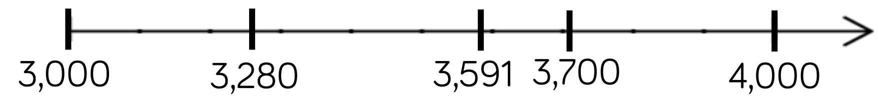
Which thousands numbers does _____ sit between?

How can the number line help you to see which numbers round up/down?

Which place value column do we need to look at when we round the nearest 1,000?

Varied Fluency

- Say whether each number on the number line is closer to 3,000 or 4,000



Round 3,280, 3,591 and 3,700 to the nearest thousand.

- Round these numbers to the nearest 1,000
  - Eight thousand and fifty-six
  - 5 thousands, 5 hundreds, 5 tens and 5 ones
  - 

  - LXXXII

- Complete the table.

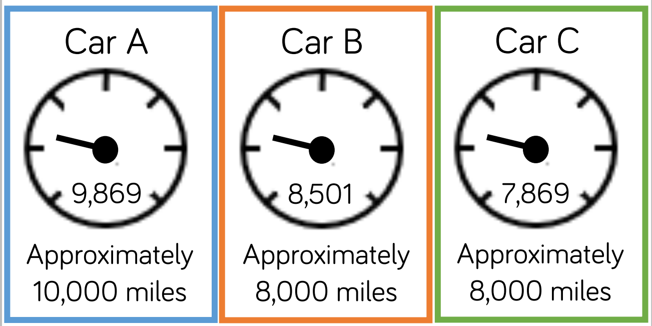
Start number	Rounded to the nearest 10	Rounded to the nearest 100	Rounded to the nearest 1,000
			
4,999			
LXXXII			

Round to the Nearest 1,000

Reasoning and Problem Solving

David's mum and dad are buying a car.

They look at the following cars:



Are all of the cars correctly advertised?

Explain your reasoning.

Car B is incorrectly advertised. It should be rounded up to 9,000

A number is rounded to the nearest thousand.

The answer is 7,000

What could the original number have been?

Give five possibilities.

What is the greatest number possible?

What is the smallest number possible?

Possible answers:

6,678
7,423
7,192
6,991

Greatest: 7,499
Smallest: 6,500

Count in 25s

Notes and Guidance

Children will count in 25s to spot patterns. They use their knowledge of counting in 50s and 100s to become fluent in 25s.

Children should recognise and use the number facts that there are two 25s in 50 and four 25s in 100.

Mathematical Talk

What is the first/second number pattern counting up in?
Can you notice a pattern as the numbers increase/decrease?
Are any numbers in both of the number patterns? Why?

What digit do multiples of 25 end in?

What's the same and what's different when counting in 50s and 25s?

Varied Fluency

Look at the number patterns.
What do you notice?

25	50	75	100	125	150

50	100	150	200	250	300

Complete the number tracks

25		75		125	150				250

	725	700		650		600			

Circle the mistake in each sequence.

2, 275   2,300   2,325   2,350   2,400, …

1,000   975   925   900   875 …

Count in 25s

Reasoning and Problem Solving

Whitney is counting in 25s and 1,000s.
She says:

- Multiples of 1,000 are also multiples of 25
- Multiples of 25 are therefore multiples of 1,000

Do you agree with Whitney?
Explain why.

I don't agree. Multiples of 1,000 are multiples of 25 because 25 goes into 1,000 exactly, but not all multiples of 25 are multiples of 1,000 e.g. 1,075

Ron is counting down in 25s from 790.
Will he say 725?

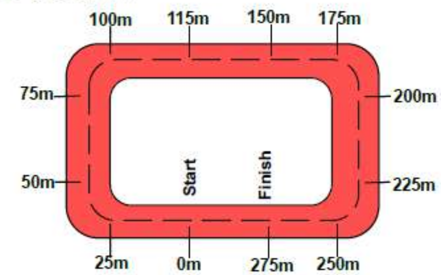
Explain your answer.

No, he will not say 725 because:

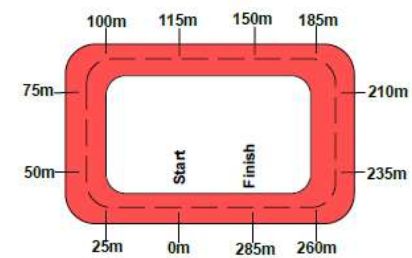
790, 765, 740, 715, 690, 665, …

Two race tracks have been split into 25m intervals.

Race track A



Race track B



What errors have been made?

Possible answers:

Race track A has miscounted when adding 25 m to 100 m. After this they have continued to count in 25s correctly from 150

Race track B has miscounted when adding 25 m to 150 m. They have then added 25 m from this point.

Negative Numbers

Notes and Guidance

Children recognise that there are numbers below zero. It is essential that this concept is linked to real life situations such as temperature, water depth etc.
Children should be able to count back through zero using correct mathematical language of "negative four" rather than "minus four" for example. This counting can be supported through the use of number squares, number lines or other visual aids.

Mathematical Talk

What number is missing next to −5? Can you count up to fill in the missing numbers?

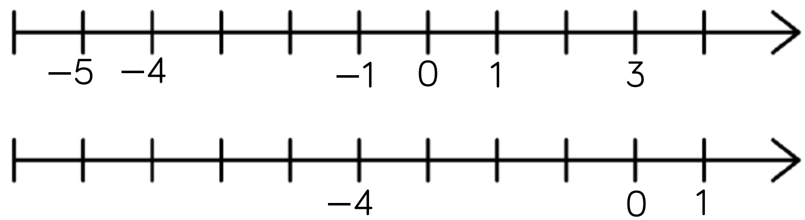
Can you use the words positive and negative in a sentence to describe numbers?

What do you notice about positive and negative numbers on the number line? Can you see any patterns?

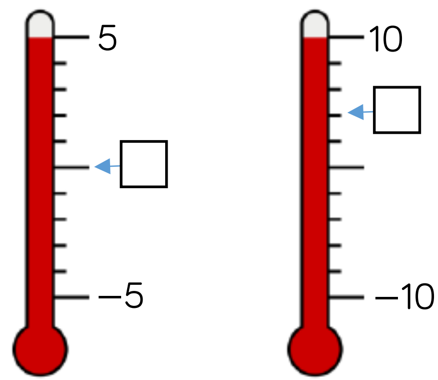
Is −1 degrees warmer or colder than −4 degrees?

Varied Fluency

Complete the number lines



Fill in the missing temperatures on the thermometers.



Dexter is counting backwards out loud.
He says,
"Two, one, negative one, negative two, negative three ..."
What mistake has Dexter made?

Negative Numbers

Reasoning and Problem Solving

Can you spot the mistake in these number sequences? a) 2, 0, 0, −2, −4 b) 1, −2, −4, −6, −8 c) 5, 0, −5, −10, −20 Explain how you found the mistake and convince me you are correct.	a) 0 is incorrect as it is written twice. b) 1 is incorrect. The sequence has a difference of 2 each time, so the first number should be 2 c) −20 is incorrect. The sequence is decreasing by 5, so the final number should be −15
Teddy counted down in 3s until he reached −18 He started at 21, what was the tenth number he said?	−6 Ensure the first number said is 21 21, 18, 15, 12, 9, 6, 3, 0, −3,−6, …

Roman Numerals

Notes and Guidance

Children will build on their knowledge of numerals to 12 on a clock face, from Year 3, to explore Roman Numerals to 100

They explore what is the same and what is different between the number systems, including the fact that in the Roman system there is no symbol for zero and so no placeholders.

Mathematical Talk

Why is there no zero in the Roman Numerals? What might it look like?

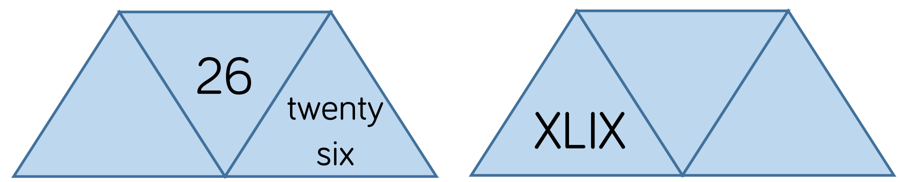
Can you spot any patterns? If 20 is XX what might 200 be?

How can you check you have represented the Roman Numeral correctly? Can you use numbers you know, such as 10 and 100 to help you?

Varied Fluency

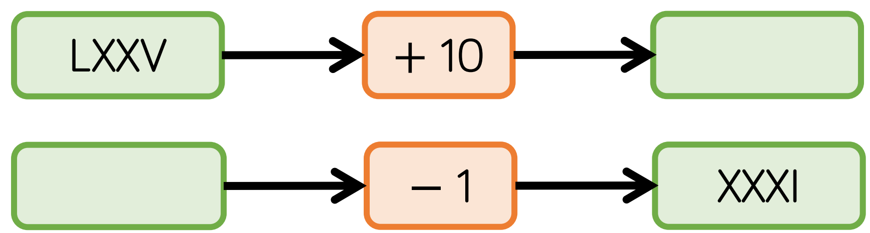
- Lollipop stick activity.
  The teacher shouts out a number and the children make it with lollipop sticks.
  Children could also do this in pairs or groups, and for a bit of fun they could test the teacher!

- Each diagram shows a number in numerals, words and Roman Numerals.



  Complete the diagrams.

- Complete the function machines.



Roman Numerals

Reasoning and Problem Solving

Solve the following calculation:

XIV + XXXVI = ____

How many other calculations, using Roman Numerals, can you write to get the same total?

Answer: L

Other possible calculations include:

C ÷ II = L
L ÷ I = L

X × V = L
XXV × II = L

LXV – XV = L
C – L = L

XX + XX + X = L

Mo says:

> In the 10 times table, all the numbers have a zero. Therefore, in Roman Numerals all multiples of 10 have an X

Research and give examples to prove whether or not Mo is correct.

Mo is incorrect. A lot of multiples of 10 have an X in them, but the X can mean different things depending on its position.
For example, X in 10 just means one ten, but X in XL means 10 less than 50
X in 60 (LX) means 10 more than 50
The number 50 has no X and neither does 100

White Rose Maths

Autumn - Block 2

Addition & Subtraction

Overview

Small Steps

- Add and subtract 1s, 10s, 100s and 1,000s
- Add two 3-digit numbers - not crossing 10 or 100 (R)
- Add two 4-digit numbers – no exchange
- Add two 3-digit numbers - crossing 10 or 100 (R)
- Add two 4-digit numbers – one exchange
- Add two 4-digit numbers – more than one exchange
- Subtract a 3-digit number from a 3-digit number - no exchange (R)
- Subtract two 4-digit numbers – no exchange
- Subtract a 3-digit number from a 3-digit number - exchange (R)
- Subtract two 4-digit numbers – one exchange
- Subtract two 4-digit numbers – more than one exchange
- Efficient subtraction
- Estimate answers
- Checking strategies

Notes for 2020/21

As we move through the autumn term we've suggested you spend a little more time on addition and subtraction making sure children can add any 2 and 3 digit numbers, before moving into 4 digit numbers.

Ensuring children have this solid foundation will make the move into larger numbers much simpler.

1s, 10s, 100s, 1,000s

Notes and Guidance

Children build on prior learning of adding and subtracting hundreds, tens and ones. They are introduced to adding and subtracting thousands.

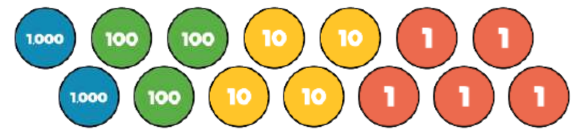
Children should use concrete representations (Base 10, place value counters etc.) before moving to abstract and mental methods.

Mathematical Talk

Can you represent the numbers using Base 10 and place value counters? What's the same about the representations? What's different?

If we are adding tens, are the digits in the tens column the only ones that change? Do the ones/hundreds/thousands ever change?

Varied Fluency



The number being represented is ____.

Add 3 thousands to the number. What do you have now?

Add 3 hundreds to the number. What do you have now?

Subtract 3 tens from the number. What do you have now?

Add 5 ones to the number. What do you have now?

Here is a number.

Thousands	Hundreds	Tens	Ones
5	3	8	2

Add 3 thousands to the number.
Subtract 4 thousands from the answer.
Subtract 2 ones.
Add 5 tens.
What number do you have now?

White Rose Maths

1s, 10s, 100s, 1,000s

Reasoning and Problem Solving

Which questions are easy?
Which questions are hard?

8,273 + 4 = ____

8,273 + 4 tens = ____

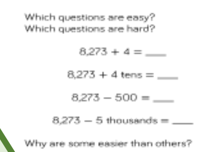
8,273 – 500 = ____

8,273 – 5 thousands = ____

Why are some easier than others?

8,273 + 4 and 8,273 – 5 thousands are easier because you do not cross any boundaries. 8,723 + 4 tens and 8,273 – 500 are harder because you have to cross boundaries and make an exchange.

Mo says,


Which questions are easy?
Which questions are hard?
8,273 + 4 = ___
8,273 + 4 tens = ___
8,273 – 500 = ___
8,273 – 5 thousands = ___
Why are some easier than others?

> When I add hundreds to a number, only the hundreds column will change.

Is Mo correct? Explain your answer.

Mo is incorrect because when you add hundreds to a number and end up with more than ten hundreds, you have to make an exchange which also affects the thousands column.

Add Two 3-digit Numbers (1)

Notes and Guidance

Children add two 3-digit numbers with no exchange. They should focus on the lining up of the digits and setting the additions clearly out in columns.
Having exchanged between columns in recent steps, look out for children who exchange ones and tens when they don't need to.
Reinforce that we only exchange when there are 10 or more in a column.

Mathematical Talk

Where would these digits go on the place value chart? Why?

Why do we make both numbers when we add?

Can you represent____using the equipment?

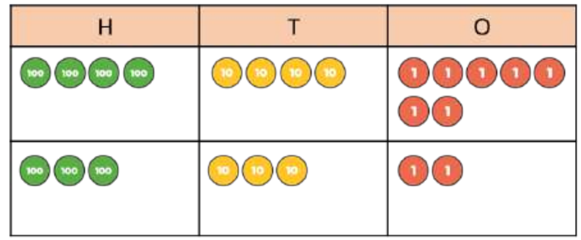
Can you draw a picture to represent this?

Why is it important to put the digits in the correct column?

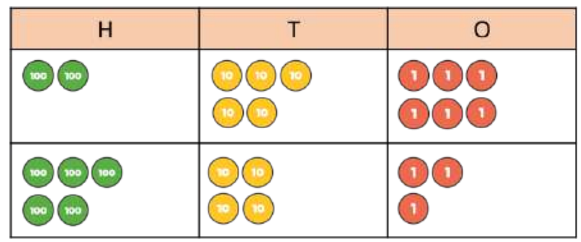
Varied Fluency

R

Complete the calculations.



___ + ___ = ___



___ + ___ = ___

Use the column method to calculate:

- Three hundred and forty-five add two hundred and thirty-six.
- Five hundred and sixteen plus three hundred and sixty-two.
- The total of two hundred and forty-seven and four hundred and two.

Add Two 3-digit Numbers (1)

Reasoning and Problem Solving

Jack is calculating 506 + 243

Here is his working out.

		5	6
+	2	4	3
	2	9	9

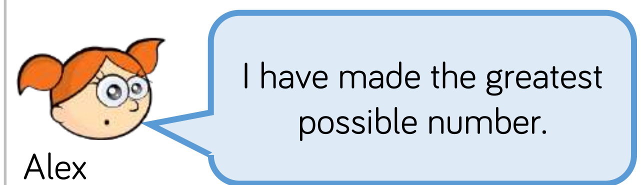
Can you spot Jack's mistake?
Work out the correct answer.

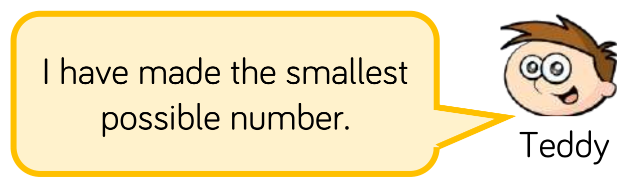
Jack hasn't used zero as a place holder in the tens column.
The correct answer should be 749

Here are three digit cards.

2 3 4

Alex and Teddy are making 3-digit numbers using each card once.





Work out the total of their two numbers.

Alex's number is 432
Teddy's number is 234

The total is 666

Add Two 4-digit Numbers (1)

Notes and Guidance

Children use their understanding of addition of 3-digit numbers to add two 4-digit numbers with no exchange.

They use concrete equipment and a place value grid to support their understanding alongside column addition.

Mathematical Talk

How many ones are there altogether? Can we make an exchange? Why? (Repeat questions for other columns)

Is it more difficult to add 3-digit or 4-digit numbers without exchanging? Why?

How can you find the missing numbers? Do you need to add or subtract?

Varied Fluency

- Use counters and a place value grid to calculate 242 + 213

- Use counters and a place value grid to calculate 3,242 + 2,213

1,000s	100s	10s	1s
1,000 1,000 1,000	100 100	10 10 10 10	1 1
1,000 1,000	100 100	10	1 1 1

Now calculate 3,242 + 213 in the same way.
What is the same and what is different?

- Work out the missing numbers.

	Th	H	T	O
	4	___	6	___
+	2	5	___	1
	___	7	8	9

Add Two 4-digit Numbers (1)

Reasoning and Problem Solving

Rosie adds 2 numbers together that total 4,444

Both numbers have 4 digits.

All the digits in both numbers are even.

What could the numbers be?

Prove it.

How many ways can you find?

Possible answers:

2,222 + 2,222
2,244 + 2,200
2,224 + 2,220
2,442 + 2,002
2,242 + 2,202
2,424 + 2,020
2,422 + 2,022
2,444 + 2,000

There are more possible pairs. This includes 0 as an even number. Discussion could be had around whether 0 is odd or even and why.

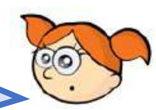
Two children completed the following calculation:

1,234 + 345

Dora

My answer is 1,589

My answer is 4,684



Alex

Both of the children have made a mistake in their calculations.

Calculate the actual answer to the question.

What mistakes did they make?

The actual answer is 1,579

Dora's mistake was a miscalculation for the 10s column, adding 30 and 40 to get 80 rather than 70

Alex's mistake was a place value error, placing the 3 hundred in the thousands column and following the calculation through incorrectly.

White Rose Maths

Add Two 3-digit Numbers (2)

Notes and Guidance

Children add two 3-digit numbers with an exchange. They start by adding numbers where there is one exchange required before looking at questions where they need to exchange in two different columns. Children may use Base 10 or place value counters to model their understanding. Ensure that children continue to show the written method alongside the concrete so they understand when and why an exchange takes place.

Mathematical Talk

How many ones do we need to exchange for one ten?

How many tens do we need to exchange for one hundred?

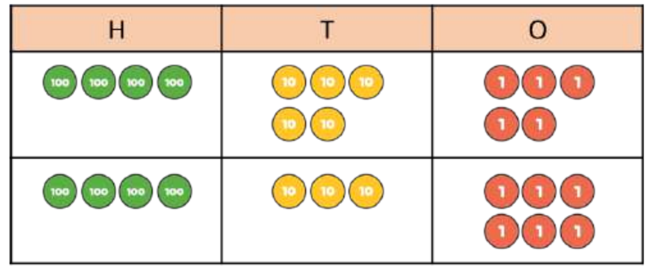
Can you work out how many points Eva and Ron scored each over the two games?

Why is it so important to show the exchanged digit on the column method?

Varied Fluency

R

- Use place value counters to calculate 455 + 436

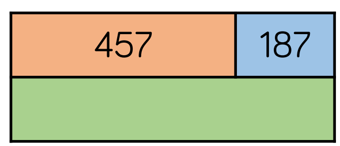


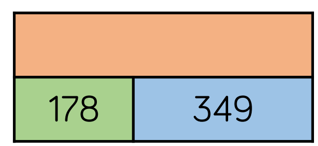
	4	5	5
+	4	3	6

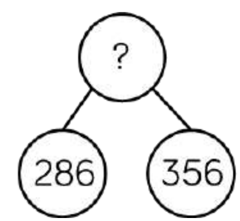
- Eva and Ron are playing a game.
Eva scores 351 points and Ron scores 478 points.
How many points do they score altogether?
How many more points does Ron score than Eva?

  Eva and Ron play the game again.
Eva scores 281 points, Ron scores 60 less than Eva.
How many points do they score altogether?

- Complete the models.







White Rose Maths

Add Two 3-digit Numbers (2)

Reasoning and Problem Solving

R

Roll a 1 to 6 die.
Fill in a box each time you roll.

☐☐☐ + ☐☐☐ =

Can you make the total:

- An odd number
- An even number
- A multiple of 5
- The greatest possible number
- The smallest possible number

Discuss the rules with the children and what they would need to roll to get them e.g. to get an odd number only one of the ones should be odd because if both ones have an odd number, their total will be even.

Complete the statements to make them correct.

487 + 368 ◯ 487 + 468

326 + 258 ◯ 325 + 259

391 + 600 = 401 + ___

Explain why you do not have to work out the answers to compare them.

<

=

590

In the first one we start with the same number, so the one we add more to will be greater.
In the second 325 is one less than 326 and 259 is one more than 258, so the total will be the same.
In the last one 401 is 10 more than 391, so we need to add 10 less than 600.

Add Two 4-digit Numbers (2)

Notes and Guidance

Children add two 4-digit numbers with one exchange. They use a place value grid to support understanding alongside column addition.

They explore exchanges as they occur in different place value columns and look for similarities/differences.

Mathematical Talk

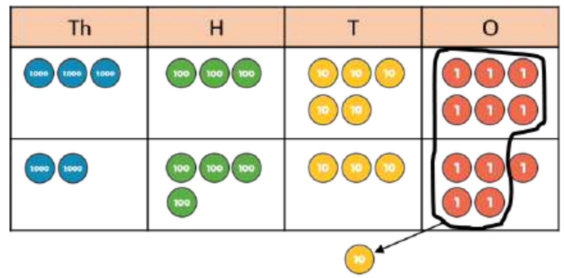
How many ones do we have altogether? Can we make an exchange? Why? How many ones do we exchange for one ten? Do we have any ones remaining? (Repeat for other columns.)

Why is it important to line up the digits in the correct column when adding numbers with different amounts of digits?

Which columns are affected if there are more than ten tens altogether?

Varied Fluency

- Rosie uses counters to find the total of 3,356 and 2,435



	Th	H	T	O
	3	3	5	6
+	2	4	3	5
	5	7	9	1
			1	

Use Rosie's method to calculate:
3,356 + 2,437 3,356 + 2,473 3,356 + 2,743

- Dexter buys a laptop costing £1,265 and a mobile phone costing £492
How much do the laptop and the mobile phone cost altogether?

- Complete the bar models.

1,185	405

3,535	2,634

3,264	1,655

Add Two 4-digit Numbers (2)

Reasoning and Problem Solving

What is the missing 4-digit number?

	Th	H	T	O
	___	___	___	___
+	6	3	9	5
	8	9	4	9

2,554

Annie, Mo and Alex are working out the solution to the calculation 6,374 + 2,823

Annie's Strategy

6,000 + 2,000 = 8,000
300 + 800 = 110
70 + 20 = 90
4 + 3 = 7
8,000 + 110 + 90 + 7 = 8,207

Mo's Strategy

	6	3	7	4
+	2	8	2	3
	8	1	9	7

Alex's Strategy

	6	3	7	4
+	2	8	2	3
				7
			9	0
	1	1	0	0
	8	0	0	0
	9	1	9	7

Who is correct?

Alex is correct with 9,197

Annie has miscalculated 300 + 800, forgetting to exchange a ten hundreds to make a thousand (showing 11 tens instead of 11 hundreds).

Mo has forgotten both to show and to add on the exchanged thousand.

Add Two 4-digit Numbers (3)

Notes and Guidance

Building on adding two 4-digit numbers with one exchange, children explore multiple exchanges within an addition.

Ensure children continue to use equipment alongside the written method to help secure understanding of why exchanges take place and how we record them.

Mathematical Talk

How many ones do we have altogether? Can we make an exchange? Why? How many ones do we exchange for one ten? How many ones are remaining? (Repeat for each column.)

Why do you have to add the digits from the right to the left, starting with the smallest place value column? Would the answer be the same if you went left to right?

What is different about the total of 4,844 and 2,156? Can you think of two other numbers where this would happen?

Varied Fluency

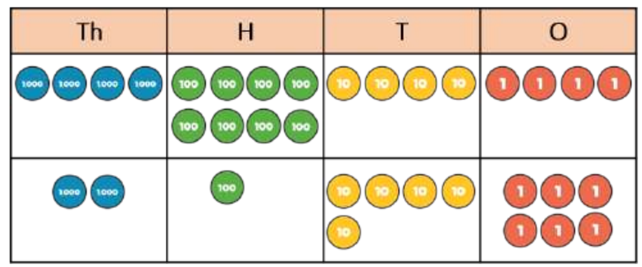
- Use counters and a place value grid to calculate:

	5	9	3	4
+	2	2	4	6

	3	2	7	5
+	6	1	5	6

	1	7	7	2
+	2	2	5	0

- Find the total of 4,844 and 2,156



	4	8	4	4
+	2	1	5	6

- Use <, > or = to make the statements correct.

3,456 + 789	◯	1,810 + 2,436
2,829 + 1,901	◯	2,312 + 2,418
7,542 + 1,858	◯	902 + 8,496
1,818 + 1,999	◯	3,110 + 707

Add Two 4-digit Numbers (3)

Reasoning and Problem Solving

Jack says,

When I add two numbers together I will only ever make up to one exchange in each column.

Do you agree?
Explain your reasoning.

Jack is correct.
When adding any two numbers together, the maximum value in any given column will be 18 (e.g. 18 ones, 18 tens, 18 hundreds). This means that only one exchange can occur in each place value column.
Children may explore what happens when more than two numbers are added together.

Complete:

	Th	H	T	O
	6	?	?	8
+	?	?	8	?
	9	3	2	5

Mo says that there is more than one possible answer for the missing numbers in the hundreds column.
Is he correct?
Explain your answer.

The solution shows the missing numbers for the ones, tens and thousands columns.

6,__38 + 2,__87

Mo is correct. The missing numbers in the hundreds column must total 1,200 (the additional 100 has been exchanged).

Possible answers include:
6,338 + 2,987
6,438 + 2,887

Subtract 3-digits from 3-digits (1)

Notes and Guidance

It is important for the children to understand that there are different methods of subtraction. They need to explore efficient strategies for subtraction, including:

- counting on (number lines)
- near subtraction
- number bonds

They then move on to setting out formal column subtraction supported by practical equipment.

Mathematical Talk

Which strategy would you use and why?

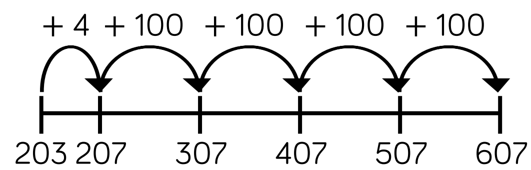
How could you check your answer is correct?

Does it matter which number is at the top of the subtraction?

Varied Fluency

We can count on using a number line to find the missing value on the bar model. E.g.

607	
203	404



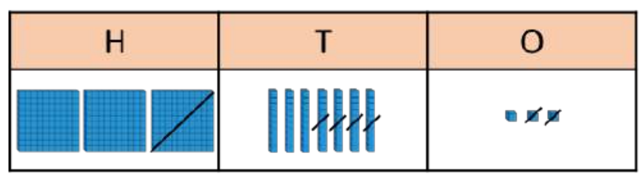
Use this method to find the missing values.

390	
273	?

294	
?	134

There are 146 girls and boys in a swimming club.
115 of them are girls. How many are boys?

Mo uses Base 10 to subtract 142 from 373



	3	7	3
–	1	4	2

Use Mo's method to calculate:
565 – 154 565 – 145 565 – 165

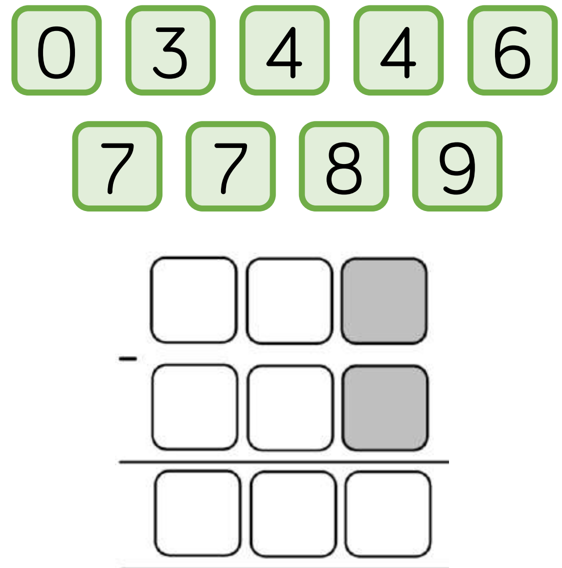
White Rose Maths

Subtract 3-digits from 3-digits (1)

Reasoning and Problem Solving

R

Start with the number 888 Roll a 1-6 die three times, to make a 3-digit number. Subtract the number from 888 What number have you got now? What's the smallest possible difference? What's the largest possible difference? What if all the digits have to be different? Will you ever find a difference that is a multiple of 10? Why? Do you have more odd or even differences?	The smallest difference is 222 from rolling 111 The largest difference is 777 from rolling 666 Children will never have a multiple of 10 because you can't roll an 8 to subtract 8 ones. Children may investigate what is subtracted in the ones column to make odd and even numbers.

Use the digit cards to complete the calculation.  The digits in the shaded boxes are odd. Is there more than one answer?	Possible answers include: 987 – 647 = 340 879 – 473 = 406

Subtract Two 4-digit Numbers (1)

Notes and Guidance

Building on their experiences in Year 3, children use their knowledge of subtracting using the formal column method to subtract two 4-digit numbers.

Children will focus on calculations with no exchanges, concentrating on the value of each digit.

Mathematical Talk

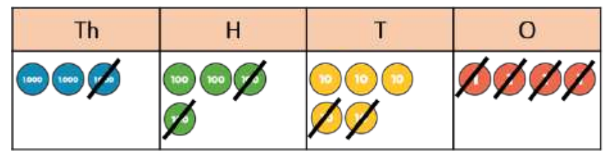
Do you need to make both numbers when you are subtracting with counters? Why?

Why is it important to always subtract the smallest place value column first?

How are your bar models different for the two problems? Can you use the written method to calculate the missing numbers?

Varied Fluency

- Eva uses place value counters to calculate 3,454 – 1,224



	Th	H	T	O
	3	4	5	4
–	1	2	2	4
	2	2	3	0

Use Eva's method to calculate:

2,348 – 235 = ____   ____ = 4,572 – 2,341

6,582 – 582 = ____   ____ = 7,262 – 7,151

- Use a bar model to represent each problem.

There are 3,597 boys and girls in a school.
2,182 are boys. How many are girls?

Car A travels 7,653 miles per year.
Car B travels 5,612 miles per year.
How much further does Car A travel than Car B per year?

Subtract Two 4-digit Numbers (1)

Reasoning and Problem Solving

Eva is performing a column subtraction with two four digit numbers.

The larger number has a digit total of 35

The smaller number has a digit total of 2

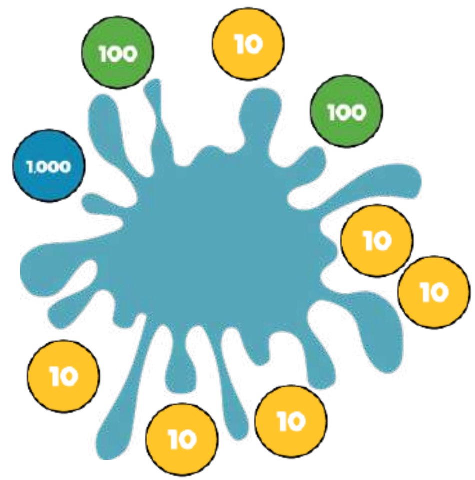
Use cards to help you find the numbers.

What could Eva's subtraction be?

How many different options can you find?

9998 – 1100 = 8898
9998 – 1010 = 8988
9998 – 1001 = 8997
9998 – 2000 = 7998
9989 – 1100 = 8889
9989 – 1010 = 8979
9989 – 1001 = 8988
9989 – 2000 = 7989
9899 – 1100 = 8799
9899 – 1010 = 8889
9899 – 1001 = 8898
9899 – 2000 = 7899
8999 – 1100 = 7899
8999 – 1010 = 7889
8999 – 1001 = 7998
8999 – 2000 = 6999

There are counters to the value of 3,470 on the table but some have been covered by the splat.



What is the total of the counters covered?
How many different ways can you make the missing total?

3470 – 1260 = 2210

Possible answers include:

- two 1000s, two 100s and one 10
- twenty-two 100s and one 10
- twenty-two 100s and ten 1s

White Rose Maths

Subtract 3-digits from 3-digits (2)

Notes and Guidance

Children explore column subtraction using concrete manipulatives. It is important to show the column method alongside so that children make the connection to the abstract method and so understand what is happening.
Children progress from an exchange in one column, to an exchange in two columns. Reinforce the importance of recording any exchanges clearly in the written method.

Mathematical Talk

Which method would you use for this calculation and why?

What happens when you can't subtract 9 ones from 7 ones? What do we need to do?

How would you teach somebody else to use column subtraction with exchange?

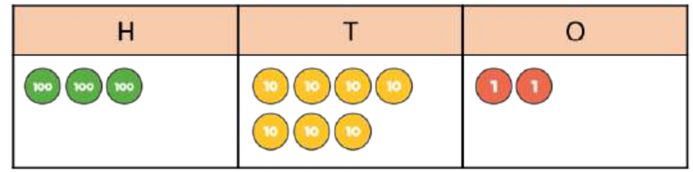
Why do we exchange? When do we exchange?

Varied Fluency

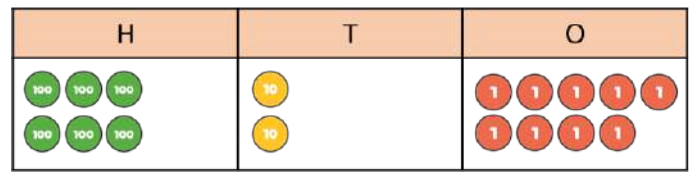
R

Complete the calculations using place value counters.

372 – 145



629 – 483



Complete the column subtractions showing any exchanges.

	H	T	O
	6	8	3
–	2	3	4

	H	T	O
	2	3	4
–	1	9	5

	H	T	O
	5	0	7
–	4	5	1

Subtract 3-digits from 3-digits (2)

Reasoning and Problem Solving

Work out the missing digits.

	H	T	O
	5	?	3
–	2	1	8
	3	1	5

	H	T	O
	?	0	?
–	2	?	8
	2	4	6

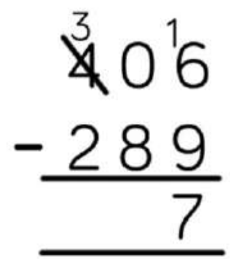
533 – 218 = 315

504 – 258 = 246

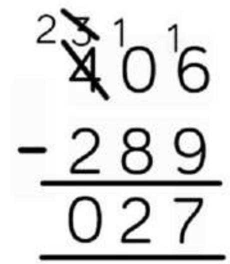
Eva is working out 406 – 289

Here is her working out:

Step 1



Step 2



Explain her mistake.

What should the answer be?

Eva has exchanged from the hundred column to the ones so there are 106 ones in the ones column. She should have exchanged 1 hundred for 10 tens and then 1 ten for 10 ones.

406 – 289 = 117

Subtract Two 4-digit Numbers (2)

Notes and Guidance

Building on their experiences in Year 3, children use their knowledge of subtracting using the formal column method to subtract two 4-digit numbers.

Children explore subtractions where there is one exchange. They use place value counters to model the exchange and match this with the written column method.

Mathematical Talk

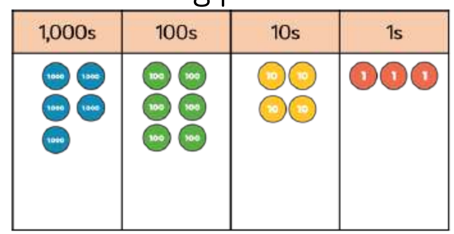
When do we need to exchange in a subtraction?
How do we indicate the exchange on the written method?

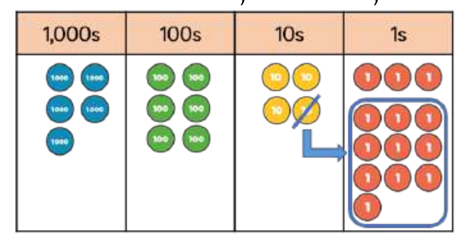
How many bars are you going to use in your bar model?
Can you find out how many tokens Mo has?
Can you find out how many tokens they have altogether?

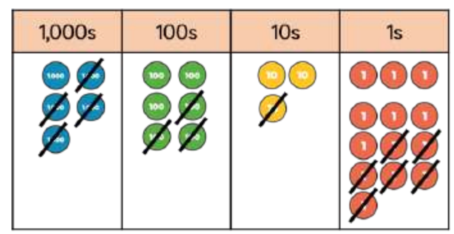
Can you create your own scenario for a friend to represent?

Varied Fluency

Dexter is using place value counters to calculate 5,643 – 4,316







	Th	H	T	O
	5	6	3 ~~4~~	1 3
–	4	3	1	6
	1	3	2	7

Use Dexter's method to calculate:
4,721 – 3,605 = 4,721 – 3,650 = 4,172 – 3,650 =

Dora and Mo are collecting book tokens.
Dora has collected 1,452 tokens.
Mo has collected 621 tokens fewer than Dora.

Represent this scenario on a bar model.
What can you find out?

Subtract Two 4-digit Numbers (2)

Reasoning and Problem Solving

1,235 people go on a school trip.

There are 1,179 children and 27 teachers. The rest are parents.

How many parents are there?

Explain your method to a friend.

Add children and teachers together first.

1,179 + 27 = 1,206

Subtract this from total number of people.

1,235 – 1,206 = 29

29 parents.

Find the missing numbers that could go into the spaces.

Give reasons for your answers.

____ – 1,345 = 4_6

What is the greatest number that could go in the first space?

What is the smallest?

How many possible answers could you have?

What is the pattern between the numbers?

What method did you use?

Possible answers:

1,751 and 0
1,761 and 10
1,771 and 20
1,781 and 30
1,791 and 40
1,801 and 50
1,811 and 60
1,821 and 70
1,831 and 80
1,841 and 90
1,841 is the greatest
1,751 is the smallest.

There are 10 possible answers. Both numbers increase by 10

Subtract Two 4-digit Numbers (3)

Notes and Guidance

Children explore what happens when a subtraction has more than one exchange. They can continue to use manipulatives to support their understanding. Some children may feel confident calculating with a written method.

Encourage children to continue to explain their working to ensure they have a secure understanding of exchange within 4-digits numbers.

Mathematical Talk

When do we need to exchange within a column subtraction?

What happens if there is a zero in the next column? How do we exchange?

Can you use place value counters or Base 10 to support your understanding?

How can you find the missing 4-digit number? Are you going to add or subtract?

Varied Fluency

- Use place value counters and the column method to calculate:

  5,783 – 844 6,737 – 759 8,252 – 6,560

  1,205 – 398 2,037 – 889 2,037 – 1,589

- A shop has 8,435 magazines.
  367 are sold in the morning and 579 are sold in the afternoon.

  How many magazines are left?

8,435		
367	579	?

  There are ____ magazines left.

- Find the missing 4-digit number.

	Th	H	T	O
	?	?	?	?
+	4	6	7	8
	7	4	3	1

Subtract Two 4-digit Numbers (3)

Reasoning and Problem Solving

Amir and Tommy solve a problem.

When I subtract 546 from 3,232 my answer is 2,714

Amir

Tommy

When I subtract 546 from 3,232 my answer is 2,686

Who is correct?
Explain your reasoning.
Why is one of the answers wrong?

Tommy is correct.

Amir is incorrect because he did not exchange, he just found the difference between the numbers in the columns instead.

There were 2,114 visitors to the museum on Saturday.
650 more people visited the museum on Saturday than on Sunday.

Altogether how many people visited the museum over the two days?

What do you need to do first to solve this problem?

First you need to find the number of visitors on Sunday which is 2,114 – 650 = 1,464

Then you need to add Saturday's visitors to that number to solve the problem.
1,464 + 2,114 = 3,578

Efficient Subtraction

Notes and Guidance

Children use their understanding of column subtraction and mental methods to find the most efficient methods of subtraction.

They compare the different methods of subtraction and discuss whether they would partition, take away or find the difference.

Mathematical Talk

Is the column method always the most efficient method?
When we find the difference, what happens if we take one off each number? Is the difference the same? How does this help us when subtracting large numbers?
When is it more efficient to count on rather than use the column method?
Can you represent your subtraction in a part-whole model or a bar model?

Varied Fluency

Ron, Rosie and Dexter are calculating 7,000 – 3,582

Here are their methods:

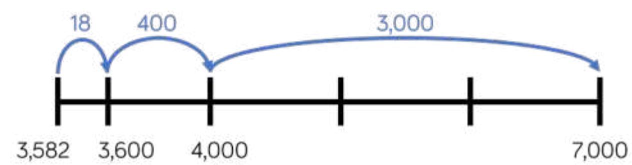
Ron

	Th	H	T	O
	^{6}~~7~~	^{9}~~0~~	^{9}~~0~~	^{1}0
–	3	5	8	2
	3	4	1	8

Rosie

	Th	H	T	O
	6	9	9	9
–	3	5	8	1
	3	4	1	8

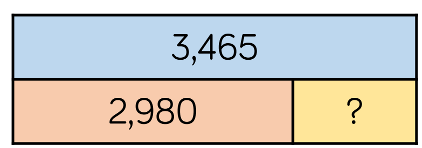
Dexter

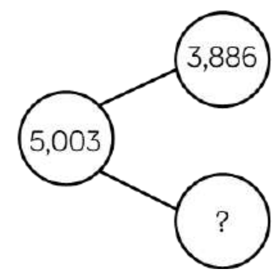


3,000 + 400 + 18 = 3,418

Whose method is most efficient?
Use the different methods to calculate 4,000 – 2,831

Find the missing numbers.
What methods did you use?





Efficient Subtraction

Reasoning and Problem Solving

Amir has £1,000

He buys a scooter for £345 and a skateboard for £110

How much money does he have left?

Show 3 different methods of finding the answer.

Explain how you completed each one.

Which is the most effective method?

Children should use the three methods demonstrated in the varied fluency section to get an answer of £545

Look at each pair of calculations.
Which one out of each pair has the same difference as 2,450 – 1,830?

2,451 – 1,831	2,451 – 1,829
2,500 – 1,880	2,500 – 1,780
2,449 – 1,829	2,449 – 1,831

When is it useful to use difference to solve subtractions?

2,451 – 1,831
Added one to each number.
2,500 – 1,880
Added 50 to both numbers.
2,449 – 1,829
Subtracted one from each number.

The difference is 620

Estimate Answers

Notes and Guidance

In this step, children use their knowledge of rounding to estimate answers for calculations and word problems.

They build on their understanding of near numbers in Year 3 to make sensible estimates.

Mathematical Talk

When in real life would we use an estimate?

Why should an estimate be quick?

Why have you rounded to the nearest 10/100/1,000?

Varied Fluency

- Match the calculations with a good estimate.

345 + 1,234	3,000 + 6,000
2,985 + 6,325	3,500 + 1,200
3,541 + 1,179	350 + 1,200
2,135 + 6,292	2,000 + 6,000

- Alex is estimating the answer to 3,625 + 4,277
She rounds the numbers to the nearest thousand, hundred and ten to give different estimates. Complete her working.

Original calculation: 3,625 + 4,277 = ____
Round to nearest thousands: 4,000 + 4,000 = ____
Round to nearest hundreds: 3,600 + ____ = ____
Round to nearest tens: ____ + ____ = ____

- Decide whether to round to the nearest 10, 100 or 1,000 and estimate the answers to the calculations.

4,623 + 3,421 9,732 – 6,489 8,934 – 1,187

Estimate Answers

Reasoning and Problem Solving

Game

The aim of the game is to get a number as close to 5,000 as possible.

Each child rolls a 1-6 die and chooses where to put the number on their grid.

Once they have each filled their grid, they add up their totals to see who is the closest.

	Th	H	T	O
	?	?	?	?
+	?	?	?	?

The aim of the game can be changed, i.e. make the smallest/largest possible total etc. Dice with more faces could also be used.

The estimated answer to a calculation is 3,400
The numbers in the calculation were rounded to the nearest 100 to find an estimate.
What could the numbers be in the original calculation?

Possible answers include

2,343 + 1,089 =

4,730 – 1,304 =

Use the number cards and + or − to make three calculations with an estimated answer of 2,500

1,295	1,120
4,002	1,489
3,812	1,449

3,812 – 1,295 (3,800 – 1,300 = 2,500)

4,002 – 1,489 (4,000 – 1,500 = 2,500)

1,449 + 1,120 (1,400 + 1,100 = 2,500)

Checking Strategies

Notes and Guidance

Children explore ways of checking to see if an answer is correct by using inverse operations.

Checking using inverse is to be encouraged so that children are using a different method and not just potentially repeating an error, for example, if they add in a different order.

Mathematical Talk

How can you tell if your answer is sensible?

What is the inverse of addition?

What is the inverse of subtraction?

Varied Fluency

- $2,300 + 4,560 = 6,860$

  Use a subtraction to check the answer to the addition.
  Is there more than one subtraction we can do to check the answer?

- If we know $3,450 + 4,520 = 7,970$, what other addition and subtraction facts do we know?

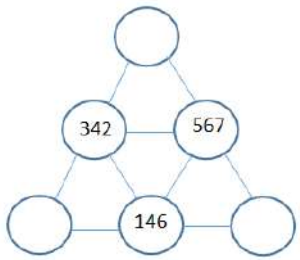
  ___ + ___ = ___

  ___ − ___ = ___

  ___ − ___ = ___

  Does the equal sign have to go at the end? Could we write an addition or subtraction with the equals sign at the beginning?
  How many more facts can you write now?

- Complete the pyramid.
  Which calculations do you use to find the missing numbers?
  Which strategies do you use to check your calculations?



Checking Strategies

Reasoning and Problem Solving

Here is a number sentence.

350 + 278 + 250

Add the numbers in different orders to find the answer.
Is one order of adding easier? Why?

Create a rule when adding more than one number of what to look for in a number.

It is easier to add 350 and 250 to make 600 and then add on 278 to make 878.
We can look for making number bonds to 10, 100 or 1,000 to make a calculation easier.

I completed an addition and then used the inverse to check my calculation.
When I checked my calculation, the answer was 3,800
One of the other numbers was 5,200
What could the calculation be?

___ + ___ = ___

___ – ___ = 3,800

Possible answers:

5,200 – 1,400 = 3,800

9,000 – 5,200 = 3,800

In the number square below, each horizontal row and vertical column adds up to 1,200
Find the missing numbers.
Is there more than one option?

897		
		832
	762	

Check the rows and columns using the inverse and adding the numbers in different orders.

There are many correct answers.

Top row missing boxes need to total 303

Middle row total 368

Bottom row total 438

897	270	33
200	168	832
103	762	335

White Rose Maths

Autumn - Block 3

Length & Perimeter

Overview

Small Steps

- Equivalent lengths - m and cm (R)
- Equivalent lengths - mm and cm (R)
- Kilometres
- Add lengths (R)
- Subtract lengths (R)
- Measure perimeter (R)
- Perimeter on a grid
- Perimeter of a rectangle
- Perimeter of rectilinear shapes

Notes for 2020/21

We've added extra time in autumn term to look at content children have likely missed at the end of Y3, particularly on metric units and conversion between them.

This is often a skill children find difficult to remember and grasp, so we think this extra time will be useful.

Equivalent Lengths – m & cm

Notes and Guidance

Children recognise that 100 cm is equivalent to 1 metre. They use this knowledge to convert other multiples of 100 cm into metres and vice versa.

When looking at lengths that are not multiples of 100, they partition the measurement and convert into metres and centimetres. At this stage, children do not use decimals. This is introduced in Year 4.

Mathematical Talk

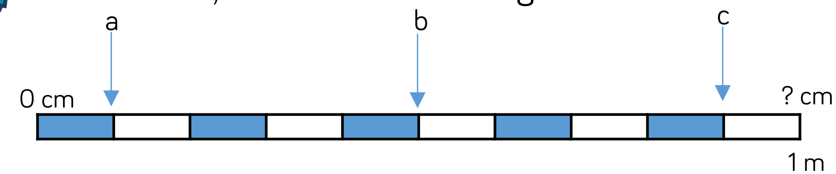
If there are 100 cm in 1 metre, how many centimetres are in 2 metres? How many centimetres are in 3 metres?

Do we need to partition 235 cm into hundreds, tens and ones to convert it to metres? Is it more efficient to partition it into two parts? What would the two parts be?

If 100 cm is equal to one whole metre, what fraction of a metre would 50 cm be equivalent to? Can you show me this in a bar model?

Varied Fluency

If a = 10 cm, calculate the missing measurements.



b = ____ cm c = ____ cm 1 metre = ____ cm

Can you match the equivalent measurements?

100 cm	9 m
5 m	200 cm
300 cm	500 cm
2 m	1 metre
900 centimetres	3 m

Eva uses this diagram to convert between centimetres and metres.
Use Eva's method to convert:

- 130 cm
- 230 cm
- 235 cm
- 535 cm
- 547 cm

120 cm	
100 cm	20 cm
1 m	20 cm
1m 20 cm	

Equivalent Lengths – m & cm

Reasoning and Problem Solving

Mo and Alex each have a skipping rope.

Alex says,

I have the longest skipping rope. My skipping rope is $2\frac{1}{2}$ metres long.

Mo says,

My skipping rope is the longest because it is 220 cm and 220 is greater than $2\frac{1}{2}$

Who is correct?
Explain your answer.

Alex is correct because her skipping rope is 250 cm long which is 30 cm more than 220 cm.

Three children are partitioning 754 cm

Teddy says,

75 m and 4 cm

Whitney says,

7 m and 54 cm

Jack says,

54 cm and 7 m

Who is correct?
Explain why.

Whitney and Jack are both correct. Teddy has incorrectly converted from cm to m when partitioning.

Equivalent Lengths – mm & cm

Notes and Guidance

Children recognise that 10 mm is equivalent to 1 cm. They use this knowledge to convert other multiples of 10 mm into centimetres and vice versa.

When looking at lengths that are not multiples of 10, they partition the measurement and convert into centimetres and millimetres. At this stage, children do not use decimals. This is introduced in Year 4.

Mathematical Talk

What items might we measure using millimetres rather than centimetres?

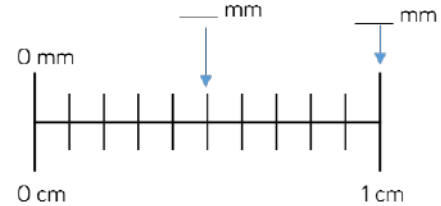
If there are 10 mm in 1 cm, how many mm would there be in 2 cm?

How many millimetres are in $\frac{1}{2}$ cm?

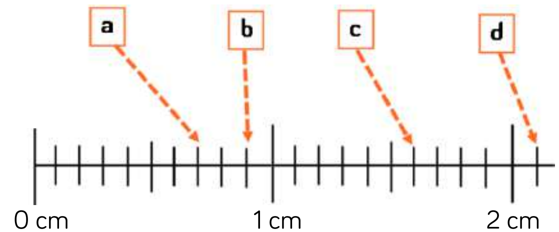
How many different ways can you partition 54 cm?

Varied Fluency

- Fill in the blanks.



