

Years 5/6

Mixed Age Schemes of Learning

WhiteRoseMaths

Welcome

Welcome to the White Rose Maths' new, more detailed schemes of learning for 2017-18.

We have listened to your feedback and as a result of this, we have made some changes to the previous WRMH primary schemes. *We believe the new schemes are bigger, bolder and more detailed than before.*

White Rose Maths' new schemes still have the *same look and feel* as the old WRMH 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 hope we can help make a difference to maths education in this country. *We all believe that every child can succeed in mathematics.* Thank you to everyone who has contributed to our work. It is only with your help that we can make a difference.

We hope that you find the new schemes of learning helpful. As always, if you or your school want support with any aspect of teaching maths please do not hesitate to get in touch

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

White Rose Maths Team

#MathsEveryoneCan

What's New?

This release of our schemes includes

- New overviews, with subtle changes being made to the timings and the order of topics.
- New 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

Recognise Equal Groups Notes and Guidance

At this stage, children are describing equal groups using stem sentences to support them. It is important that children know which groups are equal and which are unequal. The addition or multiplication symbol is not used within this small step but this language will support them in understanding repeated addition and multiplication. The examples included, refer to the multiplication facts Y2 children need to know.

Mathematical Talk

Varied Fluency

1 Are these equal groups? How do you know?



2 Complete the stem sentence



Improved ordering and timing

	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 (within 10)				Number: Addition and Subtraction (within 10)				Geometry: Shape	Number: Place Value (within 20)		Consolidation
Spring	Number: Addition and Subtraction (within 20)				Number: Place Value (within 50) (Multiples of 2, 5 and 10 to be included)			Measurement: Length and Height		Measurement: Weight and Volume		
Summer	Number: Multiplication and Division (Reinforce multiples of 2, 5 and 10)			Number: Addition and Subtraction (within 10)		Measurement: Length and Height		Measurement: Weight and Volume				

Small Steps Guidance

Overview Small Steps

- Sort objects
- Count objects
- Represent objects
- Count, read and write forwards from any number 0 to 10
- Count, read and write backwards from any number 0 to 10
- Count one more
- Count one less
- One to one correspondence to start to compare groups
- Compare groups using language such as equal, more/greater, less/fewer
- Introduce =, > and < symbols
- Compare numbers
- Order groups of objects
- Order numbers
- Ordinal numbers (1st, 2nd, 3rd ...)
- The number line

NC Objectives

Count to ten, forwards and backwards, beginning with 0 or 1, or from any given number.

Count, read and write numbers to 10 in numerals and words.

Given a number, identify one more or one less.

Identify and represent numbers using objects and pictorial representations including the number line, and use the language of: equal to, more than, less than (fewer), most, least.

Meet the Team

The schemes have been put together by a wide group of passionate and enthusiastic classroom practitioners. The development of the schemes has been led by the following people who work across Trinity MAT.



Kelsey Brown



Beth Smith



Caroline Hamilton



Stephen Monaghan



Julie Matthews



Jenny Lewis

Special Thanks

The WRM Team would like to say a huge thank you to the following people who came from all over the country to contribute their ideas and experience. We could not have done it without you.

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How to use the Small Steps

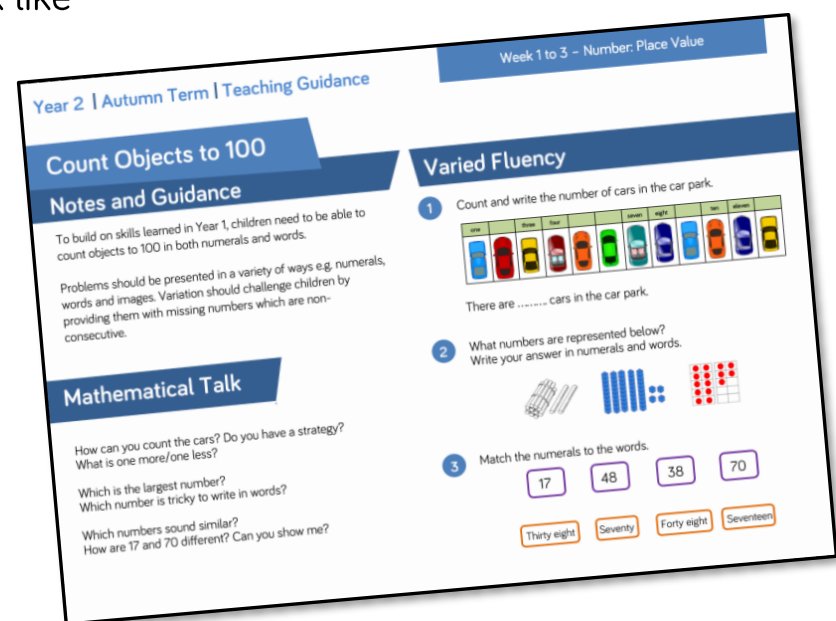
We are regularly asked how it is possible to spend so long on particular blocks of content and National Curriculum objectives. We know that breaking the curriculum down into small manageable steps should help children understand concepts better. Too often, we have noticed that teachers will try and cover 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



Assessments

Alongside these overviews, our aim is to provide an assessment for each term's plan. Each assessment will be made up of two parts:

Part 1: Fluency based arithmetic practice

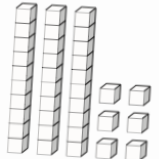
Part 2: Reasoning and problem solving based questions

Teachers can use these assessments to determine gaps in children's knowledge and use them to plan support and intervention strategies.

The assessments have been designed with new KS1 and KS2 SATs in mind. **New assessments will be released over the course of next year.**

For each assessment we will aim to provide a summary spreadsheet so that schools can analyse their own data. We hope to work with Mathematics Mastery to allow schools to make comparisons against other schools. Keep a look out for information next year.


16 Here are some cubes.



2 boys receive 8 cubes each.
The rest of the cubes are shared equally between 4 girls.
How many cubes does each girl receive?

Show your method

12 Marla spends $\frac{2}{7}$ of her weekly wage on a £120 bag.



How much does she earn in a week?

Show your method

2 marks

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

As an organisation 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.

We have produced a CPD unit for teachers in schools;

<https://www.tes.com/teaching-resource/the-importance-of-concrete-professional-development-11476476>

Additional Materials

In addition to our schemes and assessments there are a range of other materials that you may find useful.

KS1 and KS2 Problem Solving Questions

For the last two years WRMH have provided a range of KS1 and KS2 problem solving questions in the run up to SATs. There are over 150 questions on a variety of different topics and year groups.

