

Autumn Scheme of Learning

Year 5

#MathsEveryoneCan

2019-20

White  
Rose  
Maths

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# Welcome

Welcome to the White Rose Maths' new, more detailed schemes of learning for 2019-20.

We have listened to all the feedback over the last 2 years and as a result of this, we have made some changes to our primary schemes. *They are bigger, bolder and more detailed than before.*

The new schemes still have the *same look and feel* as the old ones, but we have tried to provide more detailed guidance. We have worked with enthusiastic and passionate teachers from up and down the country, who are experts in their particular year group, to bring you additional guidance. *These schemes have been written for teachers, by teachers.*

*We all believe that every child can succeed in mathematics.* Thank you to everyone who has contributed to the work of White Rose Maths. It is only with your help that we can make a difference.

We hope that you find the schemes of learning helpful. As always, get in touch if you or your school want support with any aspect of teaching maths.

If you have any feedback on any part of our work, do not hesitate to contact us. Follow us on Twitter and Facebook to keep up-to-date with all our latest announcements.

Thanks from the White Rose Maths Team  
[#MathsEveryoneCan](#)

White Rose Maths contact details

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 @WhiteRoseMaths

 White Rose Maths

# What's included?

Our schemes include:

- Small steps progression. These show our blocks broken down into smaller steps.
- Small steps guidance. For each small step we provide some brief guidance to help teachers understand the key discussion and teaching points. This guidance has been written for teachers, by teachers.
- A more integrated approach to fluency, reasoning and problem solving.
- Answers to all the problems in our new scheme.
- This year there will also be updated assessments.
- We are also working with Diagnostic Questions to provide questions for every single objective of the National Curriculum.

## Teaching notes and examples

**Count Objects to 100**  
Notes and Guidance  
To build on skills learned in Year 1, children need to be able to count objects to 100 in both numerals and words.  
Problems should be presented in a variety of ways e.g. numerals, words and images. Variation should challenge children by providing them with missing numbers which are non-consecutive.

**Mathematical Talk**  
How can you count the cars? Do you have a strategy?  
What is one more/one less?  
Which is the largest number? Write in words?

**Varied Fluency**  
Count and write the number of cars in the car park.  
There are \_\_\_\_ cars in the car park.  
What numbers are represented below?  
Write your answer in numerals and words.  
Match the numerals to the words.

## Answers to Reasoning Questions

Is he correct?  
Explain your reasoning.

Here are two sets of objects.  
Which are easier to count?  
Explain your answer.

The strawberries are easier to count because they are set out on ten frames.

Jack is incorrect. He has 16 not 6!

Each jar contains 10 cookies.  
There are 48 (forty-eight) cookies altogether.  
Children may count in 10s and 1s or know that there are 4 tens which are equal to 40 and then count on 8 more.

How many cookies are there altogether?  
Write your answer in numerals and words.  
What strategy did you use?  
Did your partner...

## Small Steps Guidance

**Overview**  
Small Steps

- Count objects to 100 and read and write numbers in numerals and words
- Represent numbers to 100
- Tens and ones with a part-whole model
- Tens and ones using addition
- Use a place value chart
- Compare objects
- Compare numbers
- Order objects and numbers
- Count in 2s, 5s and 10s
- Count in 3s

**NC Objectives**  
Read and write numbers to at least 100 in numerals and in words.  
Recognise the place value of each digit in a two digit number (tens, ones).  
Identify, represent and estimate numbers using different representations including the number line.  
Compare and order numbers from 0 up to 100, use < and > signs.  
Use place value and number facts to solve problems.  
Count in steps of 2, 3 and 5 from 0, and in tens from any number, forward and backward.

## How to use the small steps

We were regularly asked how it is possible to spend so long on particular blocks of content and National Curriculum objectives.

We know that breaking the curriculum down into small manageable steps should help children understand concepts better. Too often, we have noticed that teachers will try and cover too many concepts at once and this can lead to cognitive overload. In our opinion, it is better to follow a small steps approach.

As a result, for each block of content we have provided a “Small Step” breakdown. We recommend that the steps are taught separately and would encourage teachers to spend more time on particular steps if they feel it is necessary. Flexibility has been built into the scheme to allow this to happen.

## Teaching notes

Alongside the small steps breakdown, we have provided teachers with some brief notes and guidance to help enhance their teaching of the topic. The “Mathematical Talk” section provides questions to encourage mathematical thinking and reasoning, to dig deeper into concepts.

We have also continued to provide guidance on what varied fluency, reasoning and problem solving should look like.

Year 2 | Autumn Term | Week 1 to 3 - Number: Place Value

### Count Objects to 100

#### Notes and Guidance

To build on skills learned in Year 1, children need to be able to count objects to 100 in both numerals and words.

Problems should be presented in a variety of ways e.g. numerals, words and images. Variation should challenge children by providing them with missing numbers which are non-consecutive.

#### Mathematical Talk

How can you count the cars? Do you have a strategy?  
What is one more/one less?

Which is the largest number?  
Which number is tricky to write in words?

Which numbers sound similar?  
How are 17 and 70 different? Can you show me?

### Varied Fluency

Count and write the number of cars in the car park.

There are \_\_\_\_ cars in the car park.

What numbers are represented below?  
Write your answer in numerals and words.

Match the numerals to the words.

17	48	38	70
Thirty-eight	Seventy	Forty-eight	Seventeen

# 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](http://www.whiterosemaths.com) for find a course right for you.

# Supporting resources

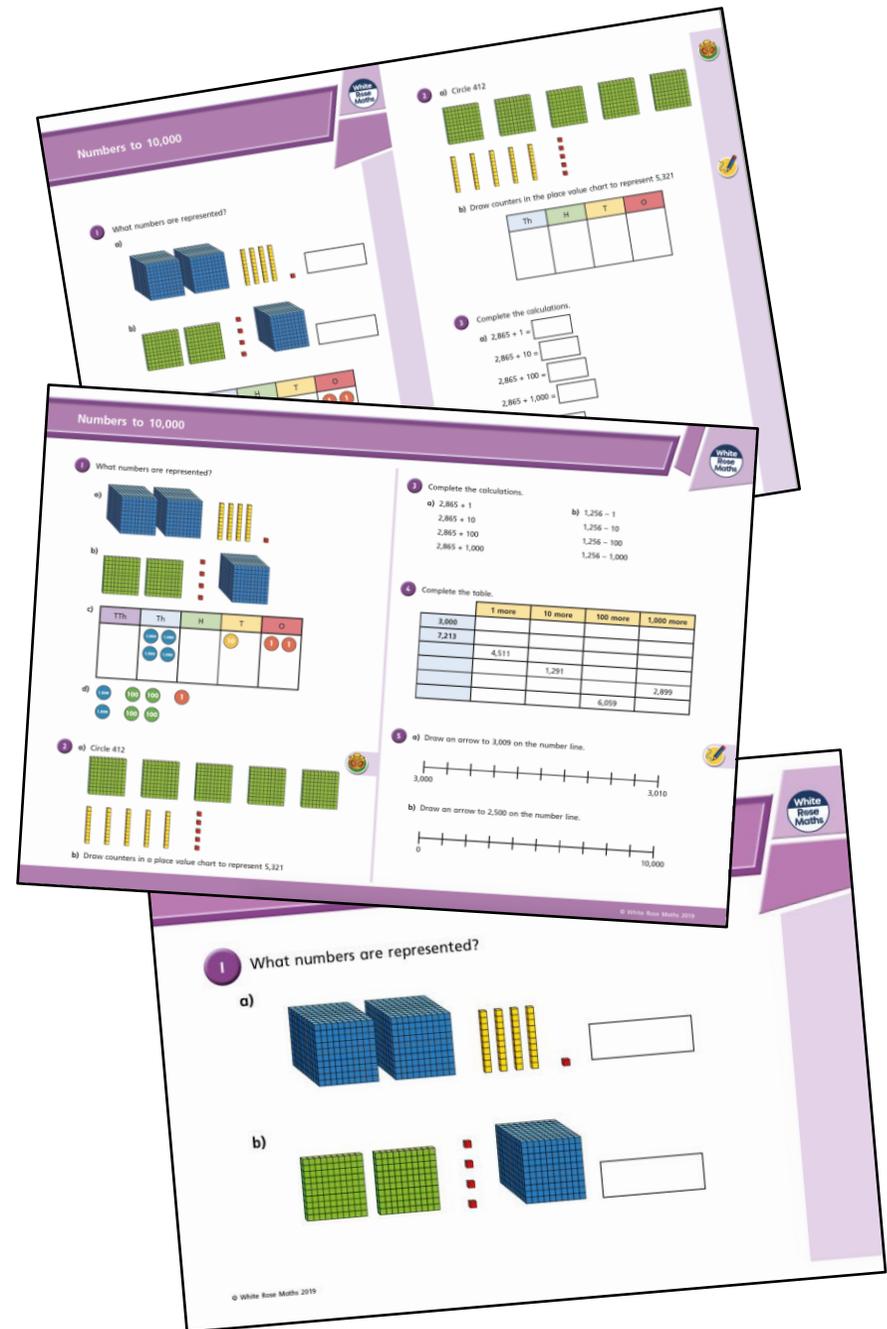
NEW for 2019-20!

We have produced supporting resources for every small step from Year 1 to Year 8.

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 [www.resources.whiterosemaths.com](http://www.resources.whiterosemaths.com) or email us directly at [support@whiterosemaths.com](mailto:support@whiterosemaths.com)



# Training

White Rose Maths offer a plethora of training courses to help you embed teaching for mastery at your school.

Our popular JIGSAW package consists of five key elements:

- CPA
- Bar Modelling
- Mathematical Talk & Questioning
- Reasoning & Problem Solving
- Thinking through Variation

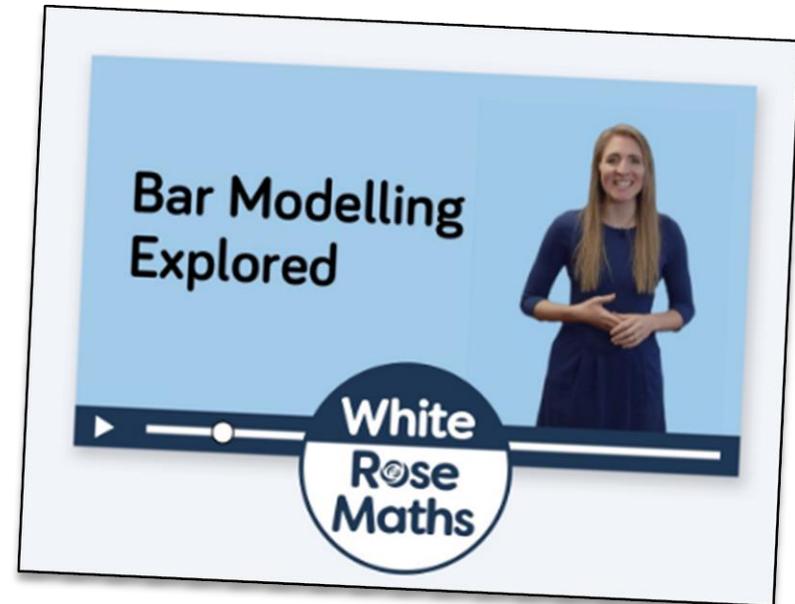
For more information and to book visit our website

[www.whiterosemaths.com](http://www.whiterosemaths.com)

NEW for 2019-20!

We have made the above courses available in a digital format. You can now have CPD whenever you want, wherever you want in easy to digest bite size chunks.

Find out more at [www.resources.whiterosemaths.com](http://www.resources.whiterosemaths.com)



## FAQs

### *If we spend so much time on number work, how can we cover the rest of the curriculum?*

Children who have an excellent grasp of number make better mathematicians. Spending longer on mastering key topics will build a child's confidence and help secure understanding. This should mean that less time will need to be spent on other topics.

In addition, schools that have been using these schemes already have used other subjects and topic time to teach and consolidate other areas of the mathematics curriculum.

### *Should I teach one small step per lesson?*

Each small step should be seen as a separate concept that needs teaching. You may find that you need to spend more time on particular concepts. Flexibility has been built into the curriculum model to allow this to happen. This may involve spending more than one lesson on a small step, depending on your class' understanding.

### *How do I use the fluency, reasoning and problem solving questions?*

The questions are designed to be used by the teacher to help them understand the key teaching points that need to be covered. They should be used as inspiration and ideas to help teachers plan carefully structured lessons.

### *How do I reinforce what children already know if I don't teach a concept again?*

The scheme has been designed to give sufficient time for teachers to explore concepts in depth, however we also interleave prior content in new concepts. E.g. when children look at measurement we recommend that there are lots of questions that practice the four operations and fractions. This helps children make links between topics and understand them more deeply. We also recommend that schools look to reinforce number fluency through mental and oral starters or in additional maths time during the day.

## 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?



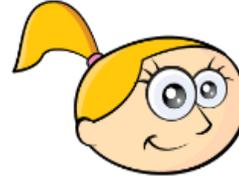
Teddy



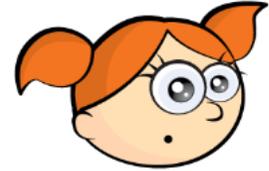
Rosie



Mo



Eva



Alex



Jack



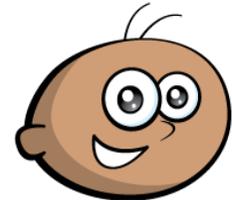
Whitney



Amir



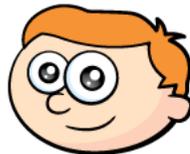
Dora



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		Statistics		Number: Multiplication and Division		Measurement: Perimeter and Area		Consolidation
Spring	Number: Multiplication and Division			Number: Fractions						Number: Decimals and Percentages		Consolidation
Summer	Number: Decimals				Geometry: Properties of Shape			Geometry: Position and Direction	Measurement: Converting Units		Measurement: Volume	Consolidation

**White**

**Rose  
Maths**

Autumn - Block 1

**Place Value**

# Overview

## Small Steps

## NC Objectives

- ▶ Numbers to 10,000
- ▶ Roman Numerals to 1,000
- ▶ Round to nearest 10, 100 and 1,000
- ▶ Numbers to 100,000
- ▶ Compare and order numbers to 100,000
- ▶ Round numbers within 100,000
- ▶ Numbers to a million
- ▶ Counting in 10s, 100s, 1,000s, 10,000s, and 100,000s
- ▶ Compare and order numbers to one million
- ▶ Round numbers to one million
- ▶ Negative numbers

Read, write, order and compare numbers to at least 1,000,000 and determine the value of each digit.