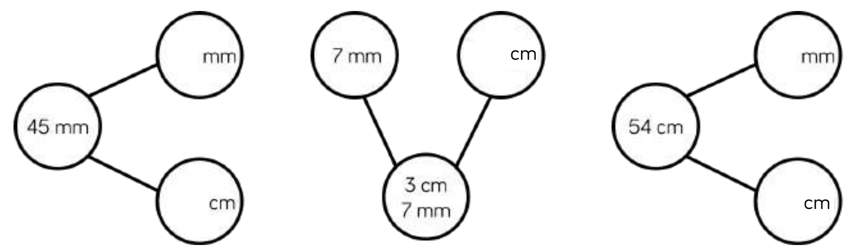
There are ____ mm in 1 cm.



a = ____ cm ____ mm
b = ____ cm ____ mm
c = ____ cm ____ mm
d = ____ cm ____ mm

- Measure different items around your classroom.
  Record your measurements in a table in cm and mm, and just mm.

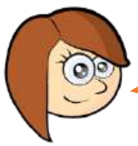
- Complete the part whole models.



Equivalent Lengths – mm & cm

Reasoning and Problem Solving

Rosie is measuring a sunflower using a 30 cm ruler.
Rosie says,



Rosie is incorrect.
Explain what mistake she might have made.
How tall is the sunflower?

Rosie is incorrect. She has used the wrong unit on the ruler.
The sunflower is 15 cm tall or 150 mm tall.

Ron is thinking of a measurement.
Use his clues to work out which measurement he is thinking of.

Ron is thinking of 84 mm (8 cm and 4 mm)

Kilometres

Notes and Guidance

Children multiply and divide by 1,000 to convert between kilometres and metres.
They apply their understanding of adding and subtracting with four-digit numbers to find two lengths that add up to a whole number of kilometres.
Children find fractions of kilometres, using their Year 3 knowledge of finding fractions of amounts. Encourage children to use bar models to support their understanding.

Mathematical Talk

Can you research different athletic running races? What different distances are the races? Can you convert the distances from metres into kilometres? Which other sports have races over distances measured in metres or kilometres?
If 10 children ran 100 metres each, how far would they run altogether? Can we go outside and do this? How long do you think it will take to run 1 kilometre?
How can we calculate half a kilometre? Can you find other fractions of a kilometre?

Varied Fluency

Complete the statements.

3,000 m = ___ km
5 km = ___ m
500 m = ___ km
9,500 m = ___ km

8 km = _______ m
3 km + 6 km = _______ m
250 m = _______ km
4,500 m – 2,000 m = _____ km

Complete the bar models.

3 kilometres	
	1,800 metres

___ km	
2,870 m	4,130 m

Use <, > or = to make the statements correct.

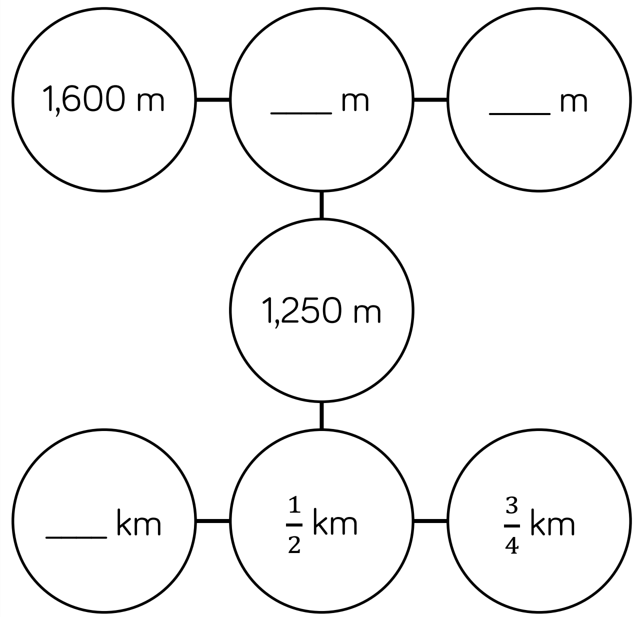
500 m	◯	$\frac{1}{2}$ km
7 km	◯	800 m
5 km	◯	500 m

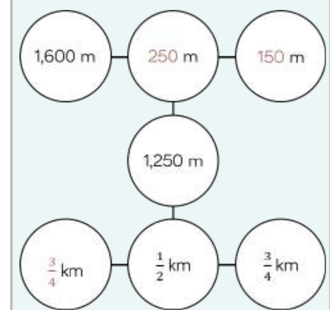
Kilometres

Reasoning and Problem Solving

Dexter and Rosie walk 15 kilometres altogether for charity. Rosie walks double the distance that Dexter walks. How far does Dexter walk?	Rosie walks 10 km. Dexter walks 5 km.
Dexter and Rosie each raise £1 for every 500 metres they walk. How much money do they each make?	Rosie raises £20 Dexter raises £10

Complete the missing measurements so that each line of three gives a total distance of 2 km.





Add Lengths

Notes and Guidance

Children add lengths given in different units of measurement. They convert measurements to the same unit of length to add more efficiently. Children should be encouraged to look for the most efficient way to calculate and develop their mental addition strategies.

This step helps prepare children for adding lengths when they calculate the perimeter.

Mathematical Talk

How did you calculate the height of the tower?

Estimate which route is the shortest from Tommy's house to his friend's house.

Which route is the longest?

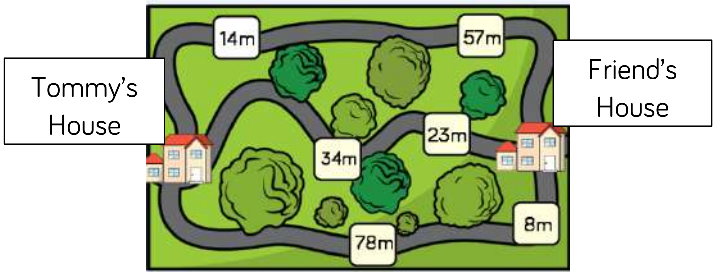
Why does converting the measurements to the same unit of length make it easier to add them?

Varied Fluency

R

- Ron builds a tower that is 14 cm tall.
  Jack builds a tower than is 27 cm tall.
  Ron puts his tower on top of Jack's tower.
  How tall is the tower altogether?

- Tommy needs to travel to his friend's house.
  He wants to take the shortest possible route.
  Which way should Tommy go?



- Miss Nicholson measured the height of four children in her class.
  What is their total height?

95 cm	1 m and 11 cm	1 m and 50 mm	89 cm

Add Lengths

Reasoning and Problem Solving

Eva is building a tower using these blocks.

100 mm 80 mm 50 mm

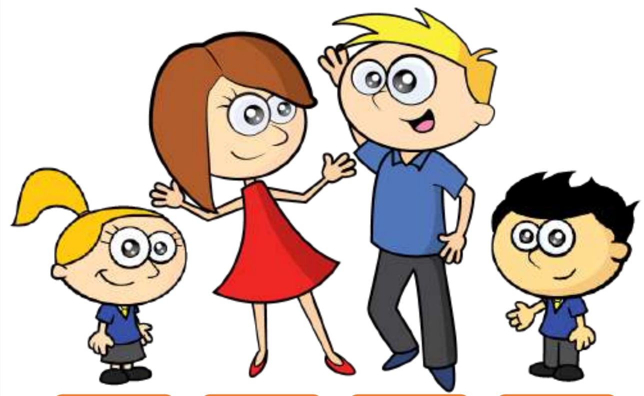
How many different ways can she build a tower measuring 56 cm?
Can you write your calculations in mm and cm?

Possible answer:

Four 100 mm blocks and two 80 mm blocks.

There are many other solutions.

Eva and her brother Jack measured the height of their family.



134 cm | 1 m and 60 cm | 1 m and 85 cm | 1 m and 10 cm

Eva thinks their total height is 4 m and 55 cm

Jack thinks their total height is 5 m and 89 cm

Who is correct? Prove it.

Jack is correct.
Eva has not included her own height.

Subtract Lengths

Notes and Guidance

Children use take-away and finding the difference to subtract lengths. Children should be encouraged to look for the most efficient way to calculate and develop their mental subtraction strategies.

This step will prepare children for finding missing lengths within perimeter.

Mathematical Talk

What is the difference between the length of the two objects? How would you work it out?

How are Alex's models different? How are they the same?

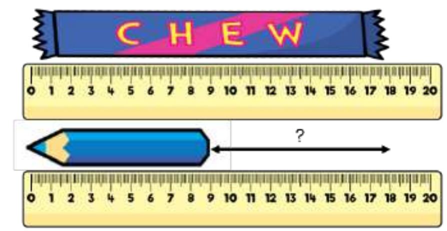
Which model do you prefer? Why?

What is the most efficient way to subtract mixed units?

Varied Fluency

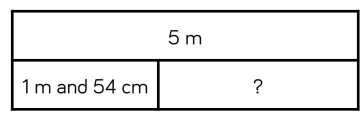
R

- Find the difference in length between the chew bar and the pencil.

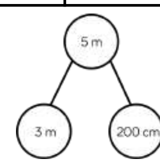


The chew bar is ___ cm long.
The pencil is ___ cm long.
The chew bar is ___ cm longer than the pencil.

- Alex has 5 m of rope. She uses 1 m and 54 cm to make a skipping rope. She works out how much rope she has left using two different models.



5 m – 1 m = 4 m
4 m – 54 cm = 3 m 46 cm



200 cm – 154 cm = 46 cm
3 m + 46 cm = 3 m 46 cm

Use the models to solve:

- Mrs Brook's ball of wool is 10 m long. She uses 4 m and 28 cm to knit a scarf. How much does she have left?
- A roll of tape is 3 m long. If I use 68 cm of it wrapping presents, how much will I have left?

Subtract Lengths

Reasoning and Problem Solving

R

A bike race is 950 m long.
Teddy cycles 243 m and stops for a break.
He cycles another 459 m and stops for another break.
How much further does he need to cycle to complete the race?

Teddy needs to cycle 248 metres further.

A train is 20 metres long.
A car is 15 metres shorter than the train.
A bike is 350 cm shorter than the car.

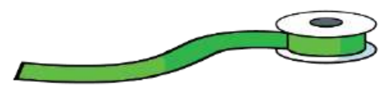
Calculate the length of the car.
Calculate the length of the bike.
How much longer is the train than the bike?



The car is 5 m and the bike is 150 cm or 1 m 50 cm.

The train is 18 metres and 50 cm longer than the bike.

Annie has a 3 m roll of ribbon.



She is cutting it up into 10 cm lengths.
How many lengths can she cut?

Annie can cut it in to 30 lengths.

Annie gives 240 cm of ribbon to Rosie.
How much ribbon does she have left?
How many 10 cm lengths does she have left?

Annie has 60 cm left.
She has 6 lengths left.

Measure Perimeter

Notes and Guidance

Children are introduced to perimeter for the first time. They explore what perimeter is and what it isn't.

Children measure the perimeter of simple 2-D shapes. They may compare different 2-D shapes which have the same perimeter.

Children make connections between the properties of 2-D shapes and measuring the perimeter.

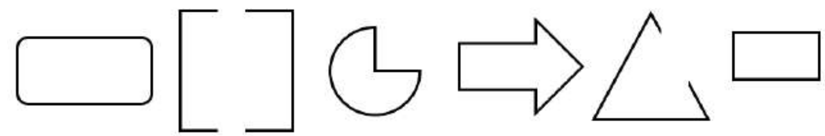
Mathematical Talk

What is perimeter?
Which shape do you predict will have the longest perimeter?
Does it matter where you start when you measure the length of the perimeter? Can you mark the place where you start and finish measuring?
Do you need to measure all the sides of a rectangle to find the perimeter? Explain why.

Varied Fluency

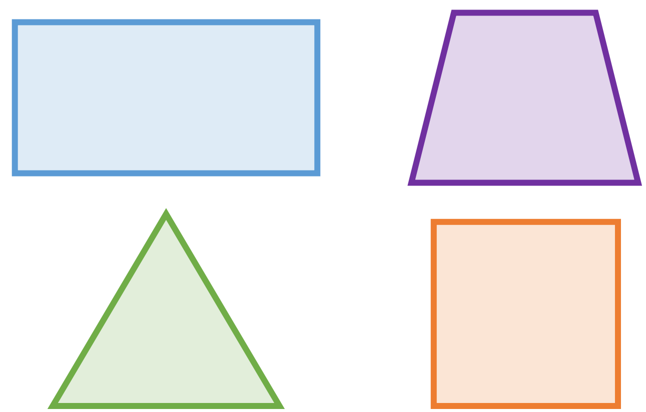
R

- Using your finger, show me the perimeter of your table, your book, your whiteboard etc.
- Tick the images where you can find the perimeter.



Explain why you can't find the perimeter of some of the images.

- Use a ruler to measure the perimeter of the shapes.

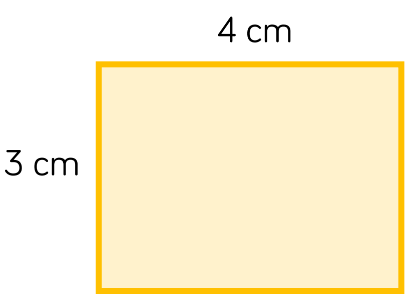


Measure Perimeter

Reasoning and Problem Solving

Amir is measuring the shape below.
He thinks the perimeter is 7 cm.

Can you spot his mistake?



Amir has only included two of the sides. To find the perimeter he needs all 4 sides. It should be 14 cm.

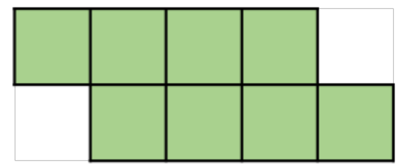
Whitney is measuring the perimeter of a square.
She says she only needs to measure one side of the square.

Do you agree?
Explain your answer.

Whitney is correct because all four sides of a square are equal in length so if she measures one side she can multiply it by 4

Here is a shape made from centimetre squares.

Find the perimeter of the shape.



The perimeter is 14 cm.

Can you use 8 centimetre squares to make different shapes?

Find the perimeter of each one.

There are various different answers depending on the shape made.

Perimeter on a Grid

Notes and Guidance

Children calculate the perimeter of rectilinear shapes by counting squares on a grid. Rectilinear shapes are shapes where all the sides meet at right angles.

Encourage children to label the length of each side and to mark off each side as they add the lengths together. Ensure that children are given centimetre squared paper to draw the shapes on to support their calculation of the perimeter.

Mathematical Talk

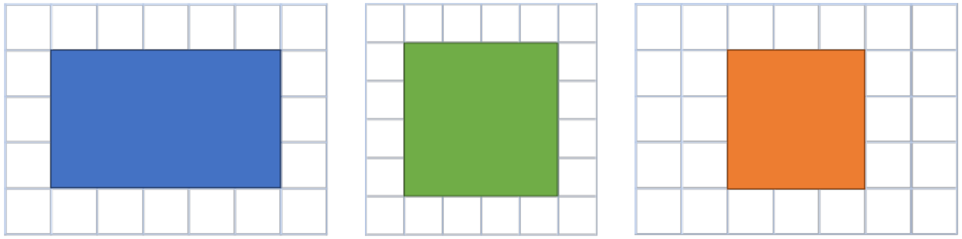
What is perimeter? How can we find the perimeter of a shape?

What do you think rectilinear means? Which part of the word sounds familiar?

If a rectangle has a perimeter of 16 cm, could one of the sides measure 14 cm? 8 cm? 7 cm?

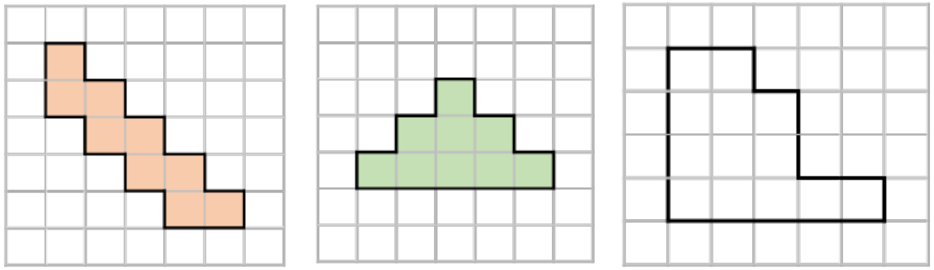
Varied Fluency

- Calculate the perimeter of the shapes.



- Using squared paper, draw two rectilinear shapes, each with a perimeter of 28 cm.
  What is the longest side in each shape? What is the shortest side in each shape?

- Draw each shape on centimetre square paper.

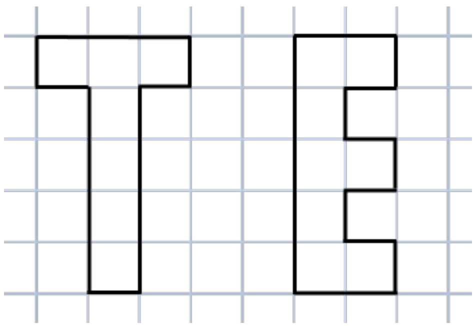


Order the shapes from smallest to largest perimeter.

Perimeter on a Grid

Reasoning and Problem Solving

Which of these shapes has the longest perimeter?



Explore other letters which could be drawn as rectilinear shapes.

Put them in order of shortest to longest perimeter.

Can you make a word?

E has a greater perimeter, it is 18 compared to 16 for T.

Open ended.

Letters which could be drawn include:

B C D F I J L O P

Letters with diagonal lines would be omitted.

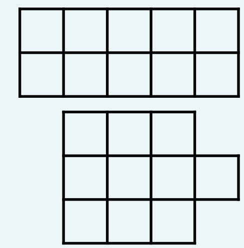
If heights of letters are kept the same, I or L could be the shortest.

You have 10 paving stones to design a patio. The stones are one metre square.

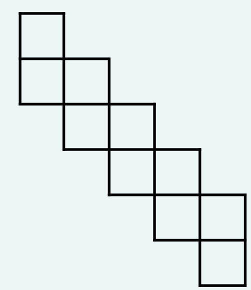
The stones must be joined to each other so that at least one edge is joined corner to corner.

Use squared paper to show which design would give the longest perimeter and which would give the shortest.

The shortest perimeter would be 14 m in a 2 × 5 arrangement or 3 × 3 square with one added on.



The longest would be 22 m.



Perimeter of a Rectangle

Notes and Guidance

Children calculate the perimeter of rectangles (including squares) that are not on a squared grid. When given the length and width, children explore different approaches of finding the perimeter: adding all the sides together, and adding the length and width together then multiplying by 2
Children use their understanding of perimeter to calculate missing lengths and to investigate the possible perimeters of squares and rectangles.

Mathematical Talk

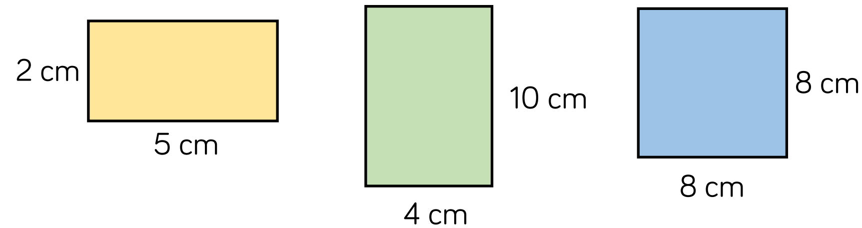
If I know the length and width of a rectangle, how can I calculate the perimeter? Can you tell me 2 different ways? Which way do you find the most efficient?

If I know the perimeter of a shape and the length of one of the sides, how can I calculate the length of the missing side?

Can a rectangle where the length and width are integers, ever have an odd perimeter? Why?

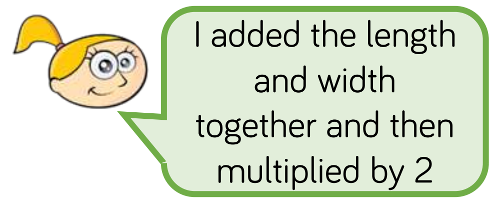
Varied Fluency

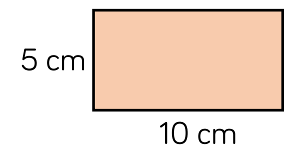
- Calculate the perimeter of the rectangles.



___ cm + ___ cm + ___ cm + ___ cm = ___ cm

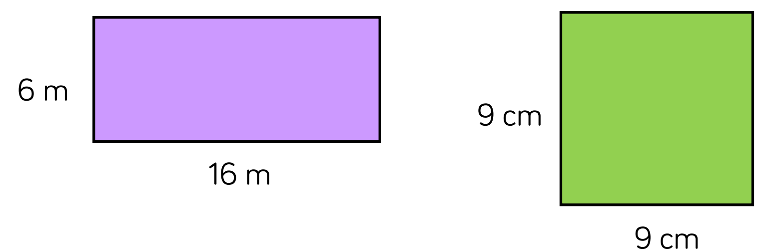
- Eva is finding the perimeter of the rectangle.





5 cm + 10 cm = 15 cm
15 cm × 2 = 30 cm

Use Eva's method to find the perimeter of the rectangles.



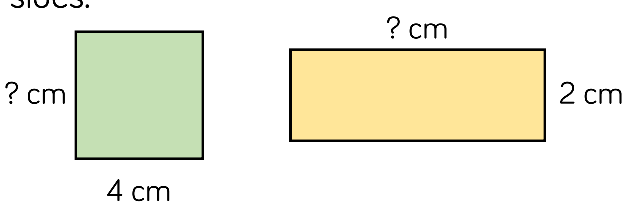
Perimeter of a Rectangle

Reasoning and Problem Solving

The width of a rectangle is 2 metres less than the length.
The perimeter of the rectangle is between 20 m and 30 m.
What could the dimensions of the rectangle be?
Draw all the rectangles that fit these rules.
Use 1 cm = 1 m.

If the perimeter is:
20 m
Length = 6 m
Width = 4 m
24 m
Length = 7 m
Width = 5 m
28 m
Length = 8 m
Width = 6 m

Each of the shapes have a perimeter of 16 cm.
Calculate the lengths of the missing sides.



4 cm

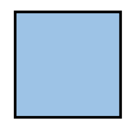
6 cm

Always, Sometimes, Never

When all the sides of a rectangle are odd numbers, the perimeter is even.
Prove it.

Always because when adding an odd and an odd they always equal an even number.

Here is a square. Each of the sides is a whole number of metres.



Which of these lengths could be the perimeter of the shape?
24 m, 34 m, 44 m, 54 m, 64 m, 74 m

Why could the other values not be the perimeter?

24 cm

Sides = 6 cm

44 cm

Sides = 11 cm

64 cm

Sides = 16 cm

They are not divisible by 4

Perimeter of Rectilinear Shapes

Notes and Guidance

Children will begin to calculate perimeter of rectilinear shapes without using squared paper. They use addition and subtraction to calculate the missing sides. Teachers may use part-whole models to support the understanding of how to calculate missing sides.
Encourage children to continue to label each side of the shape and to mark off each side as they calculate the whole perimeter.

Mathematical Talk

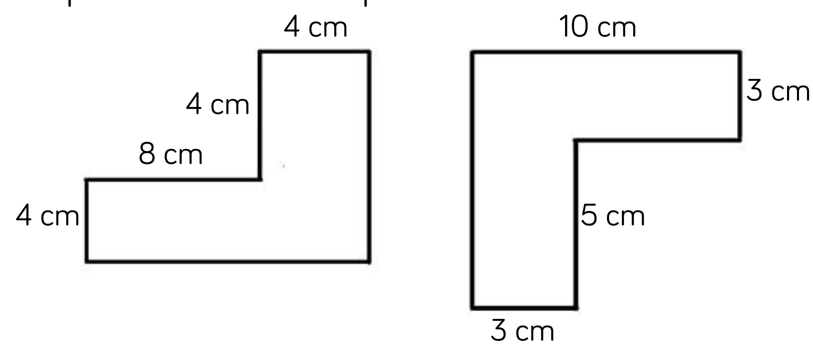
Why are opposite sides important when calculating the perimeter of rectilinear shapes?

If one side is 10 cm long, and the opposite side is made up of two lengths, one of which is 3 cm, how do you know what the missing length is? Can you show this on a part-whole model?

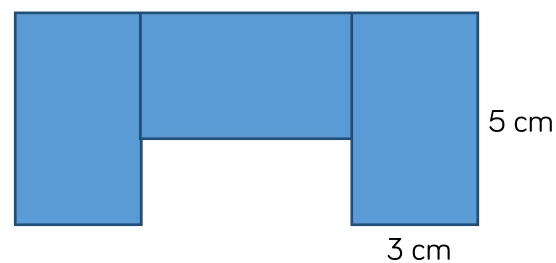
If a rectilinear shape has a perimeter of 24 cm, what is the greatest number of sides it could have? What is the least number of sides it could have?

Varied Fluency

- Find the perimeter of the shapes.



- The shape is made from 3 identical rectangles. Calculate the perimeter of the shape.

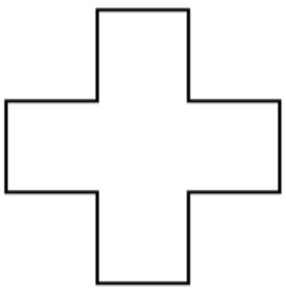


- How many different rectilinear shapes can you draw with a perimeter of 24 cm? How many sides do they each have? What is the longest side? What is the shortest side?

Perimeter of Rectilinear Shapes

Reasoning and Problem Solving

Here is a rectilinear shape. All the sides are the same length and are a whole number of centimetres.



Which of these lengths could be the perimeter of the shape?

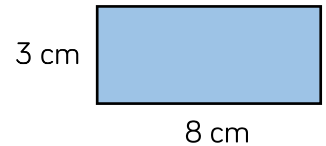
48 cm, 36 cm, 80 cm, 120 cm, 66 cm

Can you think of any other answers which could be correct?

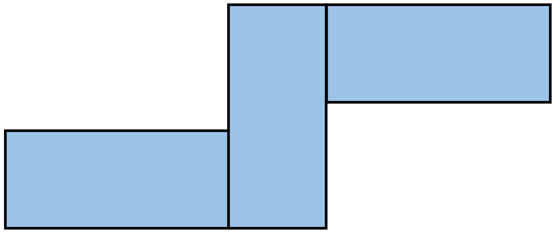
48 cm, 36 cm or 120 cm as there are 12 sides and these numbers are all multiples of 12

Any other answers suggested are correct if they are a multiple of 12

Amir has some rectangles all the same size.

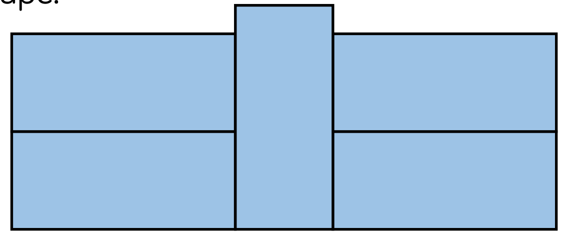


He makes this shape using his rectangles. What is the perimeter?



54 cm

He makes another shape using the same rectangles. Calculate the perimeter of this shape.



54 cm

White Rose Maths

Autumn - Block 4

Multiplication & Division

Overview

Small Steps

- Multiply by 10
- Multiply by 100
- Divide by 10
- Divide by 100
- Multiply by 1 and 0
- Divide by 1 and itself
- Multiply and divide by 3 (R)
- The 3 times-table (R)
- Multiply and divide by 6
- 6 times table and division facts
- Multiply and divide by 9
- 9 times table and division facts
- Multiply and divide by 7
- 7 times table and division facts

Notes for 2020/21

We have added in the 3 times table steps from year 3 to help support children's understanding of the 6 and 9 times tables and see the links between them.

We feel that it is vital that there is plenty of practice of times table facts. This will help children with their future learning in many areas of mathematics.

Multiply by 10

Notes and Guidance

Children need to be able to visualise and understand making a number ten times bigger and that 'ten times bigger' is the same as 'multiply by 10'

The language of 'ten lots of' is vital to use in this step. The understanding of the commutative law is essential because children need to see calculations such as 10 × 3 and 3 × 10 as equal.

Mathematical Talk

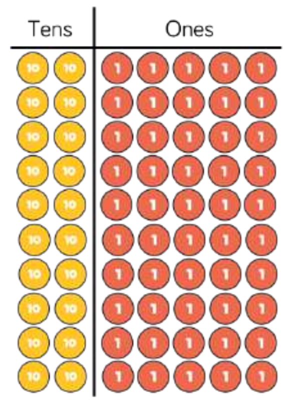
Can you represent these calculations with concrete objects or a drawing?

Can you explain what you did to a partner?

What do you notice when multiplying by 10? Does it always work?

What's the same and what's different about 5 buses with 10 passengers on each and 10 buses with 5 passengers on each?

Varied Fluency



Write the calculation shown by the place value counters.

Each row has ____ tens and ____ ones.

Each row has a value of ____.

There are ____ rows.

The calculation is ____ × ____ = ____.

Use place value counters to calculate:

10 × 3 4 × 10 12 × 10

Match each statement to the correct bar model.

5 buses have ten passengers.

8 pots each have ten pencils.

10 chickens lay 5 eggs each.

10	10	10	10	10

5	5	5	5	5	5	5	5	5	5

10	10	10	10	10	10	10	10

Multiply by 10

Reasoning and Problem Solving

Always, Sometimes, Never If you write a whole number in a place value grid and multiply it by 10, all the digits move one column to the left.	Always. Discuss the need for a placeholder after the new rightmost digit.
Annie has multiplied a whole number by 10 Her answer is between 440 and 540 What could her original calculation be? How many possibilities can you find?	45×10 46×10 47×10 48×10 49×10 50×10 51×10 52×10 53×10 (or the above calculations written as 10×45 etc.).

Multiply by 100

Notes and Guidance

Children build on multiplying by 10 and see links between multiplying by 10 and multiplying by 100

Use place value counters and Base 10 to explore what is happening to the value of the digits in the calculation and encourage children to see a rule so they can begin to move away from concrete representations.

Mathematical Talk

How do the Base 10 help us to show multiplying by 100?

Can you think of a time when you would need to multiply by 100?

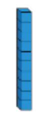
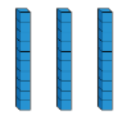
Will you produce a greater number if you multiply by 100 rather than 10? Why?

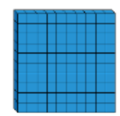
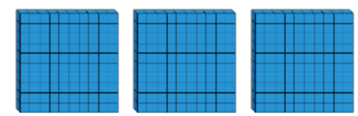
Can you use multiplying by 10 to help you multiply by 100? Explain why.

Varied Fluency

- 3 ×  =  = 3 ones = 3

  Complete:

  3 ×  =  = ____ tens = ____

  3 ×  =  = ____ hundreds = ____

- Use a place value grid and counters to calculate:

7 × 10	63 × 10	80 × 10
7 × 100	63 × 100	80 × 100

  What's the same and what's different comparing multiplying by 10 and 100? Write an explanation of what you notice.

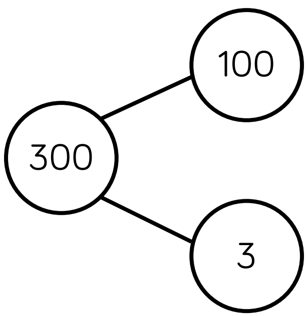
- Use <, > or = to make the statements correct.

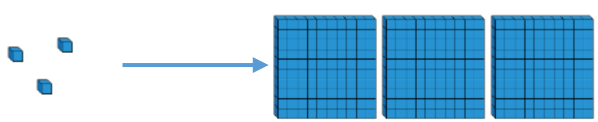
75 × 100	◯	75 × 10
39 × 100	◯	39 × 10 × 10
460 × 10	◯	100 × 47

Multiply by 100

Reasoning and Problem Solving

Which representation does **not** show multiplying by 100?
Explain your answer.





The part-whole model does not represent multiplying by 100

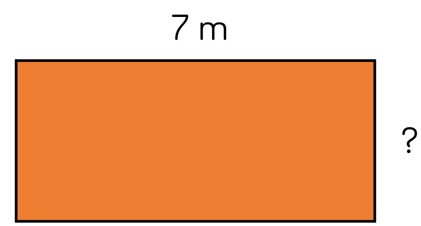
Part-whole models show addition (the aggregation structure) and subtraction (the partitioning structure), so if the whole is 300 and there are two parts, the parts added together should total 300 (e.g. 100 and 200, or 297 and 3). If the parts are 100 and 3, the whole should be 103.

To show multiplying 3 by 100 as a part-whole model, there would need to be 100 parts each with 3 in.

The perimeter of the rectangle is 26 m.

Find the length of the missing side.

Give your answer in cm.



The missing side length is 6 m so in cm it will be:

$6 \times 100 = 600$

The missing length is 600 cm.

White Rose Maths

Divide by 10

Notes and Guidance

Exploring questions with whole number answers only, children divide by 10
They should use concrete manipulatives and place value charts to see the link between dividing by 10 and the position of the digits before and after the calculation.
Using concrete resources, children should begin to understand the relationship between multiplying and dividing by 10 as the inverse of the other.

Mathematical Talk

What has happened to the value of the digits?

Can you represent the calculation using manipulatives?
Why do we need to exchange tens for ones?

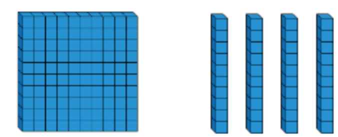
When dividing using a place value chart, in which direction do the digits move?

Varied Fluency

- Use place value counters to show the steps to divide 30 by 10

Can you use the same steps to divide a 3-digit number like 210 by 10?

- Use Base 10 to divide 140 by 10
Explain what you have done.



- Ten friends empty a money box. They share the money equally between them. How much would they have each if the box contained:
  - 20 £1 coins?
  - £120
  - £24?

After emptying the box and sharing the contents equally, each friend has 90 p.
How much money was in the box?

Divide by 10

Reasoning and Problem Solving

Four children are in a race. The numbers on their vests are:

350	35
3,500	53

Use the clues to match each vest number to a child.

- Jack's number is ten times smaller than Mo's.
- Alex's number is not ten times smaller than Jack's or Dora's or Mo's.
- Dora's number is ten times smaller than Jack's.

Alex – 53

Jack – 350

Dora – 35

Mo – 3,500

While in Wonderland, Alice drank a potion and everything shrank. All the items around her became ten times smaller! Are these measurements correct?

Item	Original measurement	After shrinking
Height of a door	220 cm	2,200 cm
Her height	160 cm	16 cm
Length of a book	340 mm	43 mm
Height of a mug	220 mm	?

Can you fill in the missing measurement?

Can you explain what Alice did wrong?

Write a calculation to help you explain each item.

Height of a door
Incorrect – Alice has multiplied by 10.

Her height
Correct

Length of a book
Incorrect – Alice has swapped the order of the digits. When dividing by 10 the order of the digits never changes.

Height of a mug
22 mm.

Divide by 100

Notes and Guidance

Children divide by 100 with whole number answers.

Money and measure is a good real-life context for this, as coins can be used for the concrete stage.

Mathematical Talk

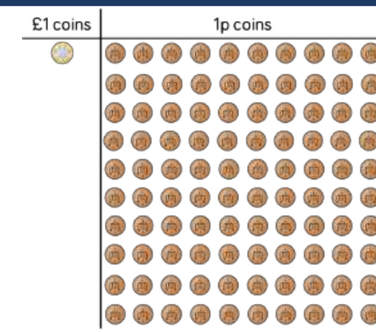
How can you use dividing by 10 to help you divide by 100?

How are multiplying and dividing by 100 related?

Write a multiplication and division fact family using 100 as one of the numbers.

Varied Fluency

- Is it possible for £1 to be shared equally between 100 people?
  How does this picture explain it?
  Can £2 be shared equally between 100 people?
  How much would each person receive?



- Match the calculation with the correct answer.

Calculation	Answer
4,200 ÷ 10	420
4,200 ÷ 100	42
420 ÷ 10	

- Use <, > or = to make each statement correct.

3,600 ÷ 10 ◯ 3,600 ÷ 100

2,700 ÷ 100 ◯ 270 ÷ 10

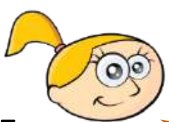
4,200 ÷ 100 ◯ 430 ÷ 10

Divide by 100

Reasoning and Problem Solving

Eva and Whitney are dividing numbers by 10 and 100
They both start with the same 4-digit number.

They give some clues about their answer.



Eva

My answer has 8 ones and 2 tens.

My answer has 2 hundreds, 8 tens and 0 ones.

Whitney

What number did they both start with?
Who divided by what?

They started with 2,800

Whitney divided by 10 to get 280 and Eva divided by 100 to get 28

Use the digit cards to fill in the missing digits.

1	2	3	4	5	6	7	8	9

170 ÷ 10 = __ __

__20 × 10 = 3,__00

1,8__0 ÷ 10 = 1__6

__9 × 100 = 5,__00

6__ = 6,400 ÷ 100

170 ÷ 10 = 17

320 × 10 = 3,200

1,860 ÷ 10 = 186

59 × 100 = 5,900

64 = 6,400 ÷ 100

Multiply by 1 and 0

Notes and Guidance

Children explore the result of multiplying by 1, using concrete equipment.

Linked to this, they look at multiplying by 0 and use concrete equipment and pictorial representations of multiplying by 0

Mathematical Talk

Use number pieces to show me 9 × 1, 3 × 1, 5 × 1

What do you notice?

What does 0 mean?

What does multiplying by 1 mean?

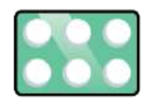
What's the same and what's different about multiplying by 1 and multiplying by 0?

Varied Fluency

- Complete the calculation shown by the number pieces.

There are ____ ones.

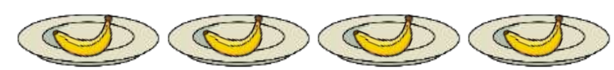
____ × ____ = ____



There is ____ six.

____ × ____ = ____

- Complete the sentences.



There are ____ plates. There is ____ banana on each plate.
Altogether there are ____ bananas.
____ × ____ = ____

- Complete:

4 × ____ = 4　　____ = 1 × 7　　0 = ____ × 42

63 × 1 = ____　　____ × 27 = 0　　50 × ____ = 50

Multiply by 1 and 0

Reasoning and Problem Solving

Which answer could be the odd one out?
What makes it the odd one out?

$3 + 0 =$ ___

$3 - 0 =$ ___

$3 \times 0 =$ ___

Explain why the answer is different.

$3 \times 0 = 0$ is the odd one out because it is the only one with 0 as an answer.

The addition and subtraction calculations have an answer of 3 because they started with that amount and added or subtracted 0 (nothing).

3×0 means '3 lots of nothing', so the total is zero.

Circle the incorrect calculations and write them correctly.

$5 \times 0 = 50$

$19 \times 1 = 19$

$7 \times 0 = 7$

$1 \times 1 = 2$

$0 \times 35 = 0$

$0 \times 0 = 1$

$1 \times 8 = 9$

Choose one calculation and create a drawing to show it.

The incorrect calculations are:
$5 \times 0 = 50$
$7 \times 0 = 7$
$1 \times 1 = 2$
$0 \times 0 = 1$
$1 \times 8 = 9$

Corrected calculations:

$5 \times 0 = 0$
$7 \times 0 = 0$
$1 \times 1 = 1$
$0 \times 0 = 0$
$1 \times 8 = 8$

Divide by 1

Notes and Guidance

Children learn what happens to a number when you divide it by 1 or by itself. Using concrete and pictorial representations, children demonstrate how both the sharing and grouping structures of division can be used to divide a number by 1 or itself. Use stem sentence to encourage children to see this e.g.
5 grouped into 5s equals 1 (5 ÷ 5 = 1)
5 grouped into 1s equals 5 (5 ÷ 1 = 5)

Mathematical Talk

What does sharing mean? Give an example.

What does grouping mean? Give an example.

Can you write a worded question where you need to group?

Can you write a worded question where you need to share?

Varied Fluency

Use counters and hands to complete.

- 4 counters **shared** between 4 hands ___ ÷ ___ = ___
- 4 counters **shared** between 1 hand ___ ÷ ___ = ___
- 9 counters **grouped** in 1s ___ ÷ ___ = ___
- 9 counters **grouped** in 9s ___ ÷ ___ = ___

Choose the correct bar model to help you answer this question.
Annie has £4 in total. She gives away £4 at a time to her friends.
How many friends receive £4?

£4			
£1	£1	£1	£1

£4
£4

Draw a bar model for each question to help you work out the answer.

- Tommy baked 7 cookies and shared them equally between his 7 friends. How many cookies did each friend receive?
- There are 5 sweets. Children line up and take 5 sweets at a time. How many children have 5 sweets?

Divide by 1

Reasoning and Problem Solving

Use <, > or = to complete the following:

$8 \div 1 \bigcirc 7 \div 1$

$6 \div 6 \bigcirc 5 \div 5$

$4 \div 4 \bigcirc 4 \div 1$

Draw an image for each one to show that you are correct.

$>$

$=$

$<$

Mo says,

Do you agree?

Explain your answer.

No, Mo is incorrect because division is not commutative.

$25 \div 1 = 25$

$1 \div 25 = \frac{1}{25}$

Multiply by 3

Notes and Guidance

Children draw on their knowledge of counting in threes in order to start to multiply by 3

They use their knowledge of equal groups to use concrete and pictorial methods to solve questions and problems involving multiplying by 3

Mathematical Talk

How many equal groups do we have?

How many are in each group?

How many do we have altogether?

Can you write a number sentence to show this?

Can you represent the problem in a picture?

Can you use concrete apparatus to solve the problem?

How many lots of 3 do we have?

How many groups of 3 do we have?

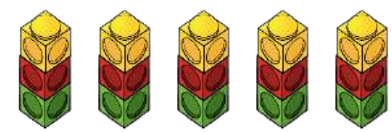
Varied Fluency

R

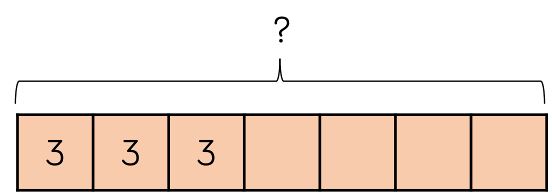
- There are five towers with 3 cubes in each tower.
  How many cubes are there altogether?

  ___ + ___ + ___ + ___ + ___ = ___

  ___ × ___ = ___



- There are 7 tricycles in a playground.
  How many wheels are there altogether?
  Complete the bar model to find the answer.



- There are 3 tables with 6 children on each table.
  How many children are there altogether?

  ___ lots of ___ = ___

  ___ × ___ = ___

Multiply by 3

Reasoning and Problem Solving

There are 8 children. Each child has 3 sweets. How many sweets altogether? Use concrete or pictorial representations to show this problem. Write another repeated addition and multiplication problem and ask a friend to represent it.	There are 24 sweets altogether. Children may use items such as counters or cubes. They could draw a bar model for a pictorial representation.
If $5 \times 3 = 15$, which number sentences would find the answer to 6×3? • $5 \times 3 + 6$ • $5 \times 3 + 3$ • $15 + 3$ • $15 + 6$ • 3×6 Explain how you know.	$5 \times 3 + 3$ because one more lot of 3 will find the answer. $15 + 3$ because adding one more lot of 3 to the answer to 5 lots will give me 6 lots. 3×6 because $3 \times 6 = 6 \times 3$ (because multiplication is commutative).

Divide by 3

Notes and Guidance

Children explore dividing by 3 through sharing into three equal groups and grouping in threes.

They use concrete and pictorial representations and use their knowledge of the inverse to check their answers.

Mathematical Talk

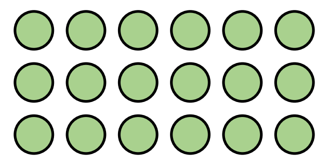
Can you put the counters into groups of three?

Can you share the number into three groups?

What is the difference between sharing and grouping?

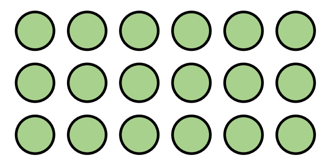
Varied Fluency

- Circle the counters in groups of 3 and complete the division.



___ ÷ 3 = ___

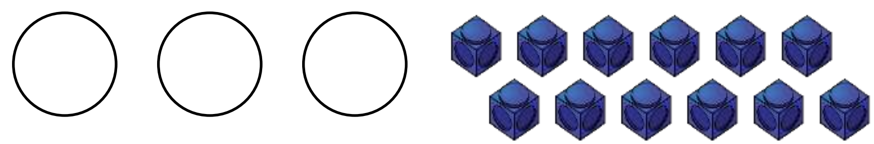
Circle the counters in 3 equal groups and complete the division.



___ ÷ 3 = ___

What's different about the ways you have circled the counters?

- There are 12 pieces of fruit. They are shared equally between 3 bowls. How many pieces of fruit are in each bowl?
Use cubes/counters to represent fruit and share between 3 circles.



- Bobbles come in packs of 3
If there are 21 bobbles altogether, how many packs are there?

Divide by 3

Reasoning and Problem Solving

Share 33 cubes between 3 groups.

Complete:
There are 3 groups with _____ cubes in each group.
33 ÷ 3 = _____

Put 33 cubes into groups of 3

Complete:
There are _____ groups with 3 cubes in each group.
33 ÷ 3 = _____

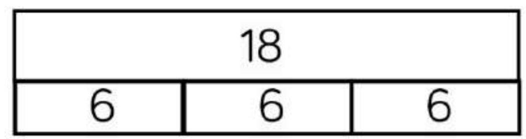
What is the same about these two divisions?
What is different?

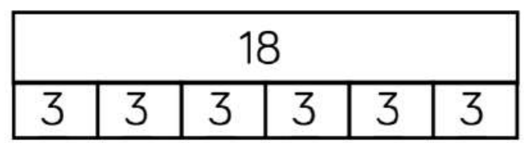
The number sentences are both the same.
The numbers in each number sentence mean different things.
In the first question, the '3' means the number of groups the cubes are shared into because the cubes are being shared.
In the second question, the '3' means the size of each group.

Jack has 18 seeds.

He plants 3 seeds in each pot.

Which bar model matches the problem?

A


B


Explain your choice.

Bar model B matches the problem because Jack plants 3 seeds in each pot, therefore he will have 6 groups (pots), each with 3 seeds.

The 3 Times Table

Notes and Guidance

Children draw together their knowledge of multiplying and dividing by three in order to become more fluent in the three times table.

Children apply their knowledge to different contexts.

Mathematical Talk

Can you use concrete or pictorial representations to help you?

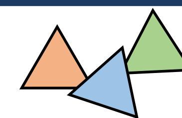
What other facts can you link to this one?

What other times table will help us with this question?

Varied Fluency

R

- Complete the number sentences.



1 triangle has 3 sides.	1 × 3 = 3
3 triangles have ___ sides in total.	3 × ___ = ___
___ triangles have 6 sides in total.	___ × ___ = 6
5 triangles have ___ sides in total.	___ × ___ = ___

- Tick the number sentences that the image shows.

12 ÷ 3 = 4	3 = 12 ÷ 4
12 = 4 × 3	3 × 12 = 4
3 ÷ 4 = 12	3 × 4 = 12

- Fill in the missing number facts.

1 × 3 = ___	___ × 3 = 30
2 × ___ = 6	8 × ___ = 24
___ = 3 × 3	6 × 3 = ___
9 × 3 = ___	21 = ___ × 3

The 3 Times Table

Reasoning and Problem Solving

R

Sort the cards below so they follow round in a loop.

Start at 18 – 3
Calculate the answer to this calculation.
The next card needs to be begin with this answer.

18 – 3	21 ÷ 3	15 ÷ 3	8 – 5
5 × 2	10 × 2	20 + 1	4 × 2
14 – 2	12 ÷ 3	3 × 6	7 × 2

Order:

18 – 3
15 ÷ 3
5 × 2
10 × 2
20 + 1
21 ÷ 3
7 × 2
14 – 2
12 ÷ 3
4 × 2
8 – 5
3 × 6

Start this rhythm:

Clap, clap, click, clap, clap, click.

Carry on the rhythm, what will you do on the 15th beat?

How do you know?

What will you be doing on the 20th beat?

Explain your answer.

Clicks are multiples of three.

On the 15th beat, I will be clicking because 15 is a multiple of 3

On the 20th beat, I will be clapping because 20 is not a multiple of 3

Multiply and Divide by 6

Notes and Guidance

Children draw on their knowledge of times tables facts in order to multiply and divide by 6

They use their knowledge of equal groups in using concrete and pictorial methods to solve multiplication and division problems.

Mathematical Talk

How many equal groups do we have? How many are in each group? How many do we have altogether?

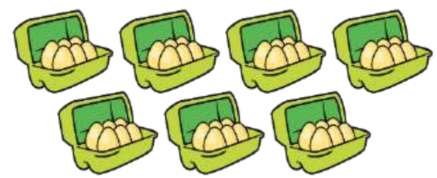
Can you write a number sentence to show this?

Can you represent the problem in a picture?

What does each number in the calculation represent?

Varied Fluency

- Complete the sentences.



There are ____ lots of ____ eggs.

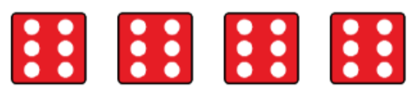
There are ____ eggs in total.

____ × ____ = ____

First there were ____ eggs. Then they were shared into ____ boxes. Now there are ____ eggs in each box.

____ ÷ ____ = ____

- Complete the fact family.



____ × ____ = ____
____ × ____ = ____
____ ÷ ____ = ____
____ ÷ ____ = ____

- There are 9 baskets.
Each basket has 6 apples in.
How many apples are there in total?
Write a multiplication sentence to describe this word problem.

Multiply and Divide by 6

Reasoning and Problem Solving

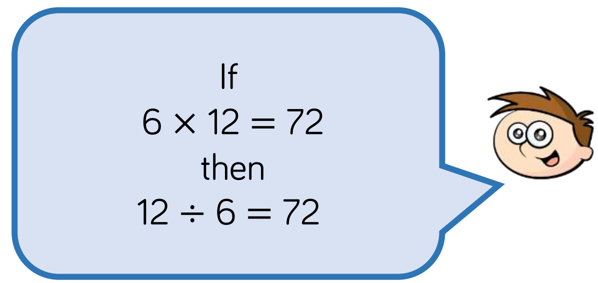
Always, Sometimes, Never

When you multiply any whole number by 6 it will always be an even number.

Explain your answer.

Always, because 6 itself is even and odd × even and even × even will always give an even product.

Teddy says,



Is Teddy correct?
Explain your answer.

Teddy is not correct because 12 ÷ 6 = 2 not 72

He should have written
72 ÷ 6 = 12 or
72 ÷ 12 = 6

6 Times Table & Division Facts

Notes and Guidance

Children use known table facts to become fluent in the six times table.
For example, applying knowledge of the 3 times table by understanding that each multiple of 6 is double the equivalent multiple of 3
Children should also be able to apply this knowledge to multiplying and dividing by 10 and 100 (for example, knowing that 30 × 6 = 180 because they know that 3 × 6 = 18).

Mathematical Talk

What do you notice about the 3 times table and the 6 times table?

Can you use 3 × ___ to work out 6 × ___?

Can you use 7 × 5 to work out 7 × 6?

Which known fact did you use?

Varied Fluency

- Complete the number sentences.

1 × 3 = ___	1 × ___ = 6
2 × ___ = 6	2 × 6 = ___
3 × 3 = ___	3 × 6 = ___

- What do you notice about the 5 times table and the 6 times table?