Other schemes of learning

As well as having schemes for Y1-Y6 we developed a range of other schemes of learning


- Schemes for reception
- Mixed aged schemes
- Year 7 – 9 schemes for secondary

Calculation policy/guidance

We also have our calculation policy for the four operations. This can be found on our TES page.

Shopping and Baking

1 These items are sold in a shop.



Ray buys three items.
Two of them were the same item.
He spent £23
Which items does he buy?


2 Erik bakes 5 trays of muffins.
Each tray contains 6 muffins.




He sells 16 muffins and eats 5
How many muffins does he have left?

MathsHUBS
White Rose

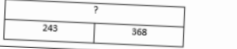
Use of place value counters to add HTO + TO, HTO + HTO etc. once the children have had practice with this, they should be able to apply it to larger numbers and the abstract



Children to represent the counters e.g. like the image below

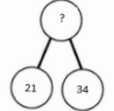


If the children are completing a word problem, draw a bar model to represent what it's asking them to do



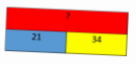
243
+368
611
1 1

Fluency variation, different ways to ask children to solve 21+34:



Sam saved £21 one week and £34 another. How much did he save in total?

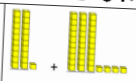
21+34=55. Prove it! (reasoning but the children need to be fluent in representing this)



21
+34
—
21 + 34 =
= 21 + 34

What's the sum of twenty one and thirty four?

Always use missing digit problems too:



What's the sum of twenty one and thirty four?

Our Partnerships

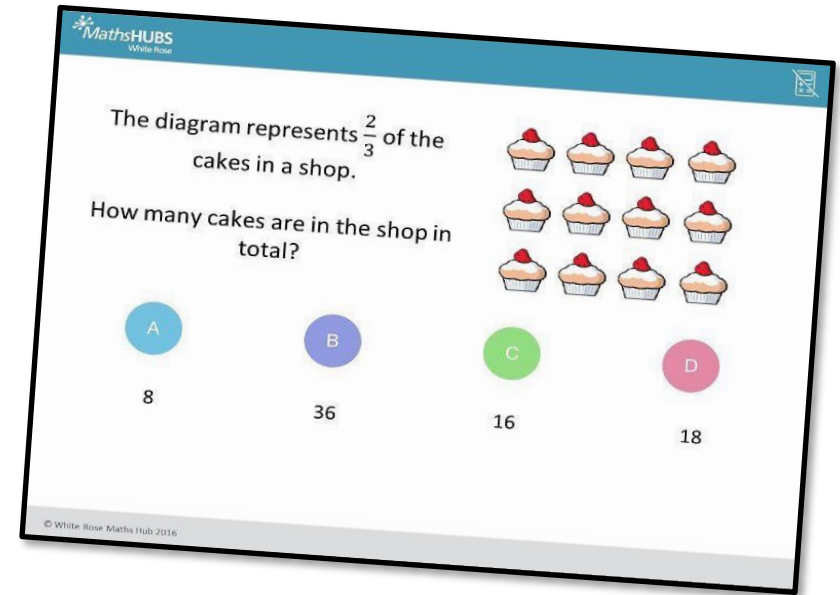
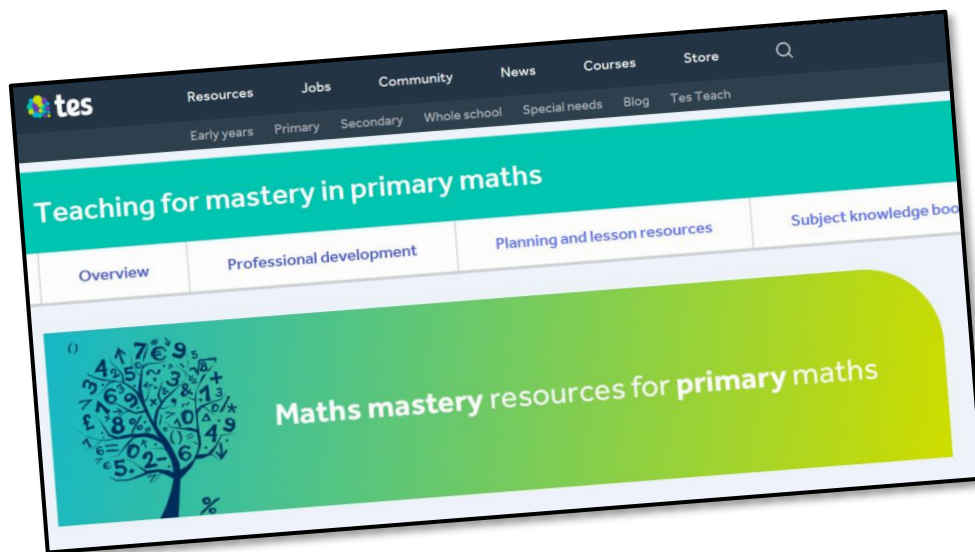
tes

www.tes.com



Over the last 12 months we have developed a partnership with tes. Working with Mathematics Mastery we have created a detailed breakdown of the National Curriculum. Watch this space for exciting developments.

<https://www.tes.com/teaching-resources/teaching-for-mastery-in-primary-maths>



Diagnostic Questions

www.diagnosticquestions.co.uk



From September 2017, we have written two sets of questions for every National Curriculum objective from Y1 to Y6. These are hosted free of charge on @mrbartonmaths Diagnostic Questions website.

Training

White Rose Maths offers paid for training to schools regionally, nationally and internationally. Over the last year we have delivered training to over 150 schools and have had over 1,000 people attend our face to face training.

As part of our 'Jigsaw' package we offer the following twilight courses:

- CPA
- Bar Modelling
- Reasoning and Problem Solving
- Mathematical Talk and Questioning
- Variation and Depth

If you would like any more information about our courses then email the team.

License Partners

We also work with a growing number of Teaching Schools around the country to deliver our training. All of our providers have been specially selected and they are as passionate about improving maths education as we are. All our providers offer our twilight bar modelling training course. If you want to see who your local provider is or would like to become a license partner then please get in touch.



Bar Modelling Deeper Learning Event

FAQs

We have bought one of the new textbook schemes, can we still use these curriculum plans?

Many schools are starting to make use of mastery textbooks used in places like Singapore and China. The schemes have been designed to work alongside these textbooks. We recommend that you follow the textbook order and use our materials for additional support and guidance.

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.

Will you be providing grade boundaries for your assessments?