Count forwards or backwards in steps of powers of 10 for any given number up to 1,000,000

Interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers including through zero.

Round any number up to 1,000,000 to the nearest 10, 100, 1,000, 10,000 and 100,000

Solve number problems and practical problems that involve all of the above.

Read Roman numerals up to 1,000 (M) and recognise years written in Roman numerals.

# Numbers to 10,000

## Notes and Guidance

Children use concrete manipulatives and pictorial representations to recap representing numbers up to 10,000

Within this step, children must revise adding and subtracting 10, 100 and 1,000

They discuss what is happening to the place value columns, when carrying out each addition or subtraction.

## Mathematical Talk

Can you show me 8,045 (any number) in three different ways?

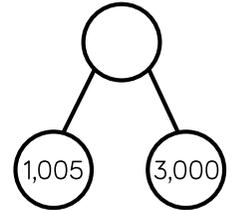
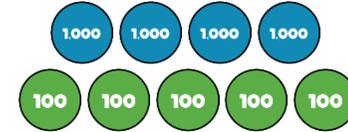
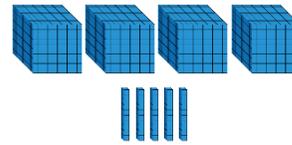
Which representation is the odd one out? Explain your reasoning.

What number could the arrow be pointing to?

Which column(s) change when adding 10, 100, 1,000 to 2,506?

## Varied Fluency

Match the diagram to the number.

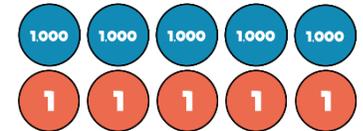
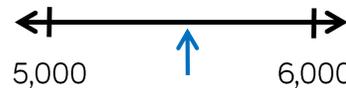
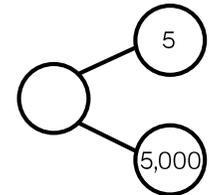
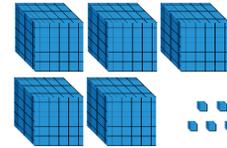


4,005

4,500

4,050

Which diagram is the odd one out?



Complete the table.

	Add 10	Add 100	Add 1,000
2,506			
7,999			
		6,070	

# Numbers to 10,000

## Reasoning and Problem Solving

Dora has made five numbers, using the digits 1, 2, 3 and 4

She has changed each number into a letter.

Her numbers are

- aabcd
- acdbc
- dcaba
- cdadc
- bdaab

Here are three clues to work out her numbers:

- The first number in her list is the greatest number.
- The digits in the fourth number total 12
- The third number in the list is the smallest number.

- 44,213
- 43,123
- 13,424
- 31,413
- 21,442

Tommy says he can order the following numbers by only looking at the first three digits.

12,516	12,832
12,679	
12,538	12,794

Is he correct?

Explain your answer.

He is incorrect because two of the numbers start with twelve thousand, five hundred therefore you need to look at the tens to compare and order.

# Roman Numerals

## Notes and Guidance

Building on their knowledge of Roman Numerals to 100, from Year 4, children explore Roman Numerals to 1,000

They explore what is the same and what is different about the number systems, for example there is no zero in the Roman system.

Writing the date in Roman Numerals could be introduced and so this concept can be revisited every day.

## Mathematical Talk

Why is there no zero in Roman Numerals?

Do you notice any patterns in the Roman number system?

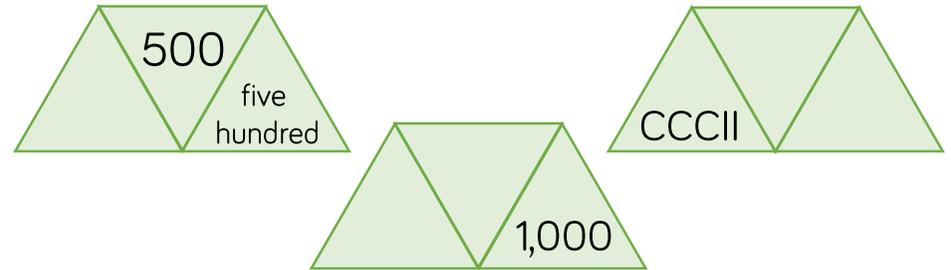
How can you check you have represented the Roman Numeral correctly?

Can you use numbers you know, such as 1, 10 and 100 to help you?

## Varied Fluency

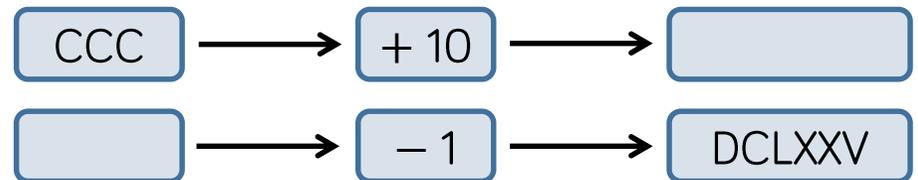
- Lollipop stick activity.  
 The teacher shouts out a number and the children make it with lollipop sticks.  
 Children could also do this in pairs or groups, or for a bit of fun they could test the teacher!

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



Complete the diagrams.

- Complete the function machines.



# Roman Numerals

## Reasoning and Problem Solving

Solve

$$\text{CCCL} + \text{CL} =$$

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

Possible answers:

- CD + C
- M ÷ II
- C + CC + CC
- C × V

Here is part of a Roman Numerals hundred square.

Complete the missing values.

XLIV	XLV		XLVII
		LVI	LVII
LXIV		LXVI	LXVII

What patterns do you notice?

Missing Roman Numerals from the top row and left to right:

- XLVI
- LIV
- LV
- LXV

# Round to 10, 100 and 1,000

## Notes and Guidance

Children build on their knowledge of rounding to 10, 100 and 1,000 from Year 4. They need to experience rounding up to and within 10,000

Children must understand that the column from the question and the column to the right of it are used e.g. when rounding 1,450 to the nearest hundred – look at the hundreds and tens columns. Number lines are a useful support.

## Mathematical Talk

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

When is it best to round to the nearest 10? 100? 1,000?

Can you give an example of this?

Can you justify your reasoning?

Is there more than one solution?

Will the answers to the nearest 100 and 1,000 be the same or different for the different start numbers?

## Varied Fluency

Complete the table.

Start Number	Rounded to the nearest 10	Rounded to the nearest 100	Rounded to the nearest 1,000
DCCLXIX			

For each number, find five numbers that round to it when rounding to the nearest 100

300

10,000

8,900

Complete the table.

Start Number	Nearest 10	Nearest 100	Nearest 1,000
365			
1,242			
	4,770		

# Rounding to 10, 100 and 1,000

## Reasoning and Problem Solving

My number rounded to the nearest 10 is 1,150  
 Rounded to the nearest 100 it is 1,200  
 Rounded to the nearest 1,000 it is 1,000



Jack

1,150  
 1,151  
 1,152  
 1,153  
 1,154

What could Jack's number be?

Can you find all of the possibilities?

2,567 to the nearest 100 is 2,500



Whitney

Do you agree with Whitney?  
 Explain why.

---

Teddy



4,725 to the nearest 1,000 is 5,025

Explain the mistake Teddy has made.

I do not agree with Whitney because 2,567 rounded to the nearest 100 is 2,600. I know this because if the tens digit is 5, 6, 7, 8 or 9 we round up to the next hundred.

Teddy has correctly changed four thousand to five thousand but has added the tens and the ones back on. When rounding to the nearest thousand, the answer is always a multiple of 1,000

# Numbers to 100,000

## Notes and Guidance

Children focus on numbers up to 100,000  
They represent numbers on a place value grid, read and write numbers and place them on a number line to 100,000

Using a number line, they find numbers between two points, place a number and estimate where larger numbers will be.

## Mathematical Talk

How can the place value grid help you to add 10, 100 or 1,000 to any number?

How many digits change when you add 10, 100 or 1,000? Is it always the same number of digits that change?

How can we represent 65,048 on a number line?

How can we estimate a number on a number line if there are no divisions?

Do you need to count forwards and backwards to find out if a number is in a number sequence? Explain.

## Varied Fluency

A number is shown in the place value grid.

10,000s	1,000s	100s	10s	1s
5	1	4	14	8

Write the number in figures and in words.

- Alex adds 10 to this number
- Tommy adds 100 to this number
- Eva adds 1,000 to this number

Write each of their new numbers in figures and in words.

Complete the grid to show the same number in different ways.

Counters	Part-whole model
65,048	
Bar model	Number line

Complete the missing numbers.

$$59,000 = 50,000 + \underline{\hspace{2cm}}$$

$$\underline{\hspace{2cm}} = 30,000 + 1,700 + 230$$

$$75,480 = \underline{\hspace{2cm}} + 300 + \underline{\hspace{2cm}}$$

# Numbers to 100,000

## Reasoning and Problem Solving

Here is a number line.

What is the value of A?

B is 40 less than A.  
What is the value of B?

C is 500 less than B.  
Add C to the number line.

Here are three ways of partitioning 27,650

27 thousands and 650 ones  
27 thousands, 5 hundreds and 150 ones  
27 thousands and 65 tens

Write three more ways

$A = 2,800$   
 $B = 2,760$

Possible answers:  
2 ten thousands, 6 hundreds and 5 tens  
20 thousands, 7 thousands and 650 ones

Rosie counts forwards and backwards in 10s from 317

Circle the numbers Rosie will count.

427	997	-7
1,666	3,210	5,627
-23	7	-3

Explain why Rosie will not say the other numbers.

427  
997  
5,627  
7  
-3  
-23

Any positive number will have to end in a 7

Any negative number will have to end in a 3

# Compare and Order

## Notes and Guidance

Children will compare and order numbers up to 100,000 by applying their understanding from Year 4 and how numbers can be represented in different ways.

Children should be able to compare and order numbers presented in a variety of ways, e.g. using place value counters, part-whole models, Roman numerals etc.

## Mathematical Talk

In order to compare numbers, what do we need to know?

What is the value of each digit in the number 63,320?

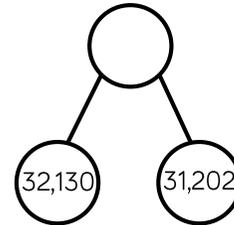
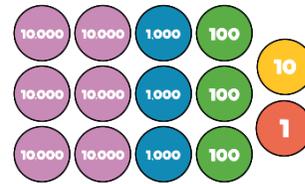
What is the value of \_\_\_\_\_ in this number?

What is the value of the whole? Can you suggest other parts that make the whole?

What number does MMXVII represent?

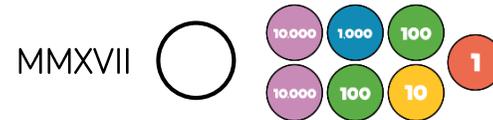
## Varied Fluency

Put these numbers in ascending order.

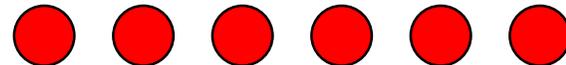


10,000s	1,000s	100s	10s	1s
6	3	3	2	0

Add the symbol  $<$ ,  $>$  or  $=$  to make the statement correct.



Use six counters to make five different 5-digit numbers.



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

Order your numbers from greatest to smallest.

## Compare and Order

### Reasoning and Problem Solving

Place the digit cards 0 to 9 face down and select five of them.

Make the greatest number possible and the smallest number possible.

How do you know which is the greatest or smallest?

Dependent on numbers chosen.  
e.g. 4, 9, 1, 3, 2

Smallest: 12,349  
Greatest: 94,321

I know this is the greatest number because the digit cards with the larger numbers are in the place value columns with the greater values.

Using the digit cards 0 to 9, create three different 5-digit numbers that fit the following clues:

- The digit in the hundreds column and the ones column have a difference of 2
- The digit in the hundreds column and the ten thousands column has a difference of 2
- The sum of all the digits totals 19

Possible answers include:

47,260  
56,341  
18,325  
20,476

# Round within 100,000

## Notes and Guidance

Children continue to work on rounding, now using numbers up to 100,000

Children use their knowledge of multiples of 10, 100, 1,000 and 10,000 to work out which two numbers the number they are rounding sits between. A number line is a good way to visualise which multiple is the nearest. Children may need reminding of the convention of rounding up if numbers are exactly halfway.

## Mathematical Talk

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

Why would we round these distances to the nearest 1,000 miles?

When is it best to round to 10? 100? 1,000?

Can you give an example of this?

Can you justify your reasoning?

## Varied Fluency

-  Round 85,617
  - To the nearest 10
  - To the nearest 100
  - To the nearest 1,000
  - To the nearest 10,000

-  Round the distances to the nearest 1,000 miles.

Destination	Miles from Manchester airport	Miles to the nearest 1,000
New York	3,334	
Sydney	10,562	
Hong Kong	5,979	
New Zealand	11,550	

-  Complete the table.

Rounded to the nearest 100	Start Number	Rounded to the nearest 1,000
	15,999	
	28,632	
	55,555	

## Round within 100,000

### Reasoning and Problem Solving

Round 59,996 to the nearest 1,000  
Round 59,996 to the nearest 10,000

What do you notice about the answers?

Can you think of three more numbers where the same thing could happen?

Both numbers round to 60,000

Other examples:

19,721 to the nearest 1,000 and 10,000

697 to the nearest 10 and 100

22,982 to the nearest 100 and 1,000

Two 5-digit numbers have a difference of five.

When they are both rounded to the nearest thousand, the difference is 1,000

What could the numbers be?

Two numbers with a difference of five where the last three digits are between 495 and 504

e.g. 52,498 and 52,503

# Numbers to One Million

## Notes and Guidance

Children read, write and represent numbers to 1,000,000

They will recognise large numbers represented in a part-whole model, when they are partitioned in unfamiliar ways.

Children need to see numbers represented with counters on a place value grid, as well as drawing the counters.

## Mathematical Talk

If one million is the whole, what could the parts be?