5 times table:	5	10	15	20	25	30
6 times table:	6	12	18	24	30	36

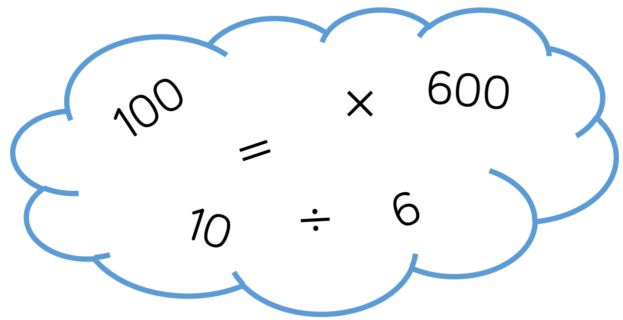
- Use your knowledge of the 6 times table to complete the missing values?

6 × 2 = ___	___ × 6 = 12	6 × 2 × 10 = ___
___ × 20 = 120	20 × ___ = 120	6 × 2 × ___ = 1,200
6 × ___ = 1,200	200 × 6 = ___	10 × ___ × 6 = 120

6 Times Table and Division Facts

Reasoning and Problem Solving

I am thinking of 2 numbers where the sum of the numbers is 15 and the product is 54 What are my numbers? Think of your own problem for a friend to solve?	6 and 9 because $9 \times 6 = 54$ $6 \times 9 = 54$ $6 + 9 = 15$ $9 + 6 = 15$
Always, Sometimes, Never If a number is a multiple of 3 it is also a multiple of 6 Explain why you think this.	Sometimes. Every even multiple of 3 is a multiple of 6, but the odd multiples of 3 are not multiples of 6

Choose the correct number or symbol from the cloud to fill in the boxes.  ___ ÷ ___ = 6 60 = 600 ___ 10	$600 \div 100 = 6$ $60 = 600 \div 10$

Multiply and Divide by 9

Notes and Guidance

Children use their previous knowledge of multiplying and dividing to become fluent in the 9 times table.

They apply their knowledge in different contexts.

Mathematical Talk

Can you use concrete or pictorial representations to help you answer the questions?

What other facts can you link to this fact?

What other times tables will help you with this times table?

What does each number in the calculation represent?

How many lots of 9 do we have?

How many groups of 9 do we have?

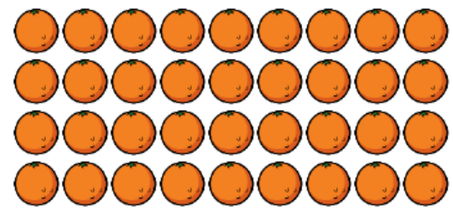
Varied Fluency

- Complete the sentences to describe the oranges:

  There are ____ lots of 9

  There are ____ nines.

  4 × ____ = ____



- Complete the fact family.

  ____ × ____ = ____
  ____ × ____ = ____
  ____ ÷ ____ = ____
  ____ ÷ ____ = ____

- Complete the sentences.

  There are ____ lots of ____.
  ____ × ____ = ____
  ____ ÷ ____ = ____

9	9	9

  There are ____ lots of ____.
  ____ × ____ = ____
  ____ ÷ ____ = ____

3	3	3	3	3	3	3	3	3

  What's the same about each question? What's different?

Multiply and Divide by 9

Reasoning and Problem Solving

True or False?

$6 \times 9 = 9 \times 3 \times 2$

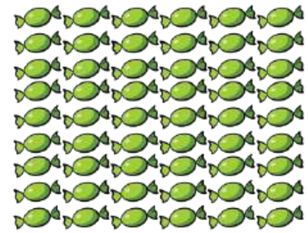
$9 \times 6 = 3 \times 9 + 9$

Explain your answer.

$6 \times 9 = 9 \times 3 \times 2$ is true because
$6 \times 9 = 54$
and
$9 \times 3 = 27$
$27 \times 2 = 54$

$9 \times 6 = 3 \times 9 + 9$ is false because
$6 \times 9 = 54$
and
$3 \times 9 = 27$
$27 + 9 = 36$

Amir and Whitney both receive some sweets.



Amir

I have more sweets because I have more rows.

Whitney

I have more sweets because I have more in each row.

Who has more sweets? Explain your reasoning.

They both have 54 sweets, arranged in two different arrays.

9 Times Table & Division Facts

Notes and Guidance

Children use known times table facts to become fluent in the 9 times table.
For example, knowing that each multiple of 9 is one less than the equivalent multiple of 10, and using that knowledge to derive related facts.
Children should also be able to apply the knowledge of the 9 times table when multiplying and dividing by 10 and 100

Mathematical Talk

How did you work out the missing numbers?

What do you notice about the multiples of 9?

What do you notice about the 9 times table and the 10 times table?

Varied Fluency

What are the missing numbers from the 9 times table?

9	18	27	___	45
54	___	72	81	90

Circle the multiples of 9.

54 108 18 24 9 67 72 37

Use your knowledge of the 9 times table to complete the missing values.

1 × 9 = ___	___ × 1 = 9	1 × 9 × ___ = 90
___ × 9 = 90	900 = 100 × ___	9 × 1 × 10 = ___
9 × ___ = 900	4 × 9 = ___	9 × 1 × ___ = 900

What do you notice about the 9 times table and the 10 times table?

9 times table:	9	18	27	36	45	54
10 times table:	10	20	30	40	50	60

9 Times Table and Division Facts

Reasoning and Problem Solving

Can you complete the calculations using some of the symbols or numbers in the box? ÷ 9 100 10 900 = ___ ÷ ___ = 9 90 = 900 ___ 10	$900 \div 100 = 9$ $90 = 900 \div 10$
I am thinking of two numbers. The sum of the numbers in 17. The product of the numbers is 72. What are my secret numbers? Can you choose your own two secret numbers from the 9 times table and create clues for your partner?	8 and 9 because $8 \times 9 = 72$ or $9 \times 8 = 72$ and $8 + 9 = 17$ or $9 + 8 = 17$
Always, Sometimes, Never All multiples of 9 have digits that have a sum of 9.	Always.

Multiply and Divide by 7

Notes and Guidance

Children use their knowledge of multiplication and division to multiply by 7
They count in 7s, and use their knowledge of equal groups supported by use of concrete and pictorial methods to solve multiplication calculations and problems.
They explore commutativity and also understand that multiplication and division are inverse operations.

Mathematical Talk

How many do we have altogether?

What do you notice?

Can you work out the answers by partitioning 7 into 4 and 3?

Which multiples of 7 do you already know from your other tables?

Varied Fluency

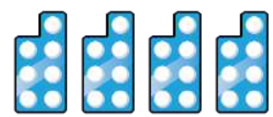
- Use a number stick to support counting in sevens.
  What do you notice?

  Write down the first five multiples of 7

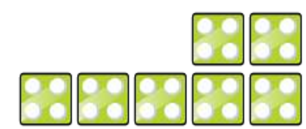
  ___ ___ ___ ___ ___

- Rosie uses number pieces to represent seven times four. She does it in two ways.

  4 sevens
  4 lots of 7
  4×7

  7 fours
  7 lots of 4
  7×4

  Use Rosie's method to represent seven times six in two ways.

- Seven children share 56 stickers. How many stickers will they get each?
  Use a bar model to solve the problem.

  One apple costs 7 pence. How much would 5 apples cost?
  Use a bar model to solve the problem.

Multiply and Divide by 7

Reasoning and Problem Solving

Mrs White's class are selling tickets at £2 each for the school play. The class can sell one ticket for each chair in the hall. There are 7 rows of chairs in the hall. Each row contains 9 chairs. How much money will they make?	Number of tickets (chairs): $7 \times 9 = 63$ $63 \times £2 = £126$
What do you notice about the pattern when counting in 7s from 0? Does this continue beyond 7 times 12? Can you explain why? In which other times tables will you see the same pattern?	Odd, even pattern because odd + odd = even. Then even + odd = odd, and this will continue throughout the whole times table. The same pattern will occur in all other odd multiplication tables (e.g. 1, 3, 5, 9).

White Rose Maths

7 Times Table & Division Facts

Notes and Guidance

Children apply the facts from the 7 times table (and other previously learned tables) to solve calculations with larger numbers.
They need to spend some time exploring links between multiplication tables and investigating how this can help with mental strategies for calculation.
e.g. $7 \times 7 = 49$, $5 \times 7 = 35$ and $2 \times 7 = 14$

Mathematical Talk

If you know the answer to three times seven, how does it help you?

What's the same and what's different about the number facts?

How does your 7 times table help you work out the answers?

Varied Fluency

- Complete.

  $3 \times 7 =$ ____

  $30 \times 7 =$ ____

  $300 \times 7 =$ ____

- Use your knowledge of the 7 times table to calculate.

  $80 \times 7 =$ ____ ____ $= 60 \times 7$

  $70 \times 7 =$ ____ $7 \times 500 =$ ____

- How would you use times tables facts to help you calculate how many days there are in 15 weeks? Complete the sentences.

  There are ____ days in one week.

  ____ $\times 10 =$ ____
  There are ____ days in 10 weeks.

  ____ $\times 5 =$ ____
  There are ____ days in 5 weeks.

  ____ + ____ = ____
  There are ____ days in 15 weeks.

7 Times Table & Division Facts

Reasoning and Problem Solving

True or False?

$$7 \times 6 = 7 \times 3 \times 2$$

$$7 \times 6 = 7 \times 7 + 8$$

Explain your answer to a friend. Prove using a drawing.

True.

False, because $7 \times 6 = 42$ whereas $7 \times 7 = 49$ then $49 + 8 = 57$

Children could draw a bar model or bundles of straws.

Children were arranged into rows of seven.
There were 5 girls and 2 boys in each row.

Use your times table knowledge to show how many girls would be in 10 rows and in 100 rows.

Show as many number sentences using multiplication and division as you can which are linked to this picture.

How many children in total are there in 200 rows? How many girls? How many boys?

<u>10 rows</u>

$5 \times 10 = 50$ girls

<u>100 rows</u>

$5 \times 100 = 500$ girls

<u>200 rows</u>

Children in total: $7 \times 200 = 1,400$

Girls: $5 \times 200 = 1,000$

Boys: $2 \times 200 = 400$

Spring Scheme of Learning

Year 4

#MathsEveryoneCan

2020-21

New for 2020/21

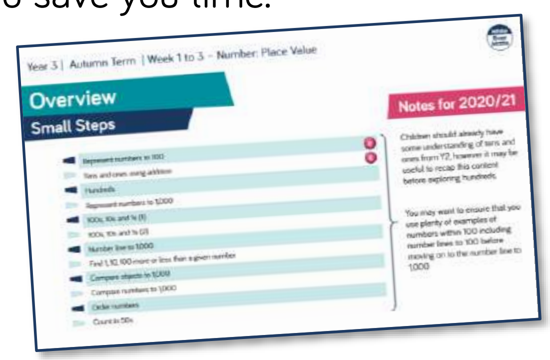
2020 will go down in history. The world has changed for all of us.

We want to do as much as we can to support children, teachers, parents and carers in these very uncertain times.

We have amended our schemes for 2020/21 to:

- ★ highlight key teaching points
- ★ recap essential content that children may have forgotten
- ★ flag any content that you might not have covered during the school closures period.

We hope these changes will add further value to the schemes and save you time.



Lesson-by-lesson overviews

We've always been reluctant to produce lesson-by-lesson overviews as every class is individual and has different needs. However, many of you have said that if blended learning becomes a key feature of school life next year, a weekly plan with linked content and videos could be really useful.

As always, we've listened! We've now produced a complete lesson-by-lesson overview for Y1 to Y9 that schools can use or adapt as they choose. Each lesson will be linked to a free-to-use home learning video, and for premium subscribers, a worksheet. This means that you can easily assign work to your class, whether they are working at home or in school.

Inevitably, this lesson-by-lesson structure won't suit everyone, but if it works for you, then please do make use of this resource as much as you wish.

Teaching for Mastery

These overviews are designed to support a mastery approach to teaching and learning and have been designed to support the aims and objectives of the new National Curriculum.

The overviews:

- have number at their heart. A large proportion of time is spent reinforcing number to build competency
- ensure teachers stay in the required key stage and support the ideal of depth before breadth.
- ensure students have the opportunity to stay together as they work through the schemes as a whole group
- provide plenty of opportunities to build reasoning and problem solving elements into the curriculum.

For more guidance on teaching for mastery, visit the NCETM website:

https://www.ncetm.org.uk/resources/47230

Concrete - Pictorial - Abstract

We believe that all children, when introduced to a new concept, should have the opportunity to build competency by taking this approach.

Concrete – children should have the opportunity to use concrete objects and manipulatives to help them understand what they are doing.

Pictorial – alongside this children should use pictorial representations. These representations can then be used to help reason and solve problems.

Abstract – both concrete and pictorial representations should support children's understanding of abstract methods.

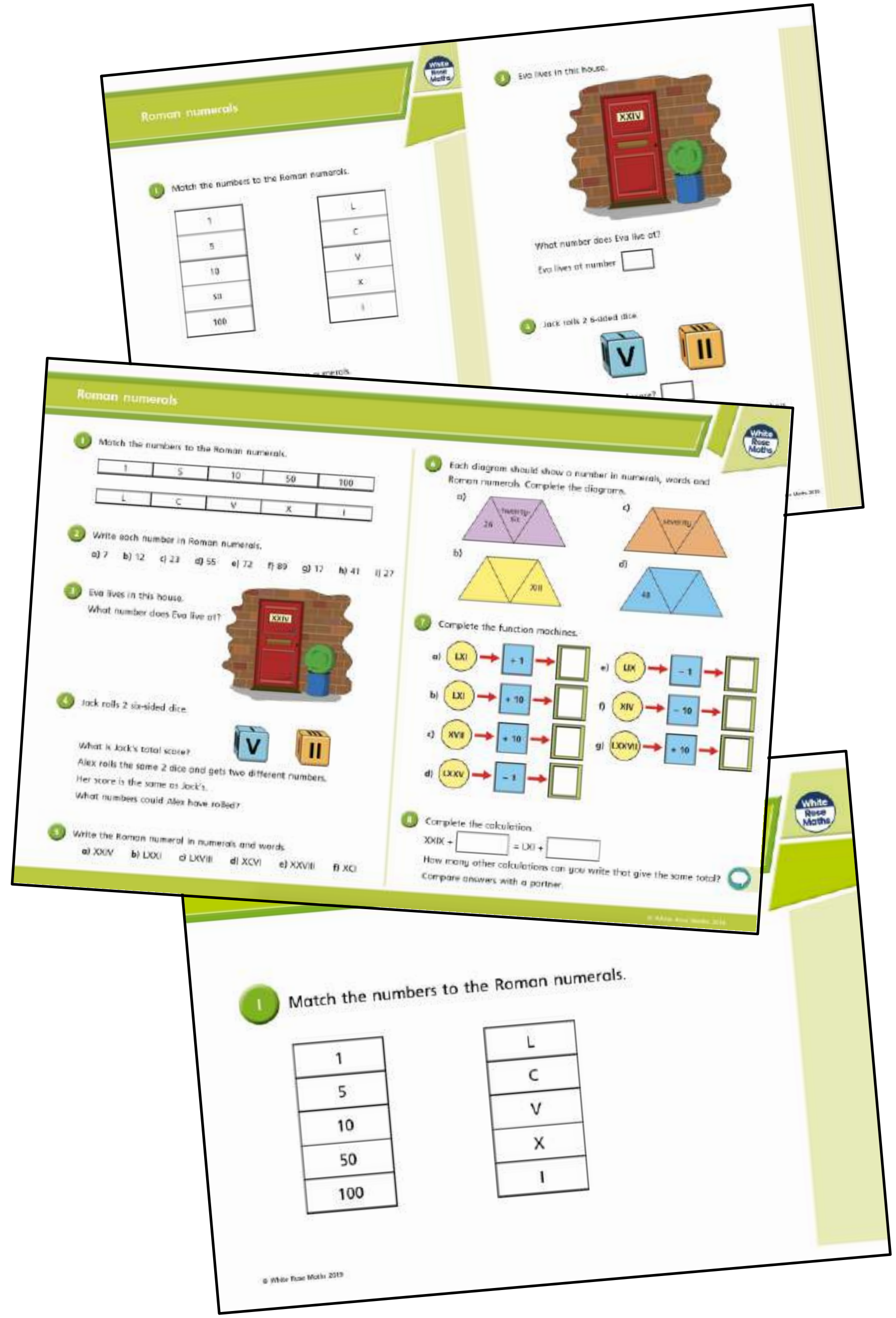
Need some CPD to develop this approach? Visit www.whiterosemaths.com for find a course right for you.

Supporting resources

We have produced supporting resources for every small step from Year 1 to Year 11.

The worksheets are provided in three different formats:

- Write on worksheet – ideal for children to use the ready made models, images and stem sentences.
- Display version – great for schools who want to cut down on photocopying.
- PowerPoint version – one question per slide. Perfect for whole class teaching or mixing questions to make your own bespoke lesson.

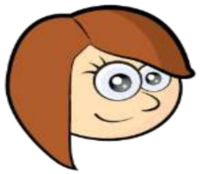


For more information visit our online training and resources centre resources.whiterosemaths.com or email us directly at support@whiterosemaths.com

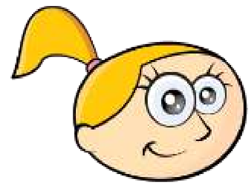
Meet the Characters

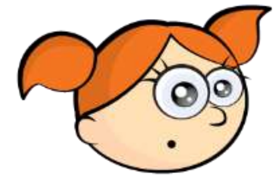
Children love to learn with characters and our team within the scheme will be sure to get them talking and reasoning about mathematical concepts and ideas. Who's your favourite?

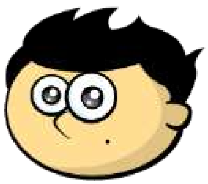

Teddy


Rosie

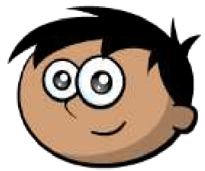

Mo

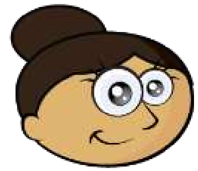

Eva


Alex


Jack

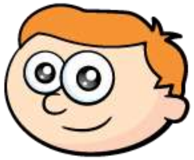

Whitney


Amir


Dora


Tommy


Dexter


Ron


Annie

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number: Place Value				Number: Addition and Subtraction			Measurement: Length and Perimeter		Number: Multiplication and Division		
Spring	Number: Multiplication and Division			Measurement: Area	Number: Fractions				Number: Decimals			Consolidation
Summer	Number: Decimals		Measurement: Money		Measurement: Time		Statistics	Geometry: Properties of Shape		Geometry: Position and Direction		Consolidation

White Rose Maths

Spring - Block 1

Multiplication & Division

White Rose Maths

Overview

Small Steps

- 11 and 12 times-table
- Multiply 3 numbers
- Factor pairs
- Efficient multiplication
- Written methods
- Multiply 2-digits by 1-digit (1) R
- Multiply 2-digits by 1-digit
- Multiply 3-digits by 1-digit
- Divide 2-digits by 1-digit (1) R
- Divide 2-digits by 1-digit (1)

Notes for 2020/21

These steps may look similar but these are difficult concepts and children need to spend time exploring different representations of multiplication with no exchange before moving on. They need to use manipulatives to support understanding and make links with repeated addition.

Similarly with division, children will first need to explore examples with no exchange or remainders, making links to the inverse.

Overview

Small Steps

- Divide 2-digits by 1-digit (2) R
- Divide 2-digits by 1-digit (2)
- Divide 3-digits by 1-digit
- Correspondence problems

Notes for 2020/21

The final division steps introduce remainders and begin to look at generalisations.
Continue to use place value counters and visual models to support understanding.

11 and 12 Times-table

Notes and Guidance

Building on their knowledge of the 1, 2 and 10 times-tables, children explore the 11 and 12 times-tables through partitioning.
They use Base 10 equipment to build representations of the times-tables and use them to explore the inverse of multiplication and division statements.
Highlight the importance of commutativity as children should already know the majority of facts from other times-tables.

Mathematical Talk

Which multiplication and division facts in the 11 and 12 times-tables have not appeared before in other times-tables?

Can you partition 11 and 12 into tens and ones? What times-tables can we add together to help us multiply by 11 and 12?

If I know 11 × 10 is equal to 110, how can I use this to calculate 11 × 11?

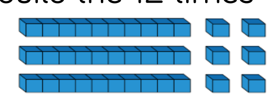
Varied Fluency

- Fill in the blanks.

2 × 10 = ____   2 × 1 = ____

2 lots of 10 doughnuts = ____   2 lots of 1 doughnut = ____
2 lots of 11 doughnuts = ____
2 × 10 + 2 × 1 = 2 × 11 = ____

- Use Base 10 to build the 12 times-table. e.g.



3 × 12 = □

Complete the calculations.

12 × 5 = □   5 × 12 = □   48 ÷ 12 = □   84 ÷ 12 = □

12 × □ = 120   12 × □ = 132   □ ÷ 12 = 8   □ = 9 × 12

- There are 11 players on a football team.
7 teams take part in a tournament.
How many players are there altogether in the tournament?

11 and 12 Times-table

Reasoning and Problem Solving

Here is one batch of muffins.

Teddy bakes 11 batches of muffins.
How many muffins does he have altogether?

In each batch there are 3 strawberry, 3 vanilla, 4 chocolate and 2 toffee muffins.
How many of each type of muffin does Teddy have in 11 batches?

Teddy sells 5 batches of muffins.
How many muffins does he have left?

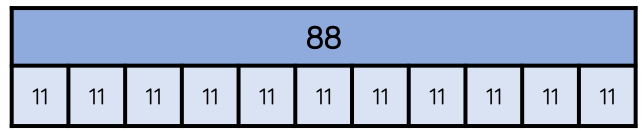
Teddy has 132 muffins altogether.

Strawberry: 33
Vanilla: 33
Chocolate: 44
Toffee: 22

132 – 55 = 77

Teddy has 77 muffins left.

Rosie uses a bar model to represent 88 divided by 11



Explain Rosie's mistake.

Can you draw a bar model to represent 88 divided by 11 correctly?

Rosie has divided by grouping in 11s but has found 11 groups of 11 which is equal to 121

To divide 88 by sharing into 11 equal groups, there would be 8 in each group.

To divide 88 by grouping in 11s, there would be 8 groups of 11

Multiply 3 Numbers

Notes and Guidance

Children are introduced to the 'Associative Law' to multiply 3 numbers. This law focuses on the idea that it doesn't matter how we group the numbers when we multiply
e.g. $4 \times 5 \times 2 = (4 \times 5) \times 2 = 20 \times 2 = 40$
or $4 \times 5 \times 2 = 4 \times (5 \times 2) = 4 \times 10 = 40$
They link this idea to commutativity and see that we can change the order of the numbers to group them more efficiently, e.g. $4 \times 2 \times 5 = (4 \times 2) \times 5 = 8 \times 5 = 40$

Mathematical Talk

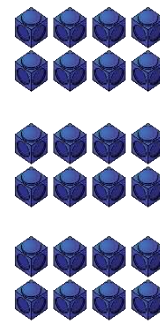
Can you use concrete materials to build the calculations?

How will you decide which order to do the multiplication in?

What's the same and what's different about the arrays?
Which order do you find easier to calculate efficiently?

Varied Fluency

- Complete the calculations.

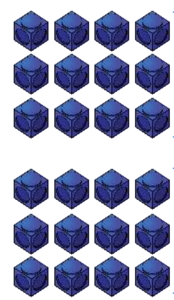


$2 \times 4 =$ ___

$2 \times 4 =$ ___

$2 \times 4 =$ ___

$3 \times 2 \times 4 = 3 \times 8 =$ ___



□ × □ = □

□ × □ = □

□ × □ × □ = □ × □ = □

- Use counters or cubes to represent the calculations.
Choose which order you will complete the multiplication.

$5 \times 2 \times 6$ $\quad$ $8 \times 4 \times 5$ $\quad$ $2 \times 8 \times 6$

Multiply 3 Numbers

Reasoning and Problem Solving

Choose three digit cards.
Arrange them in the calculation.

$\square \times \square \times \square = \square$

How many different calculations can you make using your three digit cards?
Which order do you find it the most efficient to calculate the product?
How have you grouped the numbers?

Possible answers using 3, 4 and 7:

$7 \times 3 \times 4 = 84$
$7 \times 4 \times 3 = 84$
$4 \times 3 \times 7 = 84$
$4 \times 7 \times 3 = 84$
$3 \times 4 \times 7 = 84$
$3 \times 7 \times 4 = 84$

Children may find it easier to calculate 7×3 first and then multiply it by 4 as 21 multiplied by 4 has no exchanges.

Make the target number of 84 using three of the digits below.

7	5	3	4	6	2

$\square \times \square \times \square = 84$

Multiply the remaining three digits together, what is the product of the three numbers?

Is the product smaller or larger than 84?

Can you complete this problem in more than one way?

Possible answers:

$7 \times 2 \times 6 = 84$

$4 \times 3 \times 5 = 60$

60 is smaller than 84

$7 \times 3 \times 4 = 84$

$2 \times 6 \times 5 = 60$

60 is smaller than 84

Children may also show the numbers in a different order.

Factor Pairs

Notes and Guidance

Children learn that a factor is a whole number that multiplies by another number to make a product e.g. 3 × 5 = 15, factor × factor = product.
They develop their understanding of factor pairs using concrete resources to work systematically, e.g. factor pairs for 12 – begin with 1 × 12, 2 × 6, 3 × 4. At this stage, children recognise that they have already used 4 in the previous calculation therefore all factor pairs have been identified.

Mathematical Talk

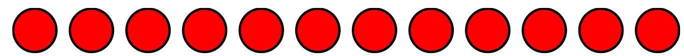
Which number is a factor of every whole number?

Do factors always come in pairs?
Do whole numbers always have an even number of factors?

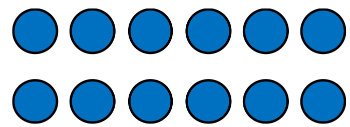
How do arrays support in finding factors of a number?
How do arrays support us in seeing when a number is not a factor of another number?

Varied Fluency

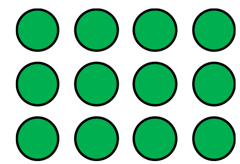
- Complete the factor pairs for 12



1 × ☐ = 12



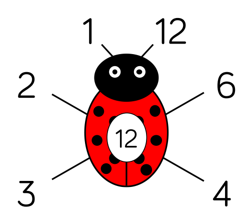
☐ × 6 = 12

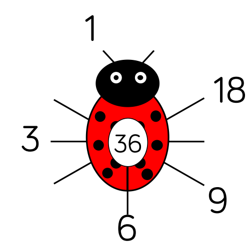


☐ × ☐ = 12

12 has ____ factor pairs. 12 has ____ factors altogether.
Use counters to create arrays for 24
How many factor pairs can you find?

- Here is an example of a factor bug for 12
Complete the factor bug for 36



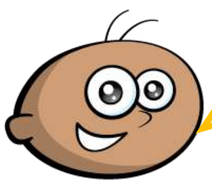


Are all the factors in pairs?
Draw your own factor bugs for 16, 48, 56 and 35

Factor Pairs

Reasoning and Problem Solving

Tommy says



> The greater the number, the more factors it will have.

Is Tommy correct?

Use arrays to explain your answer.

Tommy is incorrect.
Children explain by showing an example of two numbers where the greater number has less factors.
For example, 15 has 4 factors 1, 3, 5 and 15
17 has 2 factors 1 and 17

Some numbers are equal to the sum of all their factors (not including the number itself).
e.g. 6
6 has 4 factors, 1, 2, 3 and 6
Add up all the factors not including 6 itself.
$1 + 2 + 3 = 6$
6 is equal to the sum of its factors (not including the number itself)

How many other numbers can you find that are equal to the sum of their factors?
Which numbers are less than the sum of their factors?
Which numbers are greater than the sum of their factors?

Possible answers

$28 = 1 + 2 + 4 + 7 + 14$

28 is equal to the sum of its factors.

$12 < 1 + 2 + 3 + 4 + 6$

12 is less than the sum of its factors.

$8 > 1 + 2 + 4$

8 is greater than the sum of its factors.

Efficient Multiplication

Notes and Guidance

Children develop their mental multiplication by exploring different ways to calculate.
They partition two-digit numbers into tens and ones or into factor pairs in order to multiply one and two-digit numbers.
By sharing mental methods, children can learn to be more flexible and efficient.

Mathematical Talk

Which method do you find the most efficient?

Can you see why another method has worked? Can you explain someone else's method?

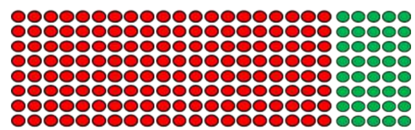
Can you think of an efficient way to multiply by 99?

Varied Fluency

Class 4 are calculating 25×8 mentally.
Can you complete the calculations in each of the methods?

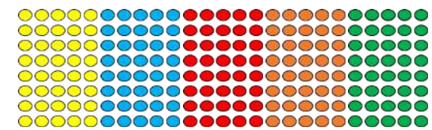
Method 1

$25 \times 8 = 20 \times 8 + 5 \times 8$
$= 160 + \square = \square$



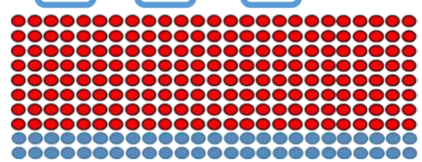
Method 2

$25 \times 8 = 5 \times 5 \times 8$
$= 5 \times \square = \square$



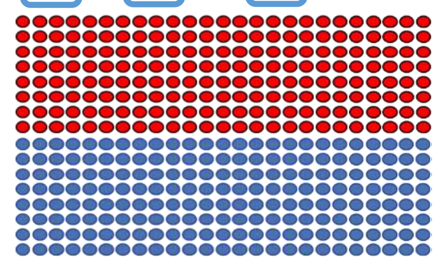
Method 3

$25 \times 8 = 25 \times 10 - 25 \times 2$
$= \square - \square = \square$



Method 4

$25 \times 8 = 50 \times 8 \div 2$
$= \square \div \square = \square$



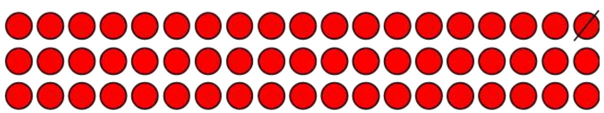
Can you think of any other ways to mentally calculate 25×8?
Which do you think is the most efficient?
How would you calculate 228×5 mentally?

White Rose Maths

Efficient Multiplication

Reasoning and Problem Solving

Teddy has calculated 19 × 3



20 × 3 = 60
60 – 1 = 59
19 × 3 = 59

Can you explain his mistake and correct the diagram?

Teddy has subtracted one, rather than one group of 3

He should have calculated,

20 × 3 = 60

60 – 1 × 3 = 57

Here are three number cards.

21 | 42 | 38

Dora, Annie and Eva choose one of the number cards each.
They multiply their number by 5

Dora says,

I did 40 × 5 and then subtracted 2 lots of five.

Annie says,

I multiplied my number by 10 and then divided 210 by 2

Eva says,

I halved my 2-digit number and doubled 5 so I calculated 21 × 10

Which number card did each child have?
Would you have used a different method to multiply the numbers by 5?

Dora has 38

Annie has 21

Eva has 42

Children can then discuss the methods they would have used and why.

Written Methods

Notes and Guidance

Children use a variety of informal written methods to multiply a two-digit and a one-digit number.
It is important to emphasise when it would be more efficient to use a mental method to multiply and when we need to represent our thinking by showing working.

Mathematical Talk

Why are there not 26 jumps of 8 on the number line?

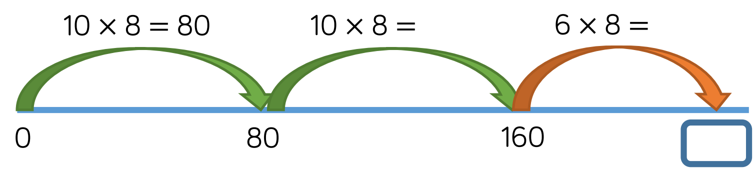
Could you find a more efficient method?

Can you calculate the multiplication mentally or do you need to write down your method?

Can you partition your number into more than two parts?

Varied Fluency

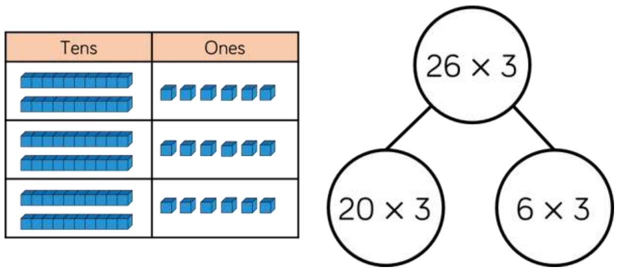
- There are 8 classes in a school.
Each class has 26 children.
How many children are there altogether?
Complete the number line to solve the problem.



Use this method to work out the multiplications.

16 × 7 34 × 6 27 × 4

- Rosie uses Base 10 and a part-whole model to calculate 26 × 3
Complete Rosie's calculations.



Use Rosie's method to work out:
36 × 3
24 × 6
45 × 4

Written Methods

Reasoning and Problem Solving

Here are 6 multiplications.

43×5	54×6	38×6
33×2	19×7	84×5

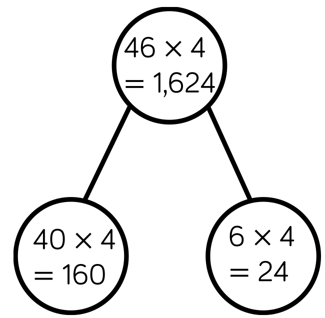
Which of the multiplications would you calculate mentally?
Which of the multiplications would you use a written method for?

Explain your choices to a partner.
Did your partner choose the same methods as you?

Children will sort the multiplications in different ways.

It is important that teachers discuss with the children why they have made the choices and refer back to the efficient multiplication step to remind children of efficient ways to multiply mentally.

Ron is calculating 46 multiplied by 4 using the part-whole model.



Can you explain Ron's mistake?

Ron has multiplied the parts correctly, but added them up incorrectly.
$160 + 24 = 184$

Multiply 2-digits by 1-digit (1)

Notes and Guidance

Children use their understanding of repeated addition to represent a two-digit number multiplied by a one-digit number with concrete manipulatives. They use the formal method of column multiplication alongside the concrete representation. They also apply their understanding of partitioning to represent and solve calculations.
In this step, children explore multiplication with no exchange.

Mathematical Talk

How does multiplication link to addition?

How does partitioning help you to multiply 2-digits by a 1-digit number?

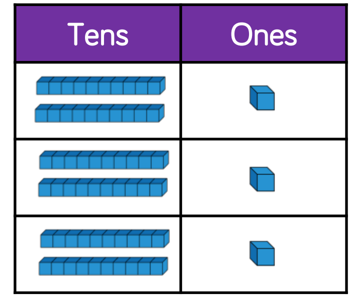
How does the written method match the concrete representation?

Varied Fluency

R

- There are 21 coloured balls on a snooker table.
How many coloured balls are there on 3 snooker tables?

Use Base 10 to calculate:
21 × 4 and 33 × 3



- Complete the calculations to match the place value counters.

Tens	Ones
10 10	1 1
10 10	1 1
10 10	1 1
10 10	1 1

□ + □ + □ + □ = □

□ × □ = □

- Annie uses place value counters to work out 34 × 2

Tens	Ones
10 10 10	1 1 1 1
10 10 10	1 1 1 1

	T	O
	3	4
×		2
	6	8

Use Annie's method to solve:
23 × 3
32 × 3
42 × 2

Multiply 2-digits by 1-digit (1)

Reasoning and Problem Solving

Alex completes the calculation:

$$43 \times 2$$

Can you spot her mistake?

	T	O
	4	3
×		2
		6
+		8
	1	4

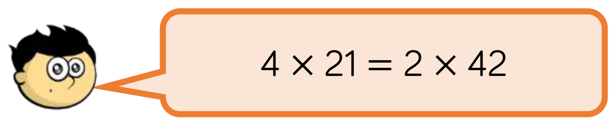
Alex has multiplied 4 by 2 rather than 40 by 2

Teddy completes the same calculation as Alex.
Can you spot and explain his mistake?

	T	O
	4	3
×		2
8	0	6

Teddy has written 80 where he should have just put an 8 because he is multiplying 4 tens by 2 which is 8 tens. The answer should be 86

Dexter says,



Is Dexter correct?

True. Both multiplications are equal to 84

Children may explore that one number has halved and the other has doubled.

Multiply 2-digits by 1-digit

Notes and Guidance

Children build on their understanding of formal multiplication from Year 3 to move to the formal short multiplication method.
Children use their knowledge of exchanging ten ones for one ten in addition and apply this to multiplication, including exchanging multiple groups of tens. They use place value counters to support their understanding.

Mathematical Talk

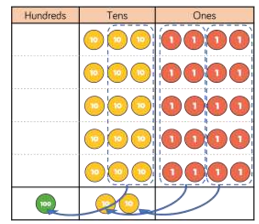
Which column should we start with, the ones or the tens?

How are Ron and Whitney's methods the same?
How are they different?

Can we write a list of key things to remember when multiplying using the column method?

Varied Fluency

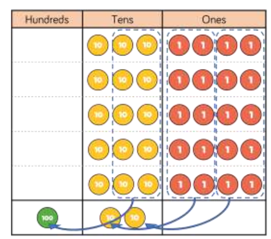
Whitney uses place value counters to calculate 5 × 34



	H	T	O	
		3	4	
×			5	
		2	0	(5 × 4)
+	1	5	0	(5 × 30)
	1	7	0	

Use Whitney's method to solve
5 × 42
23 × 6
48 × 3

Ron also uses place value counters to calculate 5 × 34



	H	T	O
		3	4
×			5
	1	7	0
	1	2	

Use Ron's method to complete:

	T	O
	4	3
×		3

	T	O
	3	6
×		4

	T	O
	7	4
×		5

Multiply 2-digits by 1-digit

Reasoning and Problem Solving

Here are three incorrect multiplications.

	T	O
	6	1
×		5
	3	5

	T	O
	7	4
×		7
4	9	8

	T	O
	2	6
×		4
8	2	4

Correct the multiplications.

	T	O
	6	1
×		5
3	0	5
3		

	T	O
	7	4
×		7
5	1	8
	2	

	T	O
	2	6
×		4
1	0	4
	2	

Always, sometimes, never

- When multiplying a two-digit number by a one-digit number, the product has 3 digits.
- When multiplying a two-digit number by 8 the product is odd.
- When multiplying a two-digit number by 7 you need to exchange.

Prove it.

Sometimes: 12 × 2 has only two-digits; 23 × 5 has three digits.

Never: all multiples of 8 are even.

Sometimes: most two-digit numbers need exchanging, but not 10 or 11

Multiply 3-digits by 1-digit

Notes and Guidance

Children build on previous steps to represent a three-digit number multiplied by a one-digit number with concrete manipulatives.
Teachers should be aware of misconceptions arising from 0 in the tens or ones column.
Children continue to exchange groups of ten ones for tens and record this in a written method.

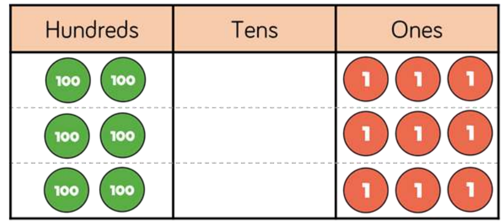
Mathematical Talk

How is multiplying a three-digit number by one-digit similar to multiplying a two-digit number by one-digit?

Would you use counters to represent 84 multiplied by 8? Why?

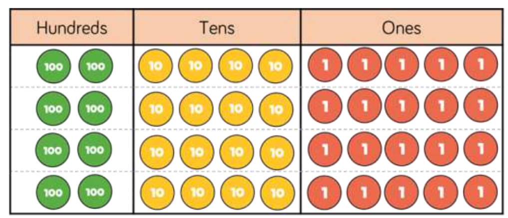
Varied Fluency

- Complete the calculation.



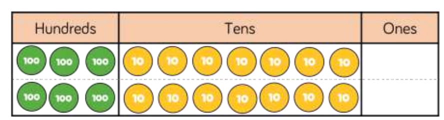
	H	T	O
	2	0	3
×			3

- A school has 4 house teams.
There are 245 children in each house team.
How many children are there altogether?



	H	T	O
	2	4	5
×			4

- Write the multiplication represented by the counters and calculate the answer using the formal written method.

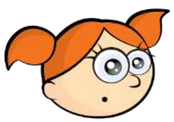


Multiply 3-digits by 1-digit

Reasoning and Problem Solving

Spot the mistake

Alex and Dexter have both completed the same multiplication.



Alex

	H	T	O
	2	3	4
×			6
1	2	0	4
	2	2	

Dexter

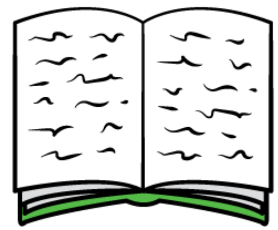
	H	T	O
	2	3	4
×			6
1	4	0	4
	2	2	

Who has the correct answer?
What mistake has been made by one of the children?

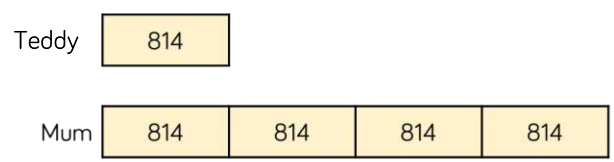
Dexter has the correct answer.

Alex has forgotten to add the two hundreds she exchanged from the tens column.

Teddy and his mum were having a reading competition.
In one month, Teddy read 814 pages.



His mum read 4 times as many pages as Teddy.
How many pages did they read altogether?
How many fewer pages did Teddy read?
Use the bar model to help.



814 × 5 = 4,070

They read 4,070 pages altogether.

814 × 3 = 2,442

Teddy read 2,442 fewer pages than his mum.

Divide 2-digits by 1-digit (2)

Notes and Guidance

Children divide 2-digit numbers by a 1-digit number by partitioning into tens and ones and sharing into equal groups.

They divide numbers that involve exchanging between the tens and ones. The answers do not have remainders.

Children use their times-tables to partition the number into multiples of the divisor.

Mathematical Talk

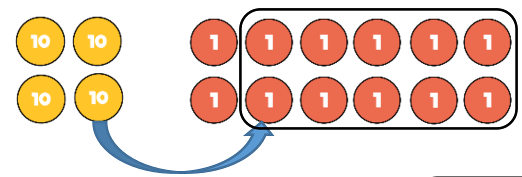
Why have we partitioned 42 into 30 and 12 instead of 40 and 2?

What do you notice about the partitioned numbers and the divisor?

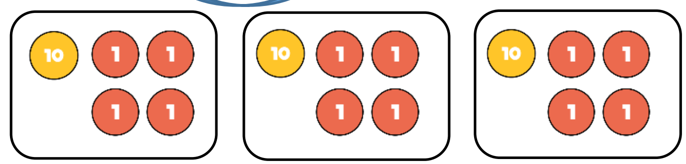
Why do we partition 96 in different ways depending on the divisor?

Varied Fluency

- Ron uses place value counters to divide 42 into three equal groups.



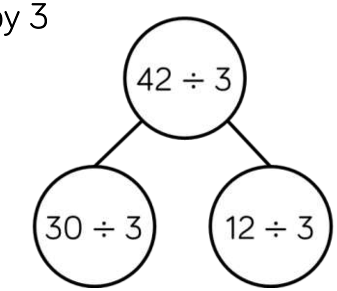
He shares the tens first and exchanges the remaining ten for ones.



Then he shares the ones.
$42 \div 3 = 14$

Use Ron's method to calculate $48 \div 3$, $52 \div 4$ and $92 \div 8$

- Annie uses a similar method to divide 42 by 3



Use Annie's method to calculate:

$96 \div 8$ $96 \div 4$ $96 \div 3$ $96 \div 6$

Divide 2-digits by 1-digit (2)

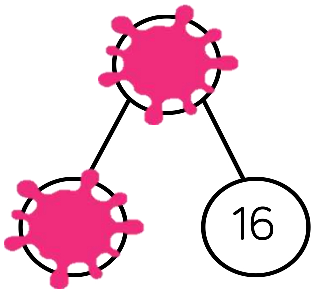
Reasoning and Problem Solving

Compare the statements using <, > or =	
48 ÷ 4 ◯ 36 ÷ 3	=
52 ÷ 4 ◯ 42 ÷ 3	<
60 ÷ 3 ◯ 60 ÷ 4	>

Amir partitioned a number to help him divide by 8

Some of his working out has been covered with paint.

What number could Amir have started with?



The answer could be 56 or 96

Divide 2-digits by 1-digit (1)

Notes and Guidance

Children build on their knowledge of dividing a 2-digit number by a 1-digit number from Year 3 by sharing into equal groups.

Children use examples where the tens and the ones are divisible by the divisor, e.g. 96 divided by 3 and 84 divided by 4. They then move on to calculations where they exchange between tens and ones.

Mathematical Talk

How can we partition 84?
How many rows do we need to share equally between?

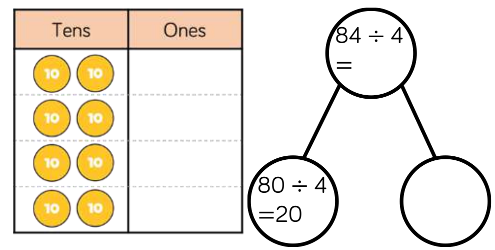
If I cannot share the tens equally, what do I need to do?
How many ones will I have after exchanging the tens?

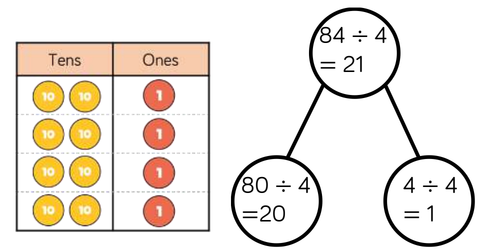
If we know $96 \div 4 = 24$, what will $96 \div 8$ be?
What will $96 \div 2$ be? Can you spot a pattern?

Varied Fluency

Jack is dividing 84 by 4 using place value counters.


First, he divides the tens. Then, he divides the ones.

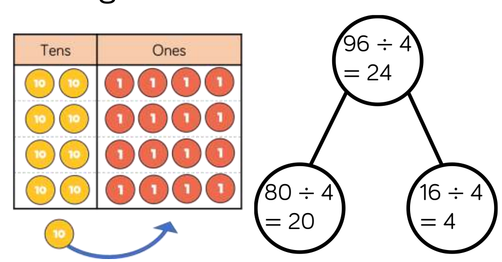




Use Jack's method to calculate:

$69 \div 3$ $88 \div 4$ $96 \div 3$

Rosie is calculating 96 divided by 4 using place value counters. First, she divides the tens. She has one ten remaining so she exchanges one ten for ten ones. Then, she divides the ones.



Use Rosie's method to solve
$65 \div 5$
$75 \div 5$
$84 \div 6$

Divide 2-digits by 1-digit (1)

Reasoning and Problem Solving

Dora is calculating 72 ÷ 3 Before she starts, she says the calculation will involve an exchange. Do you agree? Explain why.	Dora is correct because 70 is not a multiple of 3 so when you divide 7 tens between 3 groups there will be one remaining which will be exchanged.
Use < , > or = to complete the statements. 69 ÷ 3 ◯ 96 ÷ 3 96 ÷ 4 ◯ 96 ÷ 3 91 ÷ 7 ◯ 84 ÷ 6	< < <

Eva has 96 sweets. She shares them into equal groups. She has no sweets left over. How many groups could Eva have shared her sweets into?	Possible answers 96 ÷ 1 = 96 96 ÷ 2 = 48 96 ÷ 3 = 32 96 ÷ 4 = 24 96 ÷ 6 = 16 96 ÷ 8 = 12

Divide 2-digits by 1-digit (3)

Notes and Guidance

Children move onto solving division problems with a remainder.
Links are made between division and repeated subtraction, which builds on learning in Year 2
Children record the remainders as shown in Tommy's method.
This notation is new to Year 3 so will need a clear explanation.

Mathematical Talk

How do we know 13 divided by 4 will have a remainder?

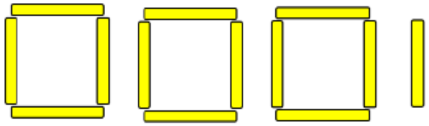
Can a remainder ever be more than the divisor?

Which is your favourite method?
Which methods are most efficient with larger two digit numbers?

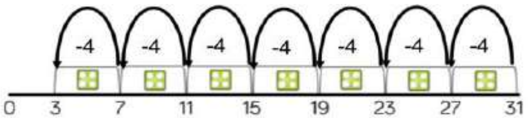
Varied Fluency

R

- How many squares can you make with 13 lollipop sticks?
  There are ___ lollipop sticks.
  There are ___ groups of 4
  There is ___ lollipop stick remaining.
  $13 \div 4 =$ ___ remainder ___
  Use this method to see how many triangles you can make with 38 lollipop sticks.



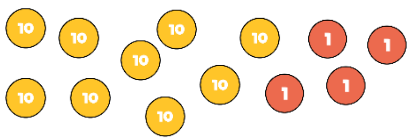
- Tommy uses repeated subtraction to solve $31 \div 4$



$31 \div 4 = 7\ r\ 3$

Use Tommy's method to solve 38 divided by 3

- Use place value counters to work out $94 \div 4$
  Did you need to exchange any tens for ones?
  Is there a remainder?



Tens	Ones

Divide 2-digits by 1-digit (3)

Reasoning and Problem Solving

Which calculation is the odd one out? Explain your thinking. $64 \div 8$ $77 \div 4$ $49 \div 6$ $65 \div 3$	$64 \div 8$ could be the odd one out as it is the only calculation without a remainder. Make sure other answers are considered such as $65 \div 3$ because it is the only one being divided by an odd number.

Jack has 15 stickers.  He sorts his stickers into equal groups but has some stickers remaining. How many stickers could be in each group and how many stickers would be remaining?	There are many solutions, encourage a systematic approach. e.g. 2 groups of 7, remainder 1 3 groups of 4, remainder 3 2 groups of 6, remainder 3
Dora and Eva are planting bulbs. They have 76 bulbs altogether. Dora plants her bulbs in rows of 8 and has 4 left over. Eva plants her bulbs in rows of 10 and has 2 left over. How many bulbs do they each have?	Dora has 44 bulbs. Eva has 32 bulbs.

Divide 2-digits by 1-digit (2)

Notes and Guidance

Children explore dividing 2-digit numbers by 1-digit numbers involving remainders.

They continue to use the place value counters to divide in order to explore why there are remainders. Teachers should highlight, through questioning, that the remainder can never be greater than the number you are dividing by.

Mathematical Talk

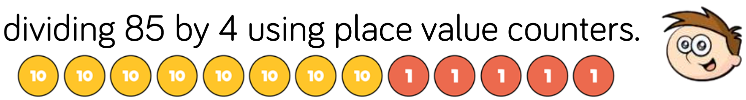
If we are dividing by 3, what is the highest remainder we can have?

If we are dividing by 4, what is the highest remainder we can have?

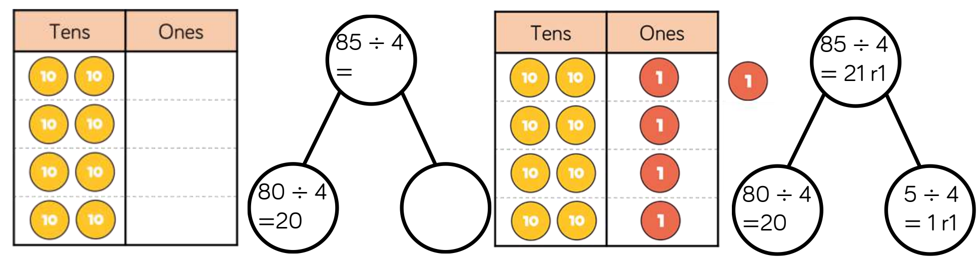
Can we make a general rule comparing our divisor (the number we are dividing by) to our remainder?