No, we will not be releasing guidance on grade boundaries. We suggest the assessments are used to find out what children can and cannot do, which will help inform future planning.

FAQs continued ...

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.

What is same day intervention?

A growing number of schools are doing different types of same day intervention. Some schools are splitting a lesson into two parts and other schools are working with small groups of students at other times during the day. The common goal is to keep up, rather than catch up.

#MathsEveryoneCan

At White Rose Maths we believe that everyone can succeed in Maths. We encourage anyone who uses our schemes to share in this belief and do all that they can to convince the children they teach that this is the case.

How do I reinforce what children already know if I don't teach the topic again?

The scheme has been designed to give sufficient time for teachers to explore concepts in depth, rather than covering it superficially and then coming back to it several times.

We understand though that schools will rightly want to ensure that students revisit concepts and ensure fluency in number.

The schemes interleave prior content in new concepts. For example 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 throughout the year. This could be done as mental and oral starters or in additional maths time during the day.

Year 5/6 – Yearly Overview

	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		Number – Multiplication and Division			Statistics		Measurement: Perimeter, Area and Volume	
Spring	Number – Fractions					Number- Decimals and Percentages				Year 5: Multiplication and Division Year 6: Algebra and Ratio		
Summer	Measurement: Converting Units		Geometry: Position and Direction	Geometry: Properties of Shape			Investigations					Consolidation

Year 5/6 – Autumn Term

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
<u>Number – Place Value</u> Read, write, order and compare numbers to at least 1000000 and determine the value of each digit. Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit. Count forwards or backwards in steps of powers of 10 for any given number up to 1000000. Interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers including through zero. Use negative numbers in context, and calculate intervals across zero. Round any number up to 1000000 to the nearest 10, 100, 1000, 10000 and 100000 Round any whole number to a required degree of accuracy. Solve number problems and practical problems that involve all of the above. Solve number and practical problems that involve all of the above. Read Roman numerals to 1000 (M) and recognise years written in Roman numerals.			<u>Number- Addition and Subtraction</u> Add and subtract numbers mentally with increasingly large numbers. Perform mental calculations, including with mixed operations and 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. Use estimation to check answers to calculations and determine in the context of a problem, an appropriate degree of accuracy. Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why. Solve addition and subtraction multi step problems in contexts, deciding which operations and methods to use and why.		<u>Number – multiplication and division</u> Multiply and divide numbers mentally drawing upon known facts. Multiply and divide whole numbers by 10, 100 and 1000. Identify multiples and factors, including finding all factor pairs of a number, and common factors of two numbers. Identify common factors, common multiples and prime numbers. Multiply numbers up to 4 digits by a one or two digit number using a formal written method, including long multiplication for 2 digit numbers. Multiply multi-digit number up to 4 digits by a 2-digit number using the formal written method of long multiplication. Divide numbers up to 4 digits by a one digit number using the formal written method of short division and interpret remainders appropriately for the context. Divide numbers up to 4 digits by a 2-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions, or by rounding as appropriate for the context. Divide numbers up to 4 digits by a 2-digit number using the formal written method of short division, interpreting remainders according to the context. Use their knowledge of the order of operations to carry out calculations involving the four operations. Solve problems involving addition and subtraction, multiplication and division and a combination of these, including understanding the use of the equals sign Solve problems involving addition, subtraction, multiplication and division.			<u>Statistics</u> Solve comparison, sum and difference problems using information presented in a line graph. Interpret and construct pie charts and line graphs and use these to solve problems. Complete, read and interpret information in tables including timetables. Illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius. Calculate the mean as an average.		<u>Measurement: Perimeter, Area and Volume</u> 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, cm^2 , m^2 estimate the area of irregular shapes. Recognise that shapes with the same areas can have different perimeters and vice versa. Recognise when it is possible to use formulae for area and volume of shapes. Calculate the area of parallelograms and triangles. Estimate volume [for example using 1cm^3 blocks to build cuboids (including cubes)] and capacity [for example, using water] Calculate, estimate and compare volume of cubes and cuboids using standard units, including cm^3, m^3 and extending to other units (mm^3, km^3)	

Year 5/6 – Spring Term












Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
<p>Number: Fractions Compare and order fractions whose denominators are multiples of the same number.</p> <p>Compare and order fractions, including fractions > 1</p> <p>Identify, name and write equivalent fractions of a given fraction, represented visually including tenths and hundredths.</p> <p>Use common factors to simplify fractions; use common multiples to express fractions in the same denomination.</p> <p>Recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements >1 as a mixed number [for example $\frac{2}{5} + \frac{4}{5} = \frac{6}{5} = 1\frac{1}{5}$]</p> <p>Add and subtract fractions with the same denominator and denominators that are multiples of the same number.</p> <p>Add and subtract fractions with different denominations and mixed numbers, using the concept of equivalent fractions.</p> <p>Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams.</p> <p>Multiply simple pairs of proper fractions, writing the answer in its simplest form [for example $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$]</p> <p>Divide proper fractions by whole numbers [for example $\frac{1}{3} \div 2 = \frac{1}{6}$]</p> <p>Read and write decimal numbers as fractions [for example $0.71 = \frac{71}{100}$]</p> <p>Associate a fraction with division and calculate decimal fraction equivalents [for example, 0.375] for a simple fraction [for example $\frac{3}{8}$]</p> <p>Solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates.</p>					<p>Number: Decimals and Percentages Read, write, order and compare numbers with up to three decimal places.</p> <p>Recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents.</p> <p>Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000.</p> <p>Identify the value of each digit in numbers given to 3 decimal places and multiply numbers by 10, 100 and 1,000 giving answers up to 3 decimal places.</p> <p>Round decimals with two decimal places to the nearest whole number and to one decimal place.</p> <p>Solve problems which require answers to be rounded to specified degrees of accuracy.</p> <p>Solve problems involving number up to three decimal places.</p> <p>Multiply one-digit numbers with up to 2 decimal places by whole numbers.</p> <p>Use written division methods in cases where the answer has up to 2 decimal places.</p> <p>Recognise the per cent symbol (%) and understand that per cent relates to ‘number of parts per hundred’, and write percentages as a fraction with denominator 100, and as a decimal.</p> <p>Solve problems which require knowing percentage and decimal equivalents of $\frac{1}{2}, \frac{1}{4}, \frac{1}{5}, \frac{2}{5}, \frac{4}{5}$ and those fractions with a denominator of a multiple of 10 or 25.</p> <p>Solve problems involving the calculation of percentages [for example, of measures and such as 15% of 360] and the use of percentages for comparison.</p> <p>Recall and use equivalences between simple fractions, decimals and percentages, including in different contexts.</p>					<p>Year 5 – Multiplication and Division and RECAP Recognise and use square numbers and cube numbers and the notation for squared (²) and cubed (³)</p> <p>Know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers</p> <p>Establish whether a number up to 100 is prime and recall prime numbers up to 19</p> <p>Solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes.</p> <p>Year 6: Algebra and Ratio Use simple formulae</p> <p>Generate and describe linear number sequences.</p> <p>Express missing number problems algebraically.</p> <p>Find pairs of numbers that satisfy an equation with two unknowns.</p> <p>Enumerate possibilities of combinations of two variables.</p> <p>Solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts.</p> <p>Solve problems involving similar shapes where the scale factor is known or can be found.</p> <p>Solve problems involving unequal sharing and grouping using knowledge of fractions and multiples</p>	

