Dudley LA

Progression in Mathematics

with NCETM Reasoning Activities

Progression in Mathematics

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This progression document sets out the learning for mathematics from the 2014 National Curriculum Programme of Study.

- Normal font - statements taken directly from the 2014 National Curriculum statutory requirements.
- Highlighted font – statements taken directly from the 2014 National Curriculum non- statutory notes and guidance.
- **Bold – statements added to aid progression and to secure learning.**
- Rows shaded in grey – Problem Solving from the National Curriculum and NCETM (National Centre for Excellence in the Teaching of Mathematics) Reasoning Activities

When statements appear to stop at a certain year, teachers should ensure that there is still consolidation and practice of learning in order to recap on prior knowledge.

Mental Maths statements from the 2014 National Curriculum are in the 'Dudley LA Maths Starters' document.

The National Curriculum for Mathematics 2014 states that:

- The expectation is that the majority of pupils will move through the programmes of study at broadly the same pace. However, decisions about when the progress should always be based on the security of pupils' understanding and their readiness to progress to the next stage.
- Pupils who grasp concepts rapidly should be challenged through being offered rich and sophisticated problems before any acceleration through new content. Those who are not sufficiently fluent with earlier material should consolidate their understanding, including through additional practice, before moving on.

The National Curriculum for Mathematics aims to ensure that all pupils:

- become **fluent** in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately;
- **reason mathematically** by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language;
- can **solve problems** by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

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Number and Place Value	Page No	Addition and Subtraction	Page No
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• Counting in fractional and decimal steps	1	• Understanding addition and subtraction	1
• Reading and writing numbers	1	• Addition and subtraction facts	1
• Roman numerals	1	• Calculation methods (formal and informal) – including Fractions and Decimals	2
• Understanding place value	2		
• Comparing and ordering (including fractions and decimals)	2	• Estimating and checking	2
	2		
• More or less	3		
• Rounding (including decimals)	3		
• Multiplying and dividing by 10, 100 and 1000	3		

Multiplication and Division	
• Problem solving	1
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• Multiplication and division facts	2
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- Factors	4
- Prime	4
- Square and cube	4

Fractions, Decimals, Percentages, Ratio and Proportion

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Fractions	
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• Calculating with fractions	2
- Addition and subtraction	2
- Multiplication	2
- Division	2
Decimals	
• Problem solving	3
• Counting in decimal steps	3
• Comparing and ordering decimals	3
• Rounding decimals	3
• Calculating with decimals	3 & 4
- Addition and subtraction	3
- Multiplication and division	4
- Multiplying and dividing by 10, 100, 1000	4
Percentages	
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- Non linear	2
- Events	2
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Measurement	Page N^{o}
• Solving problems involving money and measures	1
• Reading scales	1
• Length/height	
- Measure and calculate	1
- Compare and order	1
- Convert	2
- Metric and imperial	2
• Perimeter	2
• Area	2
• Mass	
- Measure and calculate	3
- Compare and order	3
- Convert	3
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- Convert	4
- Metric and imperial	4
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Geometry – Properties of Shapes	Page N^{o}
• Identifying shapes and their properties	
- 2D shapes	1
- Symmetry	1
- 3D shapes	1 & 2
• Angles	2
• Comparing and classifying	3
• Drawing and constructing	3
• Patterns with shapes	3

Geometry – Position and Direction	
• Location, movement and co-ordinates Translation	1

Statistics	
• Problem solving	1
• Interpreting, constructing and presenting data	1
• Reading scales	1
• Mean, median, mode and range.	1

Vocabulary

Addition	Subtraction	Multiplication	Division	Equals
Add	Decrease	Array	Divide	Balance
Altogether	Difference Between	Grouping	Divide Into	Equal To
Count On	Distance Between	Groups Of	Dividend	Equivalent
Increase	Fewer	Lots Of	Divisible By	Same As
More Than	Less Than	Multiply	Divisor	Same Value
Plus	Minus	Product	Group	
Put Together	Reduce	Sets Of	Quotient	
Sum	Subtract	Times	Remainder	
Total	Take Away		Share	
	Take From		Share Equally	
			Sharing	

	Y1	Y2	Y3	Y4	Y5	Y6
Problem solving	**Use place value and number facts to solve problems.**	Use place value and number facts to solve problems.	Solve number problems and practical problems involving these ideas below.	Solve number and practical problems that involve all of the below and with increasingly large positive numbers.	Solve number problems and practical problems that involve all of the below.	Solve number and practical problems that involve all of the below.
Counting	Count to and across 100, forwards and backwards, beginning with 0 or 1, or from any given number. Count in multiples of twos, fives and tens from different multiples (also in Multiplication and Division). Use ordinal numbers (eg first, second, third). Indicate a quantity (eg 3 apples, 2 centimetres). Recognise patterns in the number system eg odd and even.	Count in steps of 2, 3 and 5 from 0, and in tens from any number, forward and backward.	Count from 0 in multiples of 4, 8, 50 and 100. (Use multiples of 2, 3, 5 and 10 also). **Count backwards through zero to include negative numbers.**	Count in multiples of 6, 7, 9, 25 and 1000. Count backwards through zero to include negative numbers.	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.	Use negative numbers in context and calculate intervals across zero.
Counting in fractional and decimal steps (from Fractions)	**Count in steps of $^1/_2$.**	Count in fractions up to 10, starting from any number and using the $^1/_2$ and $^2/_4$ equivalence on the number line (for example $1^1/_4$, $1^2/_4$ (or $1^1/_2$), $1^3/_4$, 2).	Count up and down in tenths **and 0.1**	Count up and down in hundredths **and 0.01** Count using simple fractions and decimals both forwards and backwards.	Count forwards and backwards in simple fractional and decimal steps including bridging zero (up to 3 decimal places).	**Count forwards and backwards in a range of fractional and decimal steps up to 3 decimal places.**
Reading and writing numbers	Read and write numbers to 100 in numerals. Read and write numbers from 1 to 20 in numerals and words.	Read and write numbers to at least 100 in numerals and in words.	Read and write numbers up to 1000 in numerals and in words. **Read and write numbers with one decimal place.**	**Read and write numbers to at least 10 000.** **Read and write numbers with up to two decimal places.**	Read and write numbers to at least 1 000 000. Read and write numbers with up to three decimal places (from Decimals).	Read and write numbers up to 10 000 000. **Read and write numbers with up to three decimal places.**
Roman numerals			**Read Roman numerals from I to XII** (link to time).	Read Roman numerals to 100 (I to C) and know what over time, the numeral system changed to include the concept of zero and place value.	Read Roman numerals to 1000 (M) and recognise years written in Roman numerals.	