Varied Fluency

Teddy is dividing 85 by 4 using place value counters.



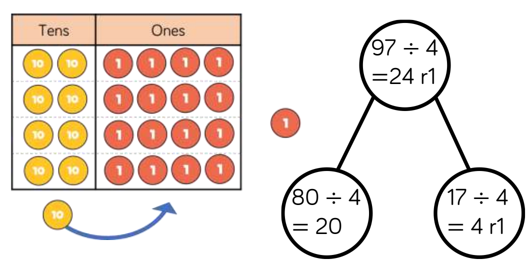
First, he divides the tens. Then, he divides the ones.



Use Teddy's method to calculate:

86 ÷ 4   87 ÷ 4   88 ÷ 4   97 ÷ 3   98 ÷ 3   99 ÷ 3

Whitney uses the same method, but some of her calculations involve an exchange.



Use Whitney's method to solve
57 ÷ 4
58 ÷ 4
58 ÷ 3

Divide 2-digits by 1-digit (2)

Reasoning and Problem Solving

Rosie writes, 85 ÷ 3 = 28 r 1 She says 85 must be 1 away from a multiple of 3 Do you agree?	I agree, remainder 1 means there is 1 left over. 85 is one more than 84 which is a multiple of 3
37 sweets are shared between 4 friends. How many sweets are left over? Four children attempt to solve this problem. • Alex says it's 1 • Mo says it's 9 • Eva says it's 9 r 1 • Jack says it's 8 r 5 Can you explain who is correct and the mistakes other people have made?	Alex is correct as there will be one remaining sweet. Mo has found how many sweets each friend will receive. Eva has written the answer to the calculation. Jack has found a remainder that is larger than the divisor so is incorrect.

Whitney is thinking of a 2-digit number that is less than 50 When it is divided by 2, there is no remainder. When it is divided by 3, there is a remainder of 1 When it is divided by 5, there is a remainder of 3 What number is Whitney thinking of?	Whitney is thinking of 28

Divide 3-digits by 1-digit

Notes and Guidance

Children apply their previous knowledge of dividing 2-digit numbers to divide a 3-digit number by a 1-digit number.

They use place value counters and part-whole models to support their understanding.

Children divide numbers with and without remainders.

Mathematical Talk

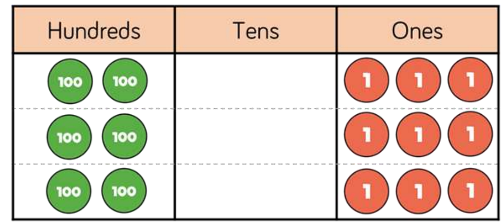
What is the same and what's different when we are dividing 3-digit number by a 1-digit number and a 2-digit number by a 1-digit number?

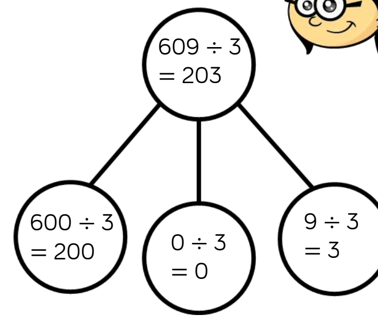
Do we need to partition 609 into three parts or could it just be partitioned into two parts?

Can we partition the number in more than one way to support dividing more efficiently?

Varied Fluency

Annie is dividing 609 by 3 using place value counters.

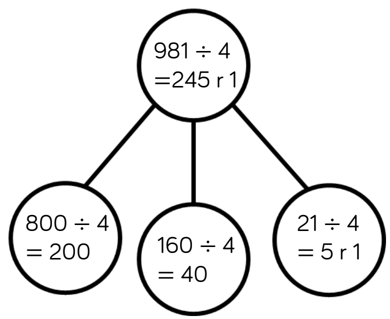




Use Annie's method to calculate the divisions.

906 ÷ 3　　884 ÷ 4　　884 ÷ 8　　489 ÷ 2

Rosie is using flexible partitioning to divide 3-digit numbers. She uses her place value counters to support her.

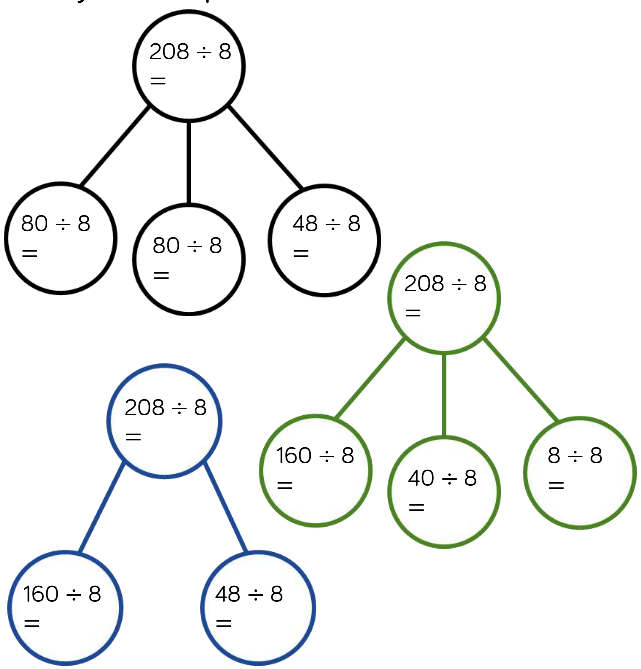


Use Rosie's method to solve:
726 ÷ 6
846 ÷ 6
846 ÷ 7

Divide 3-digits by 1-digit

Reasoning and Problem Solving

Dexter is calculating 208 ÷ 8 using part-whole models.
Can you complete each model?

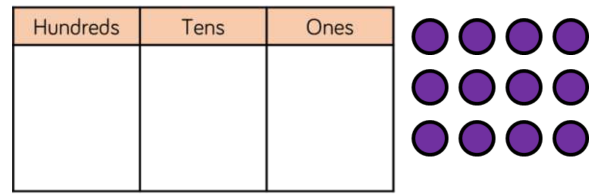


How many part-whole models can you make to calculate 132 ÷ 4?

208 ÷ 8 = 26
80 ÷ 8 = 10
48 ÷ 8 = 6
160 ÷ 8 = 20
40 ÷ 8 = 5
8 ÷ 8 = 1

Children can then make a range of part-whole models to calculate 132 ÷ 4
e.g.
100 ÷ 4 = 25
32 ÷ 4 = 8

You have 12 counters and the place value grid. You must use all 12 counters to complete the following.



Create a 3-digit number divisible by 2
Create a 3-digit number divisible by 3
Create a 3-digit number divisible by 4
Create a 3-digit number divisible by 5
Can you find a 3-digit number divisible by 6, 7, 8 or 9?

2: Any even number

3: Any 3-digit number (as the digits add up to 12, a multiple of 3)

4: A number where the last two digits are a multiple of 4

5: Any number with 0 or 5 in the ones column.

Possible answers

6: Any even number

7: 714, 8: 840

9: impossible

White Rose Maths

Correspondence Problems

Notes and Guidance

Children solve more complex problems building on their understanding from Year 3 of when *n* objects relate to *m* objects.

They find all solutions and notice how to use multiplication facts to solve problems.

Mathematical Talk

Can you use a table to support you to find all the combinations?

Can you use a code to help you find the combinations? e.g. VS meaning Vanilla and Sauce

Can you use coins to support you to make all the possible combinations?

Varied Fluency

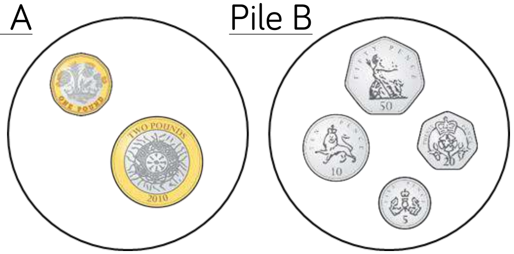
- An ice-cream van has 4 flavours of ice-cream and 2 choices of toppings.

Ice-cream flavour	Toppings
Vanilla Chocolate Strawberry Banana	Sauce Flake

How many different combinations of ice-cream and toppings can be made?
Complete the multiplication to represent the combinations.
___ × ___ = ____ There are ____ combinations.

- Jack has two piles of coins.
He chooses one coin from each pile.

Pile A Pile B



What are all the possible combinations of coins Jack can choose?
What are all the possible totals he can make?

White Rose Maths

Correspondence Problems

Reasoning and Problem Solving

Here are the meal choices in the school canteen.

Starter	Main	Dessert
Soup Garlic Bread	Pasta Chicken Beef Salad	Cake Ice-cream Fruit Salad

There are 2 choices of starter, 4 choices of main and 3 choices of dessert.

How many meal combinations can you find? Can you use a systematic approach?
Can you represent the combinations in a multiplication?

If there were 20 meal combinations, how many starters, mains and desserts might there be?

There are 24 meal combinations altogether.
$2 \times 4 \times 3 = 24$

20 combinations
$1 \times 1 \times 20$
$1 \times 2 \times 10$
$1 \times 4 \times 5$
$2 \times 2 \times 5$
Accept all other variations of these four multiplications e.g. $1 \times 20 \times 1$

Alex has 6 T-shirts and 4 pairs of shorts.
Dexter has 12 T-shirts and 2 pairs of shorts.
Who has the most combinations of T-shirts and shorts?
Explain your answer.

Alex and Dexter have the same number of combinations of T-shirts and shorts.

White Rose Maths

Spring - Block 2

Area

Overview

Small Steps

- What is area?
- Counting squares
- Making shapes
- Comparing area

Notes for 2020/21

This is brand new learning for children. Opportunities for exploration of vocabulary is key. Make sure children cover larger surfaces and have a clear understanding of the concept of area before moving onto counting small squares.

What is Area?

Notes and Guidance

Children are introduced to area for the first time. They understand that area is the amount space is taken up by a 2D shape or surface.
Children investigate different shapes that an be made with sets of sticky notes. They should be encouraged to see that the same number of sticky notes can make different shapes but they cover the same amount of surface. We call this the area of a shape.

Mathematical Talk

Use square sticky notes to find areas of different items in the classroom, which items have the largest surface area?
Would we want to find the area of the playground using sticky notes? What else could we use?
Why are shapes with perpendicular sides more effective to find the area of rectilinear shapes?

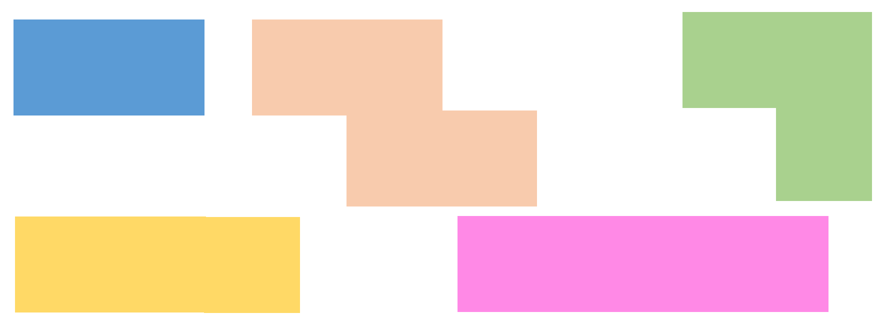
Varied Fluency

- Which of the two shapes covers most surface?

How do you know?

- This is a square sticky note. 

Estimate how many sticky notes you need to make these shapes?



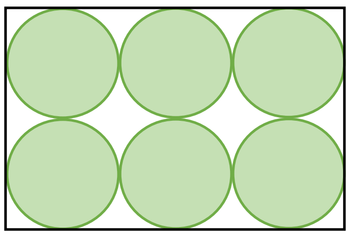
Now make the shapes using sticky notes.
Which ones cover the largest amount of surface? Which ones cover the least amount of surface?

What is Area?

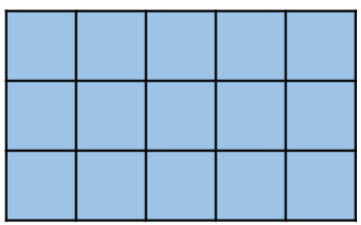
Reasoning and Problem Solving

Teddy and Eva are measuring the area of the same rectangle.

Teddy uses circles to find the area.



Eva uses squares to find the area.

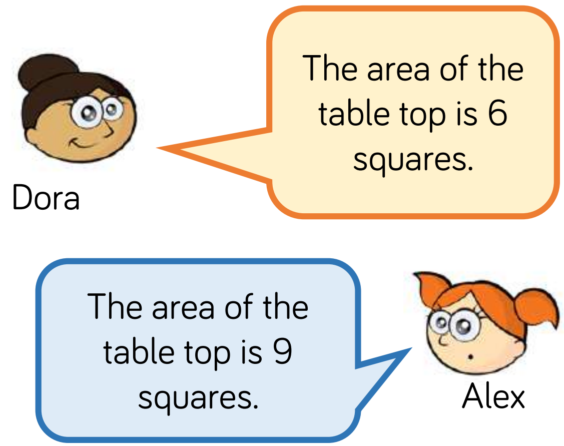


Whose method do you think is more reliable?
Explain why.

Possible answer:

Eva's method is more reliable than Teddy's because her squares cover the whole surface of the rectangle whereas the circles leave some of the surface uncovered.

Two children have measured the top of their desk. They used different sized squares.



Who used the largest squares?
How do you know?

Dora needed fewer squares to cover the space, so her squares must have been the larger ones. If the squares are smaller, you need more of them.

White Rose Maths

Counting Squares

Notes and Guidance

Once children understand that area is measured in squares, they use the strategy of counting the number of squares in a shape to measure and compare the areas of rectilinear shapes.
They explore the most efficient method of counting squares and link this to their understanding of squares and rectangles.

Mathematical Talk

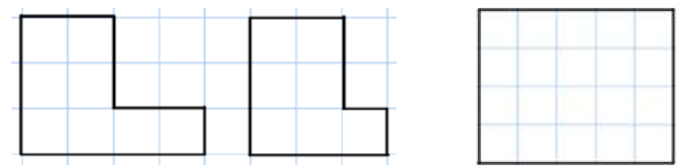
What strategy can you use to ensure you don't count a square twice?

Which colour covers the largest area of the quilt?
Which colour covers the smallest area of the quilt?

Will Jack's method work for every rectilinear shape?

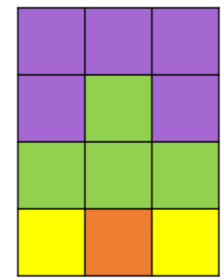
Varied Fluency

- Complete the sentences for each shape.



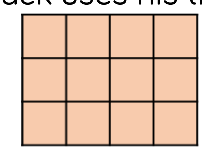
The area of the shape is ____ squares.

- Here is a patchwork quilt.
It is made from different coloured squares.
Find the area of each colour.



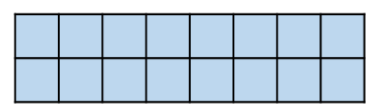
Purple = ___ squares   Green = ___ squares
Yellow = ___ squares   Orange = ___ squares

- Jack uses his times-tables to count the squares more efficiently.



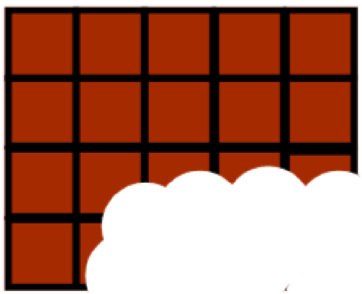
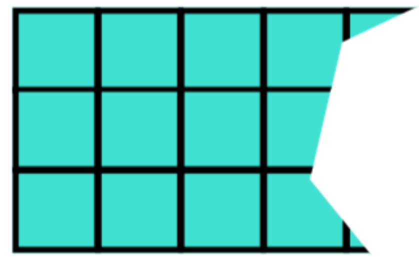
There are 4 squares in 1 row.
There are 3 rows altogether.
3 rows of 4 squares = 12 squares

Use Jack's method to find the area of this rectangle.



Counting Squares

Reasoning and Problem Solving

Dexter has taken a bite of the chocolate bar.  The chocolate bar was a rectangle. Can you work out how many squares of chocolate there were to start with?	There were 20 squares. You know this because two sides of the rectangle are shown.
This rectangle has been ripped.  What is the smallest possible area of the original rectangle? What is the largest possible area if the length of the rectangle is less than 10 squares?	Smallest area – 15 squares. Largest area – 30 squares.

Making Shapes

Notes and Guidance

Children make rectilinear shapes using a given number of squares.

It is important that children understand that the rectilinear shapes they make need to touch at the sides not just at the corners. They can work systematically to find all the different rectilinear shapes by moving one square at a time.

Mathematical Talk

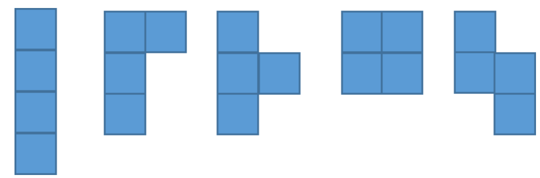
If you turn Ron's shapes upside down, do they stay the same or are they different?

Should you overlap the squares when counting area? Explain your answer.

How many different rectilinear shapes can you make with 8 squares? Will the area always be the same? Why?

Varied Fluency

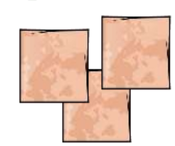
- Ron has 4 squares.
  He systematically makes rectilinear shapes.



  Use 5 squares to make rectilinear shapes.
  Can you work systematically?

- Use squared paper to draw 4 different rectilinear shapes with an area of 12 squares.
  Compare your shapes to a partner.
  Are they the same?
  Are they different?

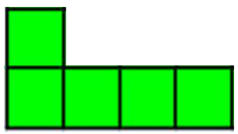
- Mo is building a patio made of 20 square slabs.
  What could the patio look like?
  Mo is using 6 black square slabs in his design.
  None of them are touching each other.
  Where could they be in the designs you have made?



Making Shapes

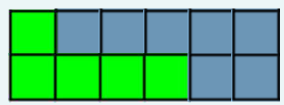
Reasoning and Problem Solving

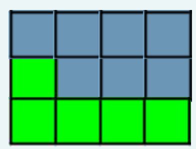
Here is a rectilinear shape.



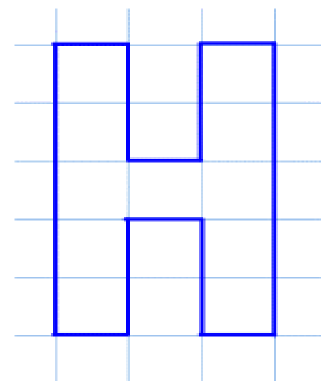
Using 7 more squares, can you make a rectangle?
Can you find more than one way?

Possible answers include:





Can you make some capital letters on squared paper using less than 20 squares?



Make a word from some and count the total area of the letters.
Which letters have a line of symmetry?
What is the area of half of each letter?

Most letters can be made. They could be drawn on large squared paper or made with square tiles.

Comparing Area

Notes and Guidance

Children compare the area of rectilinear shapes where the same size square has been used.

Children will be able to use < and > with the value of the area to compare shapes.

They will also put shapes in order of size by comparing their areas.

Mathematical Talk

How much larger/smaller is the area of the shape?

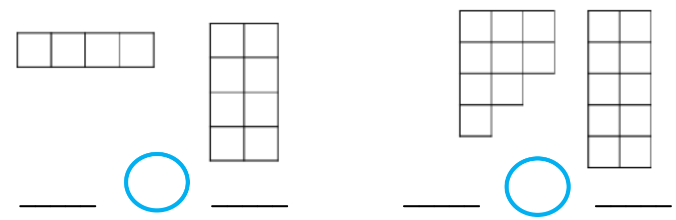
How can we order the shapes?

Can we draw a shape that would have the same area as ____?

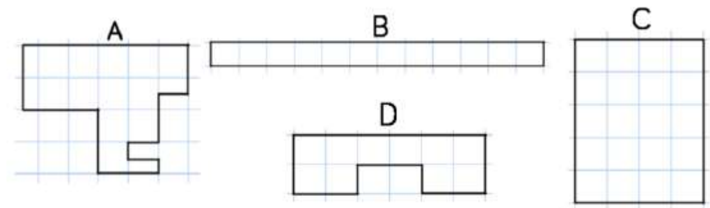
What is different about the number of squares covered by shape A?

Varied Fluency

- Use the words 'greater than' and 'less than' to compare the rectilinear shapes.
  Complete the sentence stems using < and >



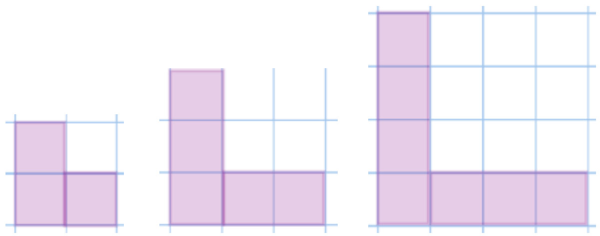
- Put the shapes in order from largest to smallest area.



- Here is a shape.
  Draw a shape that has a smaller area than this shape but an area greater than 7 squares.
  Draw a shape that has an area equal to the first shape, but looks different.

Comparing Area

Reasoning and Problem Solving



Look at the shapes. Can you spot the pattern and explain how the area is changing each time?

Draw the next shape. What is its area?

Can you predict what the area of the 6th shape would be?

Can you spot any patterns in your answers?

The area increases by 2 each time.

The next shape will have an area of 9.

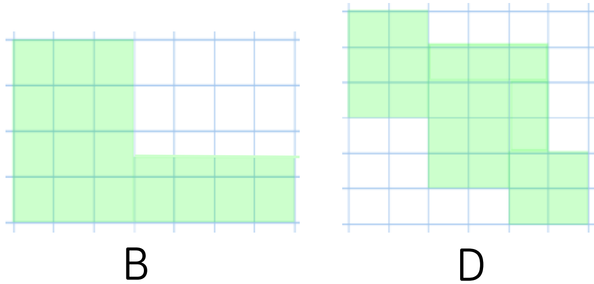
The 6th shape will have an area of 13.

The answers are all odd numbers and increase by 2 each time.

Shape C has been deleted.

Area C > Area B
Area C < Area D

Can you draw what shape C could look like?



Shape A is missing too.

- It has the smallest area.
- It is symmetrical.

Can you draw what it could look like?

Shape B has an area of 18 squares.

Shape D has an area of 21 squares.

So Shape C can be any shape that has an area between 18 and 21 squares.

Shape A must have area less than 18 squares, but can be any symmetrical design e.g. a 4 by 4 square.

White Rose Maths

Spring - Block 3

Fractions

Overview

Small Steps

- Unit and non-unit fractions (R)
- What is a fraction?
- Tenths (R)
- Count in tenths (R)
- Equivalent fractions (1) (R)
- Equivalent fractions (2) (R)
- Equivalent fractions (1)
- Equivalent fractions (2)
- Fractions greater than 1
- Count in fractions
- Add fractions (R)
- Add 2 or more fractions

Notes for 2020/21

Year 3 fractions work was in the summer term and learning may have been missed. We have therefore added a number of recap steps to ensure children have a thorough understanding of tenths and equivalent fractions before moving into adding and subtracting.

The progression from paper folding and finding two equivalent fractions is explored before moving onto looking at numerical relationships in a more abstract way.

Overview

Small Steps

- Subtract fractions (R)
- Subtract 2 fractions
- Subtract from whole amounts
- Fractions of a set of objects (1) (R)
- Fractions of a set of objects (2) (R)
- Calculate fractions of a quantity
- Problem solving – calculate quantities

Notes for 2020/21

The recap step here suggests children use practical equipment and pictorial representations to subtract fractions with the same denominator within one whole. They can then apply this to subtracting more than one fraction and from whole amounts.

Unit and Non-unit Fractions

Notes and Guidance

Children recap their understanding of unit and non-unit fractions from Year 2. They explain the similarities and differences between unit and non-unit fractions.

Children are introduced to fractions with denominators other than 2, 3 and 4, which they used in Year 2. Ensure children understand what the numerator and denominator represent.

Mathematical Talk

What is a unit fraction?

What is a non-unit fraction?

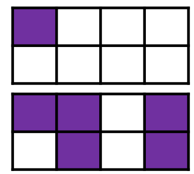
Show me $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}$ What's the same? What's different?

What fraction is shaded? What fraction is not shaded?

What is the same about the fractions? What is different?

Varied Fluency

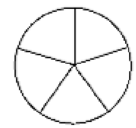
Complete the sentences to describe the images.



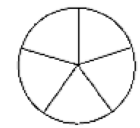
___ out of ___ equal parts are shaded.

$\frac{\square}{\square}$ of the shape is shaded.

Shade $\frac{1}{5}$ of the circle.

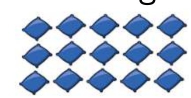


Shade $\frac{3}{5}$ of the circle



Circle $\frac{1}{5}$ of the beanbags.

Circle $\frac{3}{5}$ of the beanbags.



What's the same and what's different about $\frac{1}{5}$ and $\frac{3}{5}$?

Complete the sentences.

A unit fraction always has a numerator of _____
A non-unit fraction has a numerator that is ______ than _____
An example of a unit fraction is _____
An example of a non-unit fraction is ____

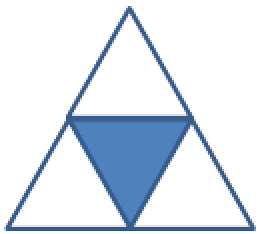
Can you draw a unit fraction and a non-unit fraction with the same denominator?

Unit and Non-unit Fractions

Reasoning and Problem Solving

R

True or False?



$\frac{1}{3}$ of the shape is shaded.

False, one quarter is shaded. Ensure when counting the parts of the whole that children also count the shaded part.

Sort the fractions into the table.

	Fractions equal to one whole	Fractions less than one whole
Unit fractions		
Non-unit fractions		

Are there any boxes in the table empty? Why?

$\frac{3}{4}$	$\frac{3}{5}$	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{2}{2}$	$\frac{4}{4}$	$\frac{2}{5}$	$\frac{1}{2}$

Top left: Empty

Top right: $\frac{1}{3}$, $\frac{1}{4}$ and $\frac{1}{2}$

Bottom left: $\frac{2}{2}$ and $\frac{4}{4}$

Bottom right: $\frac{3}{4}$, $\frac{3}{5}$ and $\frac{2}{5}$

There are no unit fractions that are equal to one whole other than $\frac{1}{1}$ but this isn't in our list.

What is a Fraction?

Notes and Guidance

Children explore fractions in different representations, for example, fractions of shapes, quantities and fractions on a number line.

They explore and recap the meaning of numerator and denominator, non-unit and unit fractions.

Mathematical Talk

How can we sort the fraction cards?

What fraction does each one represent?

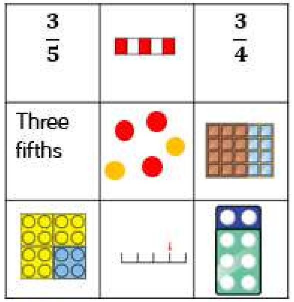
Could some cards represent more than one fraction?

Is $\frac{1.5}{3}$ an example of a non-unit fraction? Why?

Using Cuisenaire, how many white rods are equal to an orange rod? How does this help us work out what fraction the white rod represents?

Varied Fluency

Here are 9 cards.
Sort the cards into different groups.
Can you explain how you made your decision?
Can you sort the cards in a different way?
Can you explain how your partner has sorted the cards?



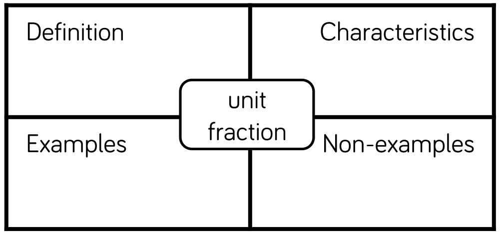
Complete the Frayer model to describe a unit fraction.

Can you use the model to describe the following terms?

Non-unit fraction

Numerator

Denominator



Use Cuisenaire rods.
If the orange rod is one whole, what fraction is represented by:

- The white rod
- The red rod
- The yellow rod
- The brown rod

Choose a different rod to represent one whole.; what do the other rods represent now?

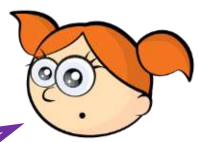
What is a Fraction?

Reasoning and Problem Solving

Always, Sometimes, Never?

Alex says,

> If I split a shape into 4 parts, I have split it into quarters.

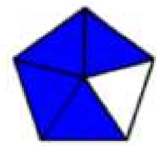


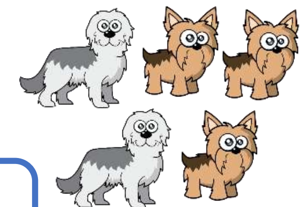
Explain your answer.

Sometimes

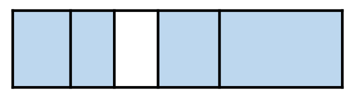
If the shape is not split equally, it will not be in quarters.

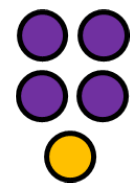
Which representations of $\frac{4}{5}$ are incorrect?





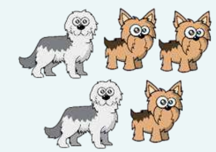
$\frac{4}{5}$





Explain how you know.

The image of the dogs could represent $\frac{2}{5}$ or $\frac{3}{5}$



The bar model is not divided into equal parts so this does not represent $\frac{4}{5}$

Tenths

Notes and Guidance

Children explore what a tenth is. They recognise that tenths arise from dividing one whole into 10 equal parts.

Children represent tenths in different ways and use words and fractions to describe them. For example, one tenth and $\frac{1}{10}$

Mathematical Talk

How many tenths make the whole?

How many tenths are shaded?

How many more tenths do I need to make a whole?

When I am writing tenths, the ___________ is always 10

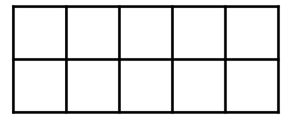
How are fractions linked to division?

Varied Fluency

R

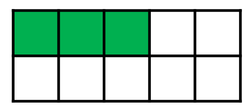
If the frame represents 1 whole, what does each box represent?
Use counters to represent:

- One tenth
- Two tenths
- Three tenths
- One tenth less than eight tenths

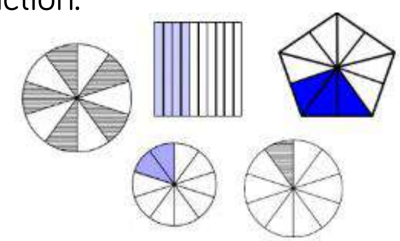


Identify what fraction of each shape is shaded.
Give your answer in words and as a fraction.

e.g.



Three tenths $\frac{3}{10}$



Annie has 2 cakes. She wants to share them equally between 10 people. What fraction of the cakes will each person get?

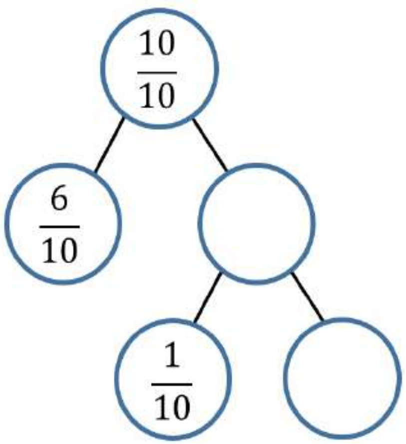
There are ____ cakes.
They are shared equally between ___ people.
Each person has $\frac{\square}{\square}$ of the cake.
___ ÷ ____ = _____

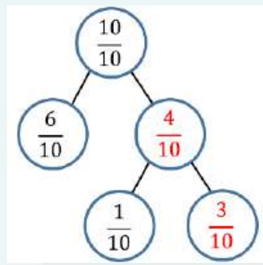
What fraction would they get if Annie had 4 cakes?

Tenths

Reasoning and Problem Solving

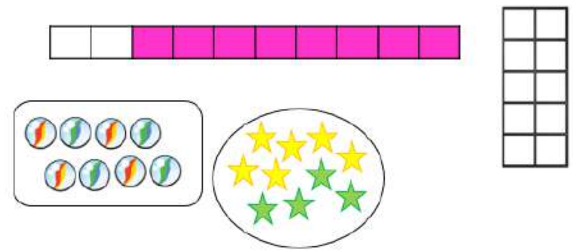
Fill in the missing values.
Explain how you got your answers.





Children could use practical equipment to explain why and how, and relate back to the counting stick.

Odd One Out



Which is the odd one out?
Explain your answer.

The marbles are the odd one out because they represent 8 or eighths. All of the other images have a whole which has been split into ten equal parts.

Count in Tenths

Notes and Guidance

Children count up and down in tenths using different representations.

Children also explore what happens when counting past $\frac{10}{10}$. They are not required to write mixed numbers, however children may see the $\frac{11}{10}$ as $1\frac{1}{10}$ due to their understanding of 1 whole.

Mathematical Talk

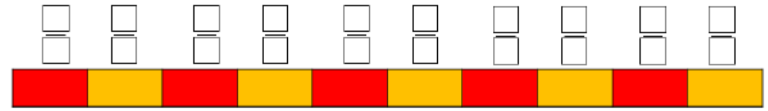
Let's count in tenths. What comes next? Explain how you know.

If I start at ___ tenths, what will be next?

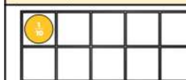
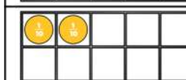
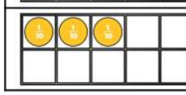
When we get to $\frac{10}{10}$ what else can we say? What happens next?

Varied Fluency

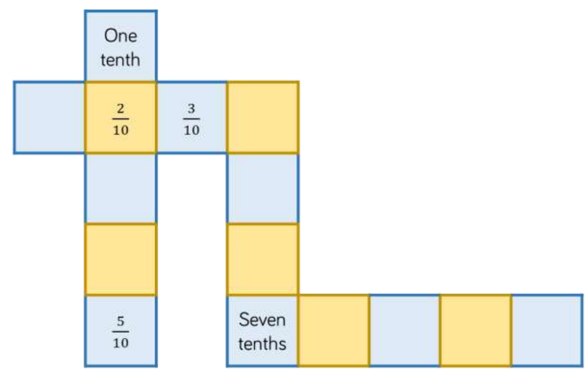
- The counting stick is worth 1 whole. Label each part of the counting stick. Can you count forwards and backwards along the counting stick?



- Continue the pattern in the table.
  - What comes between $\frac{4}{10}$ and $\frac{6}{10}$?
  - What is one more than $\frac{10}{10}$?
  - If I start at $\frac{8}{10}$ and count back $\frac{4}{10}$, where will I stop?

Representation	Words	Fraction
	One tenth	$\frac{1}{10}$
		
		

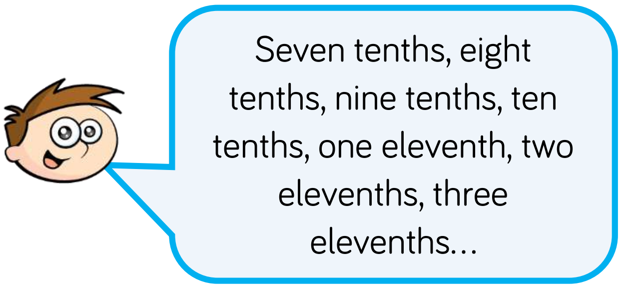
- Complete the sequences.



Count in Tenths

Reasoning and Problem Solving

Teddy is counting in tenths.



Can you spot his mistake?

Teddy thinks that after ten tenths you start counting in elevenths. He does not realise that ten tenths is the whole, and so the next number in the sequence after ten tenths is eleven tenths or one and one tenth.

True or False?

Five tenths is $\frac{2}{10}$ smaller than 7 tenths.

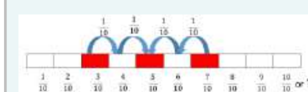
Five tenths is $\frac{2}{10}$ larger than three tenths.

Do you agree?

Explain why.

This is correct. Children could show it using pictures, ten frames, number lines etc.

For example:



Equivalent Fractions (1)

Notes and Guidance

Children begin by using Cuisenaire or number rods to investigate and record equivalent fractions. Children then move on to exploring equivalent fractions through bar models.

Children explore equivalent fractions in pairs and can start to spot patterns.

Mathematical Talk

If the ___ rod is worth 1, can you show me $\frac{1}{2}$? How about $\frac{1}{4}$?
Can you find other rods that are the same? What fraction would they represent?

How can you fold a strip of paper into equal parts?
What do you notice about the numerators and denominators?
Do you see any patterns?

Can a fraction have more than one equivalent fraction?

Varied Fluency

- The pink Cuisenaire rod is worth 1 whole.

  Which rod would be worth $\frac{1}{4}$?
  Which rods would be worth $\frac{2}{4}$?
  Which rod would be worth $\frac{1}{2}$?
  Use Cuisenaire to find rods to investigate other equivalent fractions.

- Use two strips of equal sized paper. Fold one strip into quarters and the other into eighths. Place the quarters on top of the eighths and lift up one quarter, how many eighths can you see? How many eighths are equivalent to one quarter? Which other equivalent fractions can you find?

- Using squared paper, investigate equivalent fractions using equal parts. e.g. $\frac{\square}{4} = \frac{\square}{8}$
  Start by drawing a bar 8 squares along. Label each square $\frac{1}{8}$
  Underneath compare the same length bar split into four equal parts. What fraction is each part now?

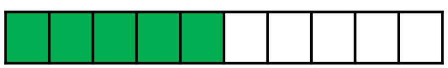
Equivalent Fractions (1)

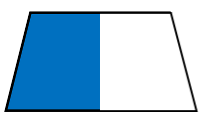
Reasoning and Problem Solving

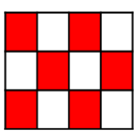
Explain how the diagram shows both $\frac{2}{3}$ and $\frac{4}{6}$

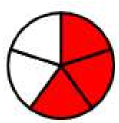
The diagram is divided in to six equal parts and four out of the six are yellow. You can also see three **columns** and two columns are yellow.

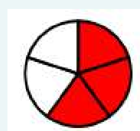
Which is the odd one out? Explain why



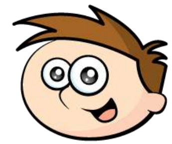








This is the odd one out because the other fractions are all equivalent to $\frac{1}{2}$



Teddy makes this fraction:

Mo says he can make an equivalent fraction with a denominator of 9

Dora disagrees. She says it can't have a denominator of 9 because the denominator would need to be double 3

Who is correct? Who is incorrect? Explain why.

Mo is correct. He could make three ninths which is equivalent to one third.

Dora is incorrect. She has a misconception that you can only double to find equivalent fractions.

Equivalent Fractions (2)

Notes and Guidance

Children use Cuisenaire rods and paper strips alongside number lines to deepen their understanding of equivalent fractions.

Encourage children to focus on how the number line can be divided into different amounts of equal parts and how this helps to find equivalent fractions e.g. a number line divided into twelfths can also represent halves, thirds, quarters and sixths.

Mathematical Talk

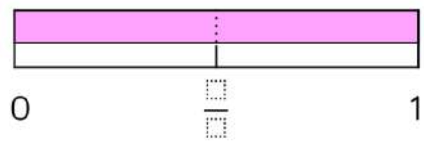
The number line represents 1 whole, where can we see the fraction $\frac{\square}{\square}$? Can we see any equivalent fractions?

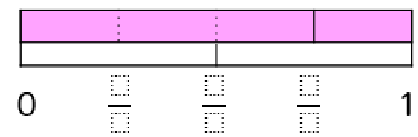
Look at the number line divided into twelfths. Which unit fractions can you place on the number line as equivalent fractions? e.g. $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}$ etc. Which unit fractions are not equivalent to twelfths?

Varied Fluency

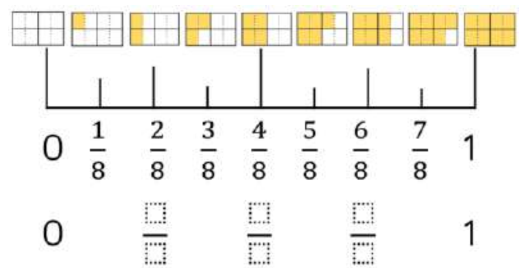
R

- Use the models on the number line to identify the missing fractions. Which fractions are equivalent?



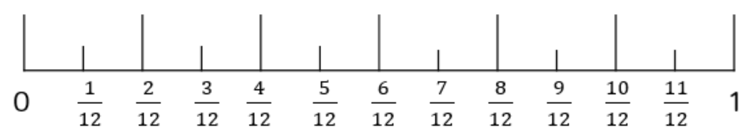


- Complete the missing equivalent fractions.



- Place these equivalent fractions on the number line.

$\frac{1}{4}$ $\frac{3}{4}$ $\frac{1}{6}$ $\frac{1}{3}$ $\frac{2}{3}$



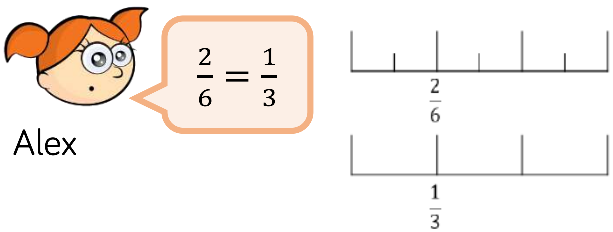
Are there any other equivalent fractions you can identify on the number line?

Equivalent Fractions (2)

Reasoning and Problem Solving

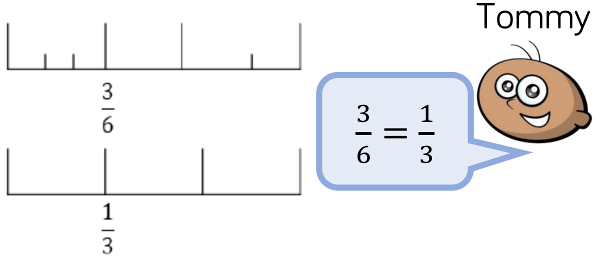
R

Alex and Tommy are using number lines to explore equivalent fractions.



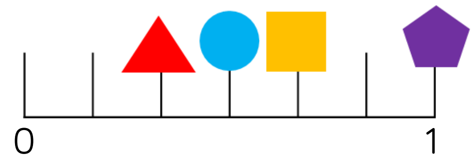
Alex

Tommy



Who do you agree with? Explain why.

Alex is correct. Tommy's top number line isn't split into equal parts which means he cannot find the correct equivalent fraction.

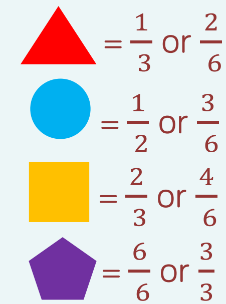


Use the clues to work out which fraction is being described for each shape.

- My denominator is 6 and my numerator is half of my denominator.
- I am equivalent to $\frac{4}{12}$
- I am equivalent to one whole
- I am equivalent to $\frac{2}{3}$

Can you write what fraction each shape is worth? Can you record an equivalent fraction for each one?

- Circle
- Triangle
- Square
- Pentagon



Accept other correct equivalences

Equivalent Fractions (1)

Notes and Guidance

Children use strip diagrams to investigate and record equivalent fractions.

They start by comparing two fractions before moving on to finding more than one equivalent fraction on a fraction wall.

Mathematical Talk

Look at the equivalent fractions you have found.
What relationship can you see between the numerators and denominators? Are there any patterns?

Can a fraction have more than one equivalent fraction?

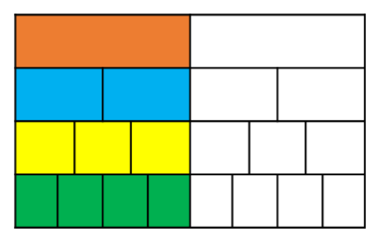
Can you use Cuisenaire rods or pattern blocks to investigate equivalent fractions?

Varied Fluency

- Use two strips of equal sized paper.
  Fold one strip into quarters and the other into eighths.
  Place the quarters on top of the eighths and lift up one quarter; how many eighths can you see?
  How many eighths are equivalent to one quarter?
  Which other equivalent fractions can you find?

- Using squared paper, investigate equivalent fractions using equal parts e.g. $\frac{2}{4} = \frac{?}{8}$
  Start by drawing a bar 8 squares long.
  Underneath, compare the same length bar split into four equal parts.

- How many fractions that are equivalent to one half can you see on the fraction wall?

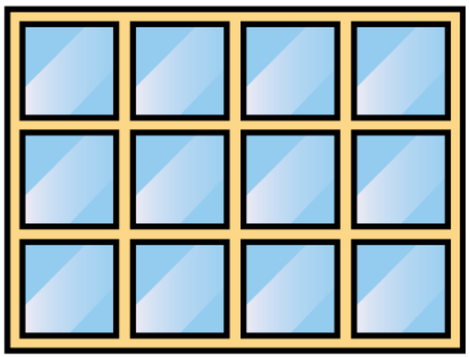


Draw extra rows to show other equivalent fractions.

Equivalent Fractions (1)

Reasoning and Problem Solving

How many equivalent fractions can you see in this picture?

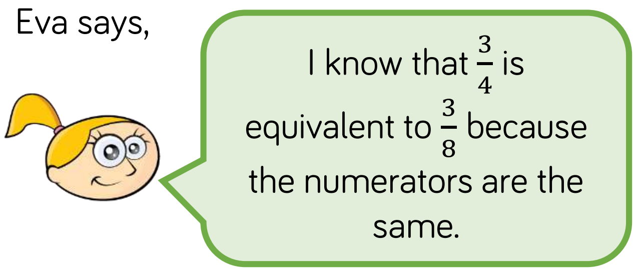


Children can give a variety of possibilities.
Examples:

$$\frac{1}{2} = \frac{6}{12} = \frac{3}{6}$$

$$\frac{1}{4} = \frac{3}{12}$$

Eva says,



Is Eva correct?
Explain why.

Eva is not correct.
$\frac{3}{4}$ is equivalent to $\frac{6}{8}$
When the numerators are the same, the larger the denominator, the smaller the fraction.

Ron has two strips of the same sized paper.
He folds the strips into different sized fractions.
He shades in three equal parts on one strip and six equal parts on the other strip.
The shaded areas are equal.

What fractions could he have folded his strips into?

Ron could have folded his strips into sixths and twelfths, quarters and eighths or any other fractions where one of the denominators is double the other.

Equivalent Fractions (2)

Notes and Guidance

Children continue to understand equivalence through diagrams. They move onto using proportional reasoning to find equivalent fractions.

Attention should be drawn to the method of multiplying the numerators and denominators by the same number to ensure that fractions are equivalent.

Mathematical Talk

What other equivalent fractions can you find using the diagram?

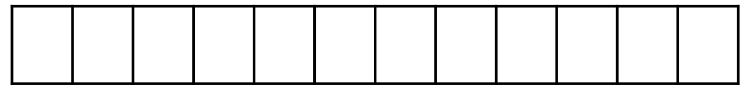
What relationships can you see between the fractions?

If I multiply the numerator by a number, what do I have to do to the denominator to keep it equivalent? Is this always true?

What relationships can you see between the numerator and denominator?

Varied Fluency

- Using the diagram, complete the equivalent fractions.



$\frac{1}{4} = \frac{\square}{12}$ $\frac{1}{\square} = \frac{6}{12}$ $\frac{2}{3} = \frac{\square}{12}$ $\frac{5}{12} = \frac{\square}{24}$

- 

Using the diagram, complete the equivalent fractions.

$\frac{1}{3} = \frac{\square}{6} = \frac{\square}{12} = \frac{\square}{24}$

- Complete:

$\frac{1}{4} = \frac{2}{\square} = \frac{\square}{12} = \frac{4}{\square} = \frac{\square}{100} = \frac{\square}{500}$

White Rose Maths

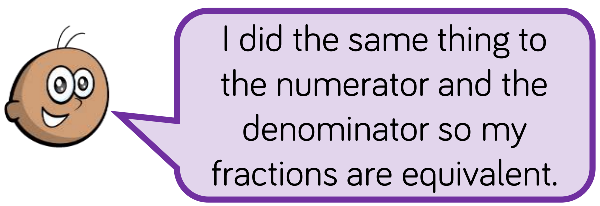
Equivalent Fractions (2)

Reasoning and Problem Solving

Tommy is finding equivalent fractions.

$$\frac{3}{4} = \frac{5}{6} = \frac{7}{8} = \frac{9}{10}$$

He says,

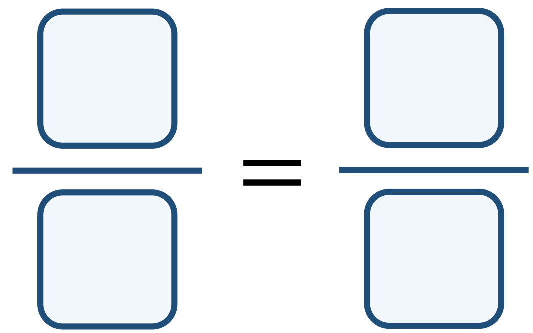


Do you agree with Tommy?
Explain your answer.

Tommy is wrong. He has added two to the numerator and denominator each time. When you find equivalent fractions you either need to multiply or divide the numerator and denominator by the same number.

Use the digit cards to complete the equivalent fractions.

1 2 3
4 6 8



How many different ways can you find?

Possible answers:

$\frac{1}{2} = \frac{3}{6}$, $\frac{1}{2} = \frac{4}{8}$,

$\frac{1}{3} = \frac{2}{6}$, $\frac{1}{4} = \frac{2}{8}$,

$\frac{3}{4} = \frac{6}{8}$, $\frac{2}{3} = \frac{4}{6}$

Fractions Greater than 1

Notes and Guidance

Children use manipulatives and diagrams to show that a fraction can be split into wholes and parts.

Children focus on how many equal parts make a whole dependent on the number of equal parts altogether. This learning will lead on to Year 5 where children learn about improper fractions and mixed numbers.

Mathematical Talk

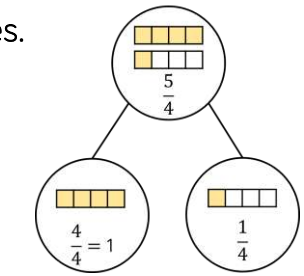
How many ____ make a whole?

If I have _____ eighths, how many more do I need to make a whole?

What do you notice about the numerator and denominator when a fraction is equivalent to a whole?

Varied Fluency

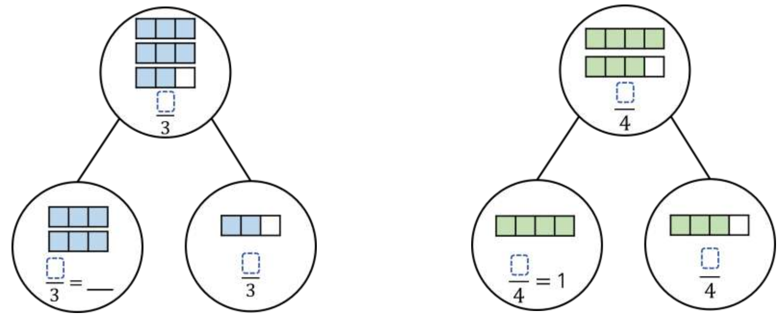
- Complete the part-whole models and sentences.



There are ____ quarters altogether.

___ quarters = ____ whole and ____ quarter.

Write sentences to describe these part-whole models.



- Complete. You may use part-whole models to help you.