Show me 800,500 represented in three different ways.  
Can 575,400 be partitioned into 4 parts in a different way?

Where do the commas go in the numbers?  
How does the place value grid help you to represent large numbers?

Which columns will change in value when Eva adds 4 counters to the hundreds column?

## Varied Fluency

Thousands			Ones		
H	T	O	H	T	O

Use counters to make these numbers on the place value chart.

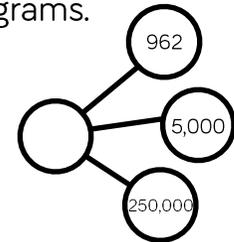
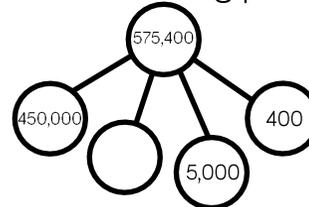
32,651

456,301

50,030

Can you say the numbers out loud?

Complete the following part-whole diagrams.



Eva has the following number.

Thousands			Ones		
H	T	O	H	T	O
	●●●● ●●●●	●●●●●● ●●●●●●	●●●● ●●●●	●●●● ●●●●	● ●

She adds 4 counters to the hundreds column.

26 What is her new number?

# Numbers to One Million

## Reasoning and Problem Solving

Describe the value of the digit 7 in each of the following numbers. How do you know?

407,338

700,491

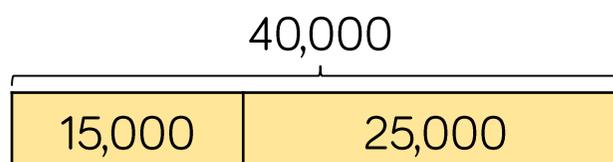
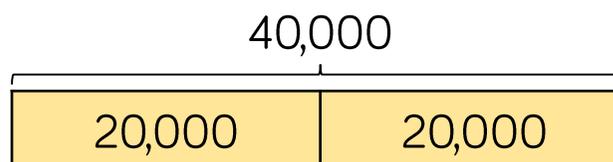
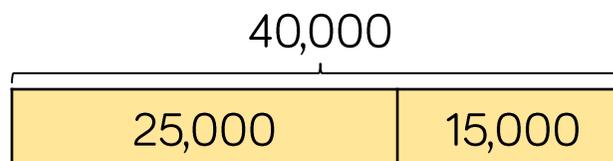
25,571

407,338: the value is 7 thousand. It is to the left of the hundreds column.

700,491: the value is 7 hundred thousand. It is a 6-digit number and there are 5 other numbers in place value columns to the right of this number.

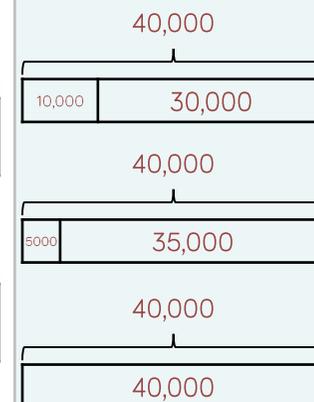
25,571: the value is 7 tens. It is one column to the left of the ones column.

The bar models are showing a pattern.



Draw the next three.

Create your own pattern of bar models for a partner to continue.



# Counting in Powers of 10

## Notes and Guidance

Children complete number sequences and can describe the term-to-term rule e.g. add ten each time. It is important to include sequences that go down as well as those that go up.

They count forwards and backwards in powers of ten up to 1,000,000

## Mathematical Talk

Will there be any negative numbers in this sequence?

What pattern do you begin to see with the positive and negative numbers in the sequence?

What patterns do you notice when you compare sequences increasing or decreasing in 10s, 100s, 1,000s etc.?

Can you create a rule for the sequence?

## Varied Fluency

Complete the sequence.

\_\_\_\_, \_\_\_\_, 2, \_\_\_\_, 22, \_\_\_\_, 42, \_\_\_\_, \_\_\_\_, 72

The rule for the sequence is \_\_\_\_\_.

Circle and correct the mistake in each sequence.

- 7,875, 8,875, 9,875, 11,875, 12,875, 13,875, ...
- 864,664, 764,664, 664,664, 554,664, 444,664, ...

Here is a Gattegno chart showing 32,450

1	2	3	4	5	6	7	8	9
10	20	30	40	50	60	70	80	90
100	200	300	400	500	600	700	800	900
1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000
10,000	20,000	30,000	40,000	50,000	60,000	70,000	80,000	90,000

Cards

+10	-10
+100	-100
+1,000	-1,000
+10,000	-10,000

Give children a target number to make then let them choose a card. Children then need to adjust their number on the chart.

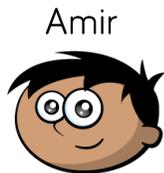
# Counting in Powers of 10

## Reasoning and Problem Solving

Amir writes the first five numbers of a sequence.

They are  
3,666, 4,666, 5,666, 6,666, 7,666

The 10<sup>th</sup> term will be 15,322 because I will double the 5<sup>th</sup> term.



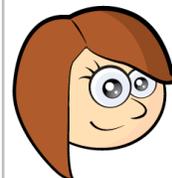
Is he correct?  
Explain why.

The 10<sup>th</sup> term is 12,666 because Amir is adding 1,000 each time. He should have added 5,000 not doubled the 5<sup>th</sup> term.

I am counting up in 10s from 184  
I will include 224



Mo



Rosie

I am counting up in 100s from 604  
I will include 1,040

I am counting up in 1,000s from 13  
I will include 130,000



Jack

Rosie has made a mistake. She is counting in 100s; therefore the ones column should never change.

Jack has also made a mistake as he is counting in 1,000s, so the tens and ones columns won't change.

Who has made a mistake?  
Identify anyone who has made a mistake and explain how you know.

# Compare and Order

## Notes and Guidance

Children compare and order numbers up to 1,000,000 using comparison vocabulary and symbols.

They use a number line to compare numbers, and look at the importance of focusing on the column with the highest place value when comparing numbers.

## Mathematical Talk

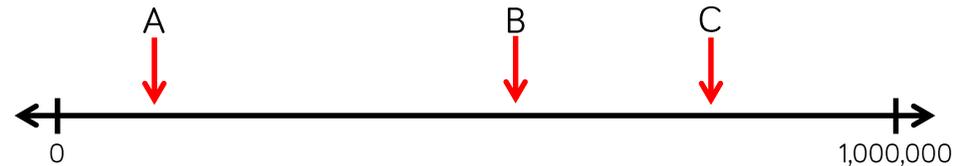
- What do we need to know to be able to compare and order large numbers?
- Why can't we just look at the thousands columns when we are ordering these five numbers?
- What is the value of each digit?
- What is the value of \_\_\_\_ in this number?
- What is the value of the whole? Can you suggest other parts that make the whole?
- Can you write a story to support your part-whole model?

## Varied Fluency

Put the number cards in order of size.

13,010    13,100    13,011    13,110    13,111

Estimate the values of A, B and C.



Here is a table showing the population in areas of Yorkshire.

Halifax	88,134
Brighouse	32,360
Leeds	720,492
Huddersfield	146,234
Wakefield	76,886
Bradford	531,200

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

The population of Halifax  the population of Wakefield.

Double the population of Brighouse  the population of Halifax.

# Compare and Order

## Reasoning and Problem Solving

The missing number is an odd number.

When rounded to the nearest 10,000 it is 440,000

The sum of the digits is 23



Greatest

Smallest

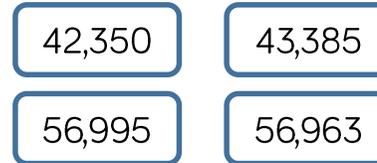
What could the number be?

Can you find three possibilities?

Possible answers include:

- 444,812
- 435,812
- 439,502

Here are four number cards.



Four children take one each and say a clue.

My number is 57,000 when rounded to the nearest 100



Mo



Rosie

My number has exactly three hundreds in it



Jack

My number is 43,000 when rounded to the nearest thousand



Dora

My number is exactly 100 less than 57,063

Dora

Which card did each child have?

- Mo: 56,995
- Rosie: 42,350
- Jack: 43,385
- Dora: 56,963

## Round within a Million

### Notes and Guidance

Children use numbers with up to six digits, to recap previous rounding, and learn the new skill of rounding to the nearest 100,000

They look at cases when rounding a number for a purpose, including certain contexts where you round up when you wouldn't expect two e.g. to pack 53 items in boxes of 10 you would need 6 boxes.

### Mathematical Talk

How many digits does one million have?

Why are we rounding these populations to the nearest 100,000?

Can you partition the number \_\_\_\_\_ in different ways?

Which digits do you need to look at when rounding to the nearest 10? 100? 1,000? 10,000? 100,000?

How do you know which has the greatest value? Show me.

### Varied Fluency

Round these populations to the nearest 100,000

City	Population	Rounded to the nearest 100,000
Leeds	720,492	
Durham	87,559	
Sheffield	512,827	
Birmingham	992,000	

Round 450,985 to the nearest

- 10
- 100
- 1,000
- 10,000
- 100,000

At a festival, 218,712 people attend across the weekend. Tickets come in batches of 100,000

How many batches should the organisers buy?

# Round within a Million

## Reasoning and Problem Solving

The difference between two 3-digit numbers is two.

499 and 501  
498 and 500

When each number is rounded to the nearest 1,000 the difference between them is 1,000

What could the two numbers be?

When the difference between A and B is rounded to the nearest 100, the answer is 700

When the difference between B and C is rounded to the nearest 100, the answer is 400

A, B and C are not multiples of 10

What could A, B and C be?

A – B is between 650 to 749

B has to be greater than 400 to complete  
 $B - C = 400$

Possible answer:

A = 1,241  
B = 506  
C = 59

# Negative Numbers

## Notes and Guidance

Children continue to explore negative numbers and their position on a number line.

They need to see and use negative numbers in context, such as temperature, to be able to count back through zero. They may need to be reminded to call them negative numbers e.g. “negative four” rather than “minus four”.

## Mathematical Talk

Do we include zero when counting backwards?

Which is the coldest/warmest temperature?

How can we estimate where a number goes on this number line?

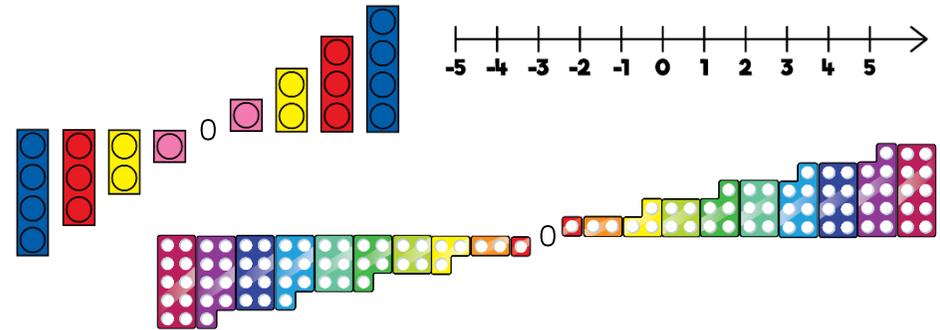
Does it help to estimate where zero goes first? Why?

What was the temperature increase/decrease?.

Can you show how you know the increase/decrease on a number line?

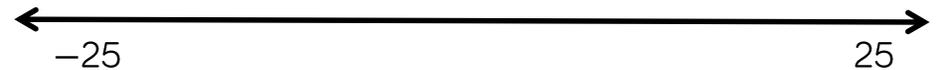
## Varied Fluency

Here are three representations for negative numbers.



What is the same and what is different about each representation?

Estimate and label where 0,  $-12$  and  $-20$  will be on the number line.



Whitney visits a zoo.  
The rainforest room has a temperature of  $32^{\circ}\text{C}$   
The Arctic room has a temperature of  $-24^{\circ}\text{C}$   
Show the difference in room temperatures on a number line.

# Negative Numbers

## Reasoning and Problem Solving

### True or False?

- The temperature outside is  $-5$  degrees, the temperature inside is 25 degrees.  
The difference is 20 degrees.
- Four less than negative six is negative two.
- 15 more than  $-2$  is 13

Explain how you know each statement is true or false.

False: the difference is 30 degrees because it is 5 degrees from  $-5$  to 0. Added to 25 totals 30.

False: it is negative 10 because the steps are going further away from zero.

True

Children may use concrete or pictorial resources to explain.

Put these statements in order so that the answers are from smallest to greatest.

- The difference between  $-24$  and  $-76$
- The even number that is less than  $-18$  but greater than  $-22$
- The number that is half way between 40 and  $-50$
- The difference between  $-6$  and 7

52

$-20$

$-5$

13

Ordered:  
 $-20, -5, 13, 52$

**White**

**Rose  
Maths**

Autumn - Block 2

**Addition & Subtraction**

# Overview

## Small Steps

- ▶ Add whole numbers with more than 4 digits (column method)
- ▶ Subtract whole numbers with more than 4 digits (column method)
- ▶ Round to estimate and approximate
- ▶ Inverse operations (addition and subtraction)
- ▶ Multi-step addition and subtraction problems

## NC Objectives

Add and subtract numbers mentally with increasingly large numbers.

Add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction). Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy.

Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.

# Add More than 4-digits

## Notes and Guidance

Children will build upon previous learning of column addition. They will now look at numbers with more than four digits and use their place value knowledge to line the numbers up accurately.

Children use a range of manipulatives to demonstrate their understanding and use pictorial representations to support their problem solving.

## Mathematical Talk

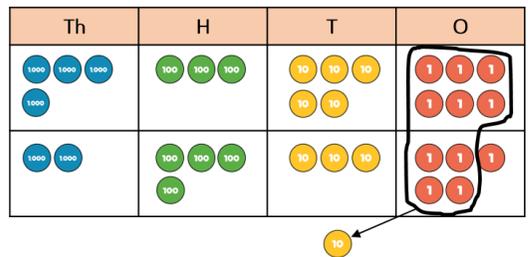
Will you have to exchange? How do you know which columns will be affected?

Does it matter that the two numbers don't have the same amount of digits?

Which number goes on top in the calculation? Does it affect the answer?