Year 5/6 – Summer Term

Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12			
<p>Measurement- converting units Convert between different units of metric measure [for example, km and m; cm and m; cm and mm; g and kg; l and ml] Use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to 3dp.</p> <p>Understand and use approximate equivalences between metric units and common imperial units such as inches, pounds and pints. Convert between miles and kilometres.</p> <p>Solve problems involving converting between units of time. Use all four operations to solve problems involving measure [for example, length, mass, volume, money] using decimal notation, including scaling. Solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate.</p>		<p>Geometry- <u>position and direction</u> Identify, describe and represent the position of a shape following a reflection or translation, using the appropriate language, and know that the shape has not changed.</p> <p>Describe positions on the full coordinate grid (all four quadrants).</p> <p>Draw and translate simple shapes on the coordinate plane, and reflect them in the axes.</p>	<p>Geometry- Properties of Shapes and Angles Identify 3D shapes, including cubes and other cuboids, from 2D representations.</p> <p>Use the properties of rectangles to deduce related facts and find missing lengths and angles.</p> <p>Distinguish between regular and irregular polygons based on reasoning about equal sides and angles. Compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals and regular polygons.</p> <p>Know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles.</p> <p>Draw given angles, and measure them in degrees (°) Draw 2-D shapes using given dimensions and angles.</p> <p>Identify: angles at a point and one whole turn (total 360°), angles at a point on a straight line and ½ a turn (total 180°) other multiples of 90° Recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles.</p>						<h1>Investigations</h1>					

Overview

Small Steps

Year 5		Year 6		
	Roman Numerals to 1,000			Roman Numerals
	Number to 10,000	Numbers to ten million		Representing Numbers
	Number to 100,000			
	Numbers to a million			
	Counting in 10s, 100s, 1000s, 10,000s and 100,000s			Counting and Multiples
	Compare and order numbers to 100,000	Compare and order any number		Compare and Order
	Compare and order numbers to a million			
	Round to nearest 10, 100 and 1,000	Round any numbers		Rounding
	Round numbers within 100,000			
	Round numbers to a million			
	Negative numbers	Negative numbers		Negative Numbers

Roman Numerals

Notes and Guidance

Building on their Y4 knowledge of Roman Numerals to 100, children explore Roman Numerals to 1,000. They explore what is the same and what is different between the number systems, for example there is no zero.

Teachers could introduce writing the date in Roman Numerals to revise the concept on a daily basis.

Mathematical Talk

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

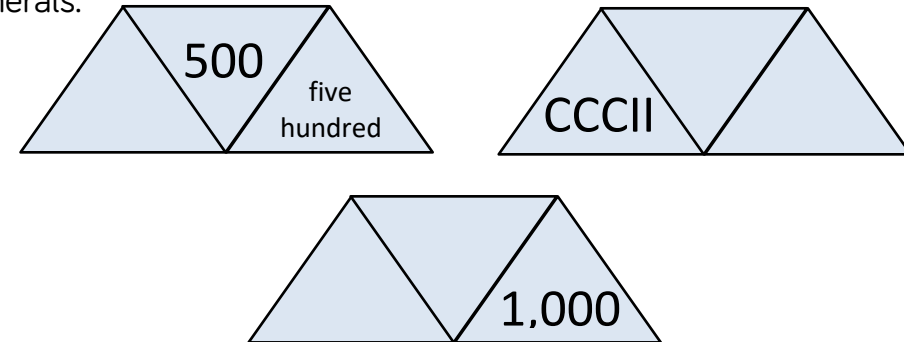
Do you notice any patterns? Look at 30 and 300.

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

Varied Fluency

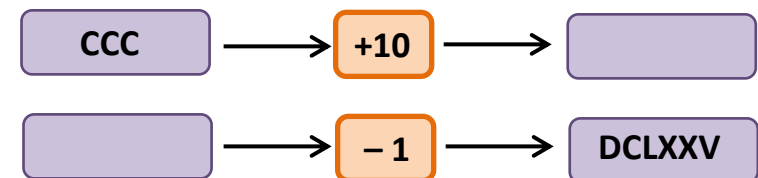
- 1 Lollipop stick activity.
The teacher shouts out a number and the children make it with lollipop sticks.
Children could also do this in pairs or groups, and for a bit of fun they could test the teacher!

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



Complete the diagrams.

- 3 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:

$$\text{CD} + \text{C} = \text{D}$$

$$\text{M} \div \text{II} = \text{D}$$

$$\text{C} + \text{CC} + \text{CC} = \text{D}$$

$$\text{C} \times \text{V} = \text{D}$$

Here is part of a Roman Numeral hundred square.

Complete the missing values.

XLIV	XLV		XLVII
		LVI	LVII
LXIV		LXVI	LXVII

What patterns do you notice?

XLIV	XLV	XLVI	XLVII
LIV	LV	LVI	LVII
LXIV	LXV	LXVI	LXVII

Numbers to 10,000

Notes and Guidance

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

Within this step, ensure children revise adding and subtracting 10, 100 and 1,000, and discuss what is happening to the place value columns.

Mathematical Talk

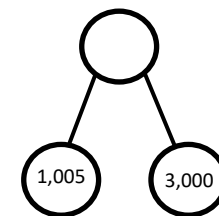
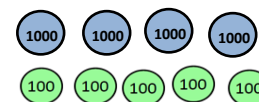
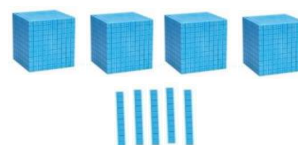
Show me 8,045 in three different ways.