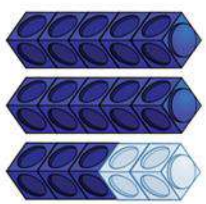
$$\frac{10}{3} = \frac{9}{3} + \frac{\square}{3} = 3\frac{\square}{3}$$

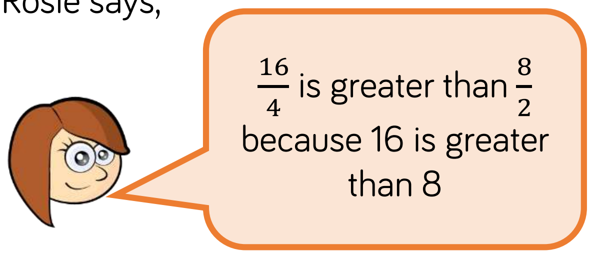
$$\frac{\square}{3} = \frac{6}{3} + \frac{2}{3} = \square\frac{2}{3}$$

$$\frac{\square}{8} = \frac{16}{8} + \frac{3}{8} = \square\frac{\square}{\square}$$

Fractions Greater than 1

Reasoning and Problem Solving

3 friends share some pizzas. Each pizza is cut into 8 equal slices. Altogether, they eat 25 slices. How many whole pizzas do they eat?	They eat 3 whole pizzas and 1 more slice.
Spot the mistake.  $\frac{13}{5}$ = 10 wholes and 3 fifths	There are 2 wholes not 10 $\frac{10}{5}$ = 2 wholes $\frac{13}{5}$ = 2 wholes and 3 fifths

Rosie says,  Do you agree? Explain why.	I disagree with Rosie because both fractions are equivalent to 4 Children may choose to build both fractions using cubes, or draw bar models.

Count in Fractions

Notes and Guidance

Children explore fractions greater than one on a number line and start to make connections between improper and mixed numbers.

They use cubes and bar models to represent fractions greater than a whole. This will support children when adding and subtracting fractions greater than a whole.

Mathematical Talk

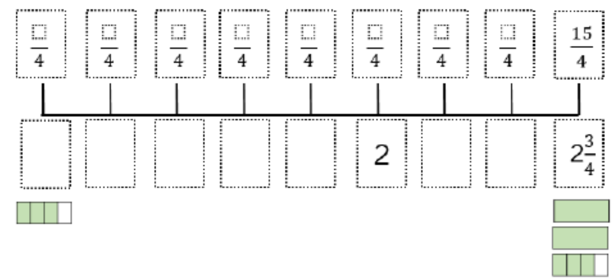
How many ____ make a whole?

Can you write the missing fractions in more than one way?

Are the fractions ascending or descending?

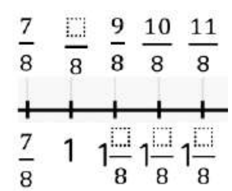
Varied Fluency

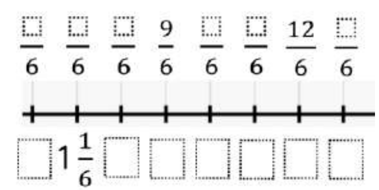
- Complete the number line.



Draw bar models to represent each fraction.

- Fill in the blanks using cubes or bar models to help you.





- Write the next two fractions in each sequence.

a) $\frac{12}{7}, \frac{11}{7}, \frac{10}{7}$, ____, ____

b) $3\frac{1}{3}, 3, 2\frac{2}{3}$, ____, ____

c) $\frac{4}{11}, \frac{6}{11}, \frac{8}{11}$, ____, ____

d) $12\frac{3}{5}, 13\frac{1}{5}, 13\frac{4}{5}$, ____, ____

Count in Fractions

Reasoning and Problem Solving

Here is a number sequence.

$\frac{5}{12}, \frac{7}{12}, \frac{10}{12}, \frac{14}{12}, \frac{19}{12},$ ____

Which fraction would come next?
Can you write the fraction in more than one way?

The fractions are increasing by one more twelfth each time. The next fraction would be $\frac{25}{12}$

Circle and correct the mistakes in the sequences.

$\frac{5}{12}, \frac{8}{12}, \frac{11}{12}, \frac{15}{12}, \frac{17}{12}$

$\frac{9}{10}, \frac{7}{10}, \frac{6}{10}, \frac{3}{10}, \frac{1}{10}$

$\frac{5}{12}, \frac{8}{12}, \frac{11}{12}, \frac{14}{12}, \frac{17}{12}$

$\frac{9}{10}, \frac{7}{10}, \frac{5}{10}, \frac{3}{10}, \frac{1}{10}$

Play the fraction game for four players.
Place the four fraction cards on the floor.
Each player stands in front of a fraction.
We are going to count up in tenths starting at 0
When you say a fraction, place your foot on your fraction.

$\frac{1}{10}$ $\frac{2}{10}$

$\frac{3}{10}$ $\frac{5}{10}$

How can we make 4 tenths?
What is the highest fraction we can count to?
How about if we used two feet?

2 children can make four tenths by stepping on one tenth and three tenths at the same time.
Alternatively, one child can make four tenths by stepping on $\frac{2}{10}$ with 2 feet.
With one foot, they can count up to 11 tenths or one and one tenth.
With two feet they can count up to 22 tenths.

White Rose Maths

Add Fractions

Notes and Guidance

Children use practical equipment and pictorial representations to add two or more fractions with the same denominator where the total is less than 1

They understand that we only add the numerators and the denominators stay the same.

Mathematical Talk

Using your paper circles, show me what $\frac{\square}{4} + \frac{\square}{4}$ is equal to.

How many quarters in total do I have?

How many parts is the whole divided into?
How many parts am I adding?
What do you notice about the numerators?
What do you notice about the denominators?

Varied Fluency

R

- Take a paper circle. Fold your circle to split it into 4 equal parts. Colour one part red and two parts blue. Use your model to complete the sentences.
  ______ quarter is red.
  ______ quarters are blue.
  ______ quarters are coloured in.
  Show this as a number sentence. $\frac{\square}{4} + \frac{\square}{4} = \frac{\square}{4}$

- 

  We can use this model to calculate $\frac{3}{8} + \frac{1}{8} = \frac{4}{8}$
  Draw your own models to calculate

  $\frac{1}{5} + \frac{2}{5} = \frac{\square}{5}$ $\frac{2}{7} + \frac{3}{7} + \frac{1}{7} = \frac{\square}{\square}$ $\frac{7}{10} + \frac{\square}{\square} = \frac{9}{10}$

- Eva eats $\frac{5}{12}$ of a pizza and Annie eats $\frac{1}{12}$ of a pizza.
  What fraction of the pizza do they eat altogether?

Add Fractions

Reasoning and Problem Solving

R

Rosie and Whitney are solving:

$$\frac{4}{7} + \frac{2}{7}$$

Rosie says,

The answer is $\frac{6}{7}$

Whitney says,

The answer is $\frac{6}{14}$

Who do you agree with?
Explain why.

Rosie is correct. Whitney has made the mistake of also adding the denominators. Children could prove why Whitney is wrong using a bar model or strip diagram.

Mo and Teddy share these chocolates.

They both eat an odd number of chocolates.
Complete this number sentence to show what fraction of the chocolates they each could have eaten.

$$\frac{\square}{\square} + \frac{\square}{\square} = \frac{12}{12}$$

Possible answers:

$\frac{1}{12} + \frac{11}{12}$

$\frac{3}{12} + \frac{9}{12}$

$\frac{5}{12} + \frac{7}{12}$

(In either order)

White Rose Maths

Add 2 or More Fractions

Notes and Guidance

Children use practical equipment and pictorial representations to add two or more fractions. Children record their answers as an improper fraction when the total is more than 1
A common misconception is to add the denominators as well as the numerators. Use bar models to support children's understanding of why this is incorrect.
Children can also explore adding fractions more efficiently by using known facts or number bonds to help them.

Mathematical Talk

How many equal parts is the whole split into? How many equal parts am I adding?

Which bar model do you prefer when adding fractions? Why?

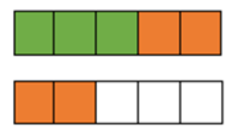
Can you combine any pairs of fractions to make one whole when you are adding three fractions?

Varied Fluency

- Take two identical strips of paper.
  Fold your paper into quarters.
  Can you use the strips to solve
  $\frac{1}{4} + \frac{1}{4}$ $\frac{1}{4} + \frac{1}{4} + \frac{1}{4}$ $\frac{3}{4} + \frac{3}{4}$ $\frac{\square}{4} + \frac{\square}{4} = \frac{7}{4}$
  What other fractions can you make and add?

- Use the models to add the fractions:

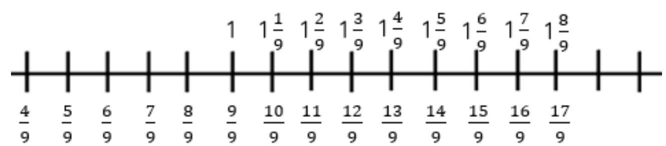
$\frac{2}{7} + \frac{2}{7} =$



$\frac{3}{5} + \frac{4}{5} =$

Choose your preferred model to add:
$\frac{2}{5} + \frac{1}{5}$ $\frac{3}{7} + \frac{6}{7}$ $\frac{7}{9} + \frac{4}{9}$

- Use the number line to add the fractions.



$\frac{4}{9} + \frac{4}{9} + \frac{8}{9} =$

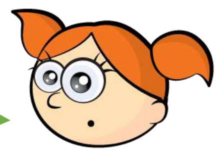
$\frac{4}{9} + \frac{5}{9} + \frac{8}{9}$ $\frac{1}{9} + \frac{11}{9} + 1$ $\frac{\square}{9} + \frac{5}{9} + \frac{7}{9} = \frac{17}{9}$

Add 2 or More Fractions

Reasoning and Problem Solving

Alex is adding fractions.

$\frac{3}{9} + \frac{2}{9} = \frac{5}{18}$



Is she correct? Explain why.

Alex is incorrect. Alex has added the denominators as well as the numerators.

How many different ways can you find to solve the calculation?

$\frac{\square}{\square} + \frac{\square}{\square} = \frac{11}{9}$

Any combination of ninths where the numerators total 11.

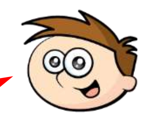
Mo and Teddy are solving:

$\frac{6}{13} + \frac{5}{13} + \frac{7}{13}$

Mo

The answer is 1 and $\frac{5}{13}$

Teddy



The answer is $\frac{18}{13}$

Who do you agree with? Explain why.

They are both correct. Mo has added $\frac{6}{13}$ + $\frac{7}{13}$ to make 1 whole and then added $\frac{5}{13}$

Subtract Fractions

Notes and Guidance

Children use practical equipment and pictorial representations to subtract fractions with the same denominator within one whole.

They understand that we only subtract the numerators and the denominators stay the same.

Mathematical Talk

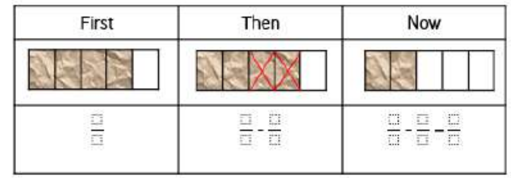
What fraction is shown first? Then what happens? Now what is left? Can we represent this in a number story?

Which models show take away? Which models show finding the difference? What's the same? What's different?
Can we represent these models in a number story?

Can you partition $\frac{9}{11}$ in a different way?

Varied Fluency

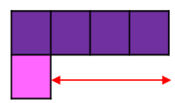
- Eva is eating a chocolate bar. Fill in the missing information.



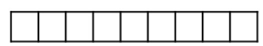
Can you write a number story using 'first', 'then' and 'now' to describe your calculation?

- Use the models to help you subtract the fractions.

$\frac{5}{7} - \frac{\square}{7} = \frac{\square}{7}$

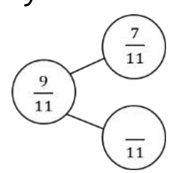


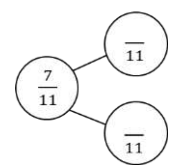
$\frac{4}{8} - \frac{\square}{8} = \frac{\square}{8}$

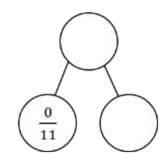


$\frac{\square}{9} - \frac{\square}{9} = \frac{4}{9}$

- Complete the part whole models. Use equipment if needed. Can you write fact families for each model?







Subtract Fractions

Reasoning and Problem Solving

Find the missing fractions:

$$\frac{7}{7} - \frac{3}{7} = \frac{2}{7} + \frac{\square}{7}$$

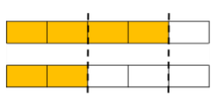
$$\frac{\square}{9} - \frac{5}{9} = \frac{4}{9} - \frac{2}{9}$$

$\frac{7}{7} - \frac{3}{7} = \frac{2}{7} + \frac{2}{7}$

$\frac{7}{9} - \frac{5}{9} = \frac{4}{9} - \frac{2}{9}$

Jack and Annie are solving $\frac{4}{5} - \frac{2}{5}$

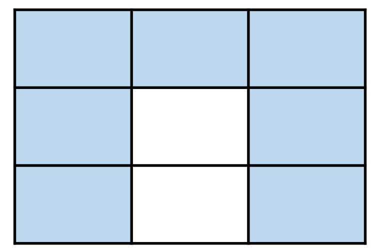
Jack's method: 

Annie's method: 

They both say the answer is two fifths. Can you explain how they have found their answers?

Jack has taken two fifths away. Annie has found the difference between four fifths and two fifths.

How many fraction addition and subtractions can you make from this model?



There are lots of calculations children could record. Children may even record calculations where there are more than 2 fractions e.g. $\frac{3}{9} + \frac{1}{9} + \frac{3}{9} = \frac{7}{9}$ Children may possibly see the red representing one fraction and the white another also.

Subtract 2 Fractions

Notes and Guidance

Children use practical equipment and pictorial representations to subtract fractions with the same denominator.

Encourage children to explore subtraction as take away and as difference. Difference can be represented on a bar model by using a comparison model and making both fractions in the subtraction.

Mathematical Talk

Have you used take away or difference to subtract the eighths using the strips of paper? How are they the same? How are they different?

How can I find a missing number in a subtraction? Can you count on to find the difference?

Can I partition my fraction to help me subtract?

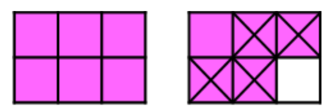
Varied Fluency

- Use identical strips of paper and fold them into eighths. Use the strips to solve the calculations.

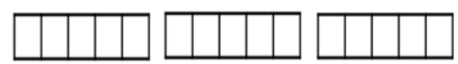
  $\frac{8}{8} - \frac{3}{8} =$ $\quad$ $\frac{7}{8} - \frac{3}{8} =$ $\quad$ $\frac{16}{8} - \frac{9}{8} =$ $\quad$ $\frac{13}{8} - \frac{\square}{8} = \frac{7}{8}$

- Use the bar models to subtract the fractions.

$\frac{6}{7} - \frac{2}{7} =$

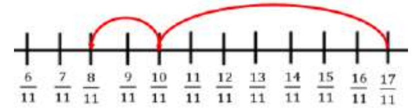


$\frac{11}{6} - \frac{\square}{6} = \frac{\square}{6}$



$\frac{13}{5} - \frac{\square}{5} = \frac{6}{5}$

- Annie uses the number line to solve $\frac{17}{11} - \frac{9}{11}$



  Use a number line to solve:

  $\frac{16}{13} - \frac{9}{13}$ $\quad$ $\frac{16}{9} - \frac{9}{9}$ $\quad$ $\frac{16}{7} - \frac{9}{7}$ $\quad$ $\frac{16}{16} - \frac{9}{16}$

Subtract 2 Fractions

Reasoning and Problem Solving

Match the number stories to the correct calculations.

Teddy eats $\frac{7}{8}$ of a pizza. Dora eats $\frac{4}{8}$ How much do they eat altogether?	$\frac{7}{8}+\frac{3}{8}=\frac{}{}$
Teddy eats $\frac{7}{8}$ of a pizza. Dora eats $\frac{4}{8}$ less. How much do they eat altogether?	$\frac{7}{8}+\frac{4}{8}=\frac{}{}$
Teddy eats $\frac{7}{8}$ of a pizza. Dora eats $\frac{3}{8}$ less. How much does Dora eat?	$\frac{7}{8}-\frac{3}{8}=\frac{}{}$

1st question matches with second calculation. 2nd question with first calculation. 3rd question with third calculation.

How many different ways can you find to solve the calculation?

$$\frac{\square}{7}-\frac{3}{7}=\frac{\square}{7}+\frac{\square}{7}$$

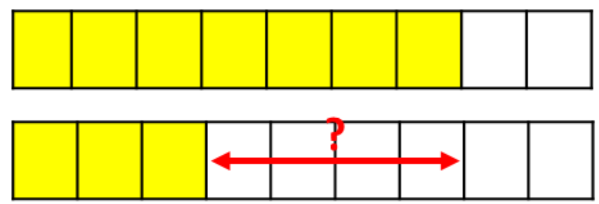
$$\frac{\square}{7}-\frac{3}{7}=\frac{\square}{7}-\frac{\square}{7}$$

Children may give a range of answers as long as the calculation for the numerators is correct.

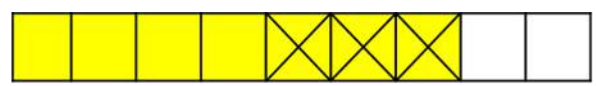
Annie and Amir are working out the answer to this problem.

$$\frac{7}{9}-\frac{3}{9}$$

Annie uses this model.



Amir uses this model.



Which model is correct? Explain why.

Can you write a number story for each model?

They are both correct. The first model shows finding the difference and the second model shows take away.

Ensure the number stories match the model of subtraction. For Annie's this will be finding the difference. For Amir this will be take away.

Subtract from Whole Amounts

Notes and Guidance

Children continue to use practical equipment and pictorial representations to subtract fractions.

Children subtract fractions from a whole amount. Children need to understand how many equal parts are equivalent to a whole e.g. $\frac{9}{9} = 1$, $\frac{18}{9} = 2$ etc.

Mathematical Talk

What do you notice about the numerator and denominator when a fraction is equal to one whole?

Using Jack's method, what's the same about your bar models? What's different?

How many more thirds/quarters/ninths do you need to make one whole?

Varied Fluency

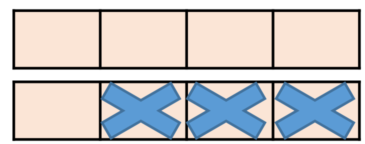
- Use cubes, strips of paper or a bar model to solve:

  $\frac{9}{9} - \frac{4}{9} = \frac{\square}{9}$ $\frac{9}{9} - \frac{\square}{9} = \frac{2}{9}$ $\frac{13}{9} - \frac{9}{9} = \frac{\square}{9}$

  What's the same? What's different?

- Jack uses a bar model to subtract fractions.

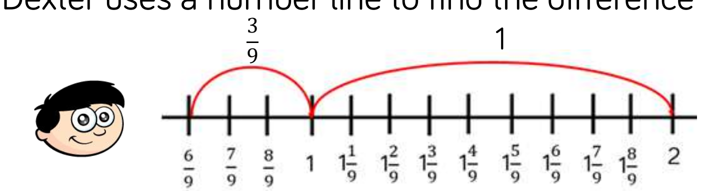
  

  $2 - \frac{3}{4} = \frac{8}{4} - \frac{3}{4} = \frac{5}{4} = 1\frac{1}{4}$

  Use Jack's method to calculate.

  $3 - \frac{3}{4} =$ $3 - \frac{3}{8} =$ $3 - \frac{7}{8} =$ $3 - \frac{15}{8} =$

- Dexter uses a number line to find the difference between 2 and $\frac{6}{9}$

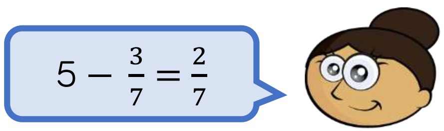
  $2 - \frac{6}{9} = 1\frac{3}{9}$

  Use a number line to find the difference between:

  2 and $\frac{2}{3}$ 2 and $\frac{2}{5}$ $\frac{2}{5}$ and 4

Subtract from Whole Amounts

Reasoning and Problem Solving

Dora is subtracting a fraction from a whole.  Can you spot her mistake? What should the answer be?	Dora has not recognised that 5 is equivalent to $\frac{35}{7}$ $5 - \frac{3}{7} = \frac{33}{7} = 4\frac{5}{7}$
How many ways can you make the statement correct? $2 - \frac{\square}{8} = \frac{5}{8} + \frac{\square}{8}$	Lots of possible responses. e.g. $2 - \frac{1}{8} = \frac{5}{8} + \frac{10}{8}$ $2 - \frac{7}{8} = \frac{5}{8} + \frac{4}{8}$ $2 - \frac{9}{8} = \frac{5}{8} + \frac{2}{8}$

Whitney has a piece of ribbon that is 3 metres long. She cuts it into 12 equal pieces and gives Teddy 3 pieces. How many metres of ribbon does Whitney have left?	Cutting 3 metres of ribbon into 12 pieces means each metre of ribbon will be in 4 equal pieces. Whitney will have $\frac{12}{4}$ to begin with. $\frac{12}{4} - \frac{3}{4} = \frac{9}{4} = 2\frac{1}{4}$ Whitney has $2\frac{1}{4}$ metres of ribbon left.

Fraction of an Amount (1)

Notes and Guidance

Children find a unit fraction of an amount by dividing an amount into equal groups.

They build on their understanding of division by using place value counters to find fractions of larger quantities including where they need to exchange tens for ones.

Mathematical Talk

Which operation do we use to find a fraction of an amount?

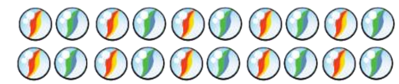
How many equal groups do we need?

Which part of the fraction tells us this?

How does the bar model help us?

Varied Fluency

- Find $\frac{1}{5}$ of Eva's marbles.

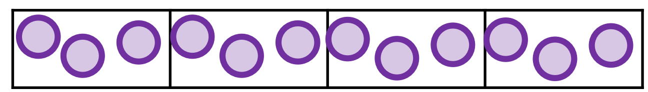


I have divided the marbles into □ equal groups.

There are □ marbles in each group.

$\frac{1}{5}$ of Eva's marbles is □ marbles.

- Dexter has used a bar model and counters to find $\frac{1}{4}$ of 12



Use Dexter's method to calculate:

$\frac{1}{6}$ of 12 $\frac{1}{3}$ of 12 $\frac{1}{3}$ of 18 $\frac{1}{9}$ of 18

- Amir uses a bar model and place value counters to find one quarter of 84

Use Amir's method to find:

$\frac{1}{3}$ of 36 $\frac{1}{3}$ of 45 $\frac{1}{5}$ of 65

Fraction of an Amount (1)

Reasoning and Problem Solving

R

Whitney has 12 chocolates.

On Friday, she ate $\frac{1}{4}$ of her chocolates and gave one to her mum.

On Saturday, she ate $\frac{1}{2}$ of her remaining chocolates, and gave one to her brother.

On Sunday, she ate $\frac{1}{3}$ of her remaining chocolates.

How many chocolates does Whitney have left?

Whitney has two chocolates left.

Fill in the Blanks

$$\frac{1}{3} \text{ of } 60 = \frac{1}{4} \text{ of } \square$$

$$\frac{1}{\square} \text{ of } 50 = \frac{1}{5} \text{ of } 25$$

80

10

Fraction of an Amount (2)

Notes and Guidance

Children need to understand that the denominator of the fraction tells us how many equal parts the whole will be divided into. E.g. $\frac{1}{3}$ means dividing the whole into 3 equal parts.

They need to understand that the numerator tells them how many parts of the whole there are. E.g. $\frac{2}{3}$ means dividing the whole into 3 equal parts, then counting the amount in 2 of these parts.

Mathematical Talk

What does the denominator tell us?

What does the numerator tell us?

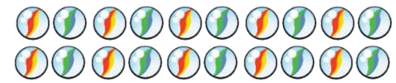
What is the same and what is different about two thirds and two fifths?

How many parts is the whole divided into and why?

Varied Fluency

R

- Find $\frac{2}{5}$ of Eva's marbles.

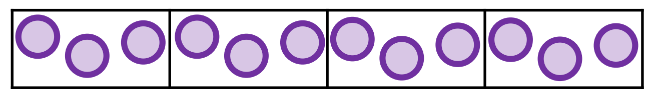


I have divided the marbles into ☐ equal groups.

There are ☐ marbles in each group.

$\frac{2}{5}$ of Eva's marbles is ☐ marbles.

- Dexter has used a bar model and counters to find $\frac{3}{4}$ of 12



Use Dexter's method to calculate:

$\frac{5}{6}$ of 12 $\frac{2}{3}$ of 12 $\frac{2}{3}$ of 18 $\frac{7}{9}$ of 18

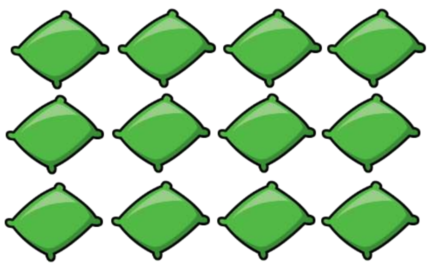
- Amir uses a bar model and place value counters to find three quarters of 84

Use Amir's method to find:

$\frac{2}{3}$ of 36 $\frac{2}{3}$ of 45 $\frac{3}{5}$ of 65

Fraction of an Amount (2)

Reasoning and Problem Solving

This is $\frac{3}{4}$ of a set of beanbags.  How many were in the whole set?	16
Ron has £28 On Friday, he spent $\frac{1}{4}$ of his money. On Saturday, he spent $\frac{2}{3}$ of his remaining money and gave £2 to his sister. On Sunday, he spent $\frac{1}{5}$ of his remaining money. How much money does Ron have left? What fraction of his original amount is this?	Ron has £4 left. This is $\frac{1}{7}$ of his original amount.

White Rose Maths

Fractions of a Quantity

Notes and Guidance

Children use their knowledge of finding unit fractions of a quantity, to find non-unit fractions of a quantity.

They use concrete and pictorial representations to support their understanding. Children link bar modelling to the abstract method in order to understand why the method works.

Mathematical Talk

What is the whole? What fraction of the whole are we finding? How many equal parts will I divide the whole into?

What's the same and what's different about the calculations? Can you notice a pattern?

What fraction of her chocolate bar does Whitney have left? How many grams does she have left? Can you represent this on a bar model?

Varied Fluency

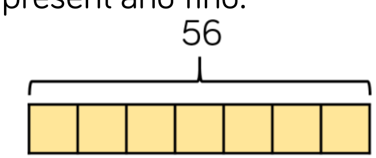
- Mo has 12 apples.
  Use counters to represent his apples and find:
  $\frac{1}{2}$ of 12 $\quad$ $\frac{1}{4}$ of 12 $\quad$ $\frac{1}{3}$ of 12 $\quad$ $\frac{1}{6}$ of 12

  Now calculate:
  $\frac{2}{2}$ of 12 $\quad$ $\frac{3}{4}$ of 12 $\quad$ $\frac{2}{3}$ of 12 $\quad$ $\frac{5}{6}$ of 12

  What do you notice? What's the same and what's different?

- Use a bar model to help you represent and find:

  $\frac{1}{7}$ of 56 = 56 ÷ ☐



  $\frac{2}{7}$ of 56 $\quad$ $\frac{3}{7}$ of 56 $\quad$ $\frac{4}{7}$ of 56 $\quad$ $\frac{4}{7}$ of 28 $\quad$ $\frac{7}{7}$ of 28

- Whitney eats $\frac{3}{8}$ of 240 g bar of chocolate.
  How many grams of chocolate has she eaten?

Fractions of a Quantity

Reasoning and Problem Solving

True or False?

To find $\frac{3}{8}$ of a number, divide by 3 and multiply by 8

Convince me.

False.
Divide the whole by 8 to find one eighth and then multiply by three to find three eighths of a number.

Ron gives $\frac{2}{9}$ of a bag of 54 marbles to Alex.

Teddy gives $\frac{3}{4}$ of a bag of marbles to Alex.

Ron gives Alex more marbles than Teddy.

How many marbles could Teddy have to begin with?

$$\frac{2}{9} \text{ of } 54 > \frac{3}{4} \text{ of } \square$$

Teddy could have 16, 12, 8 or 4 marbles to begin with.

White Rose Maths

Calculate Quantities

Notes and Guidance

Children solve more complex problems for fractions of a quantity. They continue to use practical equipment and pictorial representations to help them see the relationships between the fraction and the whole.

Encourage children to use the bar model to solve word problems and represent the formal method.

Mathematical Talk

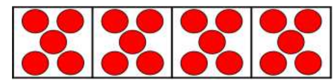
If I know one quarter of a number, how can I find three quarters of a number?

If I know one of the equal parts, how can I find the whole?

How can a bar model support my working?

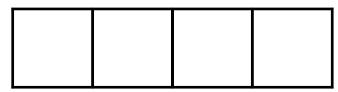
Varied Fluency

Use the counters and bar models to calculate the whole:



There are ____ counters in one part.

$\frac{1}{4}$ = ____ $\frac{2}{4}$ = ____ $\frac{3}{4}$ = ____ $\frac{4}{4}$ or 1 whole = ____



There are 7 counters in one part.

$\frac{1}{4}$ = ____ $\frac{2}{4}$ = ____ $\frac{3}{4}$ = ____ $\frac{4}{4}$ or 1 whole = ____

Complete.

Whole	Unit Fraction	Non-unit Fraction
The whole is 24	$\frac{1}{6}$ of 24 = ____	$\frac{5}{6}$ of 24 = ____
The whole is ____	$\frac{1}{3}$ of ____ = 30	$\frac{2}{3}$ of ____ = ____
The whole is ____	$\frac{1}{5}$ of ____ = 30	$\frac{3}{5}$ of ____ = ____

Jack has a bottle of lemonade.
He has one-fifth left in the bottle.
There are 150 ml left.
How much lemonade was in the bottle when it was full?

Calculate Quantities

Reasoning and Problem Solving

The school kitchen needs to buy carrots for lunch.

A large bag has 200 carrots and a medium bag has $\frac{3}{5}$ of a large bag.

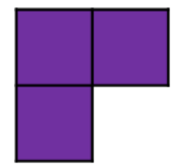
Mrs Rose says,

> I need 150 carrots so I will have to buy a large bag.

Is Mrs Rose correct?
Explain your reasoning.

Mrs Rose is correct.
$\frac{3}{5}$ of 200 = 120
Mrs Rose will need a large bag.

These three squares are $\frac{1}{4}$ of a whole shape.



How many different shapes can you draw that could be the complete shape?

Lots of different possibilities. The shape should have 12 squares in total.

If $\frac{1}{8}$ of A = 12, find the value of A, B and C.

$$\frac{5}{8} \text{ of A} = \frac{3}{4} \text{ of B} = \frac{1}{6} \text{ of C}$$

A = 96
B = 80
C = 360

White Rose Maths

Spring - Block 4

Decimals

Overview

Small Steps

- Recognise tenths and hundredths
- Tenths as decimals
- Tenths on a place value grid
- Tenths on a number line
- Divide 1-digit by 10
- Divide 2-digits by 10
- Hundredths
- Hundredths as decimals
- Hundredths on a place value grid
- Divide 1 or 2-digits by 100

Notes for 2020/21

This is new learning so there are no recap steps here. Children will need to explore the link with fractions and decimals using concrete manipulatives and pictorial representations.

Using counters on a place value chart will help children see the connections when dividing by 10 and by 100.

Tenths & Hundredths

Notes and Guidance

Children recognise tenths and hundredths using a hundred square.

When first introducing tenths and hundredths, concrete manipulatives such as Base 10 can be used to support children's understanding.

They see that ten hundredths are equivalent to one tenth and can use a part-whole model to partition a fraction into tenths and hundredths.

Mathematical Talk

If each row is one row out of ten equal rows, what fraction does this represent?

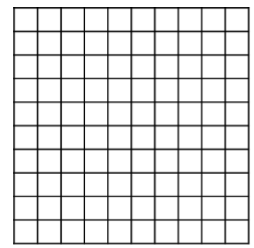
If each square is one square out of one hundred equal squares, what fraction does this represent?

How many squares are in one row? How many squares are in one column? How many hundredths are in one tenth?

How else could you partition these numbers?

Varied Fluency

If the hundred square represents one whole :



Each square is ___ out of ___ equal squares.

Each square represents $\frac{\square}{\square}$

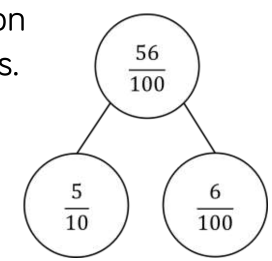
Each row is ___ out of ___ equal rows.

Each row represents $\frac{\square}{\square}$

Complete the table.

Shaded	Tenths	Hundredths
20 squares	$\frac{2}{10}$	$\frac{20}{100}$
4 columns		
3 rows		
	$\frac{7}{10}$	

We can use a part-whole model to partition 56 hundredths into tenths and hundredths.



Partition into tenths and hundredths:

- 65 hundredths
- $\frac{31}{100}$
- 80 hundredths

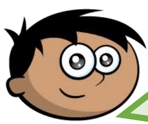
Tenths and Hundredths

Reasoning and Problem Solving

Who is correct?

Dora

5 hundredths is equivalent to 50 tenths.



50 hundredths is equivalent to 5 tenths.

Amir

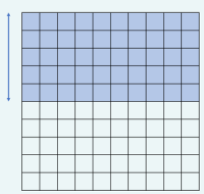
Explain why.

Amir is correct.
$\frac{50}{100}$ is equivalent to $\frac{5}{10}$

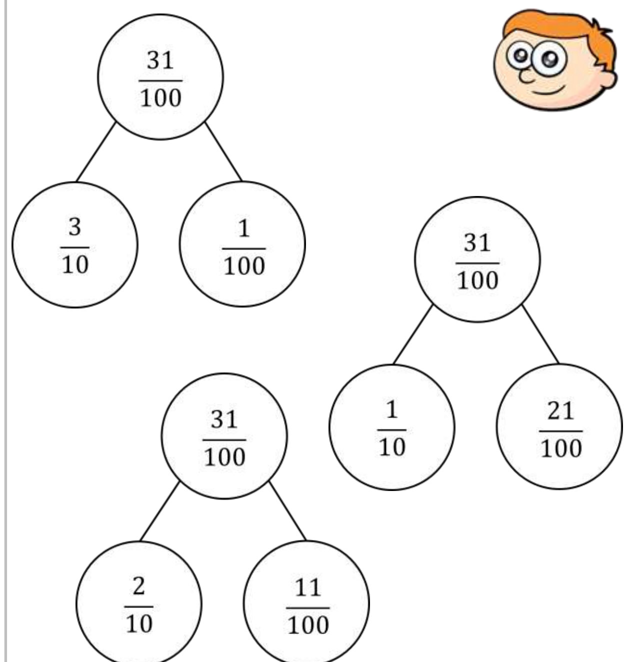
This can be demonstrated with Base 10 or a hundred square.

50 squares is $\frac{50}{100}$

5 rows is $\frac{5}{10}$



Ron says he can partition tenths and hundredths in more than one way.



Use Ron's method to partition 42 hundredths in more than one way.

Children may partition 42 hundredths as:

- 4 tenths and 2 hundredths
- 3 tenths and 12 hundredths
- 2 tenths and 22 hundredths
- 1 tenth and 32 hundredths
- 0 tenths and 42 hundredths

Other methods of partitioning are possible.

Tenths as Decimals

Notes and Guidance

Using the hundred square and Base 10, children can recognise the relationship between $\frac{1}{10}$ and 0.1

Children write tenths as decimals and as fractions. They write any number of tenths as a decimal and represent them using concrete and pictorial representations.

Children understand that a tenth is a part of a whole split into 10 equal parts.

In this small step children stay within one whole.

Mathematical Talk

What is a tenth?

How many different ways can we write a tenth?

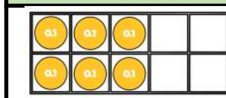
When do we use tenths in real life?

Which representation do you think is clearest? Why?

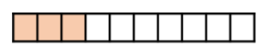
How else could you represent the decimal/fraction?

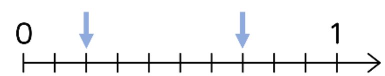
Varied Fluency

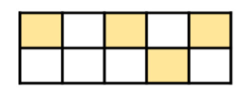
Complete the table.

Image	Words	Fraction	Decimal
			
	five tenths		
			0.9

What fractions and decimals are represented in these diagrams?







How could you represent these decimals?

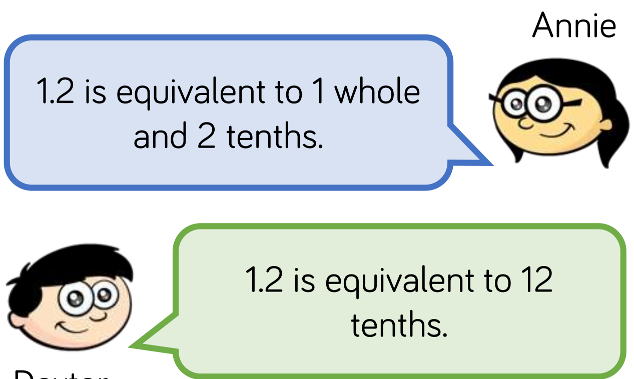
0.4 0.8 0.2

What's the same? What's different?

Tenths as Decimals

Reasoning and Problem Solving

Who is correct?



Explain why.

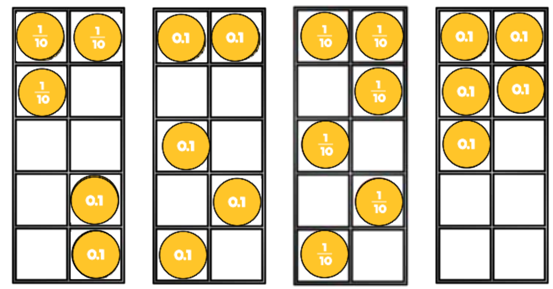
Both children are correct.
1 whole is equal to 10 tenths so 1.2 is equal to 12 tenths.

six tens | six tenths

What is the same? What's different? Show me.

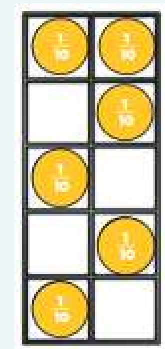
Children use concrete and pictorial representations to show the difference.

Which ten frame is the odd one out?



Explain your answer.

Three of the ten frames represent 0.5



This ten frame is the odd one out because it represents 6 tenths not 5 tenths.

Tenths on a Place Value Grid

Notes and Guidance

Children read and represent tenths on a place value grid. They see that the tenths column is to the right of the decimal point.
Children use concrete representations to make tenths on a place value grid and write the number they have made as a decimal.
In this small step children will be introduced to decimals greater than 1

Mathematical Talk

How many ones are there?

How many tenths are there?

What's the same/different between 0.2 , 1.2 and 0.8?

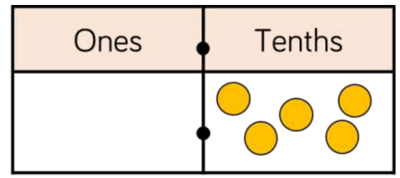
How many different ways can you make a whole using the three decimals?

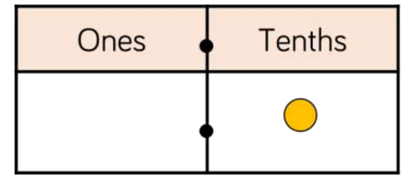
Why do we need to use the decimal point?

How many tenths are equivalent to one whole?

Varied Fluency

- Complete the stem sentences for the decimals in the place value grid.





There are ☐ ones and ☐ tenths.

The decimal represented is ☐

- Use counters or place value counters to make the decimals on a place value grid.

0.2   1.2   0.8

Ones	Tenths
3	2

There are ☐ ones and ☐ tenths.
☐ ones + ☐ tenths
= 3 + 0.2
= 3.2

Use the place value grid and stem sentences to describe the decimals:

4.0   5.9   2.2

Tenths on a Place Value Grid

Reasoning and Problem Solving

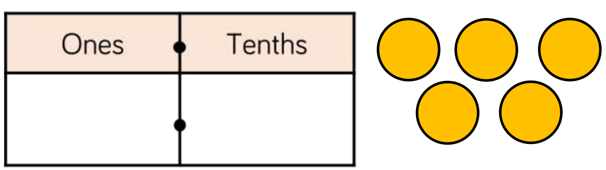
Use five counters and a place value grid. Place all five counters in either the ones or the tenths column.

How many different numbers can you make?

Describe the numbers you have made by completing the stem sentences.

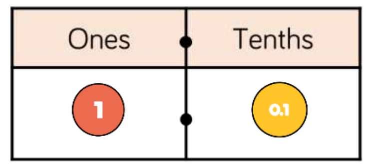
There are ☐ ones and ☐ tenths.

☐ ones + ☐ tenths = ☐

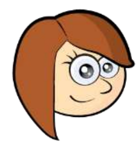


Children can make:
0.5
1.4
2.3
3.2
4.1
5.0

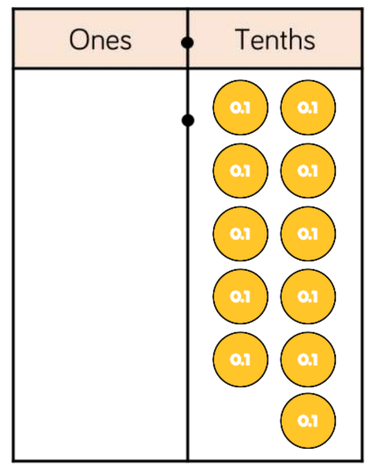
Two children are making eleven tenths.



Amir



Rosie



Who has made it correctly?
Explain your answer.

Amir and Rosie have both made eleven tenths correctly.
Amir has seen that 10 tenths is equivalent to 1 one.

Tenths on a Number Line

Notes and Guidance

Children read and represent tenths on a number line.

They link the number line to measurement, looking at measuring in centimetres and millimetres.

Children use number lines to explore relative scale.

Mathematical Talk

How many equal parts are between 0 and 1?

What are the intervals between each number?

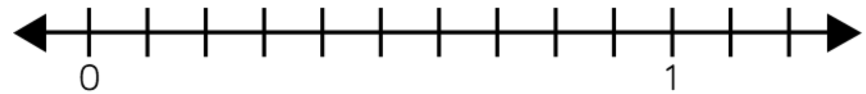
How many tenths are in one whole?

What is 0.1 metres in millimetres?

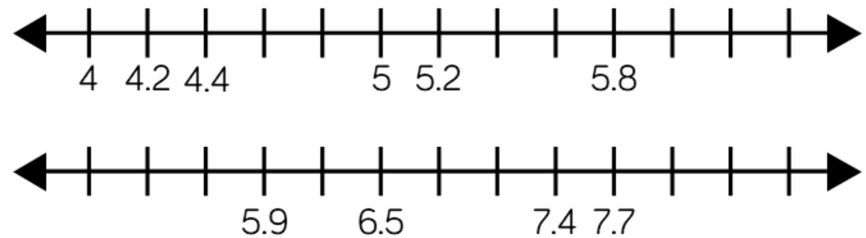
Varied Fluency

- Place the decimals on the number line.

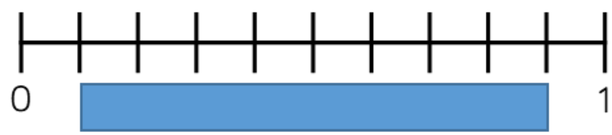
  0.5 0.9 1.1



- Complete the number lines.



- How long is the ribbon?



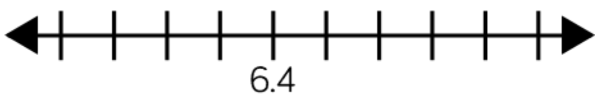
The ribbon is ___ metres long.

White Rose Maths

Tenths on a Number Line

Reasoning and Problem Solving

What could the start and end numbers on the number line be?

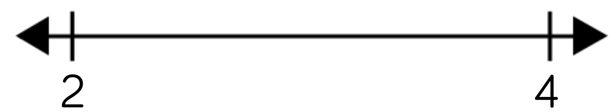


Explain your reasons.

The start and end numbers could be 6 and 6.9 respectively, or 5.6 and 7.4

Children can find different start and end numbers by adjusting the increments that the number line is going up in.

Place the decimals on the number line.



2.7 2.3 1.9 2.5 2.9 3.2

Which order did you place your numbers on the number line?

Some children will draw on 20 intervals first. This method will allow them to identify where the numbers are placed but can be considered inefficient. Encourage children to think about the numbers first and consider which numbers are easiest to place e.g. 2.5 is probably easiest, followed by 1.9 or 2.9 etc.

Divide 1-digit by 10

Notes and Guidance

Children need to understand when dividing by 10 the number is being split into 10 equal parts and is 10 times smaller.

Children use counters on a place value chart to see how the digits move when dividing by 10. Children should make links between the understanding of dividing by 10 and this more efficient method.

Emphasise the importance of 0 as a place holder.

Mathematical Talk

What number is represented on the place value chart?

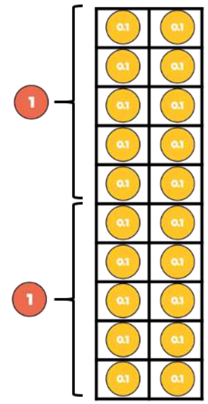
What links can you see between the 2 methods?

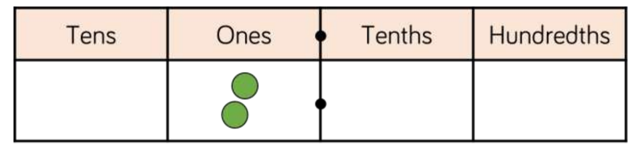
Which method is more efficient?

What is the same and what is different when dividing by 10 on a Gattegno chart compared to a place value chart?

Varied Fluency

Eva uses counters to make a 1-digit number.





To divide the number by 10, we move the counters one column to the right.
What is the value of the counters now?

Use this method to solve:

3 ÷ 10 = ☐ 7 ÷ 10 = ☐ ☐ = 4 ÷ 10

Here is a one-digit number on a place value chart.

Ones	Tenths
5	

When dividing by 10, we move the digits one place to the ________.

5 ÷ 10 = ☐

Use this method to solve:

8 ÷ 10 = ☐ ☐ = 9 ÷ 10 0.2 = ☐ ÷ 10

Divide 1-digit by 10

Reasoning and Problem Solving

Choose a digit card from 1 – 9 and place a counter over the top of that number on the Gattegno chart.

100	200	300	400	500	600	700	800	900
10	20	30	40	50	60	70	80	90
1	2	3	4	5	6	7	8	9
0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

Ron says,

To divide by 10, you need to move the counters to the right.

Do you agree? Use the Gattegno chart to explain your reason.

Ron is incorrect. Children will see that you move down one row to divide by 10 on a Gattegno chart whereas on a place value chart you move on column to the right.

Complete the number sentences.

$4 \div 10 = 8 \div \square \div 10$

$15 \div 3 \div 10 = \square \div 10$

$64 \div \square \div 10 = 32 \div 4 \div 10$

2

5

8

White Rose Maths

Divide 2-digits by 10

Notes and Guidance

As in the previous step, it is important for children to recognise the similarities and differences between the understanding of dividing by 10 and the more efficient method of moving digits.
Children use a place value chart to see how 2 digit-numbers move when dividing by 10
They use counters to represent the digits before using actual digits within the place value chart.

Mathematical Talk

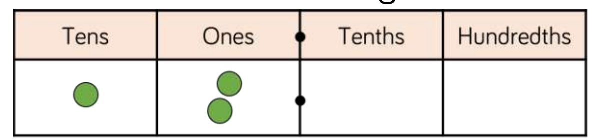
What number is represented on the place value chart?

Do I need to use 0 as a place holder when dividing a 2-digit number by 10?

What is the same and what is different when dividing by 10 on a Gattegno chart compared to a place value chart?

Varied Fluency

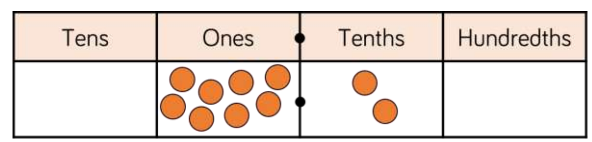
- Teddy uses counters to make a 2-digit number.



To divide the number by 10, we move the counters one column to the right.
What is the value of the counters now?
Use this method to solve:

42 ÷ 10 = □ 35 ÷ 10 = □ □ = 26 ÷ 10

- Here is a 2-digit number on a place value chart.



When dividing by 10, we move the digits 1 place to the ________.

82 ÷ 10 = □

Use this method to solve:

55 ÷ 10 = □ □ = 90 ÷ 10 3.2 = □ ÷ 10

White Rose Maths

Divide 2-digits by 10

Reasoning and Problem Solving

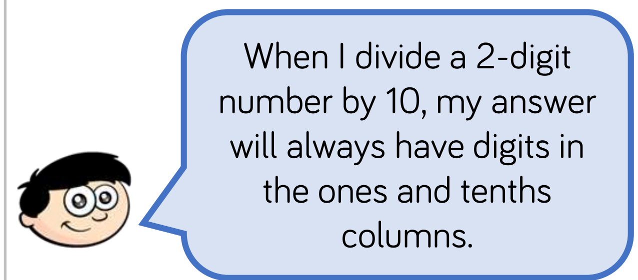
Jack has used a Gattegno chart to divide a 2-digit number by 10
He has placed counters over the numbers in his answer.

100	200	300	400	500	600	700	800	900
10	20	30	40	50	60	70	80	90
1	●	3	4	5	6	7	8	9
0.1	0.2	0.3	0.4	0.5	●	0.7	0.8	0.9
0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

What was Jack's original number?
How can you use the chart to help you?

Jack's original number was 26
You can move each counter up one to multiply them by 10, which is the inverse to division.

Dexter says,



Show that Dexter is incorrect.

Children should give an example of when Dexter is incorrect.
For example, when you divide 80 by 10, the answer is 8 so there does not need to be anything in the tenths column.

Hundredths

Notes and Guidance

Children recognise that hundredths arise from dividing one whole into one hundred equal parts.

Linked to this, they see that one tenth is ten hundredths.

Children count in hundredths and represent tenths and hundredths on a place value grid and a number line.

Mathematical Talk

One hundredth is one whole split into how many equal parts?

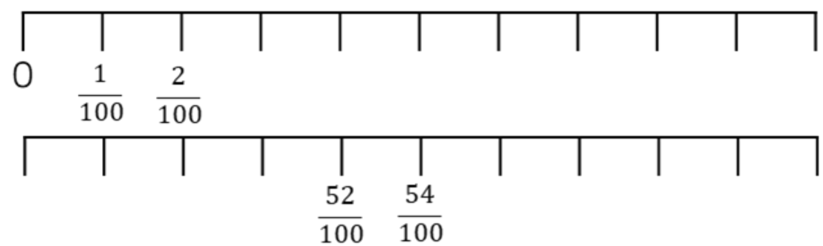
How many hundredths can I exchange one tenth for?

How many hundredths are equivalent to 5 tenths? How does this help me complete the sequence?

How does Base 10 help you represent the difference between tenths and hundredths?

Varied Fluency

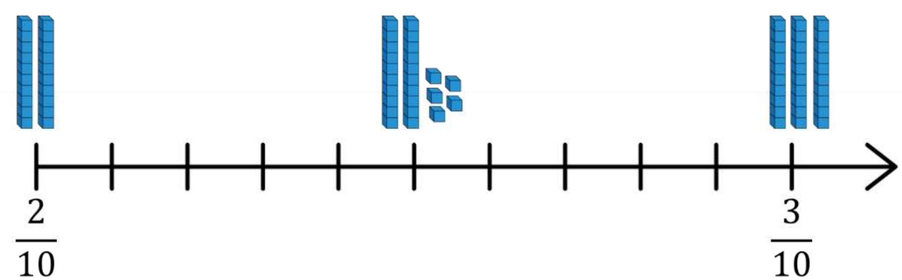
Complete the number lines.