## Varied Fluency

Ron uses place value counters to calculate  $4,356 + 2,435$



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

1

Use Ron's method to calculate:

	3	2	4	6	1
+		4	3	5	2

	4	8	2	7	6
+		5	6	1	3

Jack, Rosie and Eva are playing a computer game. Jack has 3,452 points, Rosie has 4,039 points and Eva has 10,989 points.

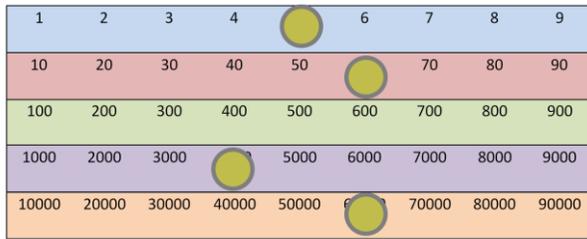
How many points do Jack and Rosie have altogether?  
 How many points do Rosie and Eva have altogether?  
 How many points do Jack and Eva have altogether?  
 How many points do Jack, Rosie and Eva have altogether?

# Add More than 4-digits

## Reasoning and Problem Solving

Amir is discovering numbers on a Gattegno chart.

He makes this number.



Amir moves one counter three spaces on a horizontal line to create a new number.

When he adds this to his original number he gets 131,130

Which counter did he move?

He moved the counter on the thousands row, he moved it from 4,000 to 7,000

Work out the missing numbers.

	?	4	?	3	?
+	2	?	5	?	2
	7	8	5	2	9

$$54,937 + 23,592 = 78,529$$

# Subtract More than 4-digits

## Notes and Guidance

Building on Year 4 experience, children use their knowledge of subtracting using the formal column method to subtract numbers with more than four digits. Children will be focusing on exchange and will be concentrating on the correct place value.

It is important that children know when an exchange is and isn't needed. Children need to experience '0' as a place holder.

## Mathematical Talk

Why is it important that we start subtracting the smallest place value first?

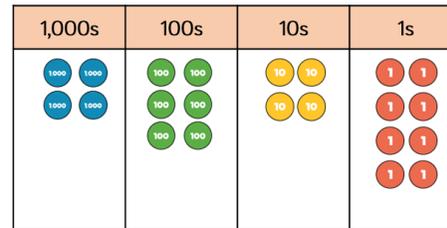
Does it matter which number goes on top? Why? Will you have to exchange? How do you know which columns will be affected?

Does it matter that the two numbers don't have the same amount of digits?

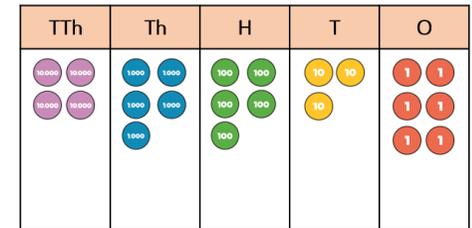
## Varied Fluency

Calculate:

$$4,648 - 2,347$$



$$45,536 - 8,426$$



Represent each problem as a bar model, and solve them.

A plane is flying at 29,456 feet.  
During the flight the plane descends 8,896 feet.  
What height is the plane now flying at?

Tommy earns £37,506 pounds a year.  
Dora earns £22,819 a year.  
How much more money does Tommy earn than Dora?

There are 83,065 fans at a football match.  
45,927 fans are male. How many fans are female?

# Subtract More than 4-digits

## Reasoning and Problem Solving

Eva makes a 5-digit number.

Mo makes a 4-digit number.

The difference between their numbers is 3,465

What could their numbers be?

Possible answers:

9,658 and 14,023  
12,654 and 8,289  
5,635 and 10,000

Etc.

Rosie completes this subtraction incorrectly.

$$\begin{array}{r}
 28701 \\
 - 7621 \\
 \hline
 21180
 \end{array}$$

Explain the mistake to Rosie and correct it for her.

Rosie did not write down the exchange she made when she exchanged 1 hundred for 10 tens. This means she still had 7 hundreds subtract 6 hundreds when she should have 6 hundreds subtract 6 hundreds. The correct answer is 21,080

## Estimate and Approximate

### Notes and Guidance

Children build on their understanding of estimating and rounding to estimate answers for calculations and problems. The term approximate is used throughout.

Encourage children to consider the most appropriate number to round to e.g. the nearest ten, hundred or thousand. Reinforce the idea that an estimate should be performed quickly by choosing much easier numbers.

### Mathematical Talk

Which numbers shall I round to?

Why should I round to this number?

Why should an estimate be quick?

When, in real life, would we use an estimate?

### Varied Fluency

Which is best to estimate the total of 22,223 and 5,687?

$$22,300 + 5,700$$

$$22,200 + 5,700$$

$$22,200 + 5,600$$

Here are the attendances from the last 3 months at a rugby club.

Month	Attendance
February	18,655
March	31,402
April	27,092

What is the approximate total of February and March?

What is the approximate difference between March and April?

What is the approximate total of the three months?

April and May had an approximate total of 50,000

Estimate the attendance in May.

# Estimate and Approximate

## Reasoning and Problem Solving

### True or False?

$$49,999 - 19,999 = 50,000 - 20,000$$



Dora

I did not need to use a written method to work this out.

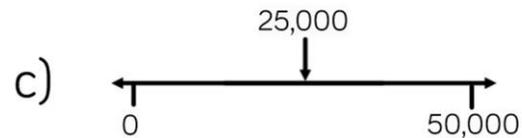
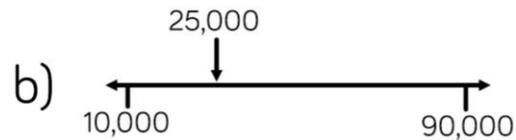
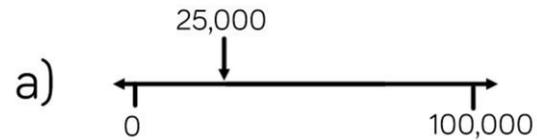
Can you explain why Dora's method work?

Can you think of another example where this method could be used?

True

Dora has used her related number facts. Both numbers on the right have increased by 1 therefore whatever the difference is, it will remain the same as the left hand side.

Which estimate is inaccurate?



Explain how you know.

B is inaccurate. The arrow is about a quarter of the way along the number line so it should be 30,000

## Inverse Operations

### Notes and Guidance

In this small step, children will use their knowledge of addition and subtraction to check their workings to ensure accuracy.

They use the commutative law to see that addition can be done in any order but subtraction cannot.

### 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

- When calculating  $17,468 - 8,947$ , which answer gives the corresponding addition question?

$$8,947 + 8,631 = 17,468$$

$$8,947 + 8,521 = 17,468$$

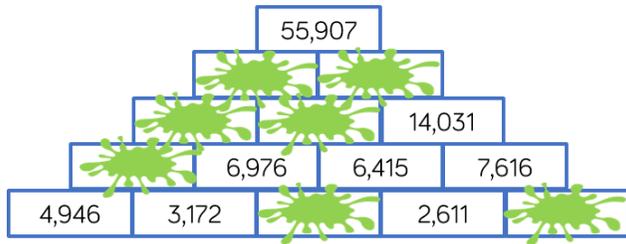
$$8,251 + 8,947 = 17,468$$

- I'm thinking of a number.  
After I add 5,241 and subtract 352, my number is 9,485  
What was my original number?
- Eva and Dexter are playing a computer game.  
Eva's high score is 8,524  
Dexter's high score is greater than Eva's.  
The total of both of their scores is 19,384  
What is Dexter's high score?

# Inverse Operations

## Reasoning and Problem Solving

Complete the pyramid using addition and subtraction.



From left to right:

Bottom row:  
3,804, 5,005

Second row:  
8,118

Third row:  
15,094, 13,391

Fourth row:  
28,485, 27,422

Mo, Whitney, Teddy and Eva collect marbles.



Mo

I have 1,648 marbles.

I have double the amount of marbles Mo has.



Whitney



Teddy

I have half the amount of marbles Mo has.

In total they have 8,524 marbles between them.

How many does Eva have?

Eva has 2,756 marbles.

## Multi-step Problems

### Notes and Guidance

In this small step children will be using their knowledge of addition and subtraction to solve multi-step problems.

The problems will appear in different contexts and in different forms i.e. bar models and word problems.

### Mathematical Talk

What is the key vocabulary in the question?

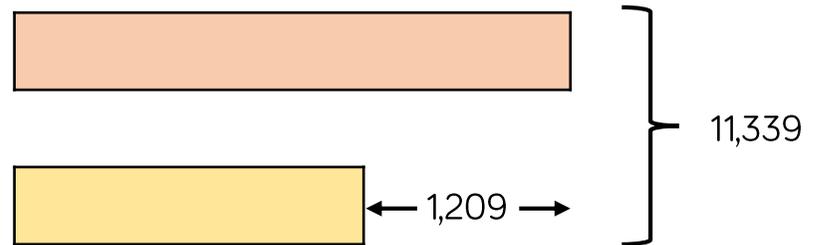
What are the key bits of information?

Can we put this information into a model?

Which operations do we need to use?

### Varied Fluency

-  When Annie opened her book, she saw two numbered pages. The sum of these two pages was 317. What would the next page number be?
-  Adam is twice as old as Barry. Charlie is 3 years younger than Barry. The sum of all their ages is 53. How old is Barry?
-  The sum of two numbers is 11,339. The difference between the same two numbers is 1,209. Use the bar model to help you find the numbers.



# Multi-step Problems

## Reasoning and Problem Solving

A milkman has 250 bottles of milk.

He collects another 160 from the dairy, and delivers 375 during the day.

How many does he have left?



Tommy

My method:

$$375 - 250 = 125$$

$$125 + 160 = 285$$

Do you agree with Tommy?  
Explain why.

Tommy is wrong. He should have added 250 and 160, then subtracted 375 from the answer.

There are 35 bottles of milk remaining.

On Monday, Whitney was paid £114

On Tuesday, she was paid £27 more than on Monday.

On Wednesday, she was paid £27 less than on Monday.

How much was Whitney paid in total?

How many calculations did you do?

Is there a more efficient method?

£342

Children might add 114 and 27, subtract 27 from 114 and then add their numbers.

A more efficient method is to recognise that the '£27 more' and '£27 less' cancel out so they can just multiply £114 by three.

**White**

**Rose  
Maths**

Autumn - Block 3

**Statistics**

# Overview

## Small Steps

## NC Objectives

- Read and interpret line graphs
- Draw line graphs
- Use line graphs to solve problems
- Read and interpret tables
- Two-way tables
- Timetables

Solve comparison, sum and difference problems using information presented in a line graph.

Complete, read and interpret information in tables including timetables.

# Read & Interpret Line Graphs

## Notes and Guidance

Children read and interpret line graphs. They make links back to using number lines when reading the horizontal and vertical axes. Children can draw vertical and horizontal lines to read the points accurately.

Encourage children to label all the intervals on the axes to support them in reading the line graphs accurately. When reading between intervals on a line graph, children can give an estimate of the value that is represented.

## Mathematical Talk

How can we use a ruler to support us to read values from a line graph?

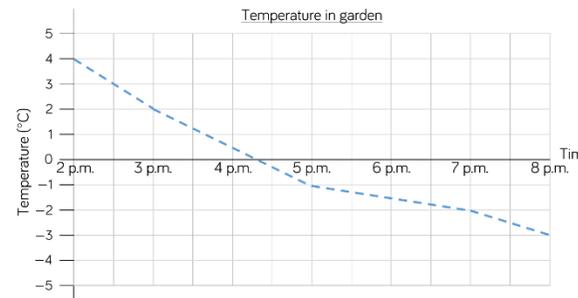
Where do we see examples of line graphs in real life?

How is the line graph different to a bar chart? How is it the same?

How can we estimate the value between intervals? Does it matter if we are not perfectly accurate? Why?

## Varied Fluency

Here is a line graph showing the temperature in a garden.



What was the temperature at 5 p.m.?

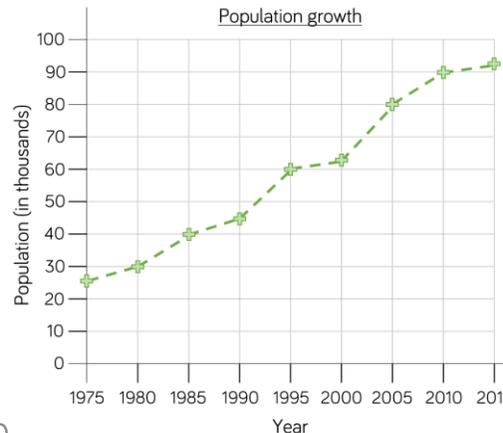
What was the difference in temperature between 3 p.m. and 7 p.m.?

When was the temperature 4°C?

Estimate the time when the temperature was 0°C.

Estimate the temperature at 6 p.m.

This line graph shows the population growth of a town.



What was the population in 1985?

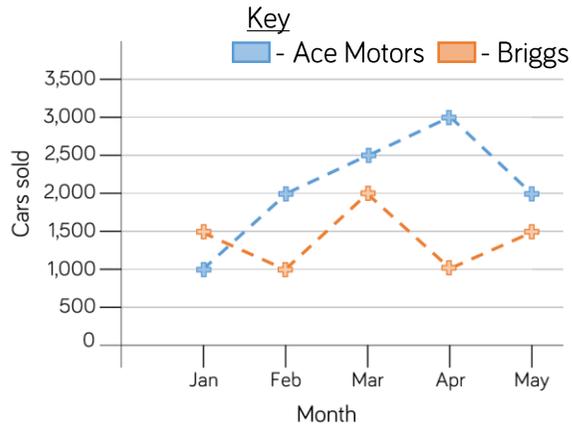
How much did the population grow between 1990 and 2010?

When was the population double the population of 1985?

# Read & Interpret Line Graphs

## Reasoning and Problem Solving

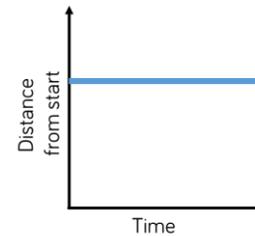
The graph shows the number of cars sold by two different companies.



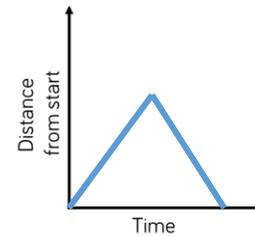
- How many more cars did Ace Motors sell than Briggs in April?
- From January to March, how many cars did each company sell? Who sold more? How many more did they sell?
- Crooks Motors sold 250 more cars than Briggs each month. Plot Crooks Motors' sales on the graph.