	Y1	Y2	Y3	Y4	Y5	Y6
Understanding place value	**Recognise the place value of each digit in a number up to at least 20.**	Recognise the place value of each digit in a two-digit number (tens, ones) and partition in different ways eg 23 = 20 + 3 and 23 = 10 + 13. Understand 0 as a place holder.	Recognise the place value of each digit in a three-digit number (hundreds, tens, ones) and partition in different ways eg 146 = 100 + 40 + 6 146 = 130 + 16	Recognise the place value of each digit in a four-digit number (thousands, hundreds, tens and ones) **and to 2 decimal place and partition in different ways.**	Determine the value of each digit in numbers to at least 1 000 000 **and to 2 decimal places and partition in different ways.**	Determine the value of each digit in numbers up to 10 000 000 and to 3 decimal places **and partition in different ways.**
	Identify and represent numbers using objects and pictorial representations including the number line.	Identify, represent and estimate numbers using different representations, including the number line.	Identify, represent and estimate numbers using different representations, **including the number line.**	Identify, represent and estimate numbers using different representations, **including the number line.**	**Identify, represent and estimate numbers using different representations, including the number line.**	**Identify, represent and estimate numbers using different representations, including the number line.**
Comparing and ordering	Use the language of: equal to, more than, less than (fewer), most, least. Compare numbers up to 100 supported by objects and pictorial representation.	Compare and order numbers from 0 up to at least 100 Use <, > and = signs.	Compare and order numbers up to 1000. **Use <, > and = to compare 2 calculations using the 4 operations.**	Order and compare numbers beyond 1000. **Use < > = to compare 2 calculations using the 4 operations.**	Order and compare numbers to at least 1 000 000 and determine the value of each digit. **Use <, > and = to compare 2 calculations using the 4 operations.**	Order and compare numbers up to 10 000 000 and determine the value of each digit**.** **Use <, > and = to compare 2 calculations using the 4 operations.**
(from Fractions)		**Compare and order $^1/_3$, $^1/_4$, $^1/_2$.**	Compare and order unit fractions and fractions with the same denominators.	**Compare and order unit fractions and fractions with the same denominators.**	Compare and order fractions whose denominators are all multiples of the same number.	Compare and order fractions, including fractions >1.
(from Decimals)			**Compare and order numbers with one decimal place and identify the value of each digit and represent on a number line.**	Order and compare numbers with the same number of decimal places up to two decimals **and identify the value of each digit** and represent on a number line.	Order and compare numbers with up to three decimal places **and determine the value of each digit.**	

	Y1	Y2	Y3	Y4	Y5	Y6
More or less	Given a number, identify one more and one less.	**Find 10 more or less than a given number.**	Find 10 or 100 more or less than a given number.	Find 1000 more or less than a given number.	**Find 0.1 and 0.01 more or less than a given number.**	**Find 0.1, 0.01 and 0.001 more or less than a given number.**
Rounding (from Decimals)	**Identify which numbers are closest to eg 20?**	**Round numbers to at least 100 to the nearest 10.**	**Round numbers to at least 1000 to the nearest 10 or 100.**	Round any number to the nearest 10, 100 or 1000. Round decimals with one decimal place to the nearest whole number.	Round any number up to 1 000 000 to the nearest 10, 100, 1000, 10 000 and 100 000. Round decimals with two decimal places to the nearest whole number and to one decimal place.	Round any whole number to a required degree of accuracy eg to the nearest 10, 20, 50 etc. **Round decimals with three decimal places to the nearest whole number or one or two decimal places.**
Multiplying and dividing by 10, 100, 1000 (from and also in Decimals and Multiplication and Division)		**Find the effect of multiplying a one- or two-digit number by 10; identify the value of the digits.**	**Find the effect of multiplying a one- or two-digit number by 10 and 100; identify the value of the digits.**	Find the effect of **multiplying and** dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths.	Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000.	Multiply and divide numbers by 10, 100 and 1000 giving answers up to three decimal places.
NCETM Reasoning						
Counting	**Spot the mistake:** 5,6,8,9 What is wrong with this sequence of numbers? **True or False?** I start at 2 and count in twos. I will say 9 **What comes next?** 10+1 = 11 11+1= 12 12+1 = 13 ……..	**Spot the mistake**: 45,40,35,25 What is wrong with this sequence of numbers? **True or False?** I start at 3 and count in threes. I will say 13? **What comes next?** 41+5=46 46+5=51 51+5=56 ……	**Spot the mistake**: 50,100,115,200 What is wrong with this sequence of numbers? **True or False?** 38 is a multiple of 8? **What comes next?** 936-10= 926 926 -10 = 916 916- 10= 906 …….	**Spot the mistake**: 950, 975,1000,1250 What is wrong with this sequence of numbers? **True or False?** 324 is a multiple of 9? **What comes next?** 6706+ 1000= 7706 7706 + 1000 = 8706 8706 + 1000 = 9706 ……	**Spot the mistake**: 177000,187000,197000,217000 What is wrong with this sequence of numbers? **True or False?** When I count in 10's I will say the number 10100? **What comes next?** 646000-10000= 636000 636000 –10000 = 626000 626000- 10000 = 616000 …….	**Spot the mistake**: -80,-40,10,50 What is wrong with this sequence of numbers? **True or False?** When I count backwards in 50s from 10 I will say -200 **True or False?** The temperature is -3. It gets 2 degrees warmer. The new temperature is -5
Comparing numbers	**Do, then explain** Look at the objects. (in a collection). Are there more of one type than another? How can you find out?	**Do, then explain** 37 13 73 33 3 If you wrote these numbers in order starting with the smallest, which number would be third? Explain how you ordered the numbers.	**Do, then explain** 835 535 538 388 508 If you wrote these numbers in order starting with the smallest, which number would be third? Explain how you ordered the numbers.	**Do, then explain** 5035 5053 5350 5530 5503 If you wrote these numbers in order starting with the largest, which number would be third? Explain how you ordered the numbers.	**Do, then explain** 747014 774014 747017 774077 744444 If you wrote these numbers in order starting with the smallest, which number would be third? Explain how you ordered the numbers.	**Do, then explain** Find out the populations in five countries. Order the populations starting with the largest. Explain how you ordered the countries and their populations

	Y1	Y2	Y3	Y4	Y5	Y6
Understanding place value		**Do, then explain** Show the value of the digit 2 in these numbers? 32 27 92 Explain how you know. **Make up an example** Create numbers where the units digit is one less than the tens digit. What is the largest/smallest number?	**Do, then explain** Show the3 value of the digit 3 in these numbers? 341 503 937 Explain how you know. **Make up an example** Create numbers where the digit sum is three. Eg 120, 300, 210 What is the largest/smallest number?	**Do, then explain** Show the value of the digit 4 in these numbers? 3041 4321 5497 Explain how you know **Make up an example** Create four digit numbers where the digit sum is four and the tens digit is one. Eg 1210, 2110, 3010 What is the largest/smallest number?	**Do, then explain** Show the value of the digit 5 in these numbers? 350114 567432 985376 Explain how you know. **Make up an example Give further examples** Create six digit numbers where the digit sum is five and the thousands digit is two. Eg 3002000 2102000 What is the largest/smallest number?	**Do, then explain** Show the value of the digit 6 in these numbers? 6787555 95467754 Explain how you know **Make up an example** Create seven digit numbers where the digit sum is six and the tens of thousands digit is two. Eg 4020000 What is the largest/smallest number?
Rounding				**Possible answers** A number rounded to the nearest ten is 540. What is the smallest possible number it could be? **What do you notice?** Round 296 to the nearest 10. Round it to the nearest 100. What do you notice? Can you suggest other numbers like this?	**Possible answers** A number rounded to the nearest thousand is 76000 What is the largest possible number it could be? **What do you notice?** Round 343997 to the nearest 1000. Round it to the nearest 10000. What do you notice? Can you suggest other numbers like this?	**Possible answers** Two numbers each with two decimal places round to 23.1 to one decimal place. The total of the numbers is 46.2. What could the numbers be? **What do you notice?** Give an example of a six digit number which rounds to the same number when rounded to the nearest 10000 and 100000