Complete the sequences.

- $\frac{27}{100}, \frac{28}{100}, \square, \square, \frac{31}{100}, \square$
- $\frac{52}{100}, \frac{51}{100}, \frac{5}{10}, \square, \square, \square$

Use fractions to complete the number lines

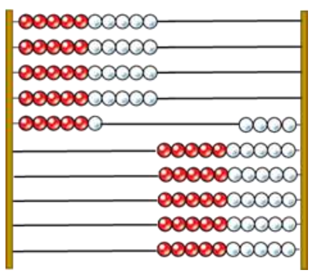


Hundredths

Reasoning and Problem Solving

Here is a Rekenrek made from 100 beads.

If the Rekenrek represents one whole, what fractions have been made on the left and on the right?



Can you partition both of the fractions into tenths and hundredths?

On the left, there are 46 hundredths, this is equivalent to 4 tenths and 6 hundredths.
On the right, there are 54 hundredths, this is equivalent to 5 tenths and 4 hundredths.

Children could also explore hundredths using a 100 bead string.

Complete the statements.

3 tenths and 2 hundredths = 2 tenths and ☐ hundredths	12
14 hundredths and 3 tenths = 4 tenths and ☐ hundredths	4
5 tenths and 1 hundredth $<$ 5 tenths and ☐ hundredths	Anything more than 1
5 tenths and 1 hundredth $>$ ☐ tenths and 5 hundredths	0, 1, 2, 3 or 4

Can you list all the possibilities?

Hundredths as Decimals

Notes and Guidance

Using the hundred square and Base 10, children can recognise the relationship between $\frac{1}{100}$ and 0.01

Children write hundredths as decimals and as fractions. They write any number of hundredths as a decimal and represent the decimals using concrete and pictorial representations.

Children understand that a hundredth is a part of a whole split into 100 equal parts.

In this small step children stay within one whole.

Mathematical Talk

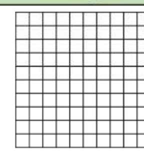
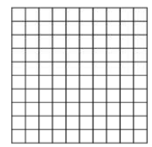
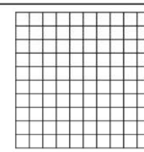
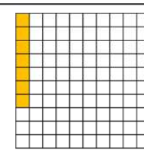
One hundredth is one whole split into _____ equal parts.

What is the same and what is different about a number written as a fraction and a number written as a decimal?

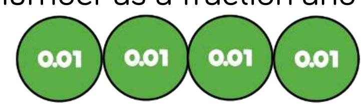
What is the same and different between 0.3 and 4 hundredths?

Varied Fluency

Complete the table.

Image	Words	Fraction	Decimals
	56 hundredths		
		$\frac{17}{100}$	
			0.2
			

Write the number as a fraction and as a decimal.



How else could you represent this number?

White Rose Maths

Hundredths as Decimals

Reasoning and Problem Solving

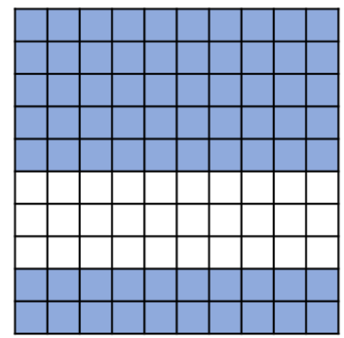
Dora says,

> 17 hundredths is the same as 1,700

Is she correct?
Explain your answer.

Dora is wrong as she has mistaken hundredths for hundreds.

Alex and Eva have been asked to write the decimal shaded on the 100 grid.



Alex says the grid shows 0.70

Eva says the grid shows 0.7

Who do you agree with?

Explain your answer.

They are both correct.
The grid shows 70 hundredths or 7 tenths and this is what Alex and Eva have given as their answers.
In Alex's answer the 0 in the hundredths column isn't needed as it is not a place holder and doesn't change the value of the number.

Hundredths on a Place Value Grid

Notes and Guidance

Children read and represent hundredths on a place value grid. They see that the hundredths column is to the right of the decimal point and the tenths column.

Children use concrete representations to make numbers with tenths and hundredths on a place value grid and write the number they have made as a decimal.

Mathematical Talk

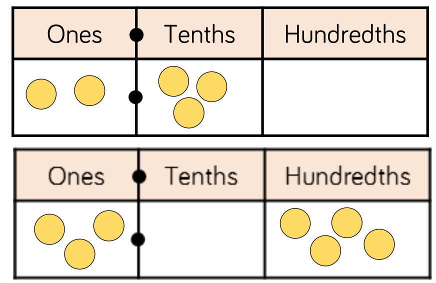
What is a hundredth?

How many hundredths are equivalent to one tenth?

Look at the decimals you have represented on the place value grid and in the part whole models.
What's the same about the numbers? What's different?

Varied Fluency

- Write the decimal represented in each place value grid.



There are ___ ones.

There are ___ tenths.

There are ___ hundredths.

The decimal represented is ___

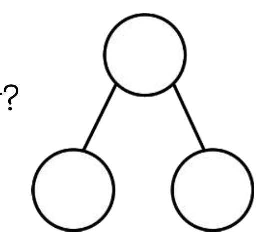
- Make the decimals on a place value grid.

0.34 2.15 0.03 1.01

Use the sentence stems to describe each number.

- Represent the decimals on a place value grid and in a part whole model.
How many ways can you partition each number?

0.27 0.72 0.62



White Rose Maths

Hundredths on a Place Value Grid

Reasoning and Problem Solving

Use four counters and a place value grid. Place all four counters in either the ones, tenths or hundredths column.

How many different numbers can you make?

Describe the numbers you have made by completing the sentences.

There are ☐ ones, ☐ tenths and ☐ hundredths.

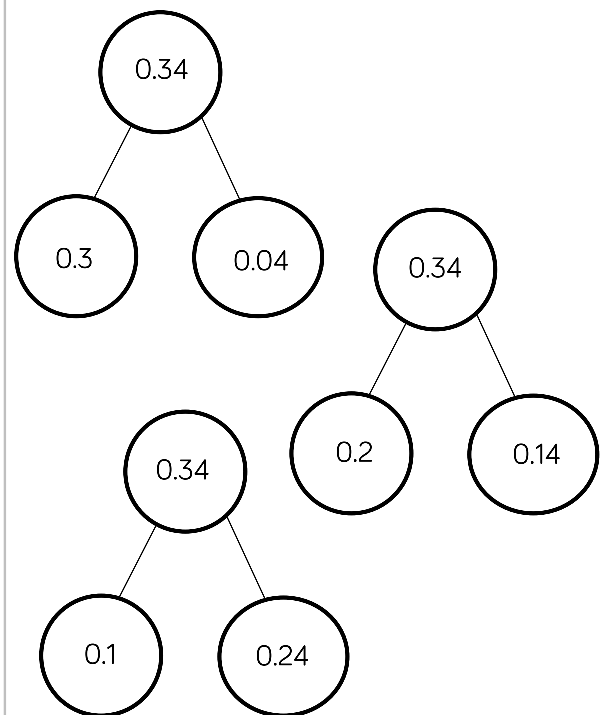
☐ ones + ☐ tenths + ☐ hundredths = ☐

Children can either make:
4, 3.1, 3.01, 2.2, 2.11, 2.02, 1.3, 1.21, 1.12, 1.03, 0.4, 0.31, 0.22, 0.13, 0.04

e.g. There are 2 ones, 0 tenths and 2 hundredths.

2 ones + 0 tenths + 2 hundredths = 2.02

Ron says he can partition 0.34 in more than one way.



Use Ron's method to partition 0.45 in more than one way.

Children may partition 0.45 into:
0 tenths and 45 hundredths
1 tenth and 35 hundredths
2 tenths and 25 hundredths
3 tenths and 15 hundredths
4 tenths and 5 hundredths

Other ways of partitioning are possible.

Divide 1 or 2-digits by 100

Notes and Guidance

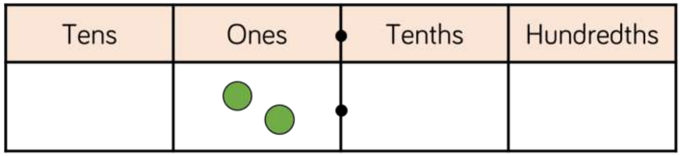
Children need to understand when dividing by 100 the number is being split into 100 equal parts and is 100 times smaller. Children use counters on a place value chart to see how the digits move when dividing by 100. Children should make links between the understanding of dividing by 100 and this more efficient method.
Emphasise the importance of 0 as a place holder.

Mathematical Talk

What number is represented on the place value chart?
Why is 0 important when dividing a one or two-digit number by 100?
What is the same and what is different when dividing by 100 on a Gattegno chart compared to a place value chart?
What happens to the value of each digit when you divide by 10 and 100?

Varied Fluency

Dexter uses counters to make a 1-digit number.



To divide the number by 100, we move the counters two columns to the right.
What is the value of the counters now?

Use this method to solve:

4 ÷ 100 = ☐   5 ÷ 100 = ☐   ☐ = 6 ÷ 100

Here is a two-digit number on a place value chart.

Tens	Ones	Tenths	Hundredths
7	2		

When dividing by 100, we move the digits 2 places to the ______.

72 ÷ 100 = ☐

Use this method to solve:

82 ÷ 100 = ☐   ☐ = 93 ÷ 100   0.23 = ☐ ÷ 100

White Rose Maths

Divide 1 or 2-digits by 100

Reasoning and Problem Solving

Describe the pattern.

$$7{,}000 \div 100 = 70$$
$$700 \div 100 = 7$$
$$70 \div 100 = 0.7$$
$$7 \div 100 = 0.07$$

Can you complete the pattern starting with 5,300 divided by 100?

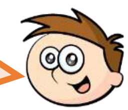
Children will describe the pattern they see e.g. 7,000 is 10 times bigger than 700, therefore the answer has to be 10 times bigger as the divisor has remained the same.

For 5,300:

$5{,}300 \div 100 = 53$
$530 \div 100 = 5.3$
$53 \div 100 = 0.53$
$5.3 \div 100 = 0.053$

Teddy says,

45 divided by 100 is 0.45 so I know 0.45 is 100 times smaller than 45



Mo says,

45 divided by 100 is 0.45 so I know 45 is 100 times bigger than 0.45

Who is correct?
Explain your answer.

Teddy and Mo are both correct. Children may use a place value chart to help them explain their answer.

Summer Scheme of Learning

Year 4

#MathsEveryoneCan

2020-21

White Rose Maths

New for 2020/21

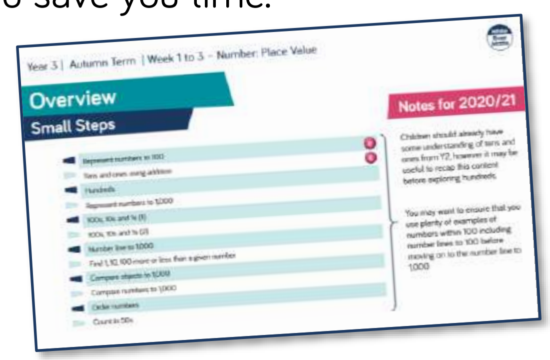
2020 will go down in history. The world has changed for all of us.

We want to do as much as we can to support children, teachers, parents and carers in these very uncertain times.

We have amended our schemes for 2020/21 to:

- ★ highlight key teaching points
- ★ recap essential content that children may have forgotten
- ★ flag any content that you might not have covered during the school closures period.

We hope these changes will add further value to the schemes and save you time.



Lesson-by-lesson overviews

We've always been reluctant to produce lesson-by-lesson overviews as every class is individual and has different needs. However, many of you have said that if blended learning becomes a key feature of school life next year, a weekly plan with linked content and videos could be really useful.

As always, we've listened! We've now produced a complete lesson-by-lesson overview for Y1 to Y9 that schools can use or adapt as they choose. Each lesson will be linked to a free-to-use home learning video, and for premium subscribers, a worksheet. This means that you can easily assign work to your class, whether they are working at home or in school.

Inevitably, this lesson-by-lesson structure won't suit everyone, but if it works for you, then please do make use of this resource as much as you wish.

Teaching for Mastery

These overviews are designed to support a mastery approach to teaching and learning and have been designed to support the aims and objectives of the new National Curriculum.

The overviews:

- have number at their heart. A large proportion of time is spent reinforcing number to build competency
- ensure teachers stay in the required key stage and support the ideal of depth before breadth.
- ensure students have the opportunity to stay together as they work through the schemes as a whole group
- provide plenty of opportunities to build reasoning and problem solving elements into the curriculum.

For more guidance on teaching for mastery, visit the NCETM website:

https://www.ncetm.org.uk/resources/47230

Concrete - Pictorial - Abstract

We believe that all children, when introduced to a new concept, should have the opportunity to build competency by taking this approach.

Concrete – children should have the opportunity to use concrete objects and manipulatives to help them understand what they are doing.

Pictorial – alongside this children should use pictorial representations. These representations can then be used to help reason and solve problems.

Abstract – both concrete and pictorial representations should support children's understanding of abstract methods.

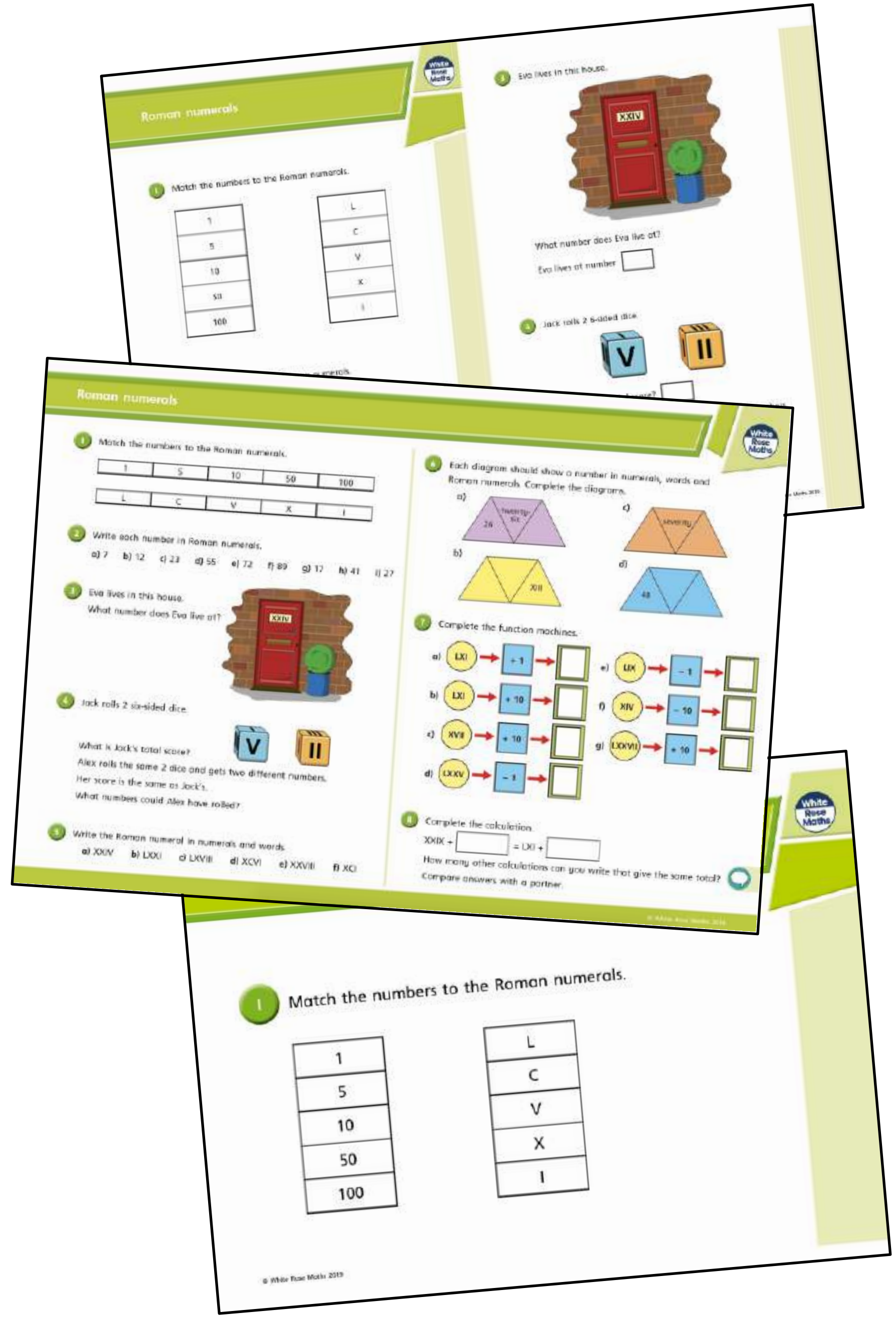
Need some CPD to develop this approach? Visit www.whiterosemaths.com for find a course right for you.

Supporting resources

We have produced supporting resources for every small step from Year 1 to Year 11.

The worksheets are provided in three different formats:

- Write on worksheet – ideal for children to use the ready made models, images and stem sentences.
- Display version – great for schools who want to cut down on photocopying.
- PowerPoint version – one question per slide. Perfect for whole class teaching or mixing questions to make your own bespoke lesson.

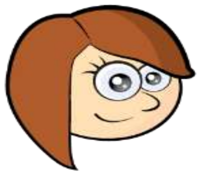


For more information visit our online training and resources centre resources.whiterosemaths.com or email us directly at support@whiterosemaths.com

Meet the Characters

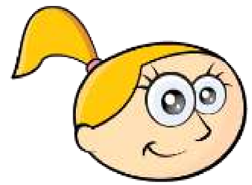
Children love to learn with characters and our team within the scheme will be sure to get them talking and reasoning about mathematical concepts and ideas. Who's your favourite?

Teddy

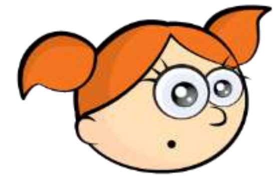


Rosie

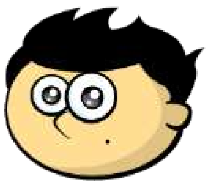
Mo



Eva

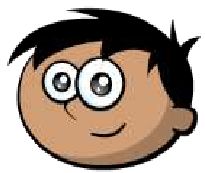


Alex

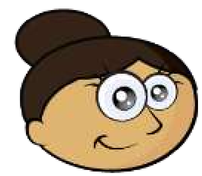


Jack

Whitney



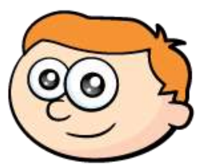
Amir



Dora

Tommy

Dexter



Ron

Annie

White Rose Maths

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number: Place Value				Number: Addition and Subtraction			Measurement: Length and Perimeter		Number: Multiplication and Division		
Spring	Number: Multiplication and Division			Measurement: Area	Number: Fractions				Number: Decimals			Consolidation
Summer	Number: Decimals		Measurement: Money		Measurement: Time		Statistics	Geometry: Properties of Shape		Geometry: Position and Direction		Consolidation

White Rose Maths

Summer - Block 1

Decimals

Overview

Small Steps

- Bonds to 10 and 100 (R)
- Make a whole
- Write decimals
- Compare decimals
- Order decimals
- Round decimals
- Halves and quarters

Notes for 2020/21

Whilst the majority of learning in this block will be new for all children, fluency in number bonds to both 10 and 100 will support children with their understanding of decimals so time should be spent recapping these.

White Rose Maths

Bonds to 100 (Tens)

Notes and Guidance

Teachers should focus at this stage on multiples of 10 up to and within 100

Links should be made again between single digit bonds and tens bonds.

Using a 10 frame to represent 100 would be a useful resource to make this link.

Mathematical Talk

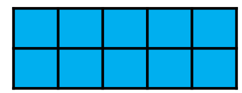
What does this represent?

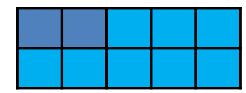
Why is it different to a normal 10 frame?

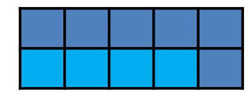
Varied Fluency

R

- Match the 10 frames to the sentences below:







One hundred equals eighty plus twenty

100 = 100 + 0

40 + 60 = 100

- Fill in the missing numbers

2 + 6 = 8

20 + 60 = ____

2___ + ___0 = 80

80 = ___0 + 6___

- Continue the pattern

90 = 100 – 10
80 = 100 – 20

Can you make up a similar pattern starting with the numbers 60, 30 and 90?

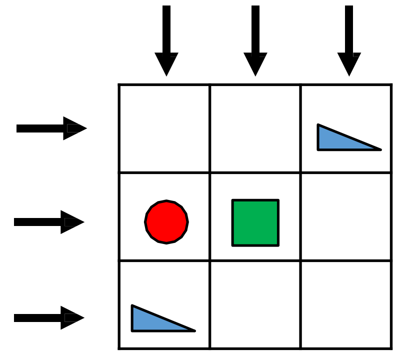
White Rose Maths

Bonds to 100 (Tens)

Reasoning and Problem Solving

R

Sara thinks there are 10 different number bonds to 90 using multiples of 10 Beth thinks there are only 5 Who is correct? Can you help the person who is wrong to understand their mistake?	Beth because 0 + 90 is the same as 90 + 0 Sara has repeated her answers the other way round.
Using multiples of 10, how many number bonds are there for the following numbers? 20 30 40 50 What do you notice about the amount of bonds for each number? If 80 has 5 bonds, predict how many 90 would have.	20 and 30 both have 2. 40 and 50 both have 3. When the tens digit is odd it has the same number of bonds as the previous tens number. 90 would also have 5.

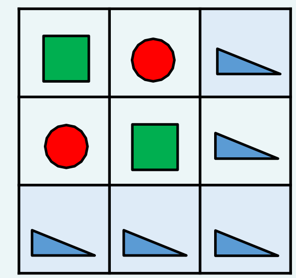


Squares are worth 10
Triangles are worth 20
Circles are worth 30

Can you complete the grid above so that all horizontal and vertical lines equal 60?

Can children create another pattern on an empty grid where each line equals 60?
How many possible ways are there to solve this?

Solution



Lots of possible solutions available.

Bonds to 100 (Tens and Ones)

Notes and Guidance

Here children build on their earlier work of number bonds to 100 with tens and number bonds to 10 and 20

They use their new knowledge of exchange to find number bonds to 100 with tens and ones.

Mathematical Talk

How many more do we need to make 100?

How many tens are in 100?

If I have 35, do I need 7 tens and 5 ones to make 100? Explain why.

Can you make the number using Base 10?
Can you add more Base 10 to the number to make 100?

Varied Fluency

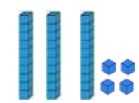
R

Use a 100 square.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

- 40 squares are shaded, how many are not shaded?
- 45 squares are shaded, how many are not shaded?
- 54 squares are shaded, how many are not shaded?

Hamza is making 100 with Base 10
How much more does he need if he has:

- 
- 5 tens and 3 ones
- 37

Children could place their Base 10 on top of a 100 piece to help them calculate.

25 + ___ = 100

100 – 84 = ___

___ + 69 = 100

100 – ___ = 11

Bonds to 100 (Tens and Ones)

Reasoning and Problem Solving

R

Chris has completed the missing number sentence.

46 + 64 = 100

Is Chris correct?
Explain your answer.

Chris is incorrect. He has seen number bonds to 10 but forgotten that he would need to exchange ten ones for one ten.

Complete the pattern.

15 + 85 = 100
20 + 80 = 100
25 + 75 = 100
30 + ___ = 100
___ + ___ = 100

Can you explain the pattern?

30 + 70 = 100
35 + 65 = 100

The first numbers are going up in fives and the second numbers are going down in fives. All of the number sentences are number bonds to 100

Each row and column adds up to 100.

Complete the grid.

45	45	
	35	
15		65

45	45	10
40	35	25
15	20	65

Make a Whole

Notes and Guidance

Children make a whole from any number of tenths and hundredths.
They use their number bonds to ten and one hundred to support their calculations. Children use pictorial and concrete representations to support their understanding.

Mathematical Talk

How many tenths make one whole?

How many hundredths make one tenth?

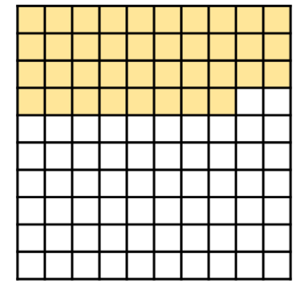
How many hundredths make one whole?

If I have ___ hundredths, how many more do I need to make one whole?

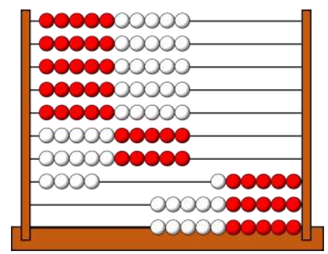
Varied Fluency

- Here is a hundred square.
  How many hundredths are shaded?
  How many more hundredths do you need to shade so the whole hundred square is shaded?

  ___ hundredths + ___ hundredths = 1 whole



- Here is a rekenrek with 100 beads.
  Each bead is one hundredth of the whole.

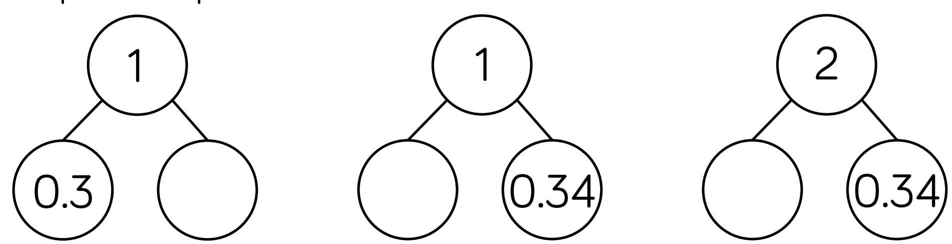


  ____ hundredths are on the left.

  ____ hundredths are on the right.

  0.____ + 0.____ = 1

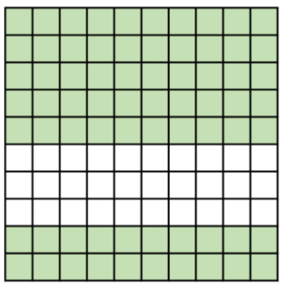
- Complete the part-whole models.

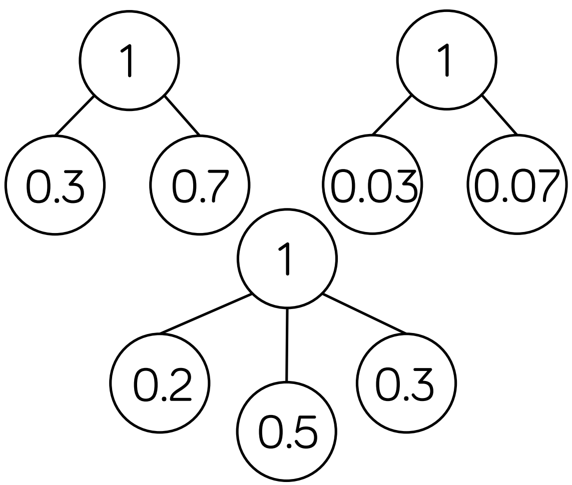


Make a Whole

Reasoning and Problem Solving

Which part-whole model does not match the hundred square?





Explain your answer.

0.03 + 0.07 does not equal one whole so this one does not match.

Three bead strings are 0.84 m long altogether.

Would four bead strings be longer or shorter than a metre?

Explain how you know.

Longer because each bead string is 28 cm (0.28 m) long, and 0.84 + 0.28 = 1.12 which is greater than 1 metre.

Write Decimals

Notes and Guidance

Children use place value counters and a place value grid to make numbers with up to two decimal places.
They read and write numbers with decimals and understand the value of each digit.
They show their understanding of place value by partitioning numbers with decimals in different ways.

Mathematical Talk

How many ones/tenths/hundredths are in the number?
How do we write this as a decimal? Why?
What is the value of the ____ in the number ______?
When do we need to use zero as a place holder?
How can we partition decimal numbers in different ways?

Varied Fluency

What number is represented on the place value grid?

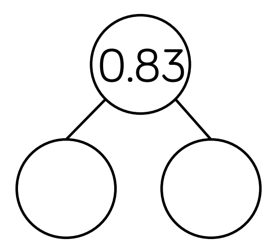
Ones	Tenths	Hundredths
	●	● ● ●
0	1	3

There are ____ ones, ____ tenths and ____ hundredths.
The number is ____

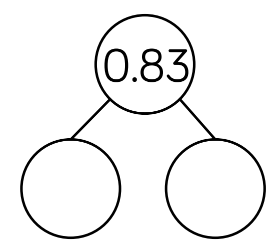
Make the numbers on a place value chart and write down the value of the underlined digit.

3.47   2.15   0.6   25.03

Complete the part-whole model in two different ways and write a number sentence to go with each.



$0.83 = \_\_\_ + 0.03$

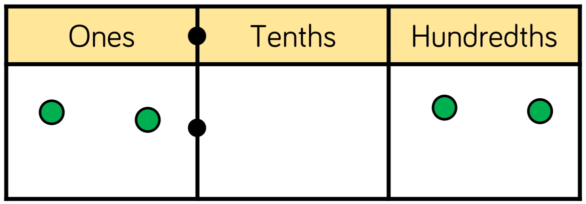


$0.83 = 0.7 + \_\_\_$

Write Decimals

Reasoning and Problem Solving

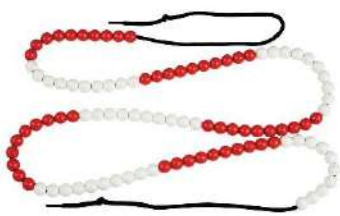
Annie thinks the number shown is 2.2



Do you agree with Annie?
Explain your answer.

No because Annie has not included the place holder. The number shown is 2.02

Mo is told that this bead string represents one whole.



He thinks that each individual bead represents one tenth.
Do you agree with Mo?
Explain your answer.

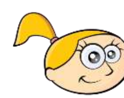
Mo is incorrect because there are 100 beads altogether on the bead string. Each individual bead is worth one hundredth.

Match each description to the correct number.

Teddy: My number has the same amount of tens as tenths.

Amir: My number has one decimal place.

Rosie: My number has two hundredths.



Eva: My number has six tenths.

46.2	2.64	46.02	40.46

Teddy: 40.46

Amir: 46.2

Rosie: 46.02

Eva: 2.64

White Rose Maths

Compare Decimals

Notes and Guidance

Children apply their understanding of place value to compare numbers with decimals with up to two decimal places.
They will consolidate and deepen their understanding of 0 as a place holder when making a comparison.

Mathematical Talk

How many tenths does it have?

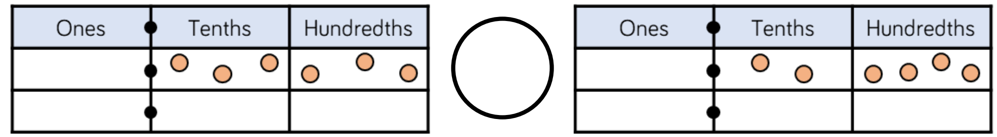
There are ___ tenths and ___ hundredths.

The number is ___ . ___ ___

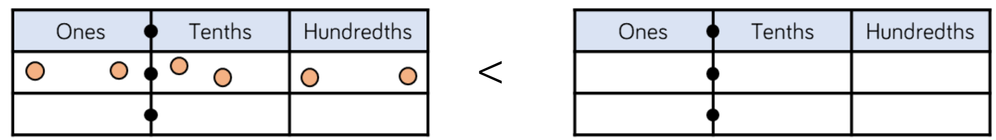
___ . ___ ___ is greater/less than ___ . ___ ___ because …

Varied Fluency

Write the numbers shown and compare using < or >



Draw counters in the place value chart to make the statement correct.



Complete.

5.5	◯	5.7	0.37	<	0.__7
0.14	◯	0.29	2.22	>	2.__2
1	◯	0.64	1.__1	>	1.__1
3.32	◯	3.23	9.9__	<	9.9__

White Rose Maths

Compare Decimals

Reasoning and Problem Solving

Use each digit card **once** to make the statement correct.

0 1 2 4 5

3.__ __ > __.__ __

Can you find eight different possible solutions?

Some possible solutions:

3.12 > 0.45
3.24 > 1.05
3.45 > 1.02
3.01 > 2.45
3.42 > 2.01
3.45 > 0.12
3.02 > 1.45
3.24 > 1.05

5 7 0 4

Use three digit cards to make the greatest possible number.

__.__ __

Use three digit cards to make the smallest possible number.

__.__ __

The greatest:

7.54

The smallest:

0.45

Order Decimals

Notes and Guidance

Children apply their understanding of place value to order numbers with decimals with up to two decimal places.
They will consolidate and deepen their understanding of 0 as a place holder, the inequality symbols and language such as ascending and descending.

Mathematical Talk

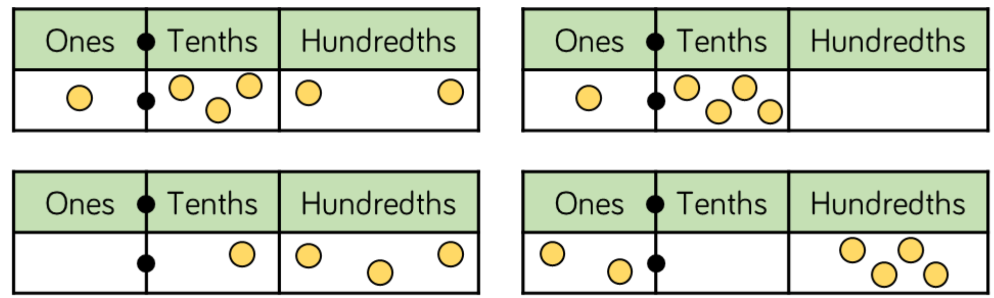
Which digit can we use to compare these decimals? Will this always be the case?

Do we always use the digit furthest left to compare decimals?

___ . ___ ___ is ________ than ___ . ___ ___ because …

Varied Fluency

- Write down the decimals represented in the place value grid and then place them in ascending order.



- Place the numbers in descending order.

46.2	9.64	46.02	40.46

- Complete.

1.11 ◯ 1.12 ◯ 1.13

3.32 ◯ 3.23 ◯ 2.32

4.44 ◯ 4.34 ◯ 4.04

0.1__ < 0.1__ < 0.15

1.9__ < 1.9__ < 2.01

6.67 > 6.__7 > 6.37

Order Decimals

Reasoning and Problem Solving

Spot the Mistake

Rosie is ordering some numbers in ascending order:

$0.09 < 0.99 < 10.01 < 1.35 < 9.09$

Can you explain her mistake?

Rosie hasn't considered the place value of the digits in the numbers and has just ordered by comparing individual digits left to right.

Some children have planted sunflowers and have measured their heights.

Child	Height
Beth	1.23 m
Tony	0.95 m
Rachel	1.02 m
Kate	1.2 m
Faye	99 cm
Emma	0.97 m

Order the children based on the heights of their sunflowers in both ascending and descending order.

Ascending:
Tony, Emma, Faye, Rachel, Kate, Beth

Descending:
Beth, Kate, Rachel, Faye, Emma, Tony

Round Decimals

Notes and Guidance

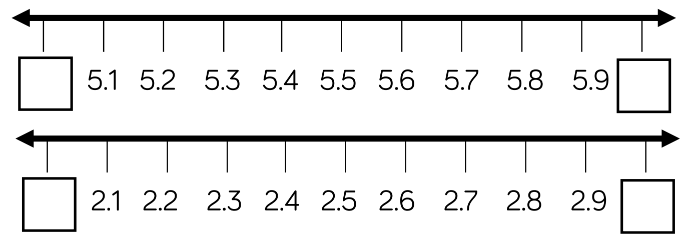
Children round numbers with 1 decimal place to the nearest whole number. They look at the digit in the tenths column to understand whether to round a number up or not. It is best to avoid the phrase 'round down' as this can sometimes lead to misconceptions. Children need to be taught that if a number is exactly half-way, then by convention we round up to the next integer.

Mathematical Talk

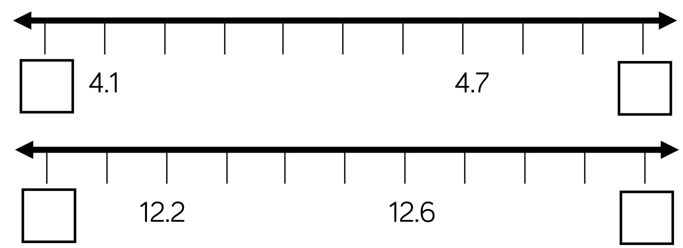
Which whole numbers does the decimal lie between?
Which whole number is the decimal closer to on the number line?
Which column do we focus on when rounding to the nearest whole number?
Which digits in the tenths column do not round up to the nearest whole number?
Which digits in the tenths column round up to the nearest whole number?

Varied Fluency

- Which integers do the decimals lie between?



- Complete the sentences to describe each decimal.



____ is closer to ____ than ____

____ rounds to ____ to the nearest whole number.

- Circle the numbers that round up to the nearest whole number.

4.5   3.7   2.3   4.2   16.8   1.9

Round Decimals

Reasoning and Problem Solving

Mo says 0.4 rounded to the nearest whole number is zero. Whitney says 0.4 rounded to the nearest whole number is one. Who is correct? Why?	Mo is correct. 0.4 lies between 0 and 1, as there are only four tenths, the number rounds to zero.

A number with one decimal place rounded to the nearest whole number is 45 What could the number be?	The number could be: 44.5, 44.6, 44.7, 44.8, 44.9, 45.1, 45.2, 45.3 or 45.4

Halves and Quarters

Notes and Guidance

Children write $\frac{1}{2}$, $\frac{1}{4}$ and $\frac{3}{4}$ as decimals. They use concrete and pictorial representations to support the conversion.
Children use their knowledge of equivalent fractions to write fractions as hundredths and then write the fractions as halves or quarters.

Mathematical Talk

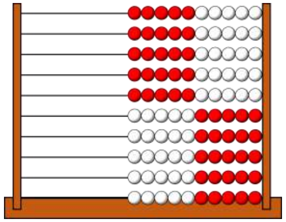
How would you write your answer as a decimal and a fraction?

Can you represent one quarter using decimal place value counters?

Can you represent three quarters using counters on a place value grid?

Varied Fluency

- Here is a rekenrek with 100 beads.



____ out of 100 beads are red.

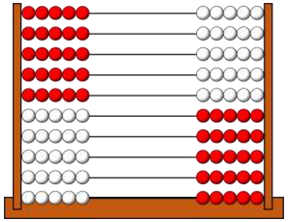
____ out of 100 beads are white.

$\frac{\square}{100}$ are red, and $\frac{\square}{100}$ are white.

Half of the beads are red, and half of the beads are white.

$\frac{1}{2} = \frac{50}{100} = \frac{5}{10}$, so $\frac{1}{2}$ is ______ as a decimal.

- The beads are split equally on each side of the rekenrek.



There are 4 equal groups.

1 out of 4 equal groups = ____ beads.

1 out of 4 equal groups = $\frac{\square}{100}$

$\frac{1}{4} = \frac{\square}{100} =$ ______

What fraction is represented by 3 out of the 4 groups?
Can you write this as a decimal?

$\frac{3}{4} = \frac{\square}{100} =$ ______

Halves and Quarters

Reasoning and Problem Solving

Alex says: If I know $\frac{1}{2}$ is 0.5 as a decimal, I also know $\frac{3}{6}$, $\frac{4}{8}$ and $\frac{6}{12}$ are equivalent to 0.5 as a decimal. Explain Alex's thinking.	Alex has used her knowledge of equivalent fractions to find other fractions that are equivalent to 0.5
Dexter has made a mistake when converting his fractions to decimals. $\frac{1}{2} = 1.2$, $\frac{1}{4} = 1.4$ and $\frac{3}{4} = 3.4$ What mistake has Dexter made?	Dexter has incorrectly placed the numerator in the ones column and the denominator in the tenths column. He should have used equivalent fractions with tenths and or hundredths to convert the fractions to decimals.

White Rose Maths

Summer - Block 2

Money

Overview

Small Steps

- Pounds and pence
- Ordering money
- Estimating money
- Convert pounds and pence (R)
- Add money (R)
- Subtract money (R)
- Find change (R)
- Four operations

Notes for 2020/21

This step provides further consolidation on the previous block of learning as children write money using decimal notation. Time is allowed to recap basic calculations with money from year 3 before looking at more complex examples.

Pounds and Pence

Notes and Guidance

Children develop their understanding of pounds and pence. This is the first time they are introduced to decimal notation for money. Once children are confident with this, they can move on to convert between different units of money.

Children can use models, such as the part-whole model, to recognise the total of an amount being partitioned in pounds and pence.

Mathematical Talk

How many pence make a pound?

Why do we write a decimal point between the pounds and pence?

How would we write 343 p using a pound sign?

How can the amounts be partitioned in to pounds and pence?

Is there only one way to complete the part-whole model?

How can these amounts be converted into pounds and pence?

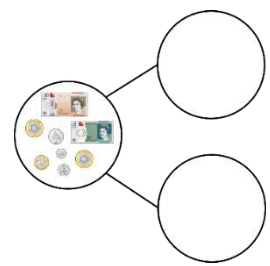
Varied Fluency

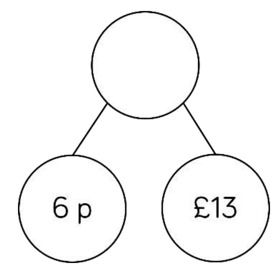
- How much money is in each purse?

There is ____ pence.
There is ____ pounds.
There is £____ and ____ p
There is £___.____

There is ____ pence.
There is ____ pounds.
There is £____ and ____ p
There is £___.____

- Complete the part-whole models to show how many pounds and pence there are.





- Convert these amounts to pounds and pence:

357 p   307 p   57 p   370 p

Pounds and Pence

Reasoning and Problem Solving

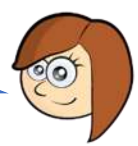
Some children are converting 1206 p into pounds.

Who is correct?

1206 p = £12.6

Whitney

1206 p = £12.06



Rosie

1206 p = £120.6

Teddy

What have the others done wrong?

Rosie is correct.
Whitney has not written the 6 p in the correct column.
Teddy has not understood how many pence there are in a pound, therefore his place value is incorrect.

Eva has these coins:

She picks three coins at a time.
Decide whether the statements will be always, sometimes or never true.

- She can make a total which ends in 2
- She can make an odd amount.
- She can make an amount greater than £6
- She can make a total which is a multiple of 5 pence

Can you think of your own always, sometimes, never statements?

- Never
- Sometimes e.g. £3.05
- Never – she can only choose three coins so the largest amount she can make is £5
- Always, because every coin is a multiple of 5 pence

Ordering Money

Notes and Guidance

Children use their knowledge of £1 = 100 p to compare amounts. Children begin by ordering amounts represented in the same format e.g. 4,562 p and 4,652 p, or £45.62 and £46.52 and relate this to their place value knowledge. Once children understand this, they look at totals that include mixed pounds and pence and also totals represented in decimal notation. Using real notes and coins could support some children.

Mathematical Talk

What does the digit ___ represent?

What place value column is the digit in? How many pounds/pence is it equivalent to?

How can this help us decide which amount is larger/smaller?

Can we think of an amount which could go in between these amounts?

What does ascending/descending mean?

What's the same? What's different?

Varied Fluency

- Two classes save their pennies for a year.

  Class A saves 3,589 pennies.
  Class B saves 3,859 pennies.

  Which class saves the most money?

- Write the amounts as pence, then compare using < , > or =

  6,209 p ◯ £60.09   £0.54 ◯ 54 p

  Write the amounts as pounds, then compare using < , > or =

  62 p ◯ £6.02   £5,010 ◯ 5,010 p

- Order the amounts in ascending order.

  130 p   £0.32   132 p   £13.20

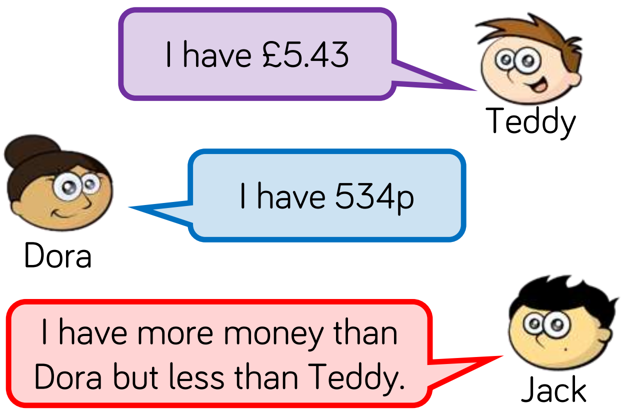
  Order the amounts in descending order.

  257 p   £2.50   2,057 p   £25.07

Ordering Money

Reasoning and Problem Solving

Teddy, Dora and Jack are buying toys.



How much money could Jack have?
Is there only one answer?

Jack could have anything from £5.35 to £5.42
Children may record this as 535 p to 542 p

What would you rather have, five 50p coins or twelve 20p coins?
Explain your answer fully.

I would rather have five 50 p coins because
$50 \times 5 = 250$p
but
$20 \times 12 = 240$p

Amir has these digits cards.

4 6 3 2

He uses them to fill the frame below:

£ ☐.☐☐

He makes a total that is more than three pounds but less than six pounds.

How many amounts can he make?

Order your amounts in ascending order.

£3.24, £3.26
£3.42, £3.46
£3.62, £3.64
£4.23, £4.26
£4.32, £4.36
£4.62, £4.63

Estimating Money

Notes and Guidance

Children round amounts of money written in decimal notation to the nearest pound. They estimate the total of two amounts and move on to estimating with more than two amounts.

Children discuss underestimating and overestimating and link this to rounding down or up and apply it to real life scenarios such as buying food in the supermarket.

Mathematical Talk

If we have ____ , what whole numbers/pounds does this come in between? Where will it go on the number line? Which pound is it nearer to?

What does estimate mean? What does approximately mean?

Where would be a sensible place to start labelling the number line?

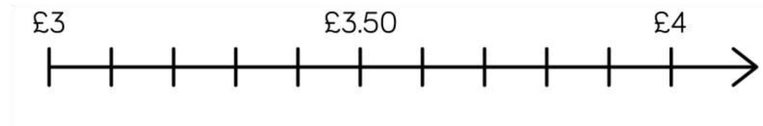
What will each amount round to? How much will they total altogether?

If you had ___ , would you have enough to buy the items?

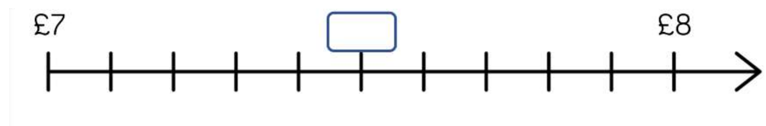
Varied Fluency

Place the amounts on the number line and round to the nearest pound.

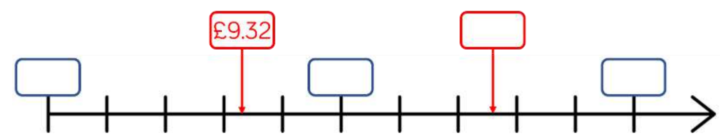
- £3.67
- £3.21
- £3.87



- £7.54
- £7.45
- 701 p



Complete this number line.



Complete the table by rounding each amount and finding the total.

Item 1	Item 2	Approximate Total
£5.63	£1.76	
£3.05	£11.54	

Annie has £15 to spend at the theme park.
She rides on the roller coaster which costs £4.34
Then she rides on the big wheel which costs £3.85
Approximately how much money will she have left?

Estimating Money

Reasoning and Problem Solving

Three children buy toys.
Can you work out who buys what?
Tommy buys a toy which rounds to £5 but gets change from £5
Amir buys two toys which total approximately £25
Eva's toy costs 5 p more than the number the cost rounds to.

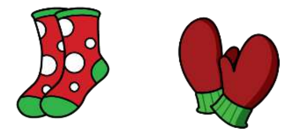
Tommy – car
Amira – computer game and rugby ball
Eve – panda

If you had £30, what combinations could you buy and what change would you approximately get?

Various answers

Mo buys some socks and gloves.
He estimates how much he'll spend.

£4 + £5 = £9



What could the actual price of the socks and gloves have been?

The socks could cost between £3.50 and £4.49
The gloves could cost between £4.50 and £5.49

Mo has £12
He says he has enough money to buy three pairs of socks.

Do you agree?
Explain why.

It depends. If the socks costs £3.50 to £4, he will.
If the socks cost £4.01 to £4.49, he will not.

Convert Pounds and Pence

Notes and Guidance

Children convert between pounds and pence using the knowledge that £1 is 100 pence.
They group 100 pennies into pounds when counting money.
They apply their place value knowledge and use their number bonds to 100

Mathematical Talk

How many pennies are there in £1?

How can this fact help us to convert between pounds and pence?

How could you convert 600p into pounds?
How could you convert 620p into pounds?

Varied Fluency

R

- What is the total of the coins shown?

Can you group any of the coins to make 100 pence?
How many whole pounds do you have?
How many pence are left over?
So there is £____ and ____ p.

- Write the amounts in pounds and pence.

- Write each amount in pounds and pence.

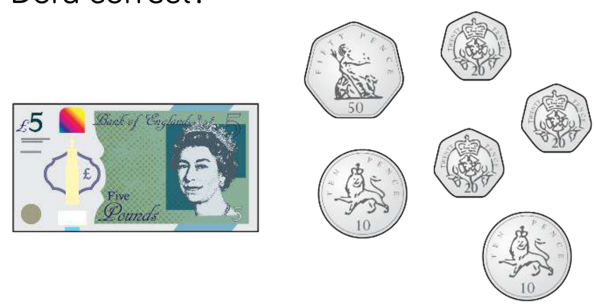
165p 234p 199p 112p 516p

Convert Pounds and Pence

Reasoning and Problem Solving

R

Dexter has 202 pence. He has **one** pound coin. Show five possible combinations of other coins he may have.	Children may work systematically and look at combinations of coins that make £1 to help them.
Whitney thinks that she has £10 and 3p. Is she correct?  Explain your answer.	Whitney is wrong, she has £12 and 1p. Whitney has not considered the value of the coins she has.

Dora thinks there is more than £5 but less than £6 Is Dora correct?  Convince me.	Dora is incorrect. There is £6 and 30p. This is greater than £6

Add Money

Notes and Guidance

Children add two amounts of money using pictorial representations to support them.

They are encouraged to add the pounds first and then add the pence. Children then exchange the pence for pounds to complete their calculations.

Mathematical Talk

Can you group any of the coins to make a pound?

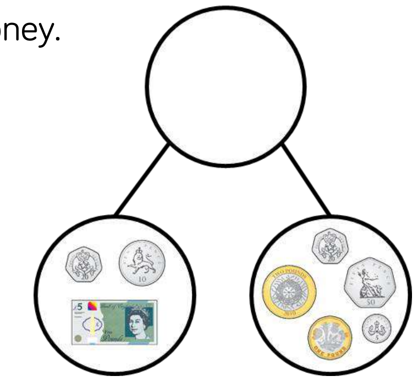
Can you use estimation to support your calculation?

Why is adding 99p the same as adding £1 and taking away 1p?

Varied Fluency

R

- Mo uses a part-whole model to add money.

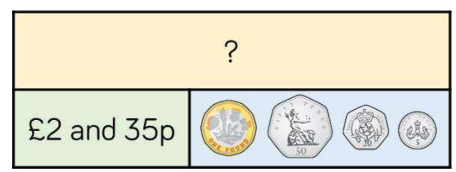


£____ and ____ p + £____ and ____ p
There is £____ and 105p.
105p= £_____ and _____p
Altogether there is £_____ and ____p.

Use Mo's method to find the total of:

£10 and 35p and £4 and 25p   £10 and 65p and £9 and 45p

- What calculation does the bar model show?
Find the total amount of money.