2,000  
 Ace 5,500  
 Briggs 4,500  
 Difference of 1,000  
 Ace sold more.  
 Points on graph are all half an interval up from Briggs.

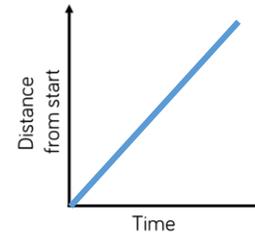
Match the graph to the activity.



A car travels at constant speed on the motorway.



A car is parked outside a house.



A car drives to the end of the road and back.

The first graph matches with the second statement.  
 Second graph with the third statement.  
 Third graph with the first statement.

# Draw Line Graphs

## Notes and Guidance

Children use their knowledge of scales and coordinates to represent data in a line graph. Drawing line graphs is a Year 5 Science objective and has been included here to support this learning and link to reading and interpreting graphs. Children draw axes with different scales depending on the data they are representing. Encourage children to collect their own data to present in line graphs focusing on accurately plotting the points.

## Mathematical Talk

On the rainfall graph, if the vertical axis went up in intervals of 5 mm, would the graph be more or less accurate? Why?

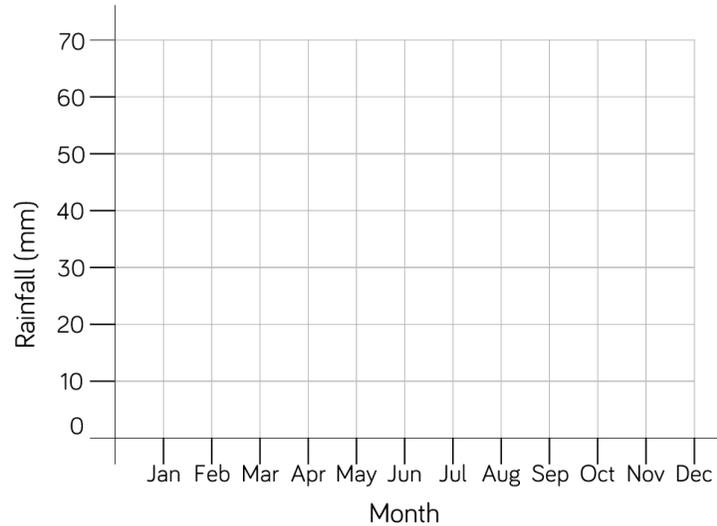
What scale will you use for the rupees on the conversion graph?

Which axis will you use for the pounds on the conversion graph? Explain why you have chosen this axis.

How can we use multiples to support our choice of intervals on the vertical axis?

## Varied Fluency

The table shows average rainfall in Leicester over a year. Complete the graph using the information from the table.



Month	Rainfall (mm)
Jan	54
Feb	40
Mar	38
Apr	38
May	48
Jun	46
Jul	58
Aug	60
Sep	50
Oct	57
Nov	65
Dec	50

Here is a table showing the conversion between pounds and rupees. Present the information as a line graph.

Pounds	1	2	3	4	5	6	7	8	9	10
Rupees	80	160	240	320	400	480	560	640	720	800

# Draw Line Graphs

## Reasoning and Problem Solving

Encourage the children to collect their own data and present it as a line graph. As this objective is taken from the science curriculum, it would be a good idea to link it to investigations.

Possible investigations could be:

- Measuring shadows over time
- Melting and dissolving substances
- Plant growth

Here is a table of data.

Time (min)	15	30	45	60	75
Distance (km)	25	46	67	72	98

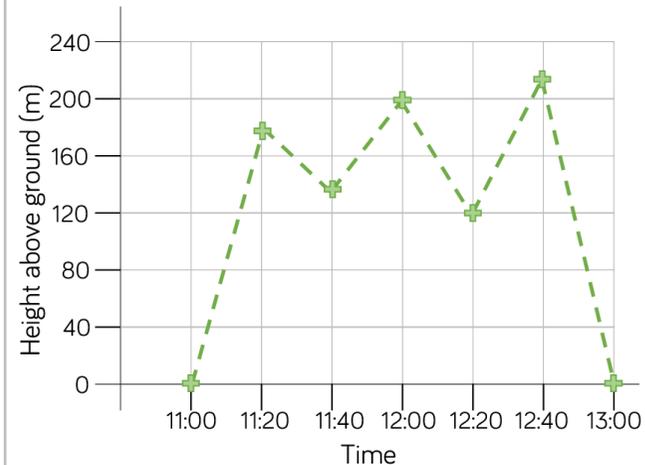
Which intervals would be the most appropriate for the vertical axis of the line graph?  
Explain your answer.

Children will present a range of line graphs over the year.

Children may give different answers but should give clear reasons. Intervals may range from 2s up to 10s. The most appropriate scale may be in 5s.

Rosie has used the data in the table to plot the line graph.

Time	11:00	11:20	11:40	12:00	12:20	12:40	13:00
Height above ground (m)	0	180	150	200	210	120	0



What mistakes has Rosie made?  
Can you draw the line graph correctly?

Rosie has plotted the time for 11:40 inaccurately, it should be closer to 160 than 120  
She has mixed up the points for 12:20 and 12:40 and plotted them the other way round.

# Problems with Line Graphs

## Notes and Guidance

Children use line graphs to solve problems. They use prepared graphs or graphs which they have drawn themselves, and make links to other subjects, particularly Science.

Children solve comparison, sum and difference problems. They can also generate their own questions for others to solve by reading and interpreting the line graphs.

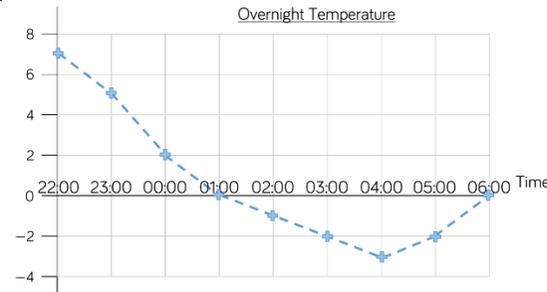
## Mathematical Talk

How does drawing vertical and horizontal lines support me in reading the line graph?

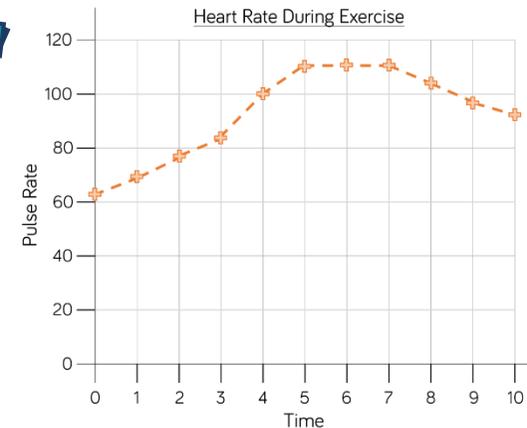
How will you plan out your own heart rate experiment? What information will you need to gather? What unit will you measure in? How will you label your axes?

Can we measure the temperature in our classroom? How could we gather the data? How could we present the data?

## Varied Fluency



What was the highest/lowest temperature?  
 What time did they occur?  
 What is the difference between the highest and lowest temperature?  
 How long did the temperature stay at freezing point or less?



How long did it take for the pulse rate to reach the highest level? Explain your answer, using the graph to help.  
 What could have happened at 5 minutes?  
 What could have happened at 7 minutes?

Estimate what the pulse rate was after 2 and a half minutes. How did you get an accurate estimate?

# Problems with Line Graphs

## Reasoning and Problem Solving

Carry out your own exercise experiment and record your heart rate on a graph like the one shown in the section above. How does it compare?

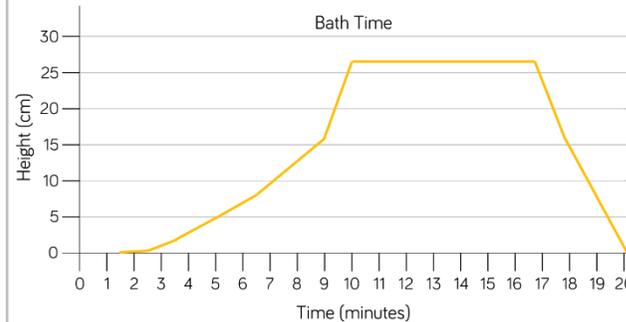


Can you make a set of questions for a friend to answer about your graph?

Can you put the information into a table?

Various answers. Children can be supported by being given part-drawn line graphs.

Here is a line graph showing a bath time. Can you write a story to explain what is happening in the graph?



How long did it take to fill the bath?

How long did it take to empty?

The bath doesn't fill at a constant rate. Why might that be?

Discussions around what happens to the water level when someone gets in the bath would be useful. Approximately 9 and a half mins to fill the bath. Approximately 3 and a half mins to empty. One or two taps could be used to fill.

## Read & Interpret Tables

### Notes and Guidance

Children read tables to extract information and answer questions. There are many opportunities to link this learning to topic work within class and in other subject areas.

Encourage children to generate their own questions about information in a table. They will get many opportunities to apply their addition and subtraction skills when solving sum and difference problems.

### Mathematical Talk

Why are column and row headings important in a table?

If I am finding the difference, what operation do I need to use?

Can you think of your own questions to ask about the information in the table?

Why is it important to put units of measure in the table?

### Varied Fluency

Here is a table with information about planets. Use the table to answer the questions.

Planet	Time for Revolution	Diameter (km)	Time for Rotation
Mercury	88 days	4,878	59 days
Venus	225 days	12,104	243 days
Earth	365 days	12,756	24 hours
Mars	687 days	6,794	25 hours
Jupiter	12 years	142,984	10 hours
Saturn	29 years	120,536	11 hours
Uranus	84 years	51,118	17 hours
Neptune	165 years	49,500	17 hours

How many planets take more than one day to rotate?  
Which planets take more than one year to make one revolution?  
Write the diameter of Jupiter in words.

What is the difference between the diameter of Mars and Earth?  
What is the difference between the time for rotation between Mercury and Venus?

Use the table to answer the questions.

City	Leeds	Wakefield	Bradford	Liverpool	Coventry
Population	720,000	316,000	467,000	440,000	305,000

What is the difference between the highest and lowest population?  
Which two cities have a combined population of 621,000?  
How much larger is the population of Liverpool than Coventry?

# Read & Interpret Tables

## Reasoning and Problem Solving

	100 m sprint (s)	Shot put (m)	50 m Sack race (s)	Javelin (m)
Amir	15.5	6.5	18.9	11.2
Dora	16.2	7.5	20.1	13.3
Teddy	15.8	6.9	19.3	13.9
Rosie	15.6	7.2	18.7	14.1
Ron	17.9	6.3	18.7	13.3

Ron's number is the biggest but this means he was the slowest therefore he did not win the 100 m sprint.

Ron thinks that he won the 100 m sprint because he has the biggest number.

Do you agree?  
Explain your answer.

This table shows the 10 largest stadiums in Europe.

Stadium	City	Country	Capacity
Camp Nou	Barcelona	Spain	99,365
Wembley	London	England	90,000
Signal Iduna Park	Dortmund	Germany	81,359
Santiago Bernabeu	Madrid	Spain	81,044
San Siro	Milan	Italy	80,018
Stade de France	Paris	France	80,000
Luzhniki Stadium	Moscow	Russia	78,300
Ataturk Olimpiyat Stadium	Istanbul	Turkey	76,092
Old Trafford	Manchester	England	75,811
Allianz Arena	Munich	Germany	75,000

### True or False?

- The fourth largest stadium is the San Siro.
- There are 6 stadiums with a capacity of more than 80,000
- Three of the largest stadiums are in England.

False

False

False

# Two-way Tables

## Notes and Guidance

Children read a range of two-way tables. These tables show two different sets of data which are displayed horizontally and vertically.

Children answer questions by interpreting the information in the tables. They complete two-way tables, using their addition and subtraction skills. Encourage children to create their own questions about the two-way tables.

## Mathematical Talk

Which column do I need to look in to find the information?  
Which row do I need to look in to find the information?

How can I calculate the total of a row/column?  
If I know the total, how can I calculate any missing information?

Can you create your own two-way table using information about your class?

## Varied Fluency

This two-way table shows the staff at Liverpool police station.

	Male	Female	Total
Constable	55	24	79
Sergeant	8	5	13
Inspector	2	4	6
Chief Inspector	1	1	2
Total	66	34	100

- How many female inspectors are there?
- How many male sergeants are there?
- How many constables are there altogether?
- How many people work at Liverpool police station?
- How many male inspectors and female constables are there altogether?

Complete the table.

	Man United	Liverpool	Chelsea	TOTAL
Lost	36	42	29	
Won	174	76	126	
TOTAL				

Write questions about the information for a friend to solve.

# Two-way Tables

## Reasoning and Problem Solving

This table shows how many children own dogs and cats.

Fill in the missing gaps and answer the questions below.

	Boys	Girls	Total
Dogs		44	
Cats	38		
Total	125		245

- How many more boys have dogs than girls?
- How many more girls have cats than dogs?
- How many more children have dogs than cats?

Completed table:

	Boys	Girls	Total
Dogs	87	44	131
Cats	38	76	114
Total	125	120	245

43

32

17

120 people were asked where they went on holiday during the summer months of last year.



Use this information to create a two-way table.

In June, 6 people went to France and 18 went to Spain.

In July, 10 people went to France and 19 went to Italy.

In August, 15 people went to Spain.

35 people went to France altogether.

39 people went to Italy altogether.

35 people went away in June.

43 people went on holiday in August.

You can choose to give children a blank template.

Children may not know where to put the 120, or realise its importance.

Children will need to work systematically in order to get all of the information.

As a teacher, you could choose not to give the children the complete total and let them find other possible answers.

# Timetables

## Notes and Guidance

Children read timetables to extract information. Gather local timetables for the children to interpret to make the learning more relevant to the children's lives, this could include online timetables.

Revisit children's previous learning on digital time to support them in reading timetables more accurately. Consider looking at online apps for timetables to make links with ICT.

## Mathematical Talk

Where do you see timetables and why are they useful?