	Y1	Y2	Y3	Y4	Y5	Y6
Problem solving	Solve one-step problems that involve: • addition and subtraction; • concrete objects • pictorial representations; • missing number problems such as 7 = □ - 9 • quantities.	Solve problems with addition and subtraction using: • concrete objects; • pictorial representation; • numbers; • quantities; • measures; • mental and written methods; • missing numbers using inverse.	Solve problems, including: • missing number problems; • using number facts, • place value; • more complex addition and subtraction; • which of the 4 operations to use and why (from Multiplication and Division).	Solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why **(including missing numbers).**	Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why **(including missing numbers).** Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign and using missing numbers eg 13 + 24 = 12 + 25; 33 = 5 x □ (from Multiplication and Division).	Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why. Solve problems involving addition, subtraction, multiplication and division (**including those with missing numbers.**
Vocabulary	**Read, spell and use a wide range of addition and subtraction associated vocabulary (see glossary)**					
Understanding addition and subtraction	Read, write and interpret mathematical statements involving addition (+), subtraction (-) and equals (=) signs. Realise the effect of + or - 0	Show that addition of two numbers can be done in any order (commutative) and subtraction of one number from another cannot. Check calculations, including by adding to check subtraction and adding numbers in a different order to check addition (eg 5 + 2 + 1 = 1 + 5 + 2 = 1 + 2 + 5).				Use knowledge of the order of operations to carry out calculations involving the four operations. Explore the order of operations using brackets eg 2 + 1 x 3 = 5 (2 + 1) x 3 = 9
Addition and subtraction facts	Represent and use number bonds and related subtraction facts within 20 in several forms eg. 9 + 7 = 16; 16 – 7 = 9; 7 = 16 – 9).	Recall and use addition and subtraction facts to 20 fluently and derive and use related facts up to 100 eg use 3 + 7 = 10; 10 – 7 = 3 and 7 = 10 – 3 to calculate: 30 + 70 = 100; 100 – 70 = 30 and 70 = 100 – 30.	**Recall and use addition and subtraction facts to 100.**	**Recall and use addition and subtraction facts to 1000.** **Derive and use addition and subtraction facts for 1 and 10 (up to 1 decimal place).**	**Recall and use addition and subtraction facts for 1 to 10 (up to 1 decimal place).**	**Recall and use addition and subtraction facts for 0.1 and also numbers1 to 10 (up to 2 decimal places).**

	Y1	Y2	Y3	Y4	Y5	Y6
Calculation methods (formal and informal) (see Calculation Policy)	Add and subtract one-digit and two-digit numbers to 20 including zero **using concrete objects, pictorial representation, mentally and a number line (including crossing tens boundary).**	Add and subtract numbers using concrete objects, pictorial representations, mentally **and using the number line** (**crossing tens and hundreds boundary), including:** • a two-digit number and ones; • a two-digit number and tens; • two two-digit numbers; • adding three one-digit numbers. Start to record addition and subtraction in columns.	Add and subtract **at least 2** numbers with up to three digits, using formal written methods of columnar addition and subtraction.	Add and subtract **at least 2** numbers with up to 4 digits **and decimals with up to two decimal places** using the formal written methods of columnar addition and subtraction where appropriate (also in Decimals).	Add and subtract **at least 2** whole numbers with more than 4 digits **and decimals with up to two decimal places**, including using formal written methods (columnar addition and subtraction) (also in Decimals).	**Add and subtract at least 2 whole numbers with more than 4 digits and decimals with up to 3 decimal places using formal written methods (columnar addition and subtraction)** (also in Decimals).
From Fractions		**Add and subtract ½, ¼ from a given number** (link to Counting in Fractional Steps).	Add and subtract fractions with the same denominator within one whole (eg $^5/_7 + {}^1/_7 = {}^6/_7$)	Add and subtract fractions with the same denominator beyond one whole.	Add and subtract fractions with the same denominator and denominators that are multiples of the same number. Write mathematical statements >1 as a mixed number eg $^2/_5 + {}^4/_5 = {}^6/_5 = 1{}^1/_5$	Add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions.
From Decimals					Add and subtract decimals, including: • a mix of whole numbers and decimals; • decimals with different numbers of decimal places; • complements of 1 (0.83 + 0.17 = 1).	**Add and subtract decimals, including:** • **a mix of whole numbers and decimals;** • **decimals with different numbers of decimal places;** • **complements of 1 (0.83 + 0.17 = 1).**
Estimating and checking	**Recognise the inverse relationship between addition and subtraction.**	Recognise and use the inverse relationship between addition and subtraction and use this to check calculations.	Estimate the answer to a calculation and use inverse operations to check answers.	Estimate and use inverse operations to check answers to a calculation.	Use **estimation, use of inverse** and rounding to check answers to calculations and determine in the context of a problem, levels of accuracy.	Use **rounding, use of inverse and** estimation to check answers to calculations and determine in the context of a problem, an appropriate degree of accuracy.

	Y1	Y2	Y3	Y4	Y5	Y6

NCETM Reasoning						
Number bonds	**Continue the pattern** 10 + 8 = 18 11 + 7 = 18 Can you make up a similar pattern for the number 17? How would this pattern look if it included subtraction? **Missing numbers** 9 + ☐ = 10 10 - ☐ = 9 What number goes in the missing box?	**Continue the pattern** 90 = 100 – 10 80 = 100 – 20 Can you make up a similar pattern starting with the numbers 74, 26 and 100? **Missing numbers** 91 + ☐ = 100 100 - ☐ = 89 What number goes in the missing box?				
Mental calculation	**Working backwards** Through practical games on number tracks and lines ask questions such as "where have you landed?" and "what numbers would you need to throw to land on other given numbers?" **What do you notice?** 11 – 1 = 10 11 – 10 = 1 Can you make up some other number sentences like this involving 3 different numbers?	**True or false?** Are these number sentences true or false?73 + 40 = 113 98 – 18 = 70 46 + 77 = 123 92 – 67 = 35 Give your reasons. **Hard and easy questions** Which questions are easy / hard? 23 + 10 = 93 + 10 = 54 + 9 = 54 + 1 = Explain why you think the hard questions are hard? **Other possibilities** ☐ + ☐ + ☐ = 14 What single digit numbers could go in the boxes? How many different ways can you do this?	**True or false?** Are these number sentences true or false?597 + 7 = 614 804 – 70 = 744 768 + 140 = 908 Give your reasons. **Hard and easy questions** Which questions are easy / hard? 323 + 10 = 393 + 10 = 454 - 100 = 954 - 120 = Explain why you think the hard questions are hard?	**True or false?** Are these number sentences true or false?6.7 + 0.4 = 6.11 8.1 – 0.9 = 7.2 Give your reasons. **Hard and easy questions** Which questions are easy / hard? 13323 - 70 = 12893 + 300 = 19354 - 500 = 19954 + 100 = Explain why you think the hard questions are hard?	**True or false?** Are these number sentences true or false?6.17 + 0.4 = 6.57 8.12 – 0.9 = 8.3 Give your reasons. **Hard and easy questions** Which questions are easy / hard? 213323 - 70 = 512893 + 300 = 819354 - 500 = 319954 + 100 = Explain why you think the hard questions are hard?	**True or false?** Are these number sentences true or false? 6.32 + ☐ = 8 ☐ = 1.68 Give your reasons. **Hard and easy questions** Which questions are easy / hard? 213323 - 70 = 512893 + 37 = 8193.54 - 5.9 = Explain why you think the hard questions are hard?
Use of operations	**Fact families** Which four number sentences link these numbers? 12, 15, 3	**Fact families** Which four number sentences link these numbers? 100, 67, 33				**Missing symbols** Write the missing signs (+ - x ÷) in this number sentence: 6 ○ 12.3 =61.9 ○ 11.9