Do you prefer to use concrete objects or draw an image pictorially? Why?

Make 1,500 and explain why you chose to make it this way (use this to see what concrete objects children choose to use).

Varied Fluency

1 Match the diagram to the number.

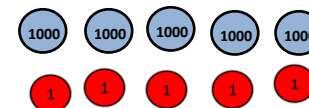
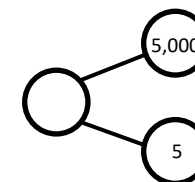
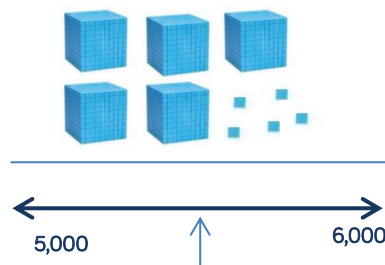


4,005

4,500

4,050

2 Which diagram is the odd one out?



3 Complete the table.

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

Numbers to 10,000

Reasoning and Problem Solving

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

She has changed each number into a letter.

Her numbers are:

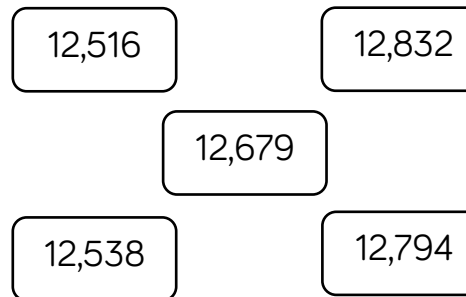
- 1) aabdc
- 2) acdbc
- 3) dcaba
- 4) cdadc
- 5) bdaab

Here are three clues to work out her numbers:

- Number 1 is the greatest number.
- The digits in number 4 total 12
- Number 3 is the smallest number.

- 1) 44,213
- 2) 43,123
- 3) 13,424
- 4) 31,413
- 5) 21,442

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



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.

Numbers to Ten Million

Notes and Guidance

Children need to read, write and represent numbers to ten million in different ways.

Numbers do not always have to be in the millions – children need to see a mixture of smaller and larger numbers.

Mathematical Talk

What does a zero in a number represent?

What strategy do you use to work out the divisions on a number line?

How many ways can you complete the partitioned number?

Varied Fluency

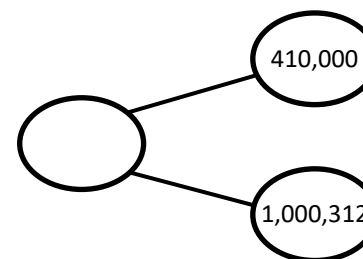
- 1 Match the representation to the numbers in digits.

One million, four hundred
and one thousand, three
hundred and twelve

1,041,312

M	HTh	TTh	Th	H	T	O
●		●● ●●	●	●● ●●	●	●● ●●

1,410,312



1,401,312

- 2 Complete the missing numbers.

$$6,305,400 = \underline{\hspace{2cm}} + 300,000 + \underline{\hspace{2cm}} + 400$$

$$7,001,001 = 7,000,000 + \underline{\hspace{2cm}} + \underline{\hspace{2cm}}$$

$$42,550 = \underline{\hspace{2cm}} + \underline{\hspace{2cm}} + \underline{\hspace{2cm}}$$

- 3 Husna's number is 306,042

She adds 5,000 to her number.

What is her new number?

Numbers to Ten Million

Reasoning and Problem Solving

Put a digit in the missing space below to make the sentence correct.

$$4,62_645 < 4,623,64_$$

Is there more than one option?
Can you find them all?

1st digit could be 0, 1, 2
2nd digit could be 6, 7, 8, 9
When 1st digit is 3, 2nd digit must be 6 or above
When 2nd digit is 5, 1st digit must be 0, 1 or 2

Miley has this number:

824,650

She takes forty thousand away.

Her answer is 820,650

Is this correct?

Explain how you know.

No, this is incorrect.
Miley has taken away 4,000 not 40,000
The number should be 784,650

Use the digit cards and statements to work out my number.

0 3 3 5 5 6 7

- The ten thousands and hundreds have the same digit.
- The hundred thousand digit is double the tens digit.
- It is a six-digit number.
- It is less than six hundred and fifty five thousand.

Is this the only option?

Possible options

653,537
650,537
650,533

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

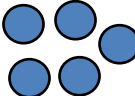

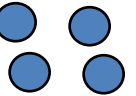
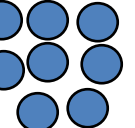
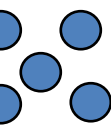
How can we estimate a number on a number line if there are no divisions?

How many digits change when you add 10, 100 or 1000?

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

Varied Fluency

- 1 A number is shown in the place value chart.

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

Write the number in figures and in words.

- Ashy adds 10 to this number
- Zack adds 100 to this number
- Isobel adds 1,000 to this number

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

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

Counters	Part whole model
Bar model	Number line

65,048

- 3 Complete the missing numbers.

$$59,000 = 50,000 + \dots\dots\dots$$

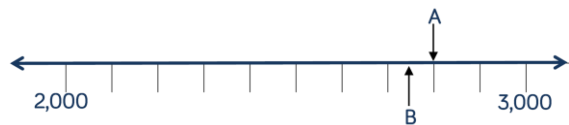
$$\dots\dots\dots = 30,000 + 1,700 + 230$$

$$75,480 = \dots\dots\dots + 300 + \dots\dots\dots$$

Numbers to 100,000

Reasoning and Problem Solving

Here is a number line.



What is the value of A?

$$A = 2,800$$

B is 40 less than A.

What is the value of B?

$$B = 2,760$$

C is 500 less than B.

Add C to the number line.



Here are three ways of partitioning 27,650

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

Write three more ways

Possible answers:
27 thousands, 6
hundreds and 5 tens

27 thousands, 7
thousands and 650
ones

20 thousands, 7
thousands and 650
ones

Jennie counts forwards and backwards in 10s from 317

Circle the numbers Jennie will count.

427

997

507

1,666

3,210

5,627

-23

7

-3

Explain why Jennie will not say the other numbers.

427
997
5,627
7
-3
-23

Any positive number will
always have to end in a
7

Any negative number
will always have to end
in a 3

Numbers to a Million

Notes and Guidance

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

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 in three different ways.

Where do the commas go in the numbers?

How else can the numbers be represented?