What information is displayed in a row when you read across the timetable?

What information is displayed in a column when you read down the timetable?

Why is it important to use 24-hour clock or a.m./p.m. on a timetable?

## Varied Fluency

 Use the timetable to answer the questions.

	Bus Timetable				
Halifax	06:05	06:35	07:10	07:43	08:15
Shelf	06:15	06:45		07:59	08:31
Shelf Village	06:16	06:46	07:23	08:00	08:32
Woodside	06:21	06:50	07:28		
Odsal	06:26	06:55	07:33	08:15	08:45
Bradford	06:40	07:10	07:48	08:30	09:00

On the 06:35 bus, how long does it take to get from Shelf to Bradford?

Can you travel to Woodside on the 07:43 bus from Halifax?

Which journey takes the longest time between Shelf Village and Bradford?

If you needed to travel from Halifax to Odsal and had to arrive by 08:20, which would be the best bus to catch? Explain your answer.

Which bus takes the longest time from Halifax to Bradford?

Amir travels on the 06:35 bus from Halifax to Woodside, how many minutes is he on the bus?

The 08:15 bus is running 12 minutes late, what time does it arrive at Odsal?

# Timetables

## Reasoning and Problem Solving

NatureWatch		NatureWatch +1		QuizTime		Cookery Channel	
5 p.m.	News	5 p.m.	Puppy Playtime	5 p.m.	Talk the Talk	5 p.m.	Cheese Please
5:30 p.m.	Weather	6 p.m.	News	5:30 p.m.	Quizdom	6 p.m.	Cook with Lydia
5:45 p.m.	Deep Blue	6:30 p.m.	Weather	6 p.m.	What's the Q?	6:30 p.m.	Pizza Pasta Pietro
6 p.m.	Pampered Pets	6:45 p.m.	Deep Blue	6:30 p.m.	aMAZEment	6:45 p.m.	5 Minute Menu
7 p.m.	Safari	7 p.m.	Pampered Pets	7:30 p.m.	Buzzed Out	7 p.m.	Budget Baker
8:15 p.m.	Animal Antics	8 p.m.	Safari	8 p.m.	Guess the Noise	8 p.m.	Lots of Lollies
9:15 p.m.	Worldly Wonders	9:15 p.m.	Animal Antics	9 p.m.	Dance & Decide	9:15 p.m.	Biscuit Bites

Ron wants to watch the following TV programmes: Cheese Please, What's the Q, aMAZEment, Budget Baker, Safari, Dance & Decide.

Will Ron be able to watch all the shows he has chosen?

It is 18:45. How long is it until 'Guess the Noise' is on?

No, Budget Baker is on at the same time as aMAZEment. Safari also overlaps with Dance & Decide by 15 minutes.

Guess the Noise is on in 1 hour and 15 minutes.

Here is Rosie's weekly timetable from secondary school.

Y7CM	Daily Assembly (09:00 - 09:15)	1 09:15 - 09:55	2 09:55 - 10:45	Break (10:45 - 11:05)	3 11:05 - 11:55	4 11:55 - 12:45	Lunchtime (12:45 - 13:45)	5 13:45 - 14:35	6 14:35 - 15:25
Monday		Literacy	English		Maths	I.C.T.		P.S.H.C.E.	Geography
Tuesday		English	Art		French	Science		D.T.	
Wednesday		Literacy	D.T.		Art	Drama		I.C.T.	Science
Thursday		P.E.	Maths		R.E.	English		History	P.S.H.C.E.
Friday		Literacy	Maths		Art	Science		P.E.	

### True or False?

- Rosie has 2 hours and 20 minutes of PE in a week.
- Rosie has 130 minutes of literacy in a week.
- Rosie does Art for the same length of time as Maths each week.
- Rosie does Art for the same length of time as English each week.

True

False, 120 mins (2 hours)

True

False (150 mins of Art, 140 mins of English)

**White**

**Rose  
Maths**

Autumn - Block 4

**Multiplication & Division**

# Overview

## Small Steps

- ▶ Multiples
- ▶ Factors
- ▶ Common factors
- ▶ Prime numbers
- ▶ Square numbers
- ▶ Cube numbers
- ▶ Multiply by 10, 100 and 1,000
- ▶ Divide by 10, 100 and 1,000
- ▶ Multiples of 10, 100 and 1,000

## NC Objectives

Multiply and divide numbers mentally drawing upon known facts.

Multiply and divide whole numbers by 10, 100 and 1,000

Identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers.

Recognise and use square numbers and cube numbers and the notation for squared ( $^2$ ) and cubed ( $^3$ )

Solve problems involving multiplication and division including using knowledge of factors and multiples, squares and cubes.

Know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers.

Establish whether a number up to 100 is prime and recall prime numbers up to 19

# Multiples

## Notes and Guidance

Building on their times tables knowledge, children will find multiples of whole numbers. Children build multiples of a number using concrete and pictorial representations e.g. an array. Children understand that a multiple of a number is the product of the number and another whole number.

Multiplying decimal numbers by 10, 100 and 1,000 forms part of Year 5 Summer block 1.

## Mathematical Talk

What do you notice about the multiples of 5? What is the same about each of them, what is different?

Look at multiples of other numbers, is there a pattern that links them to each other?

Are all multiples of 8 multiples of 4?

Are all multiples of 4 multiples of 8?

## Varied Fluency

- Circle the multiples of 5

25    32    54    175    554    3000

What do you notice about the multiples of 5?

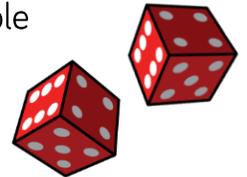
- 7,135 is a multiple of 5. Explain how you know.

- Roll 2 dice (1-6), and multiply the numbers the you roll. List all the numbers that this number is a multiple of.

Repeat the dice roll.

Use a table to show your results.

Multiply the numbers you roll to complete the table.



# Multiples

## Reasoning and Problem Solving

Use 0 – 9 digit cards. Choose 2 cards and multiply the digits shown.

What is your number a multiple of?

Is it a multiple of more than one number?

Find all the numbers you can make using the digit cards.

Use the table below to help.

	0	1	2	3	4	5	6	7	8	9
0										
1										
2										
3										
4										
5										
6										
7										
8										
9										

### Always, Sometimes, Never

- The product of two even numbers is a multiple of an odd number.
- The product of two odd numbers is a multiple of an even number.

Always - all integers are multiples of 1, which is an odd number.

Never - Two odd numbers multiplied together are always a multiple of an odd number.

Eva's age is a multiple of 7 and is 3 less than a multiple of 8

She is younger than 40

How old is Eva?

Eva is 21 years old.

# Factors

## Notes and Guidance

Children understand the relationship between multiplication and division and use arrays to show the relationship between them. Children learn that factors of a number multiply together to give that number, meaning that factors come in pairs. Factors are the whole numbers that you multiply together to get another whole number (factor  $\times$  factor = product).

## Mathematical Talk

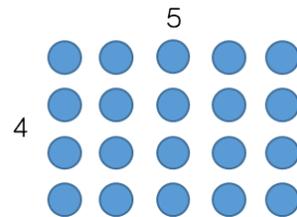
How can you work in a systematic way to prove you have found all the factors?

Do factors always come in pairs?

How can we use our multiplication and division facts to find factors?

## Varied Fluency

If you have twenty counters, how many different ways of arranging them can you find?



How many factors of twenty have you found by arranging your counters in different arrays?

Circle the factors of 60

- 9, 6, 8, 4, 12, 5, 60, 15, 45

Which factors of 60 are not shown?

Fill in the missing factors of 24

$1 \times \underline{\quad}$                        $\underline{\quad} \times 12$

$3 \times \underline{\quad}$                        $\underline{\quad} \times \underline{\quad}$

What do you notice about the order of the factors?

Use this method to find the factors of 42

# Factors

## Reasoning and Problem Solving

Here is Annie's method for finding factor pairs of 36

1	36
2	18
3	12
4	9
5	X
6	6

When do you put a cross next to a number?

How many factors does 36 have?

Use Annie's method to find all the factors of 64

If it is not a factor, put a cross.

36 has 9 factors.

Factors of 64:

1	64
2	32
3	X
4	16
5	X
6	X
7	X
8	8

### Always, Sometimes, Never

- An even number has an even amount of factors.
- An odd number has an odd amount of factors.

Sometimes, e.g. 6 has four factors but 36 has nine.  
Sometimes, e.g. 21 has four factors but 25 has three.

### True or False?

The bigger the number, the more factors it has.

False. For example, 12 has 6 factors but 13 only has 2

# Common Factors

## Notes and Guidance

Using their knowledge of factors, children find the common factors of two numbers.

They use arrays to compare the factors of a number and use Venn diagrams to show their results.

## Mathematical Talk

How can we find the common factors systematically?

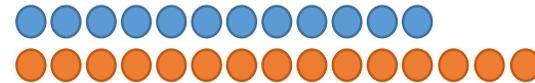
Which number is a common factor of a pair of numbers?

How does a Venn diagram help to show common factors?

Where are the common factors?

## Varied Fluency

- Use arrays to find the common factors of 12 and 15  
Can we arrange each number in counters in one row?



Yes- so they have a common factor of one.

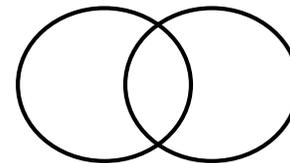
- Can we arrange each number in counters in two equal rows?



We can for 12, so 2 is a factor of 12, but we can't for 15, so 2 is not a factor of 15, meaning 2 is not a common factor of 12 and 15

Continue to work through the factors systematically until you find all the common factors.

- Fill in the Venn diagram to show the factors of 20 and 24



Where are the common factors of 20 and 24?

Use a Venn diagram to show the common factors of 9 and 15

# Common Factors

## Reasoning and Problem Solving

### True or False?

- 1 is a factor of every number. True
- 1 is a multiple of every number. False
- 0 is a factor of every number. False
- 0 is a multiple of every number. True

I am thinking of two 2-digit numbers.

24 and 60

Both of the numbers have a digit total of six.

Their common factors are:

1, 2, 3, 4, 6, and 12

What are the numbers?

# Prime Numbers

## Notes and Guidance

Using their knowledge of factors, children see that some numbers only have two factors. They are taught that these are numbers called prime numbers, and that non-primes are called composite numbers. Children can recall primes up to 19 and are able to establish whether a number is prime up to 100. Using primes, they break a number down into its prime factors. Children learn that 1 is not a prime number because it does not have exactly two factors (it only has 1 factor).

## Mathematical Talk

- How many factors does each number have?
- How many other numbers can you find that have this number of factors?
- What is a prime number?
- What is a composite number?
- How many factors does a prime number have?

## Varied Fluency

Use counters to find the factors of the following numbers.

5, 13, 17, 23

What do you notice about the arrays?

A prime number has exactly 2 factors, one and itself. A composite number can be divided by numbers other than 1 and itself to give a whole number answer.

Sort the numbers into the table.

2   3   5   9   15   24   29   30

	Prime	Composite
Exactly 2 factors (1 and itself)		
More than 2 factors		

- Put two of your own numbers into the table.
- Why are two of the boxes empty?
- Would 1 be able to go in the table? Why or why not?

# Prime Numbers

## Reasoning and Problem Solving

Find all the prime numbers between 10 and 100, sort them in the table below.

End in a 1	End in a 3	End in a 7	End in a 9

End in a 1	End in a 3
11, 31, 41, 61, 71,	13, 23, 43, 53, 73
End in a 7	End in a 9
17, 37, 47, 67, 97	19, 29, 59, 79, 89

Why do no two-digit prime numbers end in an even digit?

Why do no two-digit prime numbers end in a 5?

Because all two-digit even numbers have more than 2 factors.

Because all two-digit numbers ending in 5 are divisible by 5 as well as 1 and itself, so have more than 2 factors.

Dora says all prime numbers have to be odd.



Her friend Amir says that means all odd numbers are prime, so 9, 27 and 45 are prime numbers.



Explain Amir's and Dora's mistakes and correct them.

Dora is incorrect because 2 is a prime number (it has exactly 2 factors).

Amir thinks all odd numbers are prime but he is incorrect because most odd numbers have more than 2 factors.

E.g.  
Factors of 9:  
1, 3 and 9

Factors of 27:  
1, 3, 9 and 27

## Square Numbers

### Notes and Guidance

Children will need to be able to find factors of numbers. Square numbers have an odd number of factors and are the result of multiplying a whole number by itself.

Children learn the notation for squared is  $\square^2$

### Mathematical Talk

Why are square numbers called 'square' numbers?

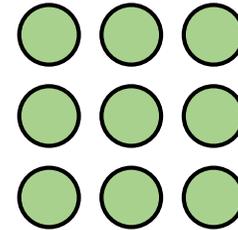
Are there any patterns in the sequence of square numbers?

Are the squares of even numbers always even?

Are the squares of odd numbers always odd?

### Varied Fluency

- What does this array show you?  
Why is this array square?



- How many ways are there of arranging 36 counters in an array?  
What is the same about each array?  
What is different?
- Find the first 12 square numbers.  
Show why they are square numbers.  
How many different squares can you make using counters?  
What do you notice?  
Are there any patterns?

# Square Numbers

## Reasoning and Problem Solving

Teddy says,



Factors come in pairs so all numbers must have an even number of factors.

Do you agree?  
Explain your reasoning.

How many square numbers can you make by adding prime numbers together?

Here's one to get you started:

$$2 + 2 = 4$$

No.

Square numbers have an odd number of factors (e.g. the factors of 25 are 1, 25 and 5).

Solutions include:

$$2 + 2 = 4$$

$$2 + 7 = 9$$

$$11 + 5 = 16$$

$$23 + 2 = 25$$

$$29 + 7 = 36$$

Whitney thinks that  $4^2$  is equal to 16

Do you agree?  
Convince me.

Amir thinks that  $6^2$  is equal to 12

Do you agree?  
Explain what you have noticed.

Children may use concrete materials or draw pictures to prove it.

Children should spot that 6 has been multiplied by 2. They may create the array to prove that  $6^2 = 36$  and  $6 \times 2 = 12$

### Always, Sometimes, Never

A square number has an even number of factors.

Never. Square numbers have an odd number of factors because one of their factors does not have a pair.