	Y1	Y2	Y3	Y4	Y5	Y6
	What else do you know? If you know this: 12 – 9 = 3 what other facts do you know? **Missing symbols** Write the missing symbols (+ - =) in these number sentences: 17 ☐ 3 ☐ 20 18 ☐ 20 ☐ 2	**What else do you know?** If you know this: 87 = 100 – 13 what other facts do you know? **Missing symbols** Write the missing symbols (+ - =) in these number sentences: 80 ☐ 20 ☐ 100 100 ☐ 70 ☐ 30 87 ☐ 13 ☐ 100				**What else do you know?** If you know this: 86.7 + 13.3 = 100 what other facts do you know?
Written methods	**Convince me** In my head I have two odd numbers with a difference of 2. What could they be? Convince me **Missing numbers** Fill in the missing numbers (using a range of practical resources to support) 12 + ☐ = 19 20 - ☐ = 3	**Convince me** What digits could go in the boxes? 7 ☐ - 2 ☐ = 46 Try to find all of the possible answers. How do you know you have got them all? Convince me	**Convince me** ☐☐ + ☐☐ + ☐☐ The total is 201 Each missing digit is either a 9 or a 1. Write in the missing digits. Is there only one way of doing this or lots of ways? Convince me	**Convince me** ☐ - 666 = 8 ☐ 5 What is the largest possible number that will go in the rectangular box? What is the smallest? Convince me	**Convince me** ☐ + 1475 = 6 ☐ 24 What numbers go in the boxes? What different answers are there? Convince me	**Convince me** Three four digit numbers total 12435. What could they be? Convince me
Inverse operations, estimating and checking answers	**Making an estimate** Pick (from a selection of number sentences) the ones where the answer is 8 or 9. **Is it true that?** Is it true that 3+4 = 4 + 3?	**Making an estimate** Which of these number sentences have the answer that is between 50 and 60 74 - 13 55 + 17 87 – 34 **Always, sometimes, never** Is it always, sometimes or never true that if you add three numbers less than 10 the answer will be an odd number	**Making an estimate** Which of these number sentences have the answer that is between 50 and 60 174 - 119 333 – 276 932 - 871 **Always, sometimes, never** Is it always, sometimes or never true that if you subtract a multiple of 10 from any number the units digit of that number stays the same. Is it always, sometimes or never true that when you add two numbers together you will get an even number	**Making an estimate** Which of these number sentences have the answer that is between 550 and 600 1174 - 611 3330 – 2779 9326 - 8777 **Always, sometimes, never** Is it always sometimes or never true that the difference between two odd numbers is odd.	**Making an estimate** Which of these number sentences have the answer that is between 0.5 and 0.6 11.74 - 11.18 33.3 – 32.71 **Always, sometimes, never** Is it always, sometimes or never true that the sum of four even numbers is divisible by 4.	**Making an estimate** Circle the number that is the best estimate to 932.6 - 931.05 1.3 1.5 1.7 1.9 **Always, sometimes, never** Is it always, sometimes or never true that the sum of two consecutive triangular numbers is a square number

	Y1	Y2	Y3	Y4	Y5	Y6
Problem solving	Solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with support.	Solve problems involving multiplication and division: • using materials; • arrays; • repeated addition; • mental methods; • multiplication and division facts; • including problems in contexts; • **missing numbers.**	Solve problems, including: • missing number problems; • multiplication and division **(and interpreting remainders)**; • positive integer scaling (eg 4 times as high, 8 times as long); • correspondence in which n objects are connected to m objects (eg 3 hats and 4 coats, how many different outfits? 12 sweets shared equally between 4 children; 4 cakes shared equally between 8 children). • deciding which of the 4 operations to use and why (also in Addition and Subtraction).	Solve 2-step problems in context involving multiplying and adding, including using: • the distributive law to multiply two digit numbers by one digit; • **division (including interpreting remainders);** • integer scaling problems; • harder correspondence problems such as n objects are connected to m objects (eg the number of choices of a meal on a menu, or three cakes shared equally between 10 children.	Solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign and using missing number (eg 13 + 24 =12 + 25; 33 = 5 x □ (also in Addition and Subtraction) Solve problems involving multiplication and division, including: • scaling by simple fractions and problems involving simple rates; • using knowledge of factors and multiples, squares and cubes.	Solve problems involving addition, subtraction, multiplication and division **including those with missing numbers.**
Vocabulary	Read, spell and use a wide range of multiplication and division associated vocabulary (see glossary)					
Understanding multiplication and division	Develop understanding of multiplication and division through practical activities.	Understand multiplication as arrays and repeated addition. Understand division as grouping and sharing discrete and continuous quantities **and that a division calculation can have a remainder.** Show that multiplication of two numbers can be done in any order (commutative) and division of one number by another cannot. Use commutativity and inverse relations to develop multiplicative reasoning eg 4 x 5 = 20, 20 ÷ 5 = 4.	**Understand that division is the inverse of multiplication and vice versa.** **Use number trios to develop family of facts** **6** **2** **3** **3 x 2 = 6** **2 x 3 = 6** **6 ÷ 3 = 2** **6 ÷ 2 = 3** Use commutativity and associativity eg 4 x 12 x 5 = 4 x 5 x 12 = 20 x 12 = 240	Write statements about the equality of expressions eg use the distributive law 39 x 7 = 30 x 7 + 9 x 7 and associative law (2 x 3) x 4 = 2 x (3 x 4). **Use number trios to develop family of facts** **27** **9** **3** **27 ÷ 3 = 9** **27 ÷ 9 = 3** **3 x 9 = 27** **9 x 3 = 27**	Distributivity can be expressed as a(b + c) = ab + ac. Construct equivalence statements eg 4 x 35 = 2 x 2 x 35; 3 x 270 = 3 x 3 x 9 x 10 = 9^2 x 10	Use their knowledge of the order of operations to carry out calculations involving the four operations. Explore the order of operations using brackets eg 2 + 1 x 3 = 5 (2 + 1) x 3 = 9