Varied Fluency

1

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

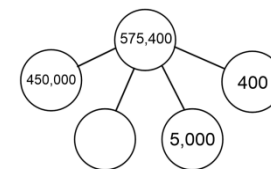
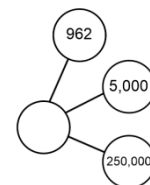
Use counters to make these numbers on the place value chart.

- 32,651
- 456,301
- 50,030

Can you say the numbers out loud?

2

Complete the part whole diagrams.



3

Katya has the following number.

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

She adds 4 counters to the hundreds column.
What is her new number?

Numbers to a Million

Reasoning and Problem Solving

Show the value of the digit 7 in each of these numbers.

407,338

7,100,491

25,571

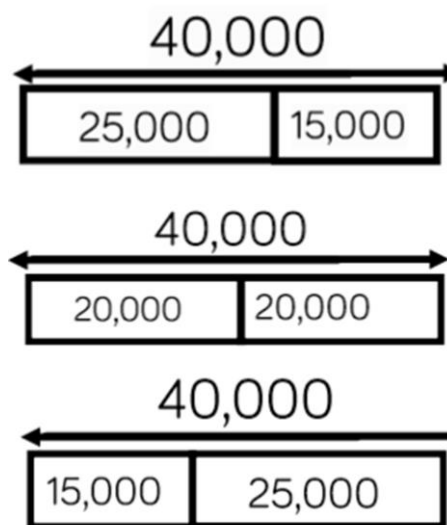
Explain how you know.

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

7,100,491: the value is 7 million. It is a 7-digit number and it is on the far left. This is where the millions column is.

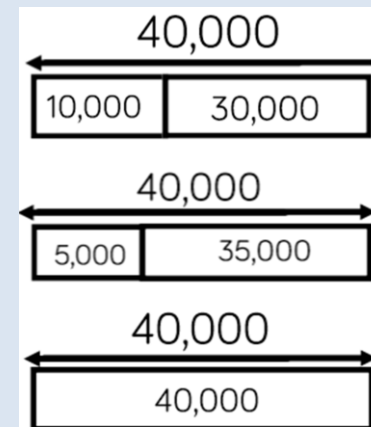
25,571; the value is 7 tens. It is second from the right, next to the ones column.

The bar models are showing a pattern.



Draw the next three.

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



Count in Powers of 10

Notes and Guidance

Children complete number sequences and can describe the term to term rule in a sequence e.g. add ten each time.

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

Mathematical Talk

What happens to the pattern when you move into negative?

What do you notice to the pattern when you compare sequences in 10's, 100's 1000's etc?

Can you create a rule for the sequence?

Varied Fluency

- 1 Complete the sequence.

.....,, 2,, 22,, 32,,, 62

The rule for this sequence is:

- 2 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....

- 3 Here is a Gattegno chart showing 32, 450

1	2	3	4	5	6	7	8	9	Cards	
10	20	30	40	50	60	70	80	90	+10	-10
100	200	300	400	500	600	700	800	900	+100	-100
1000	2000	3000	4000	5000	6000	7000	8000	9000	+1,000	-1,000
10000	20000	30000	40000	50000	60000	70000	80000	90000	+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 Gattegno chart.

Count in Powers of 10

Reasoning and Problem Solving

Daniel writes the first five numbers of a sequence.

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

The 10th term will be
15,332 because I will
double the 5th term.

Daniel



The answer would be
12,666 because it is
adding 1,000 each
time.
He should have added
5,000 not double the
5th term.

Is he correct?
Explain why.

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



Max

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



Ella

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



Henry

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

One person has made a mistake.

Identify who has made the mistake and
explain how you know.

Compare and Order

Notes and Guidance

Building on their learning from Year 4 children will compare and order numbers up to 100,000

Children should be able to do this with numbers presented in a variety of ways.

Mathematical Talk

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

What is the value of each digit?

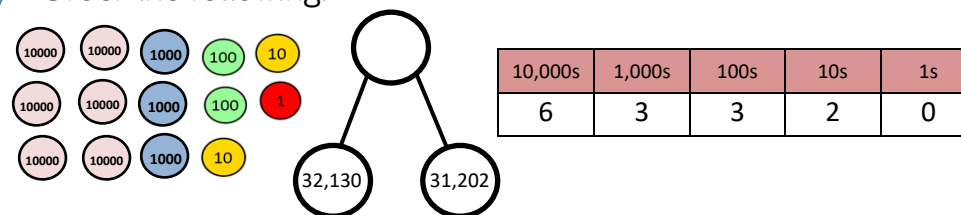
What is the value of in this number?

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

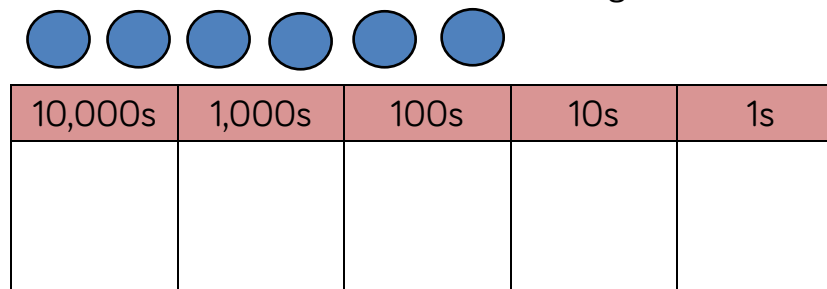
1 Order the following.



2 Add the symbols $<$, $>$ and $=$ to make the statements correct.



3 Use 6 counters to make **five** different 6 digit numbers.



Order your numbers from greatest to smallest.

Compare and Order

Reasoning and Problem Solving

Turn over digit cards 0-9 and select five.

Make the greatest number possible and the smallest number possible.

How do you know this is the greatest or smallest?

Totally dependent on what cards are chosen
e.g. 4, 9, 1, 3, 2

Smallest: 12,349
Greatest: 94,321

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

- The digit in the hundreds column and ones column has 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:

81,604
41,608
58,321
18,325

Compare and Order

Notes and Guidance

Children will compare and order numbers up to ten million using numbers presented in different formats.

Children will use greater than and less than vocabulary, and the inequality symbols.

Mathematical Talk

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

- Complete the statements to make them true.