# Cube Numbers

## Notes and Guidance

Children learn that a cube number is the result of multiplying a whole number by itself three times e.g.  $6 \times 6 \times 6$

If you multiply a number by itself, then itself again, the result is a cube number.

Children learn the notation for cubed is  $\quad^3$

## Mathematical Talk

Why are cube numbers called ‘cube’ numbers?

How are squared and cubed numbers similar?

How are they different?

True or False: cubes of even numbers are even and cubes of odd numbers are odd.

## Varied Fluency

Use multilink cubes to investigate how many are needed to make different sized cubes.



How many multilink blocks are required to make the first cube number? The second? Third?

Can you predict what the tenth cube number is going to be?

Complete the table.

		8
$3^3$	$3 \times 3 \times 3$	27
$4^3$		
$5^3$	$5 \times 5 \times 5$	
	$6 \times 6 \times 6$	

Calculate:

$4^3 = \underline{\quad}$

$5^3 = \underline{\quad}$

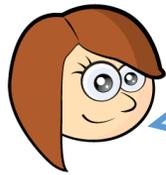
$3 \text{ cubed} = \underline{\quad}$

$6 \text{ cubed} = \underline{\quad}$

# Cube Numbers

## Reasoning and Problem Solving

Rosie says,



$5^3$  is equal to 15

Do you agree?  
Explain your answer.

Here are 3 cards



On each card there is a cube number.  
Use these calculations to find each number.

$$A \times A = B$$

$$B + B - 3 = C$$

$$\text{Digit total of } C = A$$

Rosie is wrong, she has multiplied 5 by 3 rather than by itself 3 times.

$$5^3 = 5 \times 5 \times 5$$

$$5 \times 5 \times 5 = 125$$

$$A = 8$$

$$B = 64$$

$$C = 125$$

Dora is thinking of a two-digit number that is both a square and a cube number. What number is she thinking of?

64

Teddy's age is a cube number. Next year his age will be a square number. How old is he now?

8 years old

The sum of a cube number and a square number is 150. What are the two numbers?

125 and 25

# Multiply by 10, 100 and 1,000

## Notes and Guidance

Children recap multiplying by 10 and 100 before moving on to multiplying by 1,000

They look at numbers in a place value grid and discuss the number of places to the left digits move when you multiply by different multiples of 10

## Mathematical Talk

Which direction do the digits move when you multiply by 10, 100 or 1,000?

How many places do you move to the left?

When we have an empty place value column to the right of our digits what number do we use as a place holder?

Can you use multiplying by 100 to help you multiply by 1,000? Explain why.

## Varied Fluency

Make 234 on a place value grid using counters.

HTh	TTh	Th	H	T	O
			● ●	● ● ●	● ● ● ●

When I multiply 234 by 10, where will I move my counters?  
Is this always the case when multiplying by 10?

Complete the following questions using counters and a place value grid.

$234 \times 100 = \underline{\quad}$

$100 \times 36 = \underline{\quad}$

$45,020 \times 10 = \underline{\quad}$

$\underline{\quad} = 324 \times 100$

$1,000 \times 207 = \underline{\quad}$

$\underline{\quad} = 3,406 \times 1,000$

Use  $<$ ,  $>$  or  $=$  to complete the statements.

$71 \times 1,000$



$71 \times 100$

$100 \times 32$



$16 \times 1,000$

$48 \times 100$



$48 \times 10 \times 10 \times 10$

# Multiply by 10, 100 and 1,000

## Reasoning and Problem Solving

<p>Rosie has £300 in her bank account.</p> <p>Tommy has 100 times more than Rosie in his bank account.</p> <p>How much more money does Tommy have than Rosie?</p>	<p>Tommy has £30,000</p> <p>Tommy has £29,700 more than Rosie.</p>	<p>Jack is thinking of a 3-digit number.</p> <p>When he multiplies his number by 100, the ten thousands and hundreds digit are the same.</p> <p>The sum of the digits is 10</p> <p>What number could Jack be thinking of?</p>	<p>181</p> <p>262</p> <p>343</p> <p>424</p> <p>505</p>
<p>Whitney has £1,020 in her bank account.</p> <p>Tommy has £120 in his bank account.</p> <p>Whitney says,</p> <div data-bbox="103 1013 673 1228"> </div> <p>Is Whitney correct? Explain your reasoning.</p>	<p>Whitney is incorrect, she would need to have £1,200 if this were the case (Or Tommy would need to be £102).</p>		

# Divide by 10, 100 and 1,000

## Notes and Guidance

Children look at dividing by 10, 100 and 1,000 using a place value chart.

They use counters and digits to learn that the digits move to the right when dividing by powers of ten. They develop understanding of how many places to the right to move the counters to the right.

## Mathematical Talk

What happens to the digits?

How are dividing by 10, 100 and 1,000 related to each other?

How are dividing by 10, 100 and 1,000 linked to multiplying by 10, 100 and 1,000?

What does 'inverse' mean?

## Varied Fluency



HTh	TTh	Th	H	T	O
	●	● ●	● ● ●		

What number is represented in the place value grid?

Divide the number by 100

Which direction do the counters move?

How many columns do they move? How do you know how many columns to move?

What number do we have now?



Complete the following using a place value grid.

- Divide 460 by 10
- Divide 5,300 by 100
- Divide 62,000 by 1,000

Divide these numbers by 10, 100 and 1,000

80,000

300,000

547,000



Calculate  $45,000 \div 10 \div 10$

How else could you calculate this?

# Divide by 10, 100 and 1,000

## Reasoning and Problem Solving

Mo has £357,000 in his bank.

He divides the amount by 1,000 and takes that much money out of the bank.

Using the money he has taken out, he buys some furniture costing two hundred and sixty-nine pounds.

How much money does Mo have left from the money he took out?

Show your working out.

$$357,000 \div 1,000 = 357$$

If you subtract £269, he is left with £88

Here are the answers to some problems:

5,700

405

397

6,203

Can you write at least two questions for each answer involving dividing by 10, 100 or 1,000?

Possible solutions:

$$3,970 \div 10 = 397$$

$$57,000 \div 10 = 5,700$$

$$397,000 \div 1,000 = 397$$

$$40,500 \div 100 = 405$$

$$620,300 \div 100 = 6,203$$

# Multiples of 10, 100 and 1,000

## Notes and Guidance

Children have been taught how to multiply and divide by 10, 100 and 1,000

They now use knowledge of other multiples of 10, 100 and 1,000 to answer related questions.

## Mathematical Talk

If we are multiplying by 20, can we break it down into two steps and use our knowledge of multiplying by 10?

How does using multiplication and division as the inverse of the other help us to use known facts?

## Varied Fluency

36 × 5 = 180

Use this fact to solve the following questions:

$$36 \times 50 = \underline{\quad} \qquad 500 \times 36 = \underline{\quad}$$

$$5 \times 360 = \underline{\quad} \qquad 360 \times 500 = \underline{\quad}$$

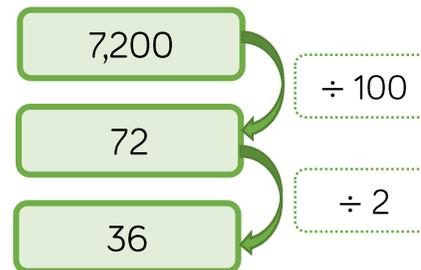
Here are two methods to solve  $24 \times 20$

Method 1	Method 2
$24 \times 10 \times 2$ $= 240 \times 2$ $= 480$	$24 \times 2 \times 10$ $= 48 \times 10$ $= 480$

What is the same about the methods, what is different?

The division diagram shows  $7,200 \div 200 = 36$

Use the diagram to solve:



$$3,600 \div 200 = \square$$

$$18,000 \div 200 = \square$$

$$5,400 \div \square = 27$$

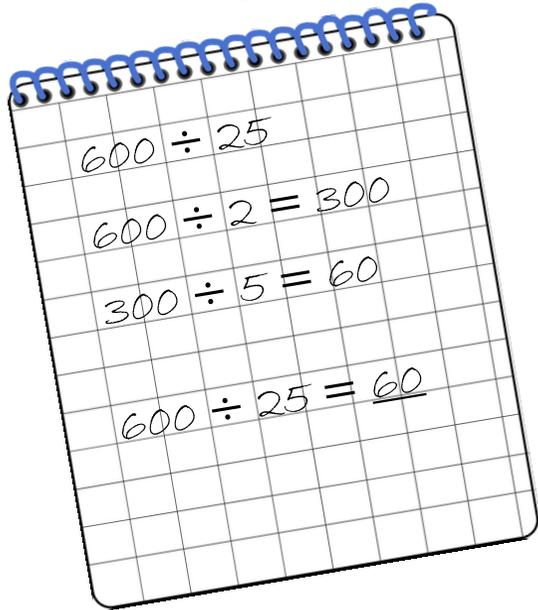
$$\square = 6,600 \div 200$$

# Multiples of 10, 100 and 1,000

## Reasoning and Problem Solving

Tommy has answered a question.

Here is his working out.



Is he correct?

Explain your answer.

Tommy is not correct as he has partitioned 25 incorrectly.

He could have divided by 5 twice.

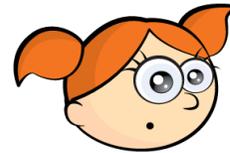
The correct answer should be 24

$$6 \times 7 = 42$$

Alex uses this multiplication fact to solve

$$420 \div 70 = \underline{\quad}$$

Alex says,



The answer is 60 because all of the numbers are 10 times bigger.

Do you agree with Alex?

Explain your answer.

Alex is wrong; both numbers (the dividend and divisor) are 10 times bigger than the numbers in the multiplication so the answer is 6.

$$6 \times 70 = 420, \text{ therefore } 420 \div 70 = 6$$

**White**

**Rose  
Maths**

Autumn - Block 5

**Perimeter & Area**

# Overview

## Small Steps

## NC Objectives

- Measure perimeter
- Calculate perimeter
- Area of rectangles
- Area of compound shapes
- Area of irregular shapes

Measure and calculate the perimeter of composite rectilinear shapes in cm and m.

Calculate and compare the area of rectangles (including squares), and including using standard units,  $\text{cm}^2$ ,  $\text{m}^2$  estimate the area of irregular shapes.

## Measure Perimeter

### Notes and Guidance

Children measure the perimeter of rectilinear shapes from diagrams without grids.

They will recap measurement skills and recognise that they need to use their ruler accurately in order to get the correct answer.

They could consider alternative methods when dealing with rectangles e.g.  $l + w + l + w$  or  $(l \times w) \times 2$

### Mathematical Talk

What is perimeter of a shape?

What's the same/different about these shapes?

Do we need to measure every side?

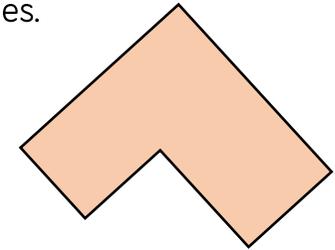
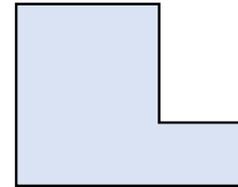
Once we have measured each side, how do we calculate the perimeter?

### Varied Fluency

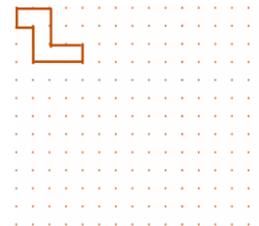
- Measure the perimeter of the rectangles.



- Measure the perimeter of the shapes.



- Make this shape double the size using dot paper.



Measure the perimeter of both shapes.

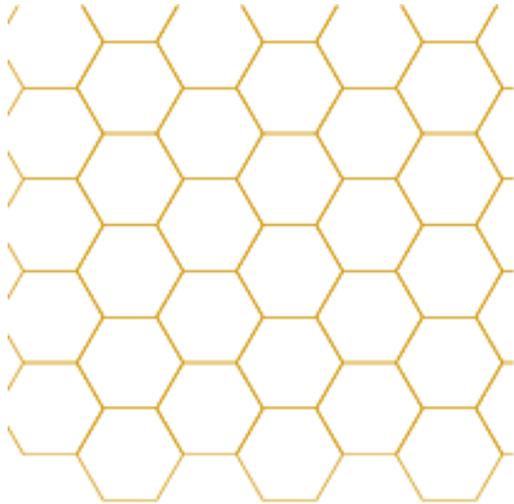
What do you notice about the perimeter of the larger one? Why?

# Measure Perimeter

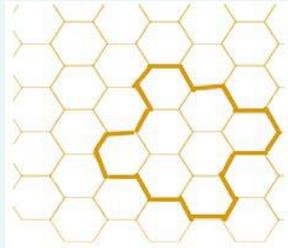
## Reasoning and Problem Solving

Each regular hexagon has a side length of 2 cm

Can you construct a shape with a perimeter of 44 cm?



Possible answer:



Discuss how many sides the shape must have with the children. Encourage their reasoning that there must be 22 2 cm sides to make a total perimeter of 44 cm.

### Activity

Investigate different ways you can make composite rectilinear shapes with a perimeter of 54 cm.

# Calculate Perimeter

## Notes and Guidance

Children apply their knowledge of measuring and finding perimeter to find the unknown side lengths.

They find the perimeter of shapes with and without grids.

When calculating perimeter of shapes, encourage children to mark off the sides as they add them up to prevent repetition of counting/omission of sides.

## Mathematical Talk

What can you tell me about the sides of a square/rectangle?  
How does this help you work out this question?

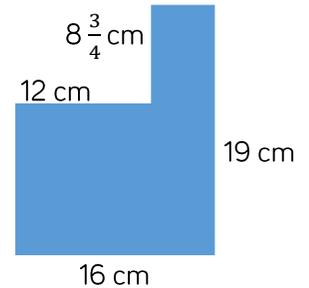
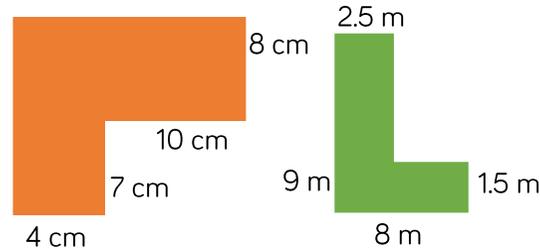
How can you use the labelled sides to find the length of the unknown sides?