	Y1	Y2	Y3	Y4	Y5	Y6
		Relate division to fractions and measures eg 40 ÷ 2 = 20, 20 is half of 40				
Multiplication and division facts	Count in multiples of 2, 5, and 10 from different multiples (from Number and Place Value).	Recall and use multiplication and division facts for 2, 5 and 10 multiplication tables and connect them to each other, recognising odd and even numbers. Connect the 10 multiplication table to place value and the 5 times table to the divisions on a clock face.	Recall and use multiplication and division facts for the 3, 4 and 8 times tables. Use multiplication and division facts to derive related facts eg use 3 x 2 = 6, 6 ÷ 3 = 2, 2 = 6 ÷ 3 to derive 30 x 2 = 60, 60 ÷ 3 = 20, 20 = 60 ÷ 3	Recall multiplication and division facts for times tables up to 12 x 12. Use place value, known and derived facts to multiply and divide mentally including: • multiplication by 0 and 1, • dividing by 1; • multiplying together 3 numbers.		
Doubling and halving	**Recall and use doubles of numbers to 20 and corresponding halves.**	**Recall and use doubles of all numbers to 50.** **Recall and use halves of 2-digit even numbers to 50.** **Double multiples of 10 to 100 and find the corresponding halves.** **Double multiples of 5 to 50 and find the corresponding halves.**	**Recall and use doubles of all multiples to 100 and corresponding halves.** **Double multiples of 10 and 100 to 1000.** **Develop doubling strategies linked to times tables eg multiply by 4 by doubling twice, dividing by 4 by halving twice.**	**Double and halve any 3-digit number by partitioning.** **Double any decimal to 1 decimal place.** **Develop doubling and halving strategies linked to times tables eg multiply by 50 by multiplying by 100 and halving, divide by 50 by dividing by 100 and doubling.**	**Double and halve any decimal to 1 decimal place.** **Develop doubling and halving strategies linked to times tables eg multiply by 50 by multiplying by 100 and halving, divide by 50 by dividing by 100 and doubling.**	**Double and halve any number including decimals.** **Develop doubling and halving strategies linked to times tables eg multiply by 50 by multiplying by 100 and halving, divide by 50 by dividing by 100 and doubling.**
Multiplying and dividing by 10, 100, 10 (also in Number and Place Value and Multiplication and Division)		**Find the effect of multiplying a one- or two-digit number by 10; identify the value of the digits.**	**Find the effect of multiplying a one- or two-digit number by 10 and 100; identify the value of the digits.**	Find the effect of **multiplying and** dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths.	Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000.	Multiply and divide numbers by 10, 100 and 1000 giving answers up to three decimal places.

	Y1	Y2	Y3	Y4	Y5	Y6
Calculation methods (formal and informal) **Multiplication** (see Calculation Policy)	Make connections between arrays, number patterns and counting in 2s, 5s and 10s. Through grouping, begin to understand multiplication, doubling numbers and quantities.	Calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication (×), division (÷) and equals (=) signs.	Write and calculate mathematical statements for multiplication using the multiplication tables that they know. Multiply two-digit numbers by one-digit numbers, progressing to formal written methods of short multiplication.	Multiply two-digit and three-digit numbers by a one-digit number using formal written layout of short multiplication.	Multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers.	Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication.
From Fractions					Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams.	Multiply simple pairs of proper fractions, writing the answer in its simplest form) (eg ¼ x ½ = $^{1}/_{8}$)
From Decimals						Multiply one-digit numbers with up to two decimal places by whole numbers.
Division (see Calculation Policy)	Through grouping and sharing small quantities, begin to understand division **and leftovers as remainders.**	**Write and calculate mathematical statements for division using the multiplication tables that they know, including for 2-digit numbers divided by 1-digit numbers grouping on a number line and including remainder.**	Write and calculate mathematical statements for division using the multiplication tables that they know, Divide two-digit numbers by one-digit numbers, progressing to formal written methods of short division, **which include remainders.**	**Divide numbers up to 3 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 one-digit number using the formal written method of short division and interpret remainders appropriately for the context (eg $98 \div 4 = {}^{98}/_{4} = 24$ r 2 = 24 ½ = 24.5 ≈ 25).	Divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context Divide numbers up to 4 digits by a two-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. Use written division methods in cases where the answer has up to two decimal places (from Decimals).

	Y1	Y2	Y3	Y4	Y5	Y6
From Fractions						Divide proper fractions by whole numbers (using diagrams) (eg $^1/_3 \div 2 = {}^1/_6$) Associate a fraction with division and calculate decimal fraction equivalents (eg 0.375) for a simple fraction. (eg $^3/_8$)
From Decimals						Divide one-digit numbers with up to 2 decimal places by 1- and then 2-digit whole numbers.
Estimating and checking			**Use estimation and inverse to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.**	**Use estimation and inverse to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.**	**Use estimation, rounding and inverse to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.**	Use estimation, **rounding and inverse** to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.
Properties of numbers Factors				Recognise and use factor pairs.	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. Relate common factors to finding equivalent fractions.
Prime					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.	
Square and cube					Recognise and use square numbers and cube numbers, and the notation for squared (^{2}) and cubed (^{3}).	

	Y1	Y2	Y3	Y4	Y5	Y6

NCETM Reasoning

Multiplication and division facts

Y2

Missing numbers
10 = 5 x □

What number could be written in the box?

Making links
I have 30p in my pocket in 5p coins. How many coins do I have?

Y3

Missing numbers
24 = □ x □

Which pairs of numbers could be written in the boxes?

Making links Cards come in packs of 4. How many packs do I need to buy to get 32 cards?

Y4

Missing numbers
72 = □ x □

Which pairs of numbers could be written in the boxes?

Making links Eggs are bought in boxes of 12. I need 140 eggs; how many boxes will I need to buy?

Y5

Missing numbers
6 x 0.9 = □ x 0.03

6 x 0.04 = 0.008 x □
Which numbers could be written in the boxes?

Making links Apples weigh about 170 g each. How many apples would you expect to get in a 2 kg bag?

Y6

Missing numbers

2.4 ÷ 0.3 = □ x 1.25

Which number could be written in the box?

Mental calculation

Y3

Use a fact

20 x 3 = 60.
Use this fact to work out
21 x 3 = 22 x 3 =
23 x 3 = 24 x 3 =

Y4

Use a fact

63 ÷ 9 = 7
Use this fact to work out
126 ÷ 9 =
252 ÷ 7 =

Y5

Use a fact

3 x 75 = 225
Use this fact to work out
450 ÷ 6 =
225 ÷ 0.6 =

To multiply by 25 you multiply by 100 and then divide by 4. Use this strategy to solve
48 x 25 78 x 25
4.6 x 25

Y6

Use a fact

12 x 1.1 = 13.2
Use this fact to work out
15.4 ÷ 1.1 =
27.5 ÷ 1.1 =

Y1

Making links
If one teddy has two apples, how many apples will three teddies have?
Here are 10 lego people If 2 people fit into the train carriage, how many carriages do we need?

Y2

Making links

Write the multiplication number sentences to describe this array

X	X	X
X	X	X

What do you notice?
Write the division sentences.

Y3

Making links

4 × 6 = 24

How does this fact help you to solve these calculations?

40 x 6 =

20 x 6 =

24 x 6 =

Y4

Making links

How can you use factor pairs to solve this calculation?
13 x 12
(13 x 3 x 4, 13 x 3 x 2 x 2, 13 x 2 x 6)

Y5

Making links

7 x 8 = 56
How can you use this fact to solve these calculations?
0.7 x 0.8 =
5.6 ÷ 8 =

Y6

Making links

0.7 x 8 = 5.6
How can you use this fact to solve these calculations?
0.7 x 0.08 =
0.56 ÷ 8 =

Written calculation

Y1

Practical
If we put two pencils in each pencil pot how many pencils will we need?

Y2

Prove It
Which four number sentences link these numbers? 3, 5, 15?
Prove it.

Y3

Prove It
What goes in the missing box?

x	?	?
4	80	12

Prove it.

How close can you get?