M	HTh	TTh	Th	H	T	O
●●	●	●	●	●●	●	●

○

M	HTh	TTh	Th	H	T	O
●●	●	●	●	●●	●	●

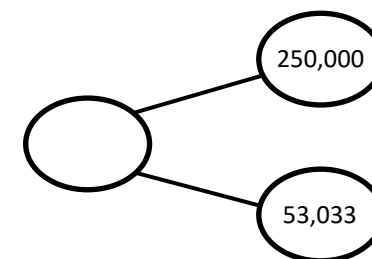
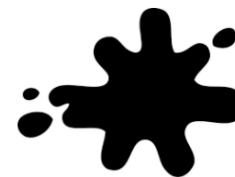
M	HTh	TTh	Th	H	T	O
●		●●●	●	●	●●	●

>

M	HTh	TTh	Th	H	T	O

- What number could the splat be covering?

Three hundred
and thirteen
thousand and
thirty three



Greatest → Smallest

- A house costs £250,000.
A motorised home costs £100,000.
A bungalow is priced half way between the two.
Work out the price of the bungalow.

Compare and Order

Reasoning and Problem Solving

Lola has ordered eight 6-digit numbers.

The smallest number is 345,900

The greatest number is 347,000

All the other numbers have digit totals of 20 and have no repeating digits.

What are the other six numbers?

Can you order all eight numbers from smallest to greatest?

The other six numbers have to have a digit total of 20 so they all must be larger than 346,000 because anything between 345,900 and 346,000 has a larger digit total.

The final three digits have to add up to 7 as $3 + 4 + 6 = 13$

As the number has no repeating digits, the other six numbers have to be:

346, 025

346, 052

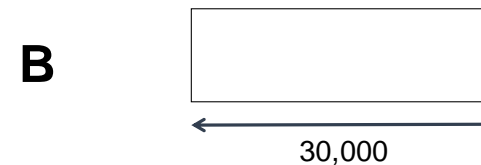
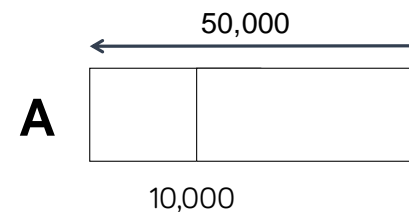
346, 205

346, 250

346, 502

346, 520

Kayleigh draws bar model A. Her teacher asks her to draw another where the total is 30,000



Explain how you know bar B is inaccurate.

Bar B is inaccurate because it starts after 10,000 and finishes after 50,000. Therefore it is longer than 40,000. $30,000 < 40,000$

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

In order to compare what do we need to know?

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?

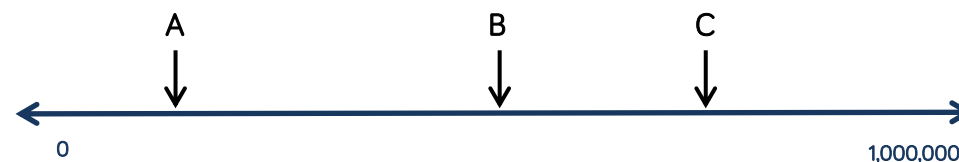
Can you write a story to support your part whole model?

Varied Fluency

- Put the number cards in order of size.

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

- Estimate the value 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

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

The population of Halifax is than the population of Wakefield.
Double the population of Brighouse is than the population of Halifax.

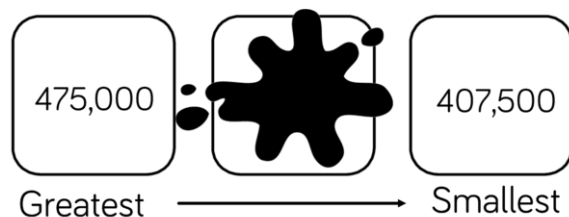
Compare and Order

Reasoning and Problem Solving

The number covered by the splat is an odd number.

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

The sum of the digits is 23



What could the number be?

Can you find three possibilities?

Possible answers:

444,812

435,812

439,502

Here are four number cards.

42,350	43,385
56,995	56,963

Four children take one each and say a clue.

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



Max



Ella

My number has exactly three hundreds in it



Henry

My number is 44,000 when rounded to the nearest thousand



Kyra

My number is exactly 100 less than 57,043

Which card did each child have?

Max: 56,995

Ella: 42,350

Henry: 43,385

Kyra: 56,963

Round to 10, 100, 1,000

Notes and Guidance

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

They need to understand that the column from the question and the column to the right of it are used e.g. round 1,450 to the nearest hundred – look at the hundred and tens column.

Mathematical Talk

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

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

Can you give an example of this?


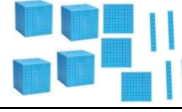
Can you justify your reasoning?

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

1 Complete the table.

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

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

300

10,000




8,900

3 Complete the table.

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

Round to 10, 100, 1,000

Reasoning and Problem Solving

<p>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</p> <p>What could Nathan's number be?</p> <p>Can you find all of the possibilities?</p>	<p>Nathan</p>  <p>1,150 1,151 1,152 1,153 1,154</p>
<p>2,567 to the nearest 100 is 2,500</p> <p>Do you agree with Alya?</p> <p>Explain why.</p> <hr/> <p>Regan</p>  <p>4,725 to the nearest 1,000 is 5,025</p> <p>Explain the mistake Regan has made.</p>	<p>Alya</p>  <p>I do not agree with Alya because 2,567 rounded to the nearest 100 is 2,600 I know this because the rule of a tens ending in 5, 6, 7, 8 and 9 round up.</p> <p>Regan has correctly changed four thousand to five thousand but has added the tens and ones back on. When rounded to the nearest thousand, the hundreds, tens and ones will be zeros.</p>

Rounding Numbers

Notes and Guidance

Children build on previous work on rounding. They need to experience rounding up to and within ten million.

Children use their knowledge of multiples to work out which two numbers the number they are rounding sits between.

Mathematical Talk

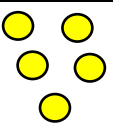
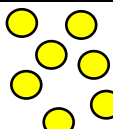
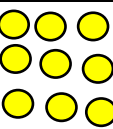
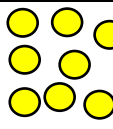
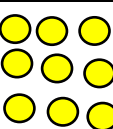
What are the 'rules' we use when rounding?

Which place value column do we need to look at when we round the nearest 100,000?

When is it best to round to 1,000? 10,000?
Can you justify your reasoning?

Varied Fluency

1

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

Round the number in the place value chart to:

- The nearest 10,000
- The nearest 100,000
- The nearest 1,000,000

2

Write five numbers that round to the following numbers when rounding to the nearest hundred thousand.