What strategies can you use to calculate the total perimeter?

What does regular mean? Why are rectangles irregular?

## Varied Fluency

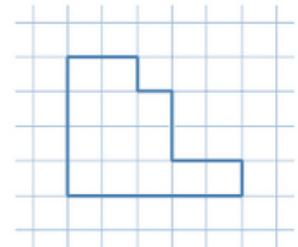
Find the perimeter of the following shapes.



Each square has an area of 4 square cm.

What is the length of each square?

What is the perimeter of the whole shape?



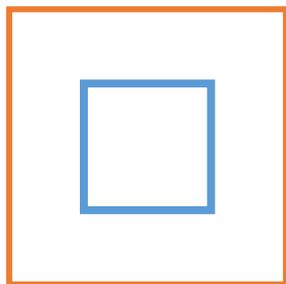
How many \_\_\_\_\_ can you draw with a perimeter of \_\_\_\_ cm?  
e.g. rectangles, other rectilinear shapes.

How many regular shapes can you make with a perimeter of \_\_\_\_ cm?

# Calculate Perimeter

## Reasoning and Problem Solving

Here is a square inside another square.



The perimeter of the inner square is 16 cm

The outer square's perimeter is four times the size of the inner square.

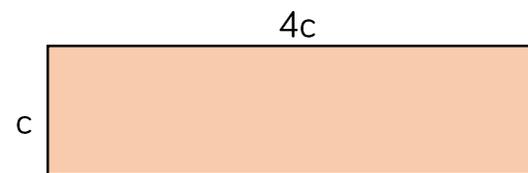
What is the length of one side of the outer square?

How do you know? What do you notice?

Small square = 16 cm

Large square = 64 cm

Length of one of the outer sides is 8 cm, because 64 is a square number.

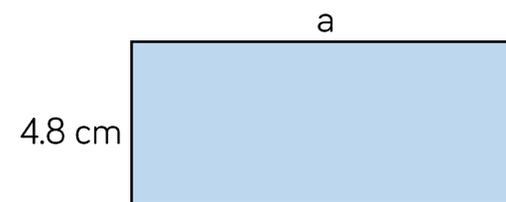


The value of  $c$  is 14 m.

What is the total perimeter of the shape?

$$4c + 4c + c + c = 10c$$

$$10 \times 14 = 140 \text{ m}$$



The blue rectangle has a perimeter of 38 cm.

What is the value of  $a$ ?

$$\text{Total perimeter} = 38 \text{ cm}$$

$$38 - (4.8 + 4.8) = 28.4$$

$$\text{So } 28.4 \text{ divided by } 2 = 14.2 \text{ cm}$$

## Area of Rectangles

### Notes and Guidance

Children build on previous knowledge in Year 4 by counting squares to find the area. They then move on to using a formula to find the area of rectangles.

Is a square a rectangle? This would be a good discussion point when the children are finding different rectangles with a given area. For example, a rectangle with an area of  $36 \text{ cm}^2$  could have four equal sides of 6 cm.

### Mathematical Talk

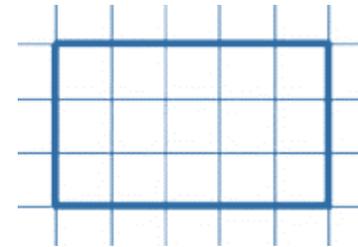
What properties of these shapes do you need to know to help you work this out?

What can you tell me about the sides of a square/rectangle? How does this help you work out this question?

Will the formula 'Area = length  $\times$  width' work for any shape, or only squares and rectangles?

### Varied Fluency

-  How many rectangles can you draw with an area of \_\_\_\_  $\text{cm}^2$ ?
-  What is the area of this shape if:
  - each square is 2 cm in length?
  - each square is 3.5 cm in length?



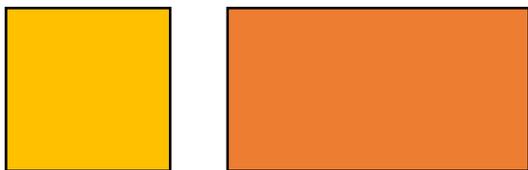
-  Mo buys a house with a small back garden, which has an area of  $12 \text{ m}^2$ . His house lies in a row of terraces, all identical. If there are 15 terraced houses altogether, what is the total area of the garden space?

# Area of Rectangles

## Reasoning and Problem Solving

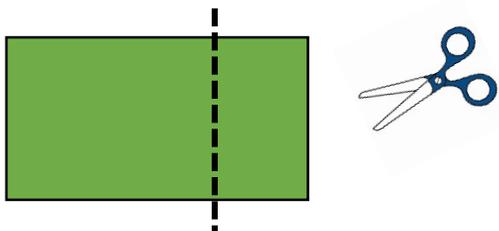
Investigate how many ways you can make different squares and rectangles with the same area of  $84 \text{ cm}^2$

What strategy did you use?

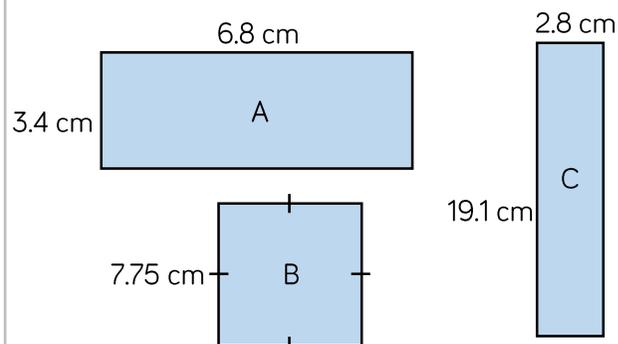


### True or False?

If you cut off a piece from a shape, you reduce its area and perimeter.  
Draw 2 examples to prove your thinking.



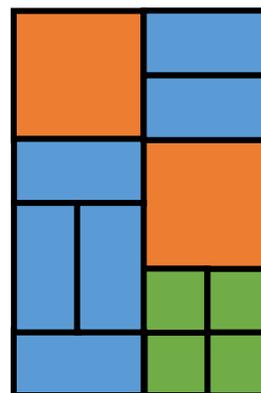
True



Estimate the area of each shape and then order from largest to smallest.

Answer:  $A = 3\text{cm} \times 7\text{cm} = 21\text{cm}^2$   
 $B = 8\text{cm} \times 8\text{cm} = 64\text{cm}^2$   
 $C = 3\text{cm} \times 19\text{cm} = 57\text{cm}^2$

Order: B, C, A



Each orange square has an area of  $24 \text{ cm}^2$ .  
 Calculate the total orange area.  
 Calculate the blue area.  
 Calculate the green area.  
 What is the total area of the whole shape?

Answer:  
 Orange =  $48 \text{ cm}^2$   
 Blue =  $72 \text{ cm}^2$   
 Green =  $24 \text{ cm}^2$   
 Total =  $144 \text{ cm}^2$

# Area of Compound Shapes

## Notes and Guidance

Children learn to calculate area of compound shapes. They need to be careful when splitting shapes up to make sure they know which lengths correspond to the whole shape, and which to the smaller shapes they have created. They will discover that the area remains the same no matter how you split up the shapes.

Children need to have experience of drawing their own shapes in this step.

## Mathematical Talk

What formula do we use to find the area of a rectangle?

Can you see any rectangles within the compound shapes?

How can we split the compound shape?

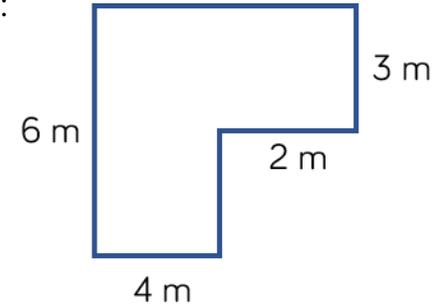
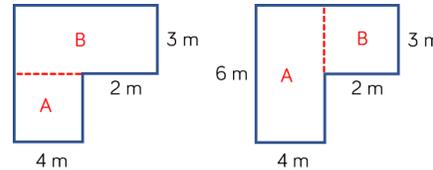
Is there more than one way?

Do we get a different answer if we split the shape differently?

## Varied Fluency

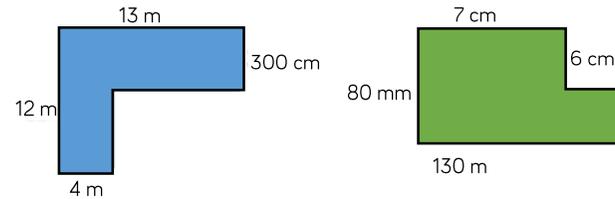
- Find the area of the compound shape: How many ways can we split the compound shape?

Is there more than one way?

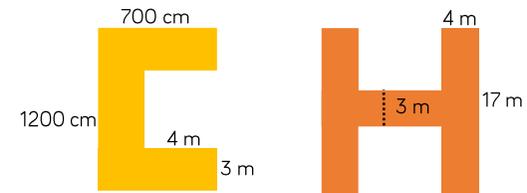


Could we multiply  $6\text{ m} \times 6\text{ m}$  and then subtract  $2\text{ m} \times 3\text{ m}$ ?

- Calculate the area.



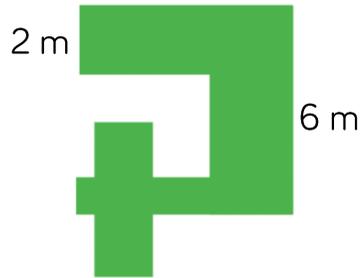
- Calculate the area of these symmetrical shapes.



# Area of Compound Shapes

## Reasoning and Problem Solving

How many different ways can you split this shape to find the area?



Add more values and work out the area.

Possible solution:

$$A = 2 \text{ m} \times 5 \text{ m} = 10 \text{ m}^2$$

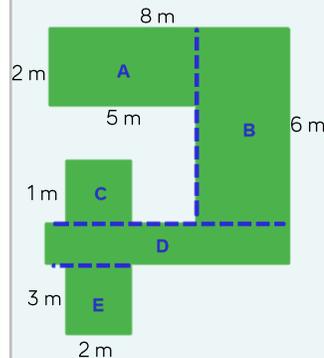
$$B = 6 \text{ m} \times 3 \text{ m} = 18 \text{ m}^2$$

$$C = 1 \text{ m} \times 2 \text{ m} = 2 \text{ m}^2$$

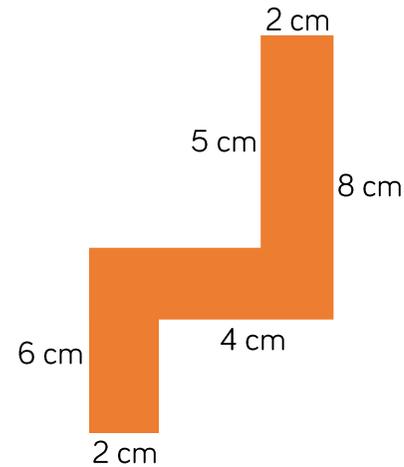
$$D = 1 \text{ m} \times 8 \text{ m} = 8 \text{ m}^2$$

$$E = 3 \text{ m} \times 2 \text{ m} = 6 \text{ m}^2$$

$$\text{Total area} = 36 \text{ m}^2$$



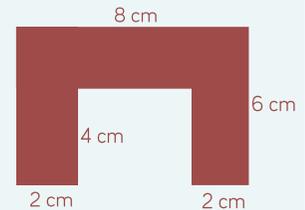
Jack says this shape has an area of  $34 \text{ cm}^2$ .



Show that Jack is correct.

Find three more possible compound shapes that have an area of  $34 \text{ cm}^2$ .

Possible solution:



# Area of Irregular Shapes

## Notes and Guidance

Children use their knowledge of counting squares to estimate the areas of shapes that are not rectilinear. They use their knowledge of fractions to estimate how much of a square is covered and combine different part-covered squares to give an overall approximate area.

Children need to physically annotate to avoid repetition when counting the squares.

## Mathematical Talk

How many whole squares can you see?

How many part squares can you see?

Can you find any part squares that you could be put together to make a full square?

What will we do with the parts?

What does approximate mean?

## Varied Fluency

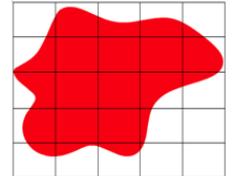
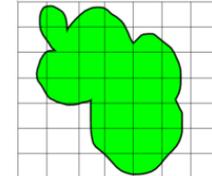
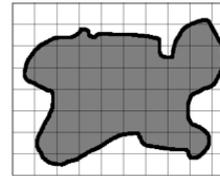
- Estimate the area of the pond.  
Each square = 1 m<sup>2</sup>



Ron's answer is 4 whole squares and 11 parts.  
Is this an acceptable answer?

What can we do with the parts to find an approximate answer?

- If all of the squares are 1 cm in length, which shape has the greatest area?

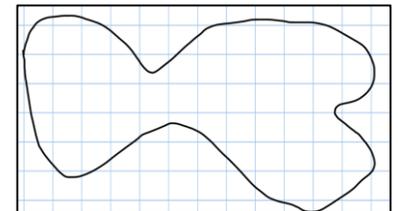


Is the red shape the greatest because it fills more squares?

Why or why not?

What is the same about each image? What is different about the images?

- Each square is \_\_\_ m<sup>2</sup>  
Work out the approximate area of the shape.



# Area of Irregular Shapes

## Reasoning and Problem Solving

Draw a circle on 1 cm<sup>2</sup> paper. What is the estimated area?  
 Can you draw a circle that has area approximately 20 cm<sup>2</sup>?



If each square represents 3 m<sup>2</sup>, what is the approximate area of:

- The lake
- The bunkers
- The fairway
- The rough
- Tree/forest area

Can you construct a 'Pirate Island' to be used as part of a treasure map for a new game? Each square represents 4 m<sup>2</sup>.

The island must include the following features and be of the given approximate measure:

- Circular Island 180 m<sup>2</sup>
- Oval Lake 58 m<sup>2</sup>
- Forests with a total area of 63 m<sup>2</sup> (can be split over more than one space)
- Beaches with a total area of 92 m<sup>2</sup> (can be split over more than one space)
- Mountains with a total area of 57 m<sup>2</sup>
- Rocky coastline with total area of 25 m<sup>2</sup>