□□ × □

Y4

Prove It
What goes in the missing box?

6 □ x 4 = 512
Prove it.

How close can you get?

□□□ X 7

Y5

Prove It
What goes in the missing box?

12 □ 2 ÷ 6 = 212

14 □ 4 ÷ 7 = 212

22 □ 3 ÷ 7 = 321 r 6

323 x □ 1 = 13243
Prove it.

Y6

Prove It
What goes in the missing box?

18 □ 4 ÷ 12 = 157

38 □ 5 ÷ 18 = 212.5

33 □ 2 ÷ 8 = 421.5

38 x □ .7 = 178.6
Prove it.
Can you find?

	Y1	Y2	Y3	Y4	Y5	Y6
			Using the digits 2, 3 and 4 in the calculation above how close can you get to 100? What is the largest product? What is the smallest product?	Using the digits 3, 4 and 6 in the calculation above how close can you get to 4500? What is the largest product? What is the smallest product?		Can you find the smallest number that can be added to or subtracted from 87.6 to make it exactly divisible by 8/7/18?
Properties of numbers, multiples, factors, primes, square and cube numbers	**Spot the mistake** Use a puppet to count but make some deliberate mistakes. e.g. 2 4 5 6 10 9 8 6 See if the pupils can spot the deliberate mistake and correct the puppet	**True or false?** When you count up in tens starting at 5 there will always be 5 units.	**True or false?** All the numbers in the two times table are even. There are no numbers in the three times table that are also in the two times table.	**Always, sometimes, never?** Is it always, sometimes or never true that an even number that is divisible by 3 is also divisible by 6. Is it always, sometimes or never true that the sum of four even numbers is divisible by 4.	**Always, sometimes, never?** Is it always, sometimes or never true that multiplying a number always makes it bigger Is it always, sometimes or never true that prime numbers are odd. Is it always, sometimes or never true that when you multiply a whole number by 9, the sum of its digits is also a multiple of 9 Is it always, sometimes or never true that a square number has an even number of factors.	**Always, sometimes, never?** Is it always, sometimes or never true that dividing a whole number by a half makes the answer twice as big. Is it always, sometimes or never true that when you square an even number, the result is divisible by 4 Is it always, sometimes or never true that multiples of 7 are 1 more or 1 less than prime numbers.
Inverse operations, estimating and checking answers		**Use the inverse** Use the inverse to check if the following calculations are correct: 12 ÷ 3 = 4 3 x 5 = 14	**Use the inverse** Use the inverse to check if the following calculations are correct 23 x 4 = 82 117 ÷ 9 = 14 **Size of an answer** Will the answer to the following calculations be greater or less than 80 23 x 3= 32 x 3 = 42 x 3 = 36 x 2=	**Use the inverse** Use the inverse to check if the following calculations are correct: 23 x 4 = 92 117 ÷ 9 = 14 **Size of an answer** Will the answer to the following calculations be greater or less than 300 152 x 2= 78 x 3 = 87 x 3 = 4 x 74 =	**Use the inverse** Use the inverse to check if the following calculations are correct: 4321 x 12 = 51852 507 ÷ 9 = 4563 **Size of an answer** The product of a two digit and three digit number is approximately 6500. What could the numbers be?	**Use the inverse** Use the inverse to check if the following calculations are correct: 2346 x 46 = 332796 27.74 ÷ 19 = 1.46 **Size of an answer** The product of a single digit number and a number with two decimal places is 21.34 What could the numbers be?

	Y1	Y2	Y3	Y4	Y5	Y6
Fractions						
Problem Solving	Solve problems involving finding ½ and ¼ of discrete and continuous quantities, using shapes, objects and quantities.	Use fractions as 'fractions of' discrete and continuous quantities by solving problems using shapes, objects and quantities.	Solve problems that involve all of the below.	Solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is a whole number. Solve simple measure and money problems involving fractions.	**Solve problems involving fractions.** Solve problems involving multiplication and division, scaling by simple fractions.	Solve problems involving fractions that mean working backwards (eg if ¼ of a length is 36cm, then the whole length is 36 x 4 = 144cm).
Fractions of objects, shapes and quantities	Recognise, find and name a half as one of two equal parts of an object, shape or quantity. Recognise, find and name a quarter as one of four equal parts of an object, shape or quantity. Recognise and combine halves and quarters as part of a whole.	Recognise, find, name and write fractions $^1/_3$, $^1/_4$, $^2/_4$ and ¾ of a length, shape, set of objects or quantity. Write simple fractions eg ½ of 6 = 3.	Recognise, find and write fractions of a discrete set of objects including measures and shapes; unit fractions and non-unit fractions with small denominators. Recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators using number line and go beyond 1.	**Recognise, find and write fractions of a discrete set of objects including measures and shapes; unit fractions and non-unit fractions with small denominators** Extend use of number line to connect fractions, numbers and measures.	Find fractions of numbers, measures and quantities.	
Counting in fractional steps (also in Number and Place Value)	**Count in steps of ½.**	Count in fractions up to 10, starting from any number and using the $^1/_2$ and $^2/_4$ equivalence on the number line (eg 1 $^1/_4$, 1 $^2/_4$ (or 1 $^1/_2$), 1 $^3/_4$, 2).	Count up and down in tenths.	Count up and down in hundredths. Count using simple fractions both forwards and backwards.	Count forwards and backwards in simple fractional steps including bridging zero.	**Count forwards and backwards in a range of fractional steps.**
Comparing and ordering fractions (also in Number and Place Value)		**Compare and order $^1/_3$, ¼, ½.**	Compare and order unit fractions and fractions with the same denominators.	**Compare and order unit fractions and fractions with the same denominators.**	Compare and order fractions whose denominators are all multiples of the same number.	Compare and order fractions, including fractions >1.

	Y1	Y2	Y3	Y4	Y5	Y6
Calculating with fractions **Addition and subtraction** (also in Addition and Subtraction)		**Add and subtract ½, ¼ from a given number to 10** (link to Counting in Fractional Steps).	Add and subtract fractions with the same denominator within one whole (eg, $^5/_7 + {}^1/_7 = {}^6/_7$)	Add and subtract fractions with the same denominator beyond one whole.	Add and subtract fractions with the same denominator and denominators that are multiples of the same number. Write mathematical statements >1 as a mixed number (eg $^2/_5 + {}^4/_5 = {}^6/_5 = 1{}^1/_5$)	Add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions.
Multiplication (also in Multiplication and Division)					Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams.	Multiply simple pairs of proper fractions, writing the answer in its simplest form) (eg ¼ x ½ = $^1/_8$)
Division (also in Multiplication and Division)						Divide proper fractions by whole numbers (using diagrams) (eg $^1/_3 \div 2 = {}^1/_6$) Associate a fraction with division and calculate decimal fraction equivalents (eg 0.375) for a simple fraction (eg $^3/_8$)