- A book costs £5 and 99p.
A magazine costs £1 and 75p.
How much do the book and magazine cost altogether?

Add Money

Reasoning and Problem Solving

R

Dora bought these muffins.

Muffins cost 35p each.
How much did Dora spend?

Tommy bought three times as many muffins as Dora.
How many muffins did Tommy buy?
How much money did Tommy spend on muffins?

How much more money did Tommy spend than Dora?

Dora spent 105p or £1 and 5p.

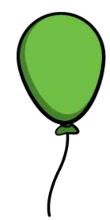
Tommy bought 9 muffins.
He spent 315p or £3 and 15p.

Tommy spent 210p or £2 and 10p more than Dora.

Rosie has £5
Has she got enough money to buy a car and two apples?

£3 and 35p

£2 and 55p



85p

75p

What combinations of items could Rosie buy with £5?

£3 and 35p + 85p + 85p = £5 and 5p

She does not have enough money.

Rosie could buy

1 car and 2 balloons
1 car, 1 apple and 1 balloon
1 magazine and 2 apples

Subtract Money

Notes and Guidance

Children use different methods to subtract money.
They will see examples where they can physically remove the coins, and examples where they will need to use their knowledge of converting money to exchange £1 for 100 pence.
Children also use number lines to count on or back to calculate the difference between two amounts.

Mathematical Talk

Can we make 50p in a different way to make it easier to subtract 10p physically?
Which number should I place on the number line first?
Could I count backwards on the number line?
Does this change the difference?
Do we need to exchange any pounds for pence?

Varied Fluency

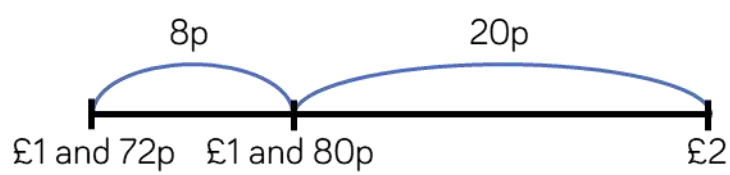
R

- Alex has £3 and 50p.
  She gives £2 and 10p to her sister.
  How much money does she have left?

£3 – £2 = £___ 50p – 10p = ___ p

Alex has £___ and ___ p remaining.

- Tommy has £1 and 72p. Rosie has £2
  How much more money does Rosie have than Tommy?



Rosie has ___ p more than Tommy.

- A T-shirt costs £7 and 20p.
  In a sale, the T-shirt costs £5 and 40p.

  How much has the cost of the T-shirt been reduced by?

White Rose Maths

Subtract Money

Reasoning and Problem Solving

R

Jack has £2 and 90p.
Teddy has three times as much money as Jack.

How much more money does Teddy have than Jack?

Rosie has twice as much money as Teddy.

How much more money does Rosie have than Jack?

Jack: £2 & 90p
Teddy: £8 & 70p
Rosie: £17 & 40p

Teddy has £5 and 80p more than Jack.

Rosie has £14 and 50p more than Jack.

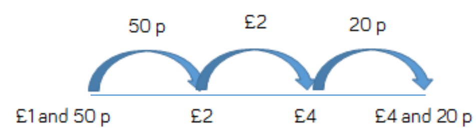
Use coins to support children in calculating.

Three children are calculating £4 and 20p subtract £1 and 50p.

£4 – £1 = £2
20p – 50p = 30p
£1 + 30p = £1 and 30p

Annie

Teddy



The difference is £2 and 70p.

£4 and 20p – £2 = £2 and 20p
£2 and 20p + 50p = £2 and 70p

Eva

Who is correct? Who is incorrect?
Which method do you prefer?

Annie's second step of calculation is incorrect.
Teddy and Eva both got the correct answer using different methods. Children may choose which method they prefer or discuss pros and cons of each.

Give Change

Notes and Guidance

Children use a number line and a part-whole model to subtract to find change.
Teachers use coins to practically model giving change.
Encourage role-play to give children a context of giving and receiving change.

Mathematical Talk

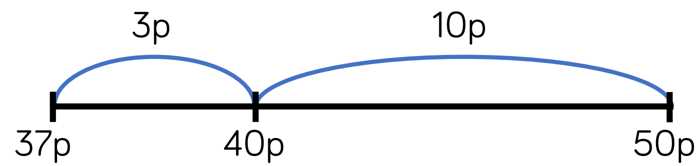
What do we mean by 'change' in the context of money?

Which method do you find most effective?

How does the part-whole model help to solve the problem?

Varied Fluency

Mo buys a chocolate bar for 37p. He pays with a 50p coin. How much change will he receive?

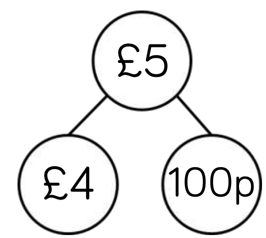


Mo will receive ____ p change.

Use a number line to solve the problems.

- Ron has £1. He buys a lollipop for 55p. How much change will he receive?
- Whitney has £5. She spends £3 and 60p. How much change will she receive?

Tommy buys a comic for £3 and 25p.
He pays with a £5 note.
How much change will he receive?
Use the part-whole model to help you.



Use a part-whole model to solve the problem.

- Eva buys a train for £6 and 55p. She pays with a £10 note. How much change will she receive?

Give Change

Reasoning and Problem Solving

Dora spends £7 and 76p on a birthday cake.

She pays with a £10 note.
How much change does she get?

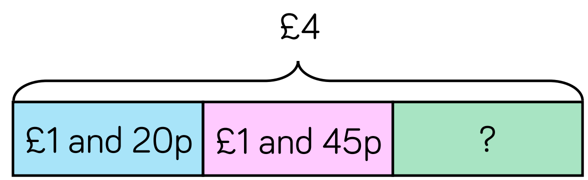
The shopkeeper gives her six coins for her change.
What coins could they be?

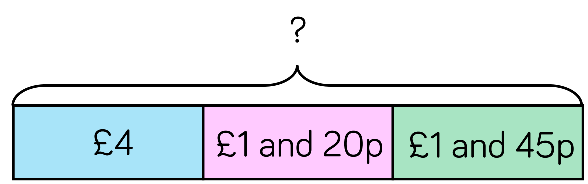
She receives £2 and 24p change.

There are various answers for which coins it could be, e.g. £1, £1, 10p, 10p, 2p, 2p.

Amir has £4
He buys a pencil for £1 and 20p and a book for £1 and 45p.

Which bar model represents the question?
Explain how you know.





Use the correct bar model to help you calculate how much change Amir receives.

The first bar model is correct as the whole is £4 and we are calculating a part as Amir has spent money.
Amir receives £1 and 35p change.

Four Operations

Notes and Guidance

Children solve simple problems with money, involving all four operations. Children are not expected to formally add with decimals in Year 4 but could explore other methods, such as partitioning and recombining to add money. They could use prior knowledge of converting, as well as number bonds, to help them.
Bar modelling could also be used as a strategy when solving problems.

Mathematical Talk

How can we label the bar model?

What other questions could we ask?

What operation will we use?

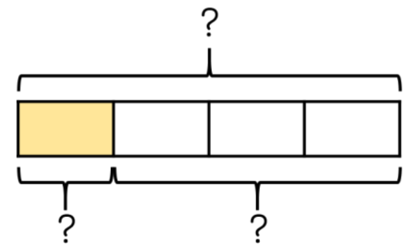
How can we partition pounds and pence to help add two amounts?

Is there an alternative way to answer this question?

Varied Fluency

- Ron has £48. He spends one quarter of his money.

  How much does he have left?
  Use the bar model to help.



- A family is going bowling.
  How much does it cost for 1 child and 1 adult at peak time?
  How much does it cost for 1 adult and 2 children off peak?

Tickets	Peak	Off Peak
Adult	£8	£6
Child	£4.20	£5.30

- Amir buys some clothes in a half price sale.
  - Jumper £14
  - Scarf £7
  - Hat £2.50
  - T-shirt £6.50

  What would the full price of each item be?
  How much would he have paid altogether if they were full price?
  How much does he pay in the sale?
  How much does he save?

Four Operations

Reasoning and Problem Solving

A class has £100 to spend on books.

Book Prices

Hardback = £8
Paperback = £4

How many books could they buy for £100?
How many different ways can this be done?

Children may explore this systematically e.g.
$8 \times 12 = 96$
(12 hardbacks)
$4 \times 1 = 4$
(1 paperback) etc.
Or they may start with paperback
$4 \times 25 = 100$
(25 paperbacks)
etc.

Dexter buys a teddy bear for £6.00, a board game for £4.00, a CD for £5.50 and a box of chocolates for £2.50
He has some discount vouchers.
He can either get £10.00 off or pay half price for his items. Which voucher would save him more?
Explain your thinking.

Total = £18
$18 - 10 = 8$
$\frac{1}{2}$ of $18 = 9$
$18 - 9 = 9$

The £10 voucher would save more.

Here is Dora's receipt.

Receipt	
Sandwich	
Orange juice	
Crisps	60 p
Banana	
TOTAL	

Use the information to complete the receipt:

- The sandwich costs £2.15 more than the crisps.
- The orange juice is the same price as the crisps and banana together.
- The banana is half the price of the crisps.

Receipt	
Sandwich	£2.75
Orange juice	90 p
Crisps	60 p
Banana	30 p
TOTAL	£4.55

White Rose Maths

Summer - Block 3

Time

Overview

Small Steps

- Telling the time to 5 minutes (R)
- Telling the time to the minute (R)
- Using a.m. and p.m. (R)
- 24-hour clock (R)
- Hours, minutes and seconds
- Years, months, weeks and days
- Analogue to digital – 12 hour
- Analogue to digital – 24 hour

Notes for 2020/21

Children should first recap telling the time to different degrees of accuracy from year 3 before moving on to new learning focused around converting between different units of time.

Telling the Time (1)

Notes and Guidance

Children tell the time to the nearest 5 minutes on an analogue clock. They focus on the language of "past" and "to", and will recognise and use Roman numerals on a clock face.

Attention should be drawn to the differences between the minute hand and the hour hand. This is especially important for times that are close to the next hour, for example, 5 minutes to 12

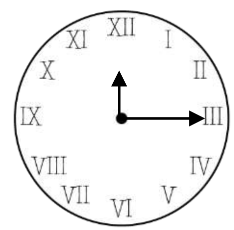
Mathematical Talk

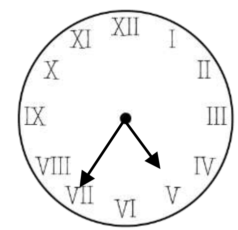
Which of the hands is the minute hand and which is the hour hand?
Is the minute hand past or to the hour?
How many minutes past/to the hour is the minute hand?
If the minute hand is pointing at the 6, how many minutes have passed in this hour?
What do you notice about the clocks?
Which Roman numeral represents the number ____?
Do we ever say "45 minutes to" the hour?

Varied Fluency

R

- Give each child a clock with moveable hands.
Children represent different times to the nearest 5 minutes on their own clock.
Discuss whether the minute hand is past or to the hour in different times.

- 

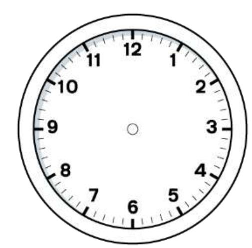


What time is shown on each clock?

_____ minutes past _____ _____ minutes to _____

- Draw the hands on the clock to show the time:

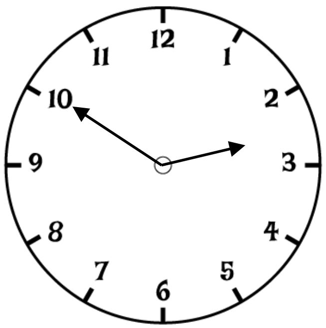
25 minutes to 6



Telling the Time (1)

Reasoning and Problem Solving

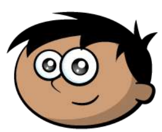
R



Dora

The clock shows ten minutes to 3

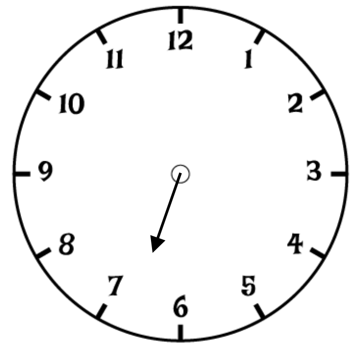
The hour hand is not quite pointing to the 3, so it must be ten to 2



Amir

Who do you agree with?
Explain your thinking.

Dora is correct because it is not 3 o'clock yet, the hour hand will not be exactly on the 3



This clock has lost its minute hand.

What time could it be?
Justify your answer.

The time is around half past six. Children may suggest it could be between twenty five to and quarter to seven.

Telling the Time (2)

Notes and Guidance

Children tell time to the nearest minute using an analogue clock. They use the terms 'past' and 'to'.

When telling time 'to' the next hour, children may need to count on to find how many minutes are left in the hour.

Mathematical Talk

Which hand is the minute hand? Which hand is the hour hand?

How many minutes is it past the hour?

How many minutes is it to the next hour?

When are the minutes to an hour and the minutes past an hour the same?

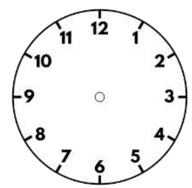
If the hour hand is between ____ and ____, which hour is the time referring to?

Varied Fluency

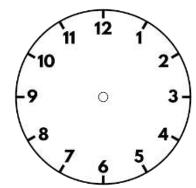
R

- Show children various times to the nearest minute for them to read.
  Give each child a clock with moveable hands.
  Children represent different times to the nearest minute on their own clock.
  Discuss whether the minute hand is past or to the hour in different times.

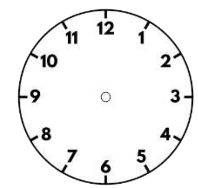
- Draw the hands on the clock from the following times.



Four minutes to 4



24 minutes to 8



24 minutes past 8

- Dora is telling the time from an analogue clock.

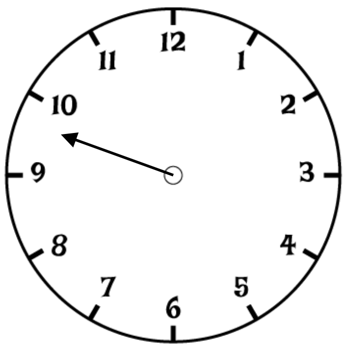
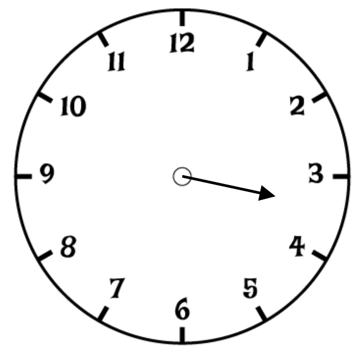
The hour hand is pointing to XI
the minute hand is pointing to XII

What time is it?

Telling the Time (2)

Reasoning and Problem Solving

R

This clock has lost its hour hand. What time could it be? 	The minute hand is at about 12 minutes to the hour. The time could be 12 minutes to any hour.	This clock has lost its minute hand. What time could it be? 	The hour hand is past the 3 and has not yet reached the 4 The hand is closer to the three and therefore the children should recognise that the time has not passed half past 3 You could accept any answers between quarter past to half past 3

Using a.m. and p.m.

Notes and Guidance

Children use ‘morning’, ‘afternoon’, ‘a.m.’ and ‘p.m.’ to describe the time of day.

Children continue using analogue clocks and will be introduced to digital time for the first time.

Mathematical Talk

What time of the day does ____ happen?
Is _____ earlier or later than _______?
How do you know whether a time is in the morning or afternoon?
What times could be a.m.?
What times could be p.m.?
What is the difference between analogue and digital?
What would the time look like on an analogue clock?
How can we change analogue to digital?

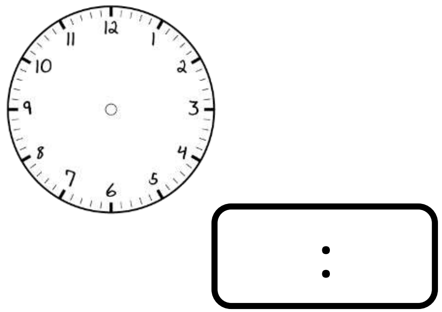
Varied Fluency

- Using a visual timetable, sort the events into morning and afternoon.
  Create sentences to describe when events take place.
  For example: Maths is in the morning. Guided Reading is in the afternoon.

- Sort the times from latest to earliest.

5:30 p.m.	9:45 a.m.	9:45 p.m.	10:23 a.m.
7:31 a.m.	10:13 p.m.	8:30 a.m.	6:32 a.m.
12:24 a.m.	8:55 p.m.	2:11 a.m.	7:40 a.m.

- Show the times on both analogue and digital clocks.
  - Guided reading at 10:00 a.m.
  - Home time at 3:30 p.m.
  - Lunchtime at 12:00 p.m.



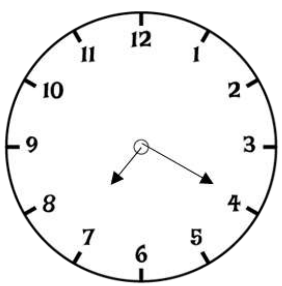
Using a.m. and p.m.

Reasoning and Problem Solving

The board shows the times of trains arriving and leaving the train station.

	Arrives	Leaves
London	5:50 a.m.	6:00 a.m.
Edinburgh	8:00 a.m.	8:20 a.m.
Manchester	2:33 p.m.	2:45 p.m.
Leeds	7:31 p.m.	7:35 p.m.

Ron's watch shows the time he arrives at the station.

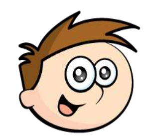


Which train could he be catching? Explain how you know.

Ron could be catching the train to Edinburgh or Leeds.
Children should explain that analogue clocks give no indication to a.m. or p.m. and since it is 20 past 7, Ron could be catching the 8:20 a.m. train or the 7:35 p.m. train.

Dora

I slept from 8 p.m. to 8 a.m.



Teddy

I slept from 8 a.m. to 8 p.m.

Who is more likely to be correct? Explain how you know.

Dora is more likely to be correct, because if she sleeps 8 p.m. to 8 a.m., she would be sleeping through the night, and wake up in the morning.
Teddy is likely to be incorrect, because he would be sleeping all day and waking up at 8 p.m. (in the evening)

24-hour Clock

Notes and Guidance

Children are introduced to telling the time on a 24-hour digital clock for the first time.

Children spend time looking at analogue and digital clocks at various times throughout the day, in order to compare what is the same and what is different.

Mathematical Talk

Using the 12-hour clock, is the time an a.m. or a p.m. time?

What will the number representing the hour be in 24-hour clock time? How do you know if it will be less than 12 or more than 12?

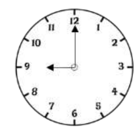
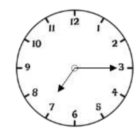
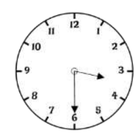
What will the minutes be in 24-hour time? Where can you count from? When does the number of minutes become 0 again on a 24-hour clock display?

Varied Fluency

R

- Create a diary using pictures to show your day from waking up to going to bed. Label these events using both 12-hour clock and 24-hour clock times.

- Match the times to the clocks showing the same time.

9 o'clock in the morning		19 : 15
Half past 3 in the afternoon		09 : 00
Quarter past 7 in the evening		15 : 30

- Complete the times.

13 : 45	Quarter to two in the ____________	__ : 45	Quarter past three in the afternoon
11 : 20	Twenty past eleven in the ________	17 : __	Twenty-five to six in the evening
15 : 50	Ten to four in the ____________	__ : __	Twenty to 9 in the morning

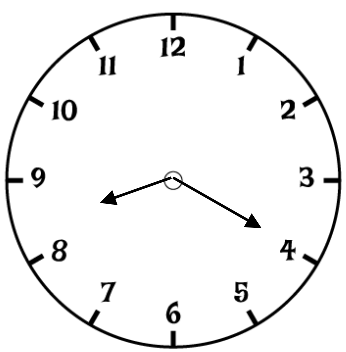
24-hour Clock

Reasoning and Problem Solving

Eva says the clocks are showing the same time of day.

Is she correct?
Explain how you know.

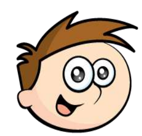
8:20



Eva could be correct. The clocks are both showing twenty past 8. However, children should recognise that the analogue clock does not show whether the time is a.m. or p.m., so this could be showing 8.20 a.m. or 8.20 p.m.

Is Teddy correct?
Prove it.

If the time has an 8 in it, it has to be 8 o'clock.



Teddy

Teddy is not correct.
Children should give examples to show this is incorrect. For example: 18:00, 8:30, 10:38 etc.

White Rose Maths

Hours, Minutes & Seconds

Notes and Guidance

Children recap the number of minutes in an hour and seconds in a minute from Year 3

They use this knowledge, along with their knowledge of multiplication and division to convert between different units of time.

Mathematical Talk

What activity might last one hour/minute/second?
How many minutes are there in an hour?
How can we use a clock face to check? How could we count the minutes?
How many seconds are there in one minute? What could we use to check?
How many minutes in _____ hours? How many seconds in ____ minutes?

Varied Fluency

Sort the activities under the headings depending on the approximate length of time they take to complete.

One hour	One minute	One second
Clap	Run around the playground	Blink
Swimming lesson	PE lesson	Tie your shoe laces

One hour = ____ minutes
Two hours = ____ minutes
Half an hour = ____ minutes

One minute = ____ seconds.
Three minutes = ____ seconds.
____ minutes = 240 seconds

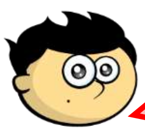
Josh reads a chapter of his book in 5 minutes and 28 seconds.
Tom reads a chapter of his book in 300 seconds.
Who reads their chapter the quickest?

Hours, Minutes & Seconds

Reasoning and Problem Solving

Jack takes part in a sponsored silence.

He says,

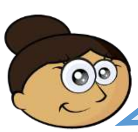


If I am silent for five hours at 10p per minute, I will raise £50

Do you agree with Jack?
Explain why you agree or disagree.

Jack is incorrect. There are 60 minutes in an hour so
$60 \times 10p = 600p$ or £6
$£6 \times 5 = £30$

Dora says,



To convert hours to minutes, I multiply the number of hours by 60

Is she correct? Can you explain why?

Dora is correct. For example
1 hour = 60 minutes
$1 \times 60 = 60$
2 hours = 120 minutes
$2 \times 60 = 120$

Five friends run a race.
Their times are shown in the table.

Name	Time
Eva	114 seconds
Dexter	199 seconds
Teddy	100 seconds
Whitney	202 seconds
Ron	119 seconds

Which child finished the race the closest to two minutes?

What was the difference between the fastest time and the slowest time?
Give your answer in minutes and seconds.

Ron was the closest to two minutes, as he is one second quicker than 2 minutes (120 seconds).

Fastest time 100 seconds, slowest time 202 seconds.

The difference between the fastest and slowest time is 1 minute and 42 seconds.

Years, Months, Weeks & Days

Notes and Guidance

Children recap the concept of a year, month, week and day from Year 3

They use this knowledge, along with their knowledge of addition, subtraction, multiplication and division to convert between the different units of time.

Mathematical Talk

How many days are there in a week? How many days are there in each month?
How many weeks in a year?
How many days are there in _____ weeks? What calculation do we need to do to convert days to weeks/weeks to days?
How many months/weeks/days are there in _____years?

Varied Fluency

- Use a calendar to help you complete the sentences.

  There are ____ months in a year.

  There are ____ days in February.

  ____ months have 30 days, and ____ months have 31 days.

  There are ____ days in a year and ____ days in a leap year.

- Complete the table.

Number of days	Number of weeks
	5
49	
	12

- Sally is 7 years and 2 months old.
  Macey is 85 months old.
  Who is the oldest?
  Explain your answer.

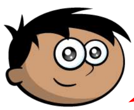
White Rose Maths

Years, Months, Weeks & Days

Reasoning and Problem Solving

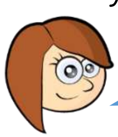
Amir, Rosie and Jack describe when their birthdays are.

Amir says,



My birthday is in exactly two weeks.

Rosie says,



My birthday is in exactly 2 months.

Jack says,

My birthday is in 35 days.

Use the clues to work out when their birthdays are if today is the 8th June.

Amir – 2 weeks is equal to 14 days so his birthday is 22nd June.

Rosie – 8th August

Jack – there are another 22 days left in June plus 13 in July, so his birthday is 13th July.

Always, sometimes, never?

There are 730 days in two years.

Sometimes – if both of the years are not leap years this is true. If one is a leap year then there will be 731 days in the 2 years.

True or false?

- 3 days $>$ 72 hours.
- $2\frac{1}{2}$ years $=$ 29 months
- 11 weeks 4 days $<$ 10 weeks 14 days

False – 3 days is equal to 72 hours

False - $2\frac{1}{2}$ years is greater than 29 months

True

Analogue to Digital – 12 hour

Notes and Guidance

Children convert between analogue and digital times using a format up to 12 hours. They use a.m. and p.m. to distinguish between times in the morning and afternoon.
They understand that how many minutes past the hour determines the digital time.
It is important for children to recognise that digital time need to be written in 4-digit format. For example, 09:30 a.m. not 9:30

Mathematical Talk

What time is the analogue clock showing?
How many minutes is it past the hour? How can you count the minutes efficiently?
How do we record each time in digital format?
What does a.m./p.m. mean?
Can you order the activities starting with the earliest?
What would the time look like on Alfie's digital watch when he left home?

Varied Fluency

The time is ________ past 10

This can also be written as ____ minutes past 10

The digital time is ____ : ____

Write each of these times in the digital format.




Record the time of each activity in digital format.

Netball	 p.m.	
Football	 a.m.	
Rock climbing	 p.m.	
Roller disco	 a.m.	

Alfie looks at his digital watch and sees this time. What could he be doing at this time?

01:00 p.m.

White Rose Maths

Analogue to Digital – 12 hour

Reasoning and Problem Solving

Annie converts the analogue time to digital format.
Here is her answer.

22 : 02

Explain what Annie has done wrong.
What should the digital time be?

Annie has recorded the minutes past the hour first instead of the hour.
The time should be 02 : 22

12 : 21

On a 12 hour digital clock, how many times will the time be read the same forwards and backwards?

Children can work systematically to work this out. For example, 12:21, 01:10, 02:20, 03:30 etc.

Jack arrives at the train station at the time shown in the morning.

Which trains could he catch?

Destination	Departs
York	07 : 10 a.m.
New Pudsey	09 : 25 a.m.
Bramley	09 : 42 a.m.
Leeds	10 : 03 a.m.

How long will Jack have to wait for each train?

Jack could catch the train to Bramley or Leeds.

He would have to wait 7 minutes to go to Bramley and 28 minutes to go to Leeds.

Analogue to Digital – 24 hour

Notes and Guidance

Children now move on to convert between analogue and digital times using a 24 hour clock

They use 12 and 24 hour digital clocks, and a number line, to explore what happens after midday.

Mathematical Talk

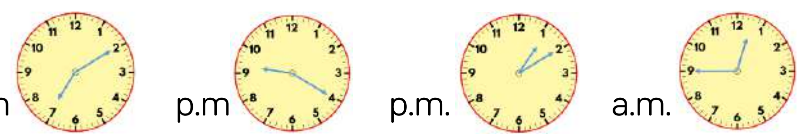
What do you notice about the time 1 o'clock in the afternoon on a 24 hour digital clock?
How will the time be shown for 3 o'clock in the morning/afternoon? How do you know?
What time is the analogue clock showing?
Why is it important to know if it is a.m. or p.m.?
What time does she leave school on a 24 digital clock?

Varied Fluency

- Explore an interactive 12 and 24 hour digital clock with the children. Compare what happens when the time reaches 1 o'clock in the afternoon. Move the 24 hour clock on to 2 o'clock.
  Plot the times above a 0-24 number line.
  What do you notice?
  Record these times using 24 hour digital format.
  4 pm 8 pm 11 pm

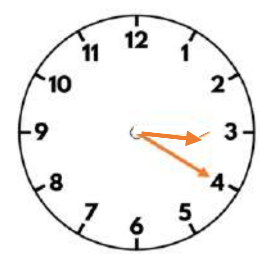
- Match the analogue and digital times.

  a.m p.m p.m. a.m.

13 : 10	07 : 10	00 : 45	21 : 20

- Sally leaves school at the time shown.
  She arrives home 1 hour later.
  What will the time be on a 24 hour digital clock?

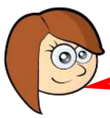
  

Analogue to Digital – 24 hour

Reasoning and Problem Solving

Three children are meeting in the park.

Rosie says,

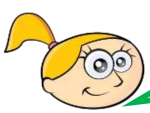


We are meeting at 14:10.

Teddy says,

We are meeting at 02:10 p.m.

Eva says,



We are meeting at ten to two.

Will all the children meet at the same time?
Explain your answer.

Annie has recorded the minutes past the hour first instead of the hour.
The time should be 02 : 22 a.m.

Children can work systematically to work this out. For example, 12:21, 01:10, 02:20, 03:30 etc.

Jack says,

To change any time after midday from 12 hours to 24 hours digital time just add 12 to the hours

Will this always be true? Are there any examples where this isn't the case?

Sometimes true

You need to add 12 to the hour, but not if it is 12 in the hours e.g. 12:04 p.m.

Can you match the time dominoes together so that the touching times are the same?

20:55 / Ten to two	13:50 / Five to ten	09:55 / Ten to three
15:05 / Ten past 4	02:50 / Five past 3	16:10 / Five to nine

Can you create your own version for your partner?

Children may find more than one way to solve this.

Summer - Block 4

Statistics

Overview

Small Steps

- Interpret charts
- Comparison, sum and difference
- Introducing line graphs
- Line graphs

Notes for 2020/21

Less time is allowed for this block than there has been in previous years to ensure more time can be spent on number. Science is a good opportunity to consolidate statistics if needed.

Interpret Charts

Notes and Guidance

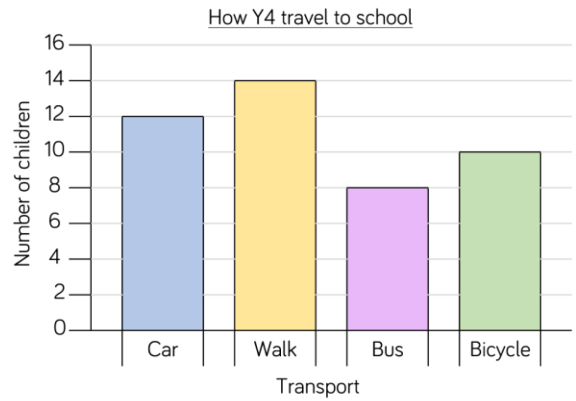
Children revisit how to use bar charts, pictograms and tables to interpret and present discrete data.
They decide which scale will be the most appropriate when drawing their own bar charts.
Children gather their own data using tally charts and then present the information in a bar chart. Questions about the data they have gathered should also be explored so the focus is on interpreting rather than drawing.

Mathematical Talk

What are the different ways to present data?
What do you notice about the different axes?
What do you notice about the scale of the bar chart?
What other way could you present the data shown in the bar chart?
What else does the data tell us?
What is the same and what is different about the way in which the data is presented?
What scale will you use for your own bar chart? Why?

Varied Fluency

- Complete the table using the information in the bar chart.

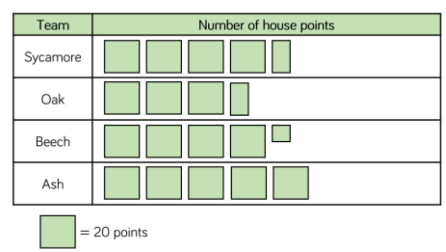


Transport	Number of children
Car	
Walk	
Bus	
Bicycle	

What is the most/least popular way to get to school?
How many children walk to school?

- Produce your own table, bar chart or pictogram showing how the children in your class travel to school.

- Represent the data in each table as a bar chart.



Day	Number of tickets sold
Monday	55
Tuesday	30
Wednesday	45
Thursday	75
Friday	85

Interpret Charts

Reasoning and Problem Solving

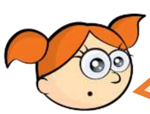
Halifax City Football Club sold the following number of season tickets:

- Male adults – 6,382
- Female adults – 5,850
- Boys – 3,209
- Girls – 5,057

Would you use a bar chart, table or pictogram to represent this data? Explain why.

Possible answer:
I would represent the data in a table because it would be difficult to show the exact numbers accurately in a pictogram or bar chart.

Alex wants to use a pictogram to represent the favourite drinks of everyone in her class.



I will use this image  to represent 5 children.

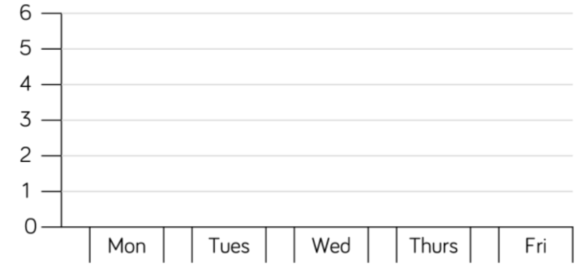
Explain why this is not a good idea.

It is not a good idea, because it would be difficult to show amounts which are not multiples of 5

Here is some information about the number of tickets sold for a concert.

Day	Number of tickets sold
Monday	55
Tuesday	30
Wednesday	45
Thursday	75
Friday	85

Jack starts to create a bar chart to represent the number of concert tickets sold during the week.



What advice would you give Jack about the scale he has chosen?
What would be a better scale to use?
Is there anything else missing from the bar chart?

Possible response:
I would tell Jack to use a different scale for his bar chart because the numbers in the table are quite large.
The scale could go up in 5s because the numbers are all multiples of 5
Jack needs to record the title and he needs to label the axes.

White Rose Maths

Comparison, Sum & Difference

Notes and Guidance

Children solve comparison, sum and difference problems using discrete data with a range of scales.
They use addition and subtraction to answer questions accurately and ask their own questions about the data in pictograms, bar charts and tables.
Although examples of data are given, children should have the opportunity to ask and answer questions relating to data they have collected themselves.

Mathematical Talk

What does a full circle represent in the pictogram?

What does a half/quarter/three quarters of the circle represent?

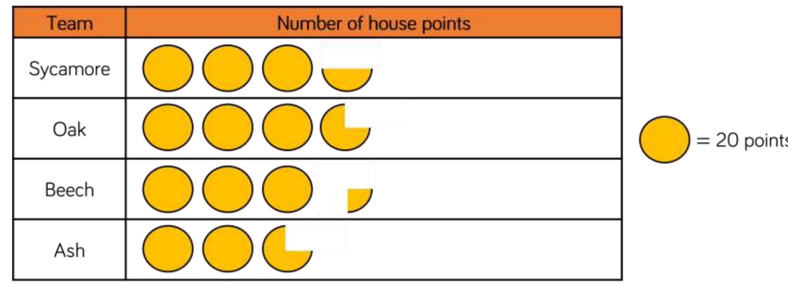
What other questions could we ask about the pictogram?

What other questions could we ask about the table?

What data could we collect as a class?

What questions could we ask about the data?

Varied Fluency



How many more points does the Sycamore team have than the Ash team?
How many points do Beech and Oak teams have altogether?
How many more points do Ash need to be equal to Oak?

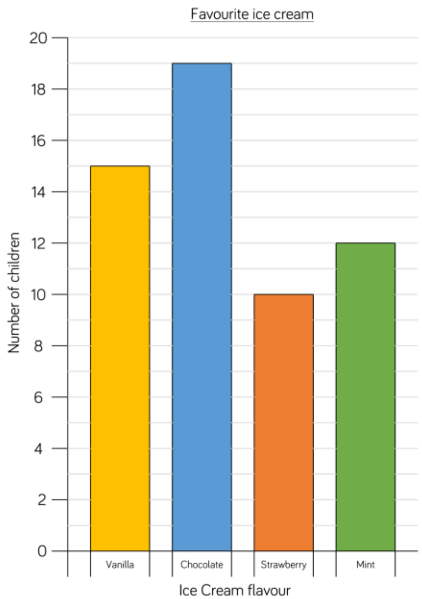
Activity	Number of votes
Bowling	9
Cinema	10
Swimming	7
Ice-skating	14

How many people voted in total?
$\frac{1}{4}$ of the votes were for ________.
7 more people voted for __________ than ___________.

As a class, decide on some data that you would like to collect, for example: favourite books, films, food.
Collect and record the data in a table.
Choose a pictogram or a bar chart to represent your data, giving reasons for your choices.
What questions can you ask about the data?

Comparison, Sum & Difference

Reasoning and Problem Solving



Rosie says,

Can you spot Rosie's mistake?
How many people were asked altogether?

Rosie has read the bar chart incorrectly.
15 people chose vanilla, 19 people chose chocolate, 10 chose strawberry and 12 chose mint.
That means 56 people were asked altogether.

Attraction	Number of visitors on Saturday	Number of visitors on Sunday
Animal World Zoo	1,282	2,564
Maltings Castle	2,045	1,820
Primrose Park	1,952	1,325
Film Land Cinema	2,054	1,595

True or false?

- The same number of people visited Maltings Castle as Film Land Cinema on Saturday.
- Double the number of people visited Animal World Zoo on Sunday than Saturday.
- The least popular attraction of the weekend was Primrose Park.

- False
  The Film Land Cinema had 9 more visitors that Maltings Castle
- True
  1,282 doubled is 2,564
- True
  Animal World Zoo - 3,846
  Maltings Castle - 3,865
  Primrose Park - 3,277
  Film Land Cinema - 3,649

Introducing Line Graphs

Notes and Guidance

Children are introduced to line graphs in the context of time. They use their knowledge of scales to read a time graph accurately and create their own graphs to represent continuous data.
It is important that children understand that continuous data can be measured (for example time, temperature and height) but as values are changing all the time, the values we read off between actual measurements are only estimates.

Mathematical Talk

How is the line graph different to a bar chart?

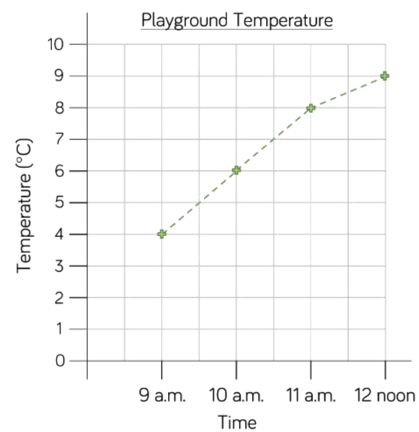
Which is the x and y axis? What do they represent?

How would you estimate the temperature at 9:30 a.m.?

How would you estimate the time it was when the temperature was 7 degrees?

Varied Fluency

The graph shows the temperature in the playground during a morning in April.



The temperature at 9 a.m. is _______ degrees.

The warmest time of the morning is __________.

Class 4 grew a plant. They measured the height of the plant every week for 6 weeks.
The table shows the height of the plant each week.

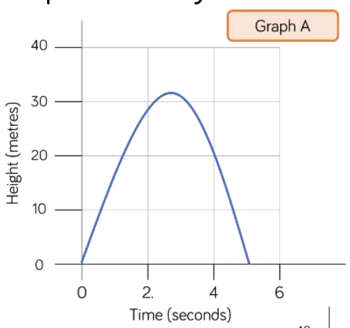
Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
4 cm	7 cm	9 cm	12 cm	14 cm	17 cm

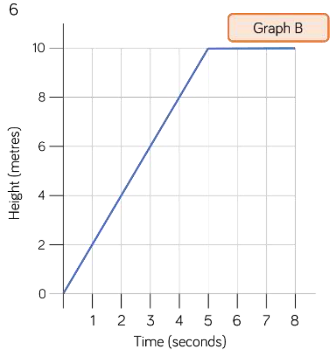
Create a line graph to represent this information.
What scale would you use on the x and y axes?
Between which two weeks did the plant reach a height of 10 cm?

Introducing Line Graphs

Reasoning and Problem Solving

Jack launched a toy rocket into the sky.
After 5 seconds the rocket fell to the ground.
Which graph shows this?
Explain how you know.



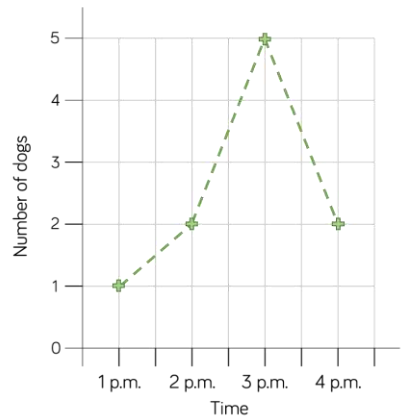


Make up your own story for the other graph.

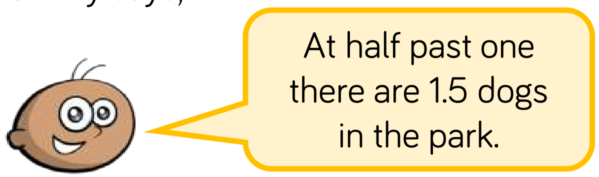
Graph A
The height of the rocket increases then decreases quickly again, returning to a height of 0 at 5 seconds.

Example story:
A bird flew up from the ground. It continued to fly upwards for 5 seconds then flew at the same height for another 3 seconds.

Tommy created a line graph to show the number of dogs walking in the park one afternoon.



Tommy says,



Why is Tommy incorrect?

What would be a better way of presenting this data?

Tommy is incorrect because you cannot have 1.5 dogs.

A better way of presenting this data would be using a bar chart, pictogram or table because the data is discrete.

Line Graphs

Notes and Guidance

Building from the last step, children continue to solve comparison, sum and difference problems using continuous data with a range of scales.
They use addition and subtraction to answer questions accurately and ask their own questions about the data in line graphs. Although examples of data are given, children need to have the opportunity to ask and answer questions relating to data they have collected themselves.

Mathematical Talk

Is this discrete or continuous data? How do you know?

What do you notice about the scale of the graph?

How could you make sure you read the graph accurately?

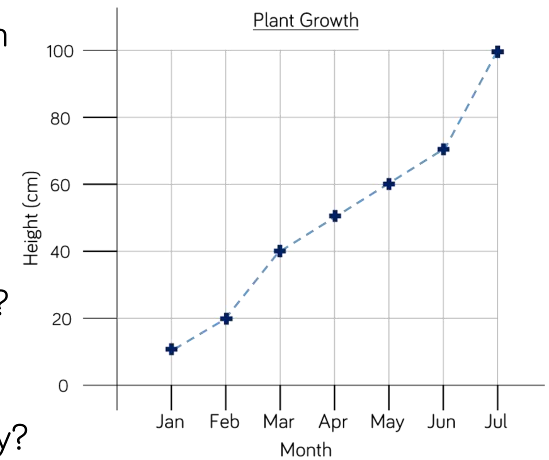
What other questions could you ask about the graph?

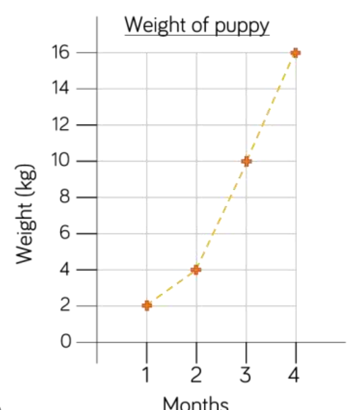
How many different ways can you fill in the stem sentences?

Varied Fluency

The graph shows the growth of a plant over 6 months.

- How tall was the plant when it was measured in May?
- In what month did the plant first reach 50 cm?
- How many centimetres did the plant grow between March and July?
- What was the difference between the height of the plant in February and the height of the plant in April?



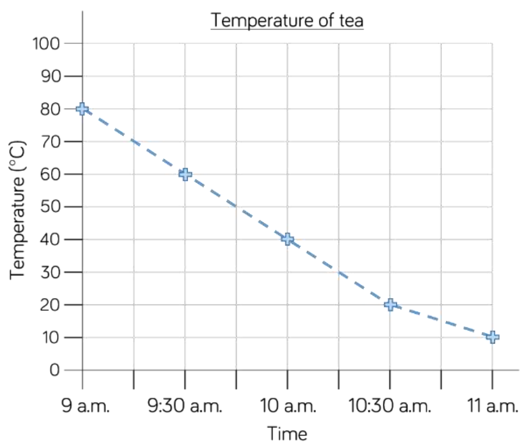


The graph shows the weight of a puppy as it grows.
When the puppy is ____ months old the weight is ____kg
Between month ____ and month ____ the puppy increased by ____ kg

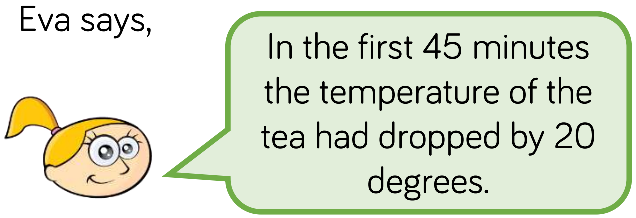
Line Graphs

Reasoning and Problem Solving

Eva measured the temperature of a cup of tea every 30 minutes for 2 hours. The graph shows Eva's results.



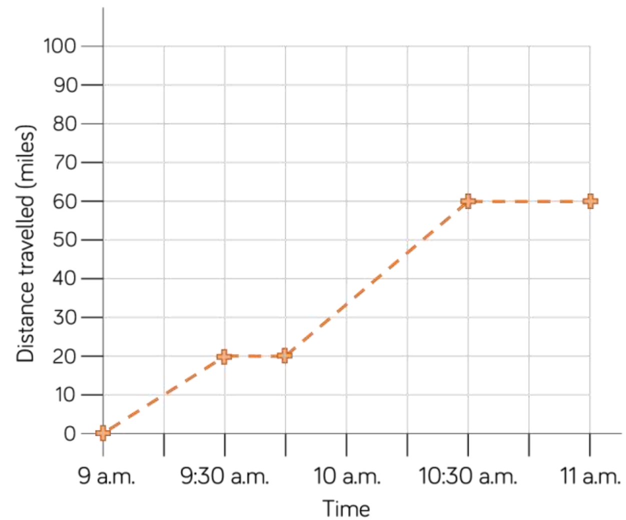
Eva says,



Do you agree with Eva?
Explain why.

I do not agree with Eva. At 9 a.m. the temperature was 80 degrees and at 9.45 a.m. the temperature was 50 degrees, so it had dropped 30 degrees not 20 degrees.

Write a story to match the graph.



Example story:
Mo drove 20 miles in his lorry. At half past 9 he had a 15 minute rest then drove for another 30 miles until he reached his destination at 10:30 a.m.

White Rose Maths

Summer - Block 5

Properties of Shape

White Rose Maths

Overview

Small Steps

- Turns and angles (R)
- Right angles in shapes (R)
- Compare angles (R)
- Identify angles
- Compare and order angles
- Recognise and describe 2-D shapes (R)
- Triangles
- Quadrilaterals
- Horizontal and vertical (R)
- Lines of symmetry
- Complete a symmetric figure

Notes for 2020/21

The new learning in this block requires students to be confident in the prerequisite steps from year 3

These are included here for recap as they are likely to have been taught remotely during the last academic year.

Turns and Angles

Notes and Guidance

Children recognise angles as a measure of a turn. They practice making $\frac{1}{2}, \frac{1}{4}, \frac{3}{4}$ and whole turns from different starting points in both clockwise and anti-clockwise directions in practical contexts. They should listen to/follow instructions and also give instructions using the correct mathematical language in different contexts. Children understand that an angle is created when 2 straight lines meet at a point.

Mathematical Talk

If we start by facing _______ and make a ______ turn, what direction will we be facing?

If we face _______ and turn to face ______, what turn have we made?

If we face north and make a quarter turn clockwise, which direction will we be facing? What if we turn anti-clockwise?

What would the time be if the minute hand started at 1, then made a quarter of a turn?

Can you see any angles around the classroom?

Varied Fluency

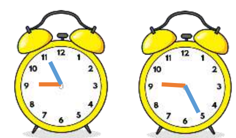
R

- Take children outside or into the hall where they can practice moving in turns themselves. Label 4 walls/points (for example: North, South, East, West).

  Give children instructions to encourage them to make $\frac{1}{2}, \frac{1}{4}, \frac{3}{4}$ and whole turns from different starting points. Allow children the opportunity to give instructions too.

- Look at the hands of the clock.
  Turn the minute hand one quarter of a turn clockwise.
  Where is the large hand pointing?
  What is the new time?

  What turn has the minute hand made?

- Tick the images where you can see an angle.
  Explain your choices.

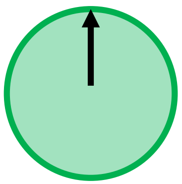
  

Turns and Angles

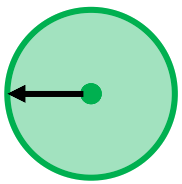
Reasoning and Problem Solving

R

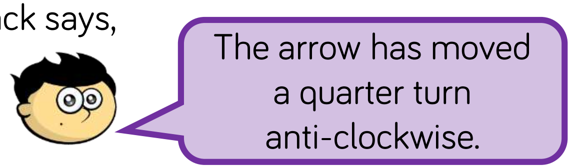
The arrow on a spinner started in this position.



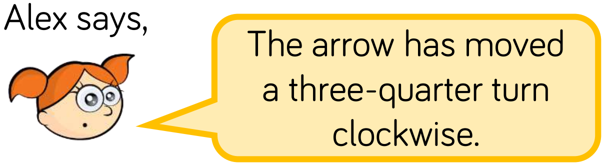
After making a turn it ended in this position.



Jack says,



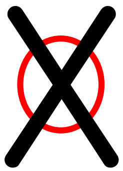
Alex says,



Who do you agree with?

Both children are correct.

The letter 'X' has four angles.



Write your name in capital letters.
How many angles can you see in each letter?
How many angles are there in your full name?

Answers will vary depending on the children's names.

Right Angles in Shapes

Notes and Guidance

Children recognise that a right angle is a quarter turn, 2 right angles make a half-turn, 3 right angles make three-quarters of a turn and 4 right angles make a complete turn.

Children need to see examples in different orientations so that they understand that a right angle does not have to be made up of a horizontal and vertical line.

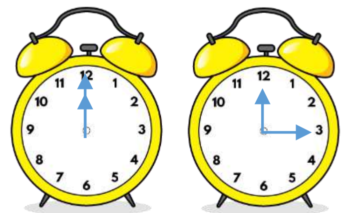
Mathematical Talk

How many right angles make a half turn/three-quarter turn/ full turn?
Where can you see a right angle in the classroom/ around school/ outside?
Which shapes contain right angles?
Can you think of a shape which doesn't have any right angles?
How many right angles does a __________ have?
Can you draw a shape with _____ right angles?
What headings would we place in our table?

Varied Fluency

R

- Give children a clock each so they can practice making turns. Start with the hands showing 12 o'clock, move the minute hand one quarter of a turn.

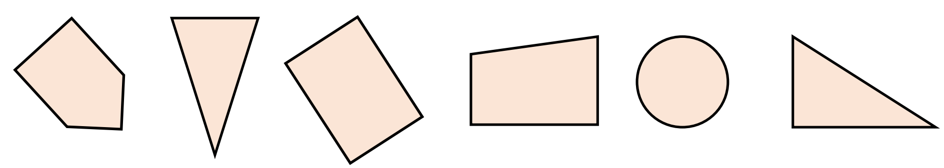


The angle between the hands is called a _________ angle.
One quarter turn is equal to a _________ angle.

- Children can create a 'Right Angle Tester' E.g.

They can then go on a right angle hunt around school. Find and draw at least 3 right angles you have seen around your school.