- 200,000
- 600,000
- 1,900,000

3

Complete the missing digits so that each number rounds to one hundred and thirty thousand when rounded to the nearest ten thousand.

12 , 6571 1, 99913 , 001

Rounding Numbers

Reasoning and Problem Solving



Ed

My number is 1,350
when rounded to
the nearest 10

The greatest possible
difference is 104
because:

$$1,449 - 1,345 = 104$$

My number is 1,400
when rounded to
the nearest 100



Joe

Both numbers are whole numbers.

What is the greatest possible difference
between the two numbers?

Kiera rounded 2,215,678 to the nearest
million and wrote 2,215,000

Can you explain to Kiera what mistake
she has made and why she has done it?

-

She has rounded it to
the nearest million
correctly. However,
digits in the other
columns should all be
zero.

Miss Grogan gives out the following
four cards: 15,987, 15,813, 15,101, 16,101

Four children each take a card and give
a clue to what their number is:

Marc says, "My number rounds to
16,000 when rounded to the nearest
1,000"

Daryl says, "My number has one
hundred."

Tom says, "My number is 15,990 when
rounded to the nearest 10"

Adam says, "My number is 15,000
rounded to the nearest 1,000"

Can you work out which child has which
card?

Explain your choices.

Tom has 15,987
Marc has 15,813
Adam has 15,101
Daryl has 16,101

Round within 100,000

Notes and Guidance

Children continue with work on rounding, now using numbers up to 100,000. They round to the nearest 10, 100, 1,000 and 10,000.

Children use their knowledge of multiples to work out which two numbers the number they are rounding sits between.

Mathematical Talk

Which place value column do we need to look at when we round the nearest 1000?

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

1 Round 85,617

- To the nearest 10
- To the nearest 100
- To the nearest 1,000
- To the nearest 10,000

2 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	

3 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 would 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 five-digit numbers have a difference of 5

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 two where the last three digits are between 495 and 504 e.g. 52,498 and 52,503

Round within a Million

Notes and Guidance

Children use up to 6 digit numbers to recap previous rounding, and learn the new skill of rounding to nearest 100,000.

They look at cases when rounding a number for a purpose, and in certain contexts, goes against the general rules of rounding.

Mathematical Talk

How many digits does a million have?

Partition these numbers. Show me.

Which digits do you need to look at when rounding to the nearest 10? 100? 1000? 10,000? 100,000?

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

Varied Fluency

- 1 Round these populations to the nearest 100,000

City	Population	Rounded to the nearest 100,000
Leeds	720,492	
Durham	87,599	
Sheffield	512,827	
Birmingham	992,000	

- 2 Round 450,985 to the nearest

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

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

How many batches should the organisers buy?
Explain why this goes against the rounding rule.

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?

The difference between A and B rounded to the nearest 100 is 700

The difference between B and C rounded to the nearest 100 is 400

A, B and C are not multiples of 10

What could A, B and C be?

A – B = in the range of and including 650 – 749

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

Possible answer:

A = 1,240
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, and be able to count back through zero.

Mathematical Talk

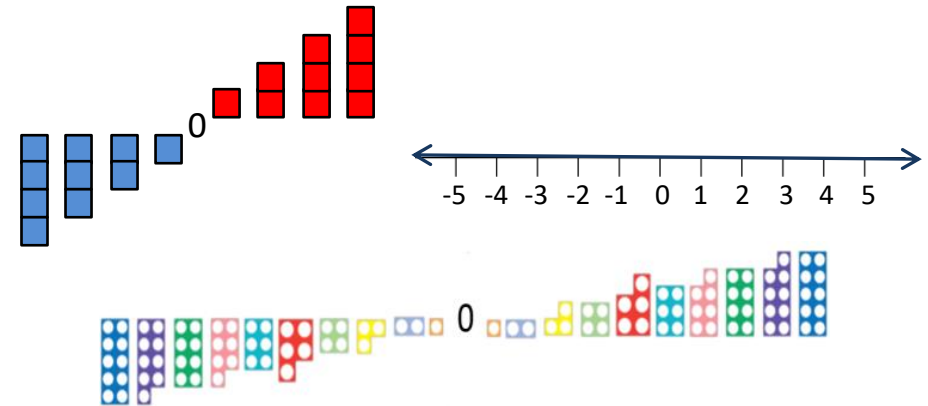
Do we include zero when counting backwards?

Which is the coldest? Warmest?

What was the temperature increase? Decrease?

Varied Fluency

- 1 Here are three representations for negative numbers.



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

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



- 3 Jane visits a zoo.
The rainforest room has a temperature of 32°C
The artic room has a temperature of -24°C
Show the difference in the 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 degree.
The difference is 20 degrees.
- Four less than minus six is minus two.
- 15 more than -2 is 13

Explain how you know if 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 minus 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

52

The even number that is less than -18 but greater -22

-20

The number that is half way between 40 and -50

-5

The difference between -6 and 7

13

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

Negative Numbers

Notes and Guidance

Children continue their work on negative numbers by counting forwards and backwards through zero.

They extend their learning by finding intervals across zero.

Children need to see negative numbers in context.

Mathematical Talk

Are negative numbers whole numbers?

Why do the numbers on a number line mirror each other from 0?

Why does positive 1 add negative 1 equal 0?

Draw me a picture to show 5 subtract 8

Varied Fluency

- 1 Use sandcastles (+1) and holes (-1) to calculate.



Here is an example.

$$-2 + 5 =$$

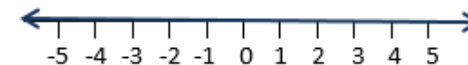
Two sandcastles will fill two holes.

There are three sandcastles left to make positive three.

Use this method to solve:

- $3 - 6$
- $-7 + 8$
- $5 - 9$

- 2 Use the number line to answer the following:



- What is 6 less than 4?
- What is 5 more than -2?
- What is the difference between 3 and -3?

- 3 Filip has £17.50 in his bank account. He pays for a jumper costing £30. How much does he have in his bank account now?

Negative Numbers

Reasoning and Problem Solving

A company decided to build offices over ground and underground.

If we build from 20 to -20, we will have 40 floors.



Do you agree?

Explain how you know.

No, there would be 41 floors because you need to count floor 0

When counting in tens from any single digit, the last number never changes.

When counting back in tens from any single digit, the last number does change.

e.g.

9, 19, 29, 39

9, -1, -11, -21

Explain why this happens.

When crossing 0, the order of the numbers changes and mirrors the positive side of the number line.

Therefore the final digit in the number changes.