	Y1	Y2	Y3	Y4	Y5	Y6
Decimals						
Problem solving				Solve simple measure and money problems involving decimals to two decimal places (also in Measurement).	Solve problems involving number up to three decimal places.	**Solve problems involving number up to three decimal places.** Solve problems which require answers to be rounded to specified degrees of accuracy.
Counting in decimal steps (also in Number and Place Value)			**Count up and down in steps of 0.1**	**Count up and down in steps of 0.01** Count using decimals both forwards and backwards.	Count forwards and backwards in decimal steps including bridging zero (up to 3 decimal places).	**Count forwards and backwards in decimal steps up to 3 decimal places.**
Comparing and ordering decimals (also in Number and Place Value)			**Compare and order numbers with one decimal place and identify the value of each digit and represent on a number line.**	Order and compare numbers with the same number of decimal places up to two decimal places **and identify the value of each digit** and representation on a number line.	Read, write, order and compare numbers with up to three decimal places **and determine the value of each digit.**	
Rounding decimals (also in Number and Place Value)				Round decimals with one decimal place to the nearest whole number.	Round decimals with two decimal places to the nearest whole number and to one decimal place.	**Round decimals with three decimal places to the nearest whole number or one or two decimal places.**
Calculating with decimals **Addition and subtraction** (from Addition and Subtraction)				Add and subtract numbers with up to 4 digits **and decimals with two decimal place** using the formal written methods of columnar addition and subtraction where appropriate.	Add and subtract whole numbers with more than 4 digits **and decimals with two decimal places**, including using formal written methods (columnar addition and subtraction). Add and subtract decimals, including: • a mix of whole numbers and decimals; • decimals with different numbers of decimal places; • complements of 1 (eg 0.83 + 0.17 = 1)	**Add and subtract whole numbers with more than 4 digits and decimals with up to 3 decimal places using formal written methods (columnar addition and subtraction).** **Add and subtract decimals, including:** • **a mix of whole numbers and decimals;** • **decimals with different numbers of decimal places;** • **complements of 1 (eg 0.83 + 0.17 = 1).**

	Y1	Y2	Y3	Y4	Y5	Y6
Multiplication and division (also in Multiplication and Division)						Multiply and divide one digit numbers with up to two decimal places by 1- and 2-digit whole numbers **(eg 1.46 x 3)** Use written division methods in cases where the answer has up to 2 decimal places.
Multiplying and dividing by 10,100,1000 (also in Number and Place Value and Multiplication and Division)				Find the effect of **multiplying and** dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths.	Multiply and divide whole numbers and those involving decimals by 10, 100 and 1000 (from Multiplication and Division)	Multiply and divide numbers by 10, 100 and 1000 where the answers are up to three decimal places.
Percentages						
Problem solving with percentages			**Solve problems involving finding 25%, 50%, and 75% of amounts.**	**Solve problems involving finding 25%, 50%, and 75% of amounts.**	Solve problems which require knowing percentage and decimal equivalents of $^1/_2$, $^1/_4$, $^1/_5$, $^2/_5$, $^4/_5$ and those fractions with a denominator of a multiple of 10 or 25. **Solve problems including finding simple percentage of amounts.**	Solve problems involving the calculation of percentages (for example, of measures, and such as 15% of 360) and the use of percentages for comparison (from Ratio).
Understanding percentages		**Recognise the per cent symbol (%) and understand that 50% = ½.**	**Recognise the per cent symbol (%) and understand that per cent relates to 'number of parts per hundred'.** **Understand that** **25% = ¼, 50% = ½, 75% = ¾, 100% = 1**	**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.**	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.	**Write percentages as a fraction with denominator 100, and as a decimal.**

	Y1	Y2	Y3	Y4	Y5	Y6
Equivalence Fractions		Recognise the equivalence of $^{2}/_{4}$ and ½.	Recognise and show, using diagrams, equivalent fractions with small denominators.	Recognise and show, using diagrams, families of common equivalent fractions. Use factors and multiples to recognise equivalent fractions and simplify where appropriate (eg $^{6}/_{9} = {}^{2}/_{3}$ or $^{1}/_{4} = {}^{2}/_{8}$).	Identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths. Recognise mixed numbers and improper fractions and convert from one form to the other.	Use common factors to simplify fractions; Use common multiples to express fractions in the same denomination.
Fractions and decimals			Recognise that tenths arise from dividing an object into 10 equal parts and in dividing one-digit numbers or quantities by 10	Recognise that hundredths arise when dividing an object by a hundred and dividing tenths by ten.	Recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents.	Associate a fraction with division and calculate decimal fraction equivalents (eg 0.375) for a simple fraction (eg $^{3}/_{8}$; 3 ÷ 8 = 0.375) Round recurring decimals to three decimal places, or other appropriate approximations depending on the context.
Fractions, decimals and percentages		**Understand that 50% = ½**	**Understand that;** **50% = ½ = 0.5** **25% = ¼** **75% = ¾**	Recognise and write decimal **and percentage** equivalents to $^{1}/_{4}$, $^{1}/_{2}$, $^{3}/_{4}$ and any number of tenths and hundredths.	Read and write decimal numbers as fractions and percentage eg 0.71 $^{71}/_{100} = 71\%$	Recall and use equivalences between simple fractions, decimals and percentages, including in different contexts.

	Y1	Y2	Y3	Y4	Y5	Y6
Ratio and proportion	Statements only appear in year 6 but ratio and proportion should be connected to other learning opportunities • colour mixing; • compare scale models to life size objects; • describe patterns 2 red to 3 blue RRBBB; • fractions; • making recipes; • multiplication and division; • real-life examples ie farm trip – ratio of cows to sheep; • scale drawings.					Solve problems involving the relative sizes of two quantities where missing values can be found using integer multiplication and division facts. Use notation a:b Solve problems involving unequal sharing and grouping using knowledge of fractions and multiples (eg for every egg you need three spoonfuls of flour; $^3/_5$ of the class are boys. Solve problems involving similar shapes where the scale factor is known or can be found.
NCETM Reasoning						
Counting in Fractional Steps		**Spot the mistake** 7, 7 ½ , 8, 9, 10 8 ½, 8, 7, 6 ½, … and correct it **What comes next?** 5 ½, 6 ½ , 7 ½ , …., …. 9 ½, 9, 8 ½, ……, …..	**Spot the mistake** six tenths, seven tenths, eight tenths, nine tenths, eleven tenths … and correct it. **What comes next?** 6/10, 7/10, 8/10, ….., …. 12/10, 11/10, ….., ….., …..	**Spot the mistake** sixty tenths, seventy tenths, eighty tenths, ninety tenths, twenty tenths … and correct it. **What comes next?** 83/100, 82/100, 81/100, ….., ….., ….. 31/100, 41/100, 51/100, ….., …..,	**Spot the mistake** 0.088, 0.089, 1.0 **What comes next?** 1.173, 1.183, 1.193	**Spot the mistake** Identify and explain mistakes when counting in more complex fractional steps
Recognising Fractions	**What do you notice?** Choose a number of counters. Place them onto 2 plates so that there is the same number on each half. When can you do this and when can't you? What do you notice?	**What do you notice?** ¼ of 4 = 1 ¼ of 8 = 2 ¼ of 12 = 3 Continue the pattern What do you notice?	**What do you notice?** 1/10 of 10 = 1 2/10 of 10 = 2 3/10 of 10 = 3 Continue the pattern. What do you notice? What about 1/10 of 20? Use this to work out 2/10 of 20, etc.	**What do you notice?** 1/10 of 100 = 10 1/100 of 100 = 1 2/10 of 100 = 20 2/100 of 100 = 2 How can you use this to work out 6/10 of 200? 6/100 of 200?	**What do you notice?** One tenth of £41 One hundredth of £41 One thousandth of £41 Continue the pattern What do you notice? 0.085 + 0.015 = 0.1 0.075 + 0.025 = 0.1 0.065 + 0.035 = 0.1 Continue the pattern for the next five number sentences.	**What do you notice?** One thousandth of my money is 31p. How much do I have?