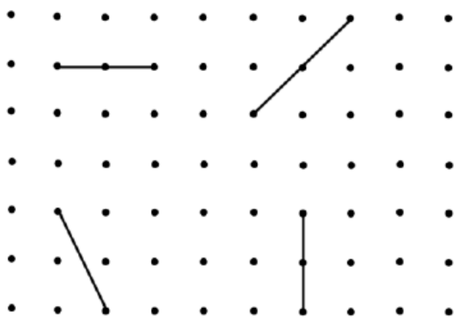
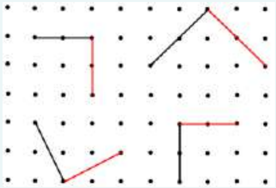
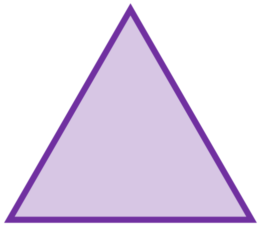
- Sort the shapes based on the number of right angles they have. Record your answer in a table.

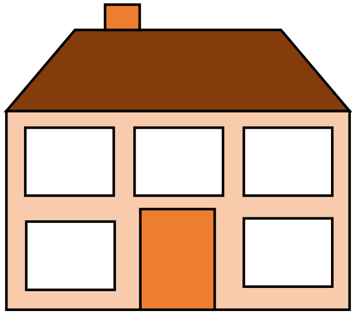


Right Angles in Shapes

Reasoning and Problem Solving

R

Draw a line along the dots to make a right-angle with each of these lines: 	For example (see red lines): 
True or False? This shape has two right-angles.  Explain your answer.	False. Children could show this by using the corner of a page to show there aren't any right angles.

How many right angles can you see in this image?  Can you create your own image with the same number of right angles?	There are 34 right angles.

Compare Angles

Notes and Guidance

Children identify whether an angle is greater than or less than a right angle in shapes and turns, by measuring, comparing and reasoning in practical contexts.

Children are introduced to the words 'acute' and 'obtuse' as a way of describing angles.

Mathematical Talk

What is an acute? (Give 3 examples of acute angles and ask them to identify what's the same about them. Draw out that they are all smaller than a right-angle).

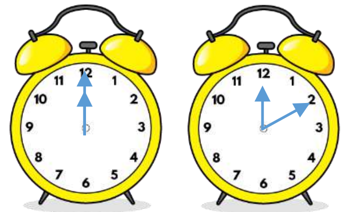
What's an obtuse angle? (Repeat activity by giving 3 examples of obtuse angles).

Can you give me a time where the hands on the clock make an acute/obtuse angle?

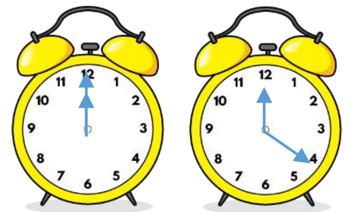
Can you see an acute/obtuse angle around the classroom?

Can you draw me a shape that contains acute/obtuse angles?

Varied Fluency R

- 

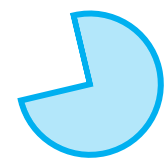
  The angle between the hands is ________ than a right angle.
  This is called an ________ angle.

  The angle between the hands is ________ than a right angle.
  This is called an ________ angle.

  Explore other times where the hands make an acute/obtuse angle.

- Find 3 acute angles and 3 obtuse angles in your classroom.
  Use your 'Right Angle Tester' to check.

- Label any acute or obtuse angles in these images.

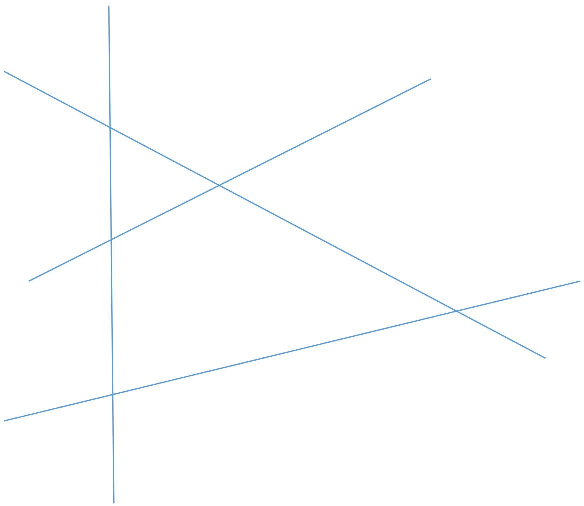
    

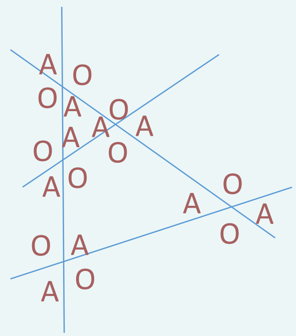
Compare Angles

Reasoning and Problem Solving

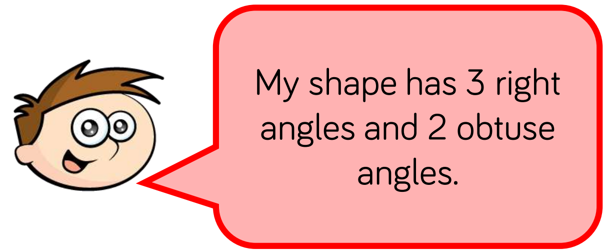
R

Label the acute angles (A) and obtuse angles (O) on the diagram below





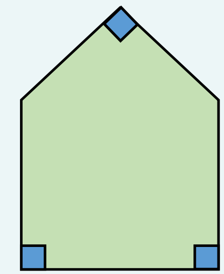
Teddy describes a shape.



What could Jack's shape look like?

Describe a shape in terms of it's angles for a friend to draw.

Possible answer:



White Rose Maths

Identify Angles

Notes and Guidance

Children develop their understanding of obtuse and acute angles by comparing with a right angle. They use an angle tester to check whether angles are larger or smaller than a right angle.
Children learn that an acute angle is more than 0 degrees and less than 90 degrees, a right angle is exactly 90 degrees and an obtuse angle is more than 90 degrees but less than 180 degrees.

Mathematical Talk

How many degrees are there in a right angle?

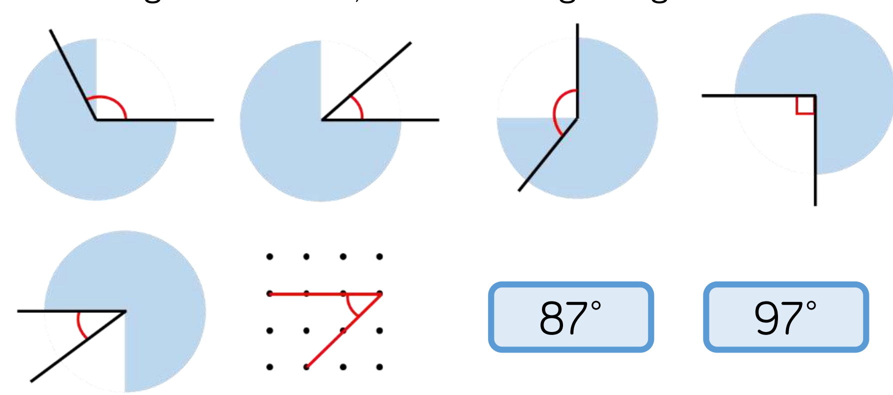
Draw an acute/obtuse angle.

Estimate the size of the angle.

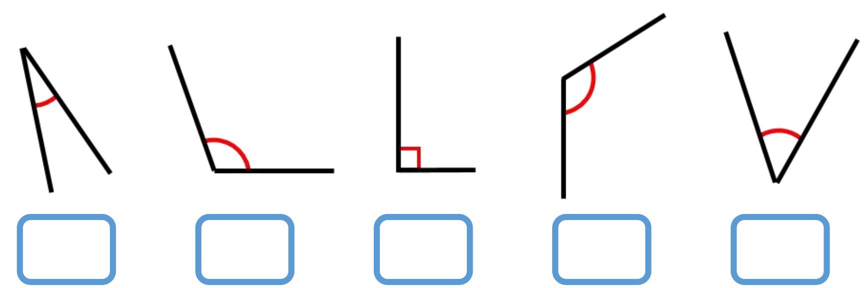
Varied Fluency

- A right angle is _____ degrees.
  Acute angles are _____ than a right angle.
  Obtuse angles are _____ than a right angle.

- Sort the angles into acute, obtuse and right angles.

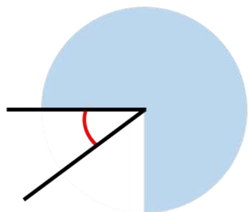


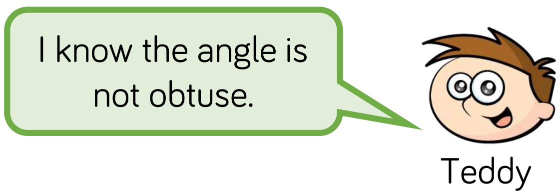
- Label the angles. O for obtuse, A for acute and R for right angle.

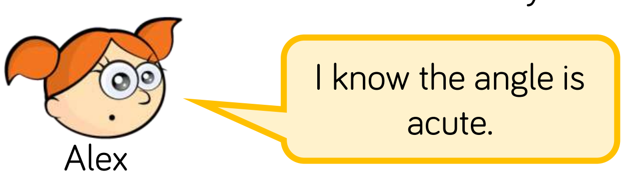


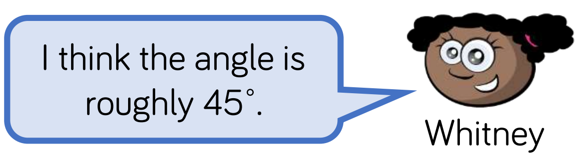
Identify Angles

Reasoning and Problem Solving



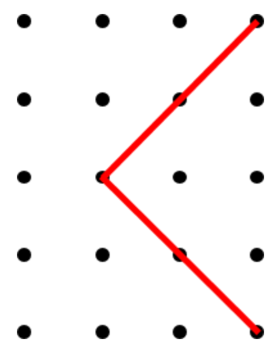






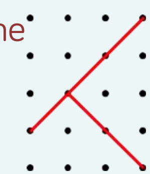
Who is correct?
Explain your reasons.

All are correct.
Children may reason about how Whitney has come to her answer and discuss that the angle is about half a right angle. Half of 90 degrees is 45 degrees.



Is the angle acute, obtuse or a right angle?
Can you explain why?

The angle is a right angle.
Children may use an angle tester to demonstrate it, or children may extend the line to show that it is a quarter turn which is the same as a right angle.



Find the sum of the largest acute angle and the smallest obtuse angle in this list:

12° 98° 87° 179° 90° 5°

$87° + 98° = 185°$

Compare & Order Angles

Notes and Guidance

Children compare and order angles in ascending and descending order.

They use an angle tester to continue to help them to decide if angles are acute or obtuse.

Children identify and order angles in different representations including in shapes and on a grid.

Mathematical Talk

How can you use an angle tester to help you order the angles?

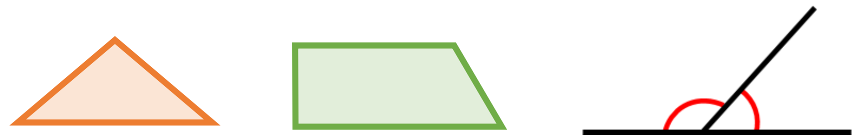
How many obtuse/acute/right angles are there in the diagrams?

Compare the angles to a right angle. Does it help you to start to order them?

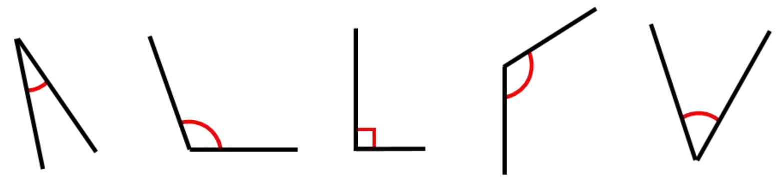
Rotate the angles so one of the lines is horizontal. Does this help you to compare them more efficiently?

Varied Fluency

- Circle the largest angle in each shape or diagram.

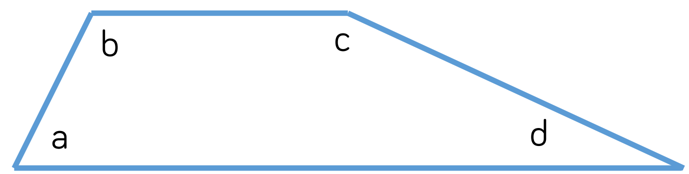


- Order the angles from largest to smallest.



Can you draw a larger obtuse angle?
Can you draw a smaller acute angle?

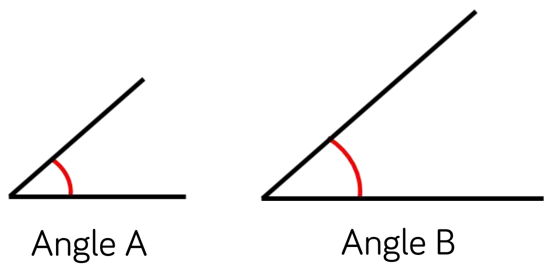
- Order the angles in the shape from smallest to largest. Complete the sentences.

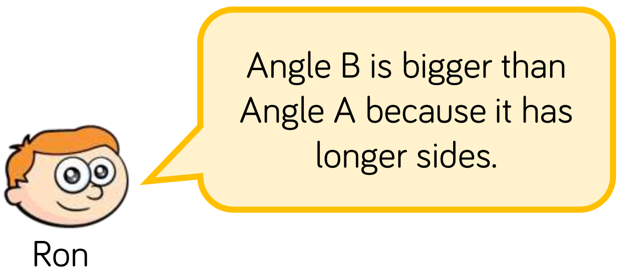


Angle _____ is smaller than angle _____.
Angle _____ is larger than angle _____.

Compare & Order Angles

Reasoning and Problem Solving

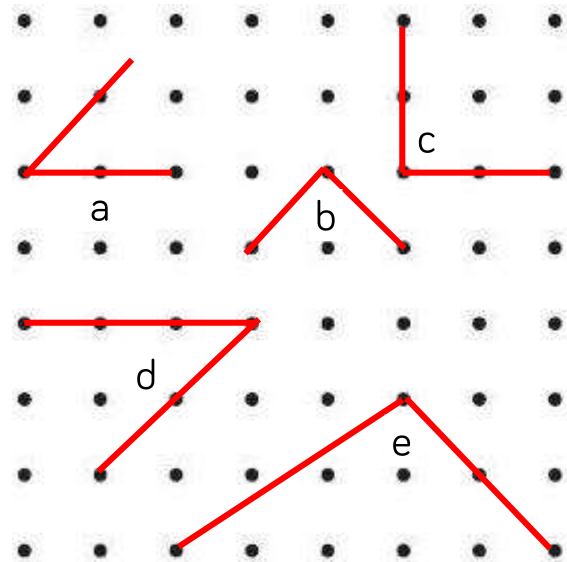




Do you agree with Ron? Explain your thinking.

Angle A and Angle B are the same size. Ron has mixed up the lengths of the lines with the size of the angles.

Here are five angles.
There are two pairs of identically sized angles and one odd one out.
Which angle is the odd one out?
Explain your reason.



Angle e is the odd one out.

Angle b and c are both right angles.

Angle a and d are both half of a right angle or 45 degrees.

Angle e is an obtuse angle.

2-D Shapes

Notes and Guidance

Children recognise, describe and draw 2-D shapes accurately. They use properties including types of angles, lines, symmetry and lengths of sides to describe the shape.
They could be given opportunities to identify/draw a hidden shape from a description given and also describe a shape for a friend to identify/draw.

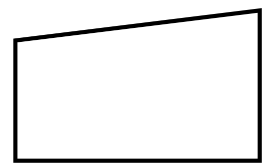
Mathematical Talk

How many angles does a ______ have?
What types of angles does a ________ have?
How many lines of symmetry does a ______ have?
What kind of lines of symmetry does a _____ have? (vertical/horizontal)
What types of lines can you spot in a _______? (perpendicular/parallel)
Can you guess the shape from the description given?
Can you draw a shape from the description given?

Varied Fluency

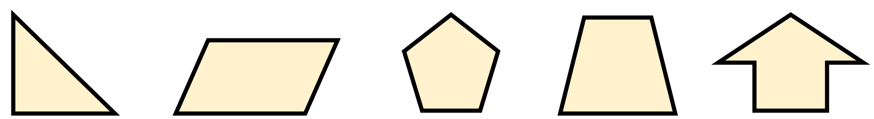
R

Describe this quadrilateral.



It has _____ angles.
It has _____ right angles.
It has _____ obtuse angle.
It has _____ acute angle.
It has _____ lines of symmetry.

Choose one of these 2-D shapes and describe it to a friend thinking about the angles, types of lines it is made up of and whether it has any lines of symmetry. Can your friend identify the shape from your description?



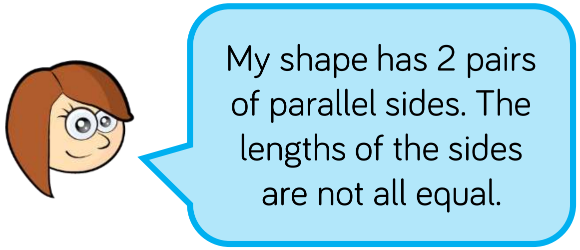
Draw the following shapes.

- A square with sides measuring 2 cm
- A square that is larger the one you have just drawn
- A rectangle with sides measuring 4 cm and 6 cm
- A triangle with two sides of equal length

2-D Shapes

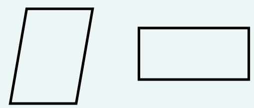
Reasoning and Problem Solving

Rosie describes a 2-D shape.

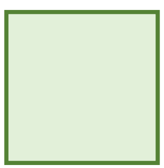


Draw the shape that Rosie is describing.

Children could draw:



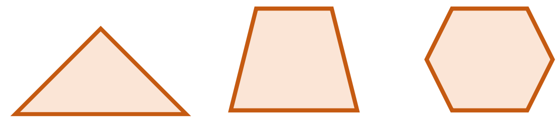
Could this square be Rosie's shape?



Explain why.

No this can't be Rosie's shape, because the lengths of the sides are equal.

What is the same and what is different about these shapes?



Possible answers: All have at least 1 line of symmetry. They have different number of sides/angles. Only the triangle has a pair of perpendicular sides.

Draw at least one shape in each section of the diagram.

	At least one right angle	No right angles
4 sided		
Not 4 sided		

Many possible answers.

Triangles

Notes and Guidance

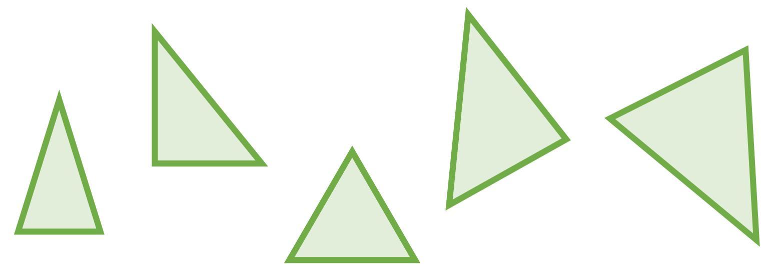
Teachers might start this small step by recapping the definition of a polygon. An activity might be to sort shapes into examples and non-examples of polygons.
Children will classify triangles for the first time using the names 'isosceles', 'scalene' and 'equilateral'. Children will use rulers to measure the sides in order to classify them correctly.
Children will compare the similarities and differences between triangles and use these to help them identify, sort and draw.

Mathematical Talk

What is a polygon? What isn't a polygon?
What are the names of the different types of triangles?
What are the properties of an isosceles triangles?
What are the properties of a scalene triangle?
What are the properties of an equilateral triangle?
Which types of triangle can also be right-angled?
How are the triangles different?
Do any of the sides need to be the same length?

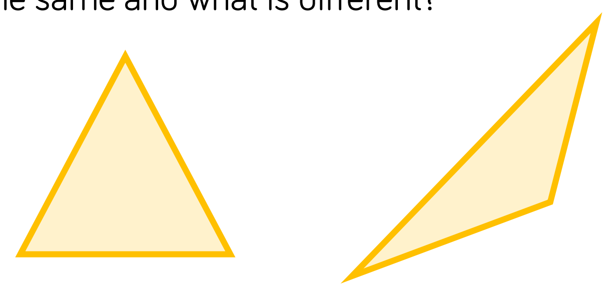
Varied Fluency

- Label each of these triangles: isosceles, scalene or equilateral.



Are any of these triangles also right-angled?

- Look at these triangles.
What is the same and what is different?

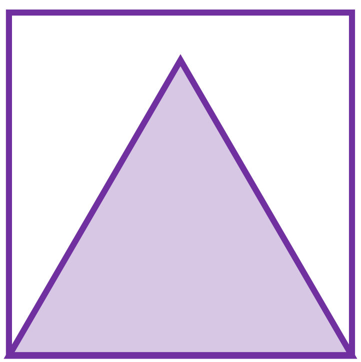


- Using a ruler, draw:
  - An isosceles triangle
  - A scalene triangle

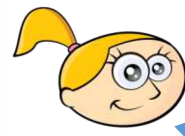
Triangles

Reasoning and Problem Solving

Here is a square.
Inside the square is an equilateral triangle.
The perimeter of the square is 60 cm.
Find the perimeter of the triangle.



The perimeter of the triangle is 45 cm.



Eva

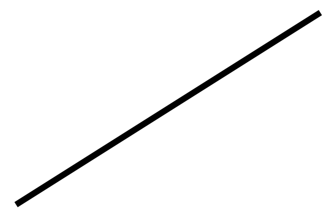
If I use 6 straws to make a triangle, I can only make an equilateral triangle.

Investigate whether Eva is correct.

Eva is correct. 2, 2, 2 is the only possible construction. 1, 1, 4 and 1, 2, 3 are not possible.

Draw two more sides to create:

- An equilateral triangle
- A scalene triangle
- An isosceles triangle



Which is the hardest to draw?

Children will draw a range of triangles. Get them to use a ruler to check their answers.
Equilateral will be difficult to draw accurately because the angle between the first two sides drawn, must be 60°

Quadrilaterals

Notes and Guidance

Children name quadrilaterals including a square, rectangle, rhombus, parallelogram and trapezium. They describe their properties and highlight the similarities and differences between different quadrilaterals.
Children draw quadrilaterals accurately using knowledge of their properties.
Teachers could use a Frayer Model with the children to explore the concept of quadrilaterals further.

Mathematical Talk

What's the same about the quadrilaterals?

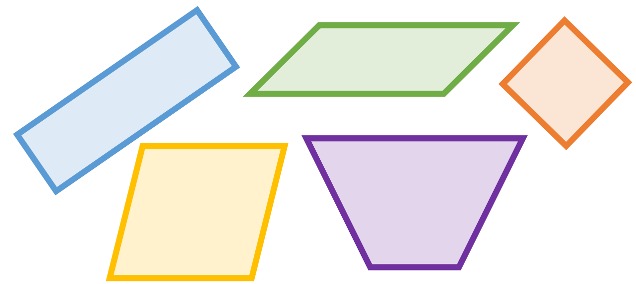
What's different about the quadrilaterals?

Why is a square a special type of rectangle?

Why is a rhombus a special type of parallelogram?

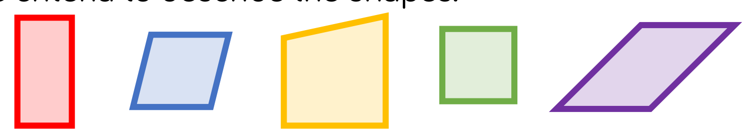
Varied Fluency

Label the quadrilaterals using the word bank.



trapezium
square
rhombus
rectangle
parallelogram

Use the criteria to describe the shapes.



four sides	2 pairs of parallel sides	four equal sides
polygon	1 pair of parallel sides	4 right angles

Which criteria can be used more than once?
Which shapes share the same criteria?

Draw and label:
- a rhombus.
- a parallelogram.
- 3 different trapeziums

Quadrilaterals

Reasoning and Problem Solving

Complete each of the boxes in the table with a different quadrilateral.

	4 equal sides	2 pairs of equal sides	1 pair of parallel sides
4 right angles			
No right angles			

Which box cannot be completed? Explain why.

	4 equal sides	2 pairs of equal sides	1 pair of parallel sides
4 right angles			
No right angles			

Children can discuss if there are any shapes that can go in the top right corner. Some children may justify it could be a square or a rectangle however these have 2 pairs of parallel sides.

You will need:

Some 4 centimetre straws
Some 6 centimetre straws

How many different quadrilaterals can you make using the straws?

Calculate the perimeter of each shape.

Square: Four 4 cm - perimeter is 16 cm or four 6 cm- perimeter is 24 cm
Rectangle: Two 4 cm and two 6 cm- perimeter is 20 cm
Rhombus: Four 4 cm - perimeter is 16 cm
Four 6 cm straws- perimeter is 24 cm
Parallelogram: Two 4 cm and two 6 cm - perimeter is 20 cm
Trapezium: Three 4 cm and one 6 cm- perimeter is 18 cm

Horizontal & Vertical

Notes and Guidance

Children identify and find horizontal and vertical lines in a range of contexts.

They identify horizontal and vertical lines of symmetry in shapes and symbols.

Mathematical Talk

What can you use to help you remember what a horizontal line looks like? (The horizon)
Can you see horizontal and vertical lines around the classroom?
What do we call a line that is not horizontal or vertical?
Which shapes/symbols/letters have a horizontal/vertical line of symmetry?
Which have both?
Can you draw your own shape that has a horizontal and vertical line of symmetry?

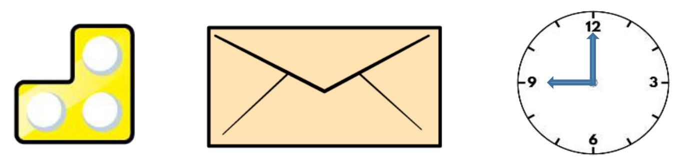
Varied Fluency

- A line that runs from left to right across the page is called a ________________ line.

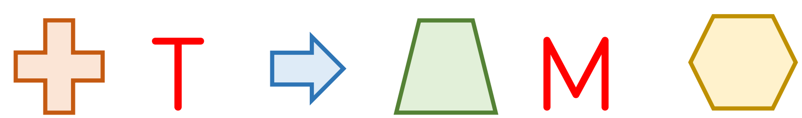
  A line that runs straight up and down the page is called a ________________ line.

  Find 3 horizontal and 3 vertical lines in the classroom.

- Label the horizontal and vertical lines in each of these images.

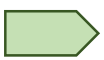
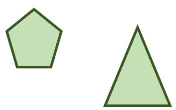
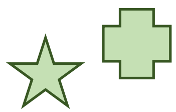


- Sort the shapes/symbols/letters depending on whether they have a horizontal line of symmetry, a vertical line of symmetry or both.



Horizontal & Vertical

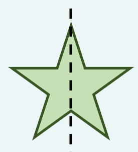
Reasoning and Problem Solving

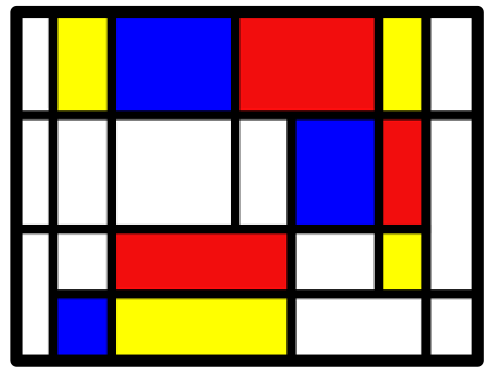
Horizontal line of symmetry	Vertical line of symmetry	Horizontal and vertical lines of symmetry
		

Eva completes the table by drawing shapes.

Can you spot and correct her mistake?

Eva thinks the star has both lines of symmetry, but it only has a vertical line of symmetry.





How many horizontal and vertical lines can you spot in this image by Mondrian?

Create your own piece of art work using only horizontal and vertical lines.

There are 5 horizontal lines and 8 vertical lines.

Lines of Symmetry

Notes and Guidance

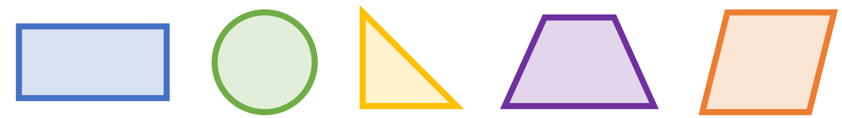
Children find and identify lines of symmetry within 2-D shapes.
Children explore symmetry in shapes of different sizes and orientations. To help find lines of symmetry children may use mirrors and tracing paper.
The key aspect of symmetry can be taught through paper folding activities. It is important for children to understand that a shape may be symmetrical, but if the pattern on the shape isn't symmetrical, then the diagram isn't symmetrical.

Mathematical Talk

Explain what you understand by the term 'symmetrical'.
Can you give any real-life examples?
How can you tell if something is symmetrical?
Are lines of symmetry always vertical?
Does the orientation of the shape affect the lines of symmetry?
What equipment could you use to help you find and identify lines of symmetry?
What would the rest of the shape look like?

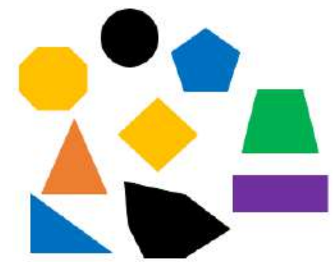
Varied Fluency

- Using folding, find the lines of symmetry in these shapes.

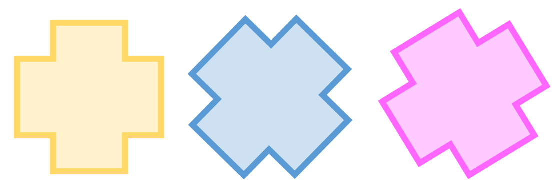


- Sort the shapes into the table.

	1 line of symmetry	More than 1 line of symmetry
Up to 4 sides		
More than 4 sides		



- Draw the lines of symmetry in these shapes (you could use folding to help you).

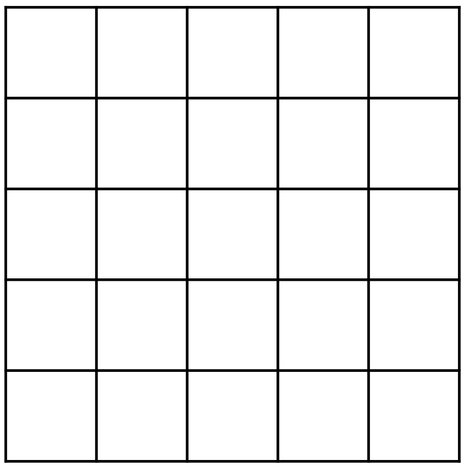


What do you notice?

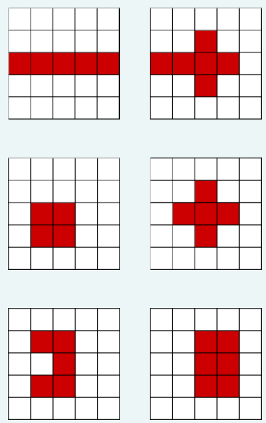
Lines of Symmetry

Reasoning and Problem Solving

How many symmetrical shapes can you make by colouring in a maximum of 6 squares?



There are a variety of options. Some examples include:



Jack

A triangle has 1 line of symmetry unless you change the orientation.

Is Jack correct? Prove it.

Jack is incorrect. Changing the orientation does not change the lines of symmetry. Children should prove this by drawing shapes in different orientations and identifying the same number of lines of symmetry.

Always, Sometimes, Never.

A four-sided shape has four lines of symmetry.

Sometimes, provided the shape is a square.

Symmetric Figures

Notes and Guidance

Children use their knowledge of symmetry to complete 2-D shapes and patterns.

Children could use squared paper, mirrors or tracing paper to help them accurately complete figures.

Mathematical Talk

What will the rest of the shape look like?

How can you check?

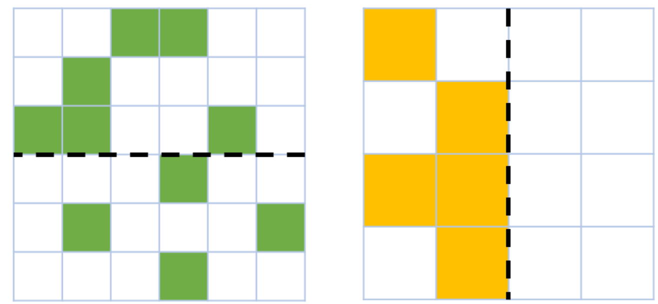
How can you use the squares to help you?

Does each side need to be the same or different?

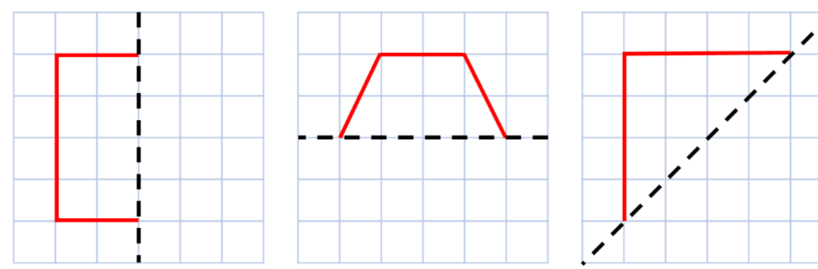
Which lines need to be extended?

Varied Fluency

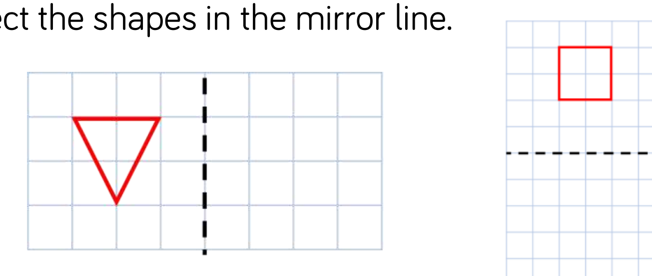
- Colour the squares to make the patterns symmetrical.



- Complete the shapes according to the line of symmetry.



- Reflect the shapes in the mirror line.



Symmetric Figures

Reasoning and Problem Solving

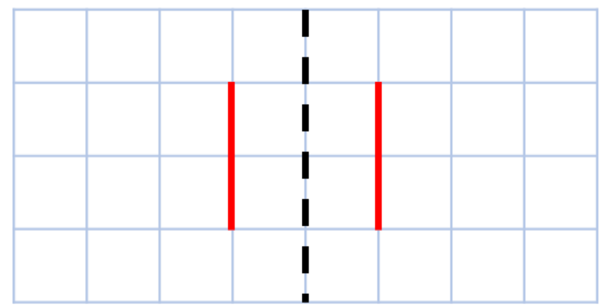
Dora

When given half of a symmetrical shape I know the original shape will have double the amount of sides.

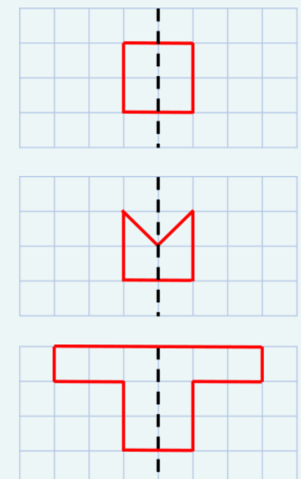
Do you agree with Dora?
Convince me.

Dora is sometimes correct. This depends on where the mirror line is. Encourage children to draw examples of times where Dora is correct, and to draw examples of times when Dora isn't correct.

How many different symmetrical shapes can you create using the given sides?



Children will find a variety of shapes. For example:



White Rose Maths

Summer - Block 6

Position & Direction

Overview

Small Steps

- Describe position
- Draw on a grid
- Move on a grid
- Describe movement on a grid

Notes for 2020/21

This is the first time children are introduced to position and direction on a coordinate grid. They may need reminding of key words related to this topic such as left, right, forwards and backwards.

Describe Position

Notes and Guidance

Children are introduced to coordinates for the first time and they describe positions in the first quadrant.

They read, write and use pairs of coordinates. Children need to be taught the order in which to read the axes, x-axis first, then y-axis next. They become familiar with notation within brackets.

Mathematical Talk

Which is the x-axis?

Which is the y-axis?

In which order do we read the axes?

Does it matter in which order we read the axes?

How do we know where to mark on the point?

What are the coordinates for ______?

Where would (__ , __) be?

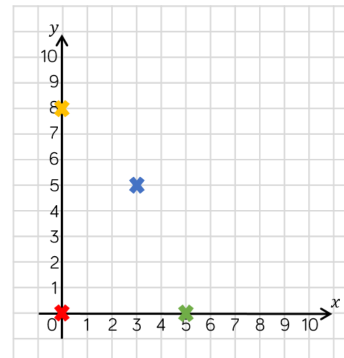
Varied Fluency

- Create a large grid using chalk or masking tape. Give the children coordinates to stand at. Encourage the children to move along the axis in the order they read them.

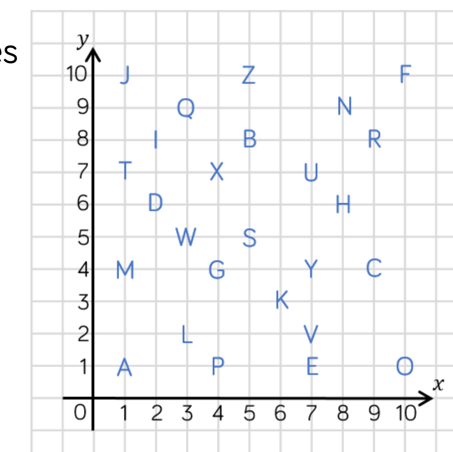
- Write the coordinates for the points shown.

  ✖ (__ , __) ✖ (__ , __)

  ✖ (__ , __) ✖ (__ , __)



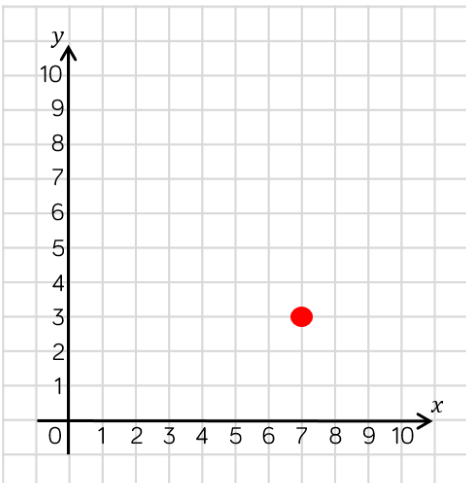
- Write out the coordinates that spell your name.



White Rose Maths

Describe Position

Reasoning and Problem Solving

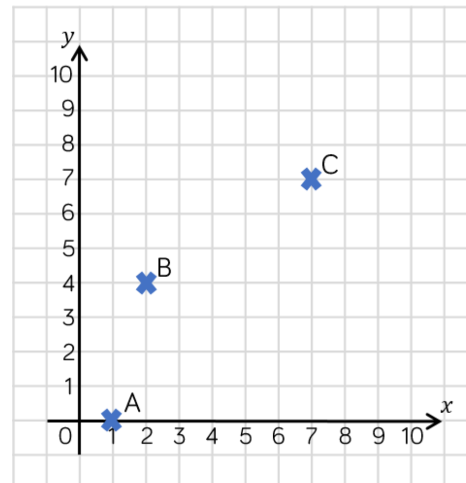


The point is plotted at (7, 3)

The point is plotted at (3, 7)

Who is correct?
What mistake has one of the children made?

Teddy is correct.
Rosie has read the y-axis before the x-axis.



Which clue matches which coordinate?

Clue 1	My x coordinate is half of my y coordinate.
Clue 2	My y coordinate is less than my x coordinate.
Clue 3	Both my coordinates are prime numbers.

Clue 1 - B
Clue 2 - A
Clue 3 - C

Draw on a Grid

Notes and Guidance

Children develop their understanding of coordinates by plotting given points on a 2-D grid.

Teachers should be aware that children need to accurately plot points on the grid lines (not between them).

They read, write and use pairs of coordinates.

Mathematical Talk

Do we plot our point on the line, or next to the line?

How could we use a ruler to help plot points?

In which order do we read and plot the coordinates?

Does it matter which way we plot the numbers on the axis?

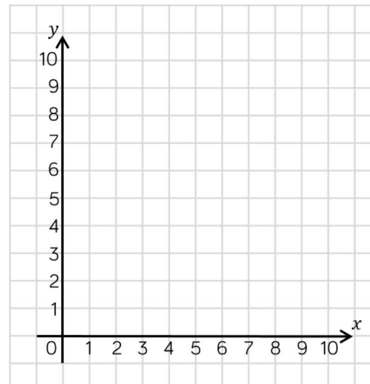
What are the coordinates of ______?

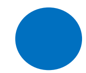
Where would (__, __) be?

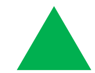
Can you show _____ on the grid?

Varied Fluency

Draw the shapes at the correct points on the grid.



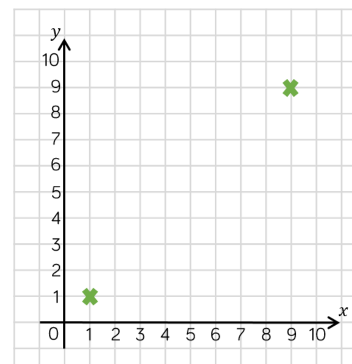
 (7, 8)

 (4, 6)

 (9, 1)

 (10, 0)

Plot two more points to create a square.



Plot these points on a grid.

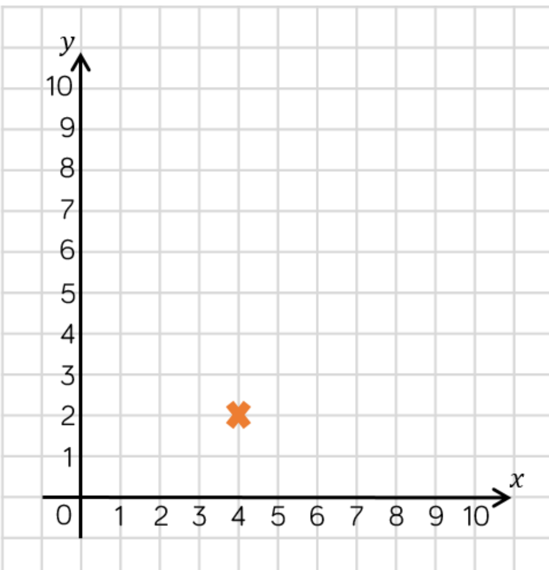
(2, 4) (4, 2) (5, 8) (7, 6)

What shape has been created?

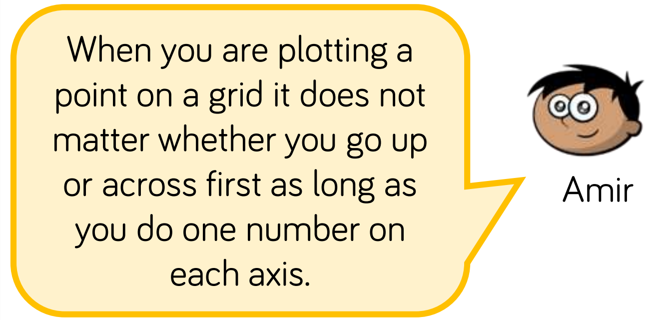
Draw on a Grid

Reasoning and Problem Solving

What shapes could be made by plotting three more points?



The children could make a range of quadrilaterals dependent on where they plot the points.
If children plot some of the points in a line they could make a triangle.



Do you agree with Amir?
Convince me.

Amir is incorrect. The x-axis must be plotted before the y-axis.
Children prove this by plotting a pair of coordinates both ways and showing the difference.

Always, Sometimes, Never.

The number of points is equal to the number of vertices when they are joined together.

Sometimes.
If points are plotted in a straight line they will not create a vertex.

Move on a Grid

Notes and Guidance

Children move shapes and points on a coordinate grid following specific directions using language such as: left/right and up/down.
Teachers might want to use a small 'object' (e.g. a small cube) to demonstrate the idea of moving a point on a grid.
They apply their understanding of coordinates when translating by starting with the left/right translation followed by up/down.

Mathematical Talk

Can you describe the translation?

Can you describe the translation in reverse?

Why do we go left and right first when describing translations.

What are the coordinates for point ____?

Write a translation for D for your partner to complete.

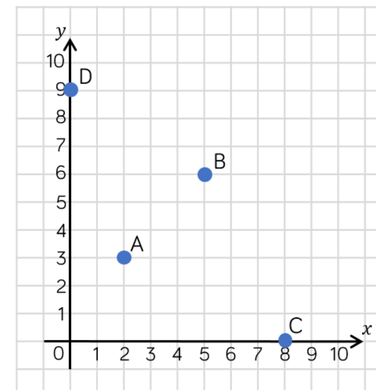
What do you notice about the new and original points?

What is the same and what is different about the new and original points?

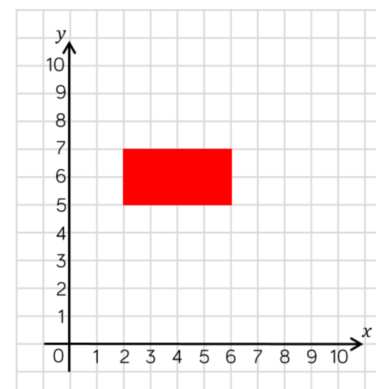
Varied Fluency

- Place a small cube on the grid at coordinate (1, 1).
Move your cube 1 up. Move your cube 1 down. What do you notice?
Now move your cube 3 to the right. Move your cube 3 to the left.
What do you notice?

- Translate A 6 right and 3 down.
Record the coordinates before (__ , __)
and after (__ , __)
Translate B and C 4 left and 3 up.
Record the coordinates before (__ , __)
and after (__ , __)

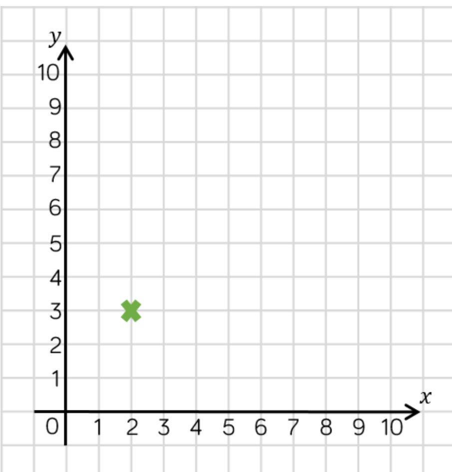


- Translate the rectangle 2 left and 3 up.
Write down the coordinates of each vertex of the rectangle before and after the translation.



Move on a Grid

Reasoning and Problem Solving



Ron translates the point (2, 3), but realises that it has returned to the same position.

What translation did he do?

Is there more than one answer?

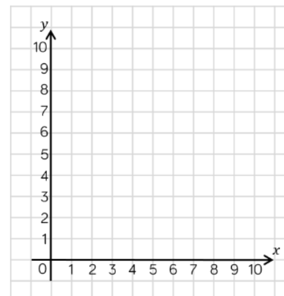
There could be a range of answers, for example:

Translate 1 left and 1 right

Translate 1 left, l right, 2 up and 2 down

Here is a game to play in pairs:

Each player needs:



1 small cube

One barrier (e.g. a mini whiteboard)

The first player places a cube on their grid. They describe the original position and perform a translation.

The second player listens to the instructions and performs the same translation.

They check to see if they have placed their cube at the same coordinate.

Swap roles and repeat several times.

The teacher could make this more competitive (points awarded when correct).

Describe Movement

Notes and Guidance

Children describe the movement of shapes and points on a coordinate grid using specific language such as: left/right and up/down. Sentence stems might be useful. They start with the left/right translation followed by up/down.

Teachers should check that children understand the idea of 'corresponding vertices' when describing translation of shapes (e.g. vertex A on the object translates to vertex A on the image).

Mathematical Talk

Can you describe the translation?

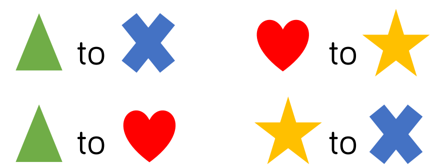
Can you describe the translation in reverse?

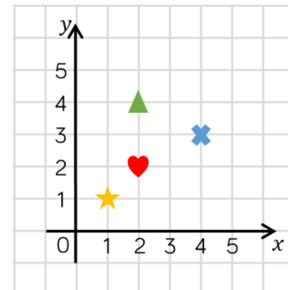
Can you complete the following stem sentence:

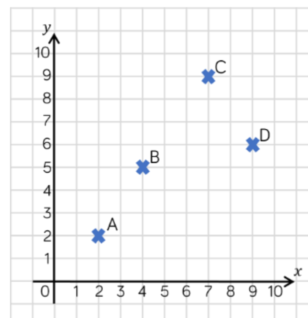
Shape A is translated ___ left/right and _____up/down to shape B

Varied Fluency

Describe the translation from:







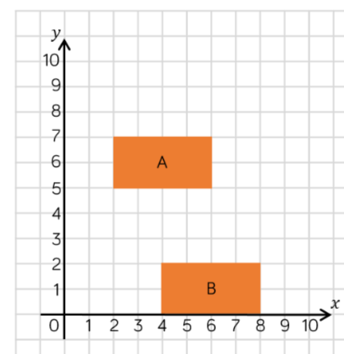
Describe the translation from:
A to B   B to C   C to D   D to A

Plot two new points and describe the translations from A to your new points.

Describe the translation of shape A to shape B.

Describe the translation of shape B to shape A.

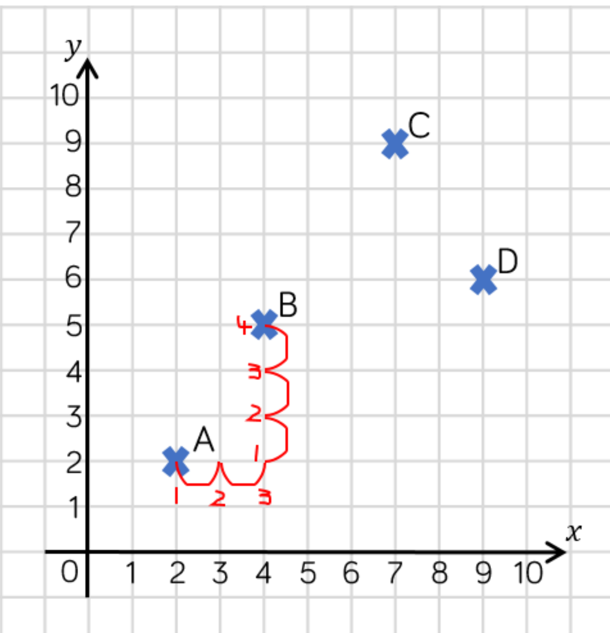
What do you notice?



Describe Movement

Reasoning and Problem Solving

Tommy has described the translation from A to B as 3 right and 4 up.

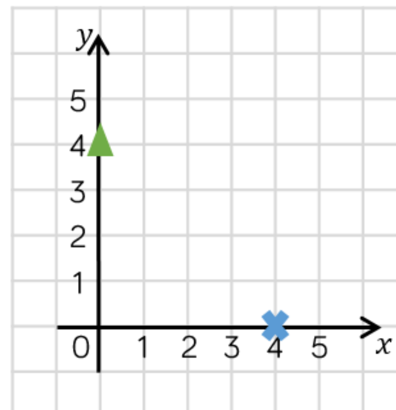


Can you explain his mistake?

Tommy has counted one move to the right when he has not moved anywhere yet. He has done the same for one move up when he has not moved up one space yet.

 to  is 4 right and 4 down.

 to  is 4 left and 4 up.



Can you plot other pairs of points where to move between them, you travel the same to left or right as you travel up or down?

What do you notice about the coordinates of these points?

Possible answers include:
(0,1) (1,0)
(0,2) (2,0)
(0,3) (3,0)
(0,5) (5,0)
(1,1) (3,3)
(0,0) (4,4)