	Y1	Y2	Y3	Y4	Y5	Y6
	True or false? Sharing 8 apples between 4 children means each child has 1 apple.	**True or false?** Half of 20cm = 5cm ¾ of 12cm = 9cm	**True or false?** 2/10 of 20cm = 2cm 4/10 of 40cm = 4cm 3/5 of 20cm = 12cm	**True or false?** 1/20 of a metre= 20cm 4/100 of 2 metres = 40cm	**True or false?** 0.1 of a kilometre is 1m. 0.2 of 2 kilometres is 2m. 0.3 of 3 Kilometres is 3m 0.25 of 3m is 500cm. 2/5 of £2 is 20p	**True or false?** 25% of 23km is longer than 0.2 of 20km. Convince me.
Comparing Fractions			Give an example of a fraction that is less than a half. Now another example that no one else will think of. Explain how you know the fraction is less than a half. (draw an image) Ben put these fractions in order starting with the smallest. Are they in the correct order? One fifth, one seventh, one sixth	Give an example of a fraction that is more than a half but less than a whole. Now another example that no one else will think of. Explain how you know the fraction is more than a half but less than a whole. (draw an image)	Give an example of a fraction that is more than three quarters. Now another example that no one else will think of. Explain how you know the fraction is more than three quarters. Imran put these fractions in order starting with the smallest. Are they in the correct order? Two fifths, three tenths, four twentieths How do you know?	Give an example of a **fraction** that is greater than 1.1 and less than 1.5. Now another example that no one will think of. Explain how you know. Sam put these fractions in order starting with the smallest. Are they in the correct order? Thirty three fifths Twenty three thirds Forty five sevenths How do you know?
Comparing Decimals				**Missing symbol** Put the correct symbol < or > in each box 3.03 ☐ 3.33 0.37 ☐ 0.32 What needs to be added to 3.23 to give 3.53? What needs to be added to 3.16 to give 3.2?	**Missing symbol** Put the correct symbol < or > in each box 4.627 ☐ 4.06 12.317 ☐ 12.31 What needs tobe added to 3.63 to give 3.13? What needs to be added to 4.652 to give 4.1?	**True or false?** In all of the numbers below, the digit 6 is worth <u>more than</u> 6 hundredths. 3.6 3.063 3.006 6.23 7.761 3.076 Is this true or false? Change some numbers so that it is true. What needs tobe adde3d to 6.543 to give 7? What needs to be added to 3.582 to give 5? Circle the two decimals which are closest in value to each other. 0.9 0.09 0.99 0.1 0.01

	Y1	Y2	Y3	Y4	Y5	Y6
Rounding including decimals				**Do, then explain** Circle each decimal which when rounded to the nearest whole number is 5. 5.3 5.7 5.2 5.8 Explain your reasoning **Top tips** Explain how to round numbers to one decimal place? *Also see rounding in place value*	**Do, then explain** Circle each decimal which when rounded to one decimal place is 6.2. 6.32 6.23 6.27 6.17 Explain your reasoning **Top tips** Explain how to round decimal numbers to one decimal place? *Also see rounding in place value*	**Do, then explain** Write the answer of each calculation rounded to the nearest whole number 75.7 × 59 7734 ÷ 60 772.4 × 9.7 20.34 × (7.9 – 5.4) **What's the same, what's different?** … when you round numbers to one decimal place and two decimal places? *Also see rounding in place value*
Equivalence		**Odd one out**. Which is the odd one out in this trio: ½ 2/4 ¼ Why? **What do you notice?** Find ½ of 8. Find 2/4 of 8 What do you notice?	**Odd one out**. Which is the odd one out in each of these trios ½ 3/6 5/8 3/9 2/6 4/9 Why? **What do you notice?** Find 2/5 of 10 Find 4/10 of 10. What do you notice? Can you write any other similar statements?	**Odd one out.** Which is the odd one out in each of these trio s¾ 9/12 4/6 9/12 10/15 2/3 Why? **What do you notice?** Find 4/6 of 24 Find 2/3 of 24 What do you notice? Can you write any other similar statements?	**Odd one out.** Which is the odd one out in each of these collections of 4 fractions 6/10 3/5 18/20 9/15 30/100 3/10 6/20 3/9 Why? **What do you notice?** Find 30/100 of 200 Find 3/10 of 200 What do you notice? Can you write any other similar statements?	**Odd one out**. Which is the odd one out in each of these collections of 4 fraction s¾ 9/12 26/36 18/24 4/20 1/5 6/25 6/30 Why? **What do you notice?** 8/5 of 25 = 40 5/4 of 16 = 20 7/6 of 36 - 42 Can you write similar statements?
				Complete the pattern by filling in the blank cells in this table: 1/10 | 2/10 | 3/10 | 10/100 | 20/100 | | 40/100 0.1 | | 0.3 | **Another and another** Write a decimal numbers (to one decimal place) which lies between a half and three quarters? … and another, … and another, …	**Complete the pattern** 71/100 | ??/100 | ??/100 | ?/10 0.71 | 0.81 | ??? | ? Complete the table. **Another and another** Write a fraction with a denominator of one hundred which has a value of more than 0.75? … and another, … and another, …	**Complete the pattern** 1/8 | 2/8 | 3/8 | 4/8 0.375 | ??? | ??? | ??? Complete the table. **Another and another** Write a unit fraction which has a value of less than 0.5? … and another, … and another, …

	Y1	Y2	Y3	Y4	Y5	Y6
		Ordering Put these fractions in the correct order, starting with the smallest. ½ ¼ 1/3	**Ordering** Put these fractions in the correct order, starting with the smallest. 4/8 ¾ 1/4	**Ordering** Put these numbers in the correct order, starting with the smallest. ¼ 0.75 5/10 Explain your thinking	**Ordering** Put these numbers in the correct order, starting with the largest. 7/10, 0.73, 7/100, 0.073 71% Explain your thinking Which is more: 20% of 200 or 25% of 180? Explain your reasoning.	**Ordering** Which is larger, $^{1}/_{3}$ or $^{2}/_{5}$? Explain how you know. Put the following amounts in order, starting with the largest. 23%, 5/8, 3/5, 0.8
Addition and subtraction of fractions			**What do you notice?** 1/10 + 9/10 = 1 2/10 + 8/10 = 1 3/10 + 7/10 = 1 **Continue the pattern** Can you make up a similar pattern for eighths? The answer is 5/10, what is the question? (involving fractions / operations)	**What do you notice?** 5/5 – 1/5 = 4/5 4/5 – 1/5 = 3/5 **Continue the pattern** Can you make up a similar pattern for addition? The answer is 3/5, what is the question? What do you notice? 11/100 + 89/100 = 1 12/100 + 88/100 = 1 13/100 + 87/100 = 1 Continue the pattern for the next five number sentences	**What do you notice?** ¾ and ¼ = 4/4 = 1 4/4 and ¼ = 5/4 = 1 ¼ 5/4 and ¼ = 6/4 = 1 ½ Continue the pattern up to the total of 2. Can you make up a similar pattern for subtraction? The answer is 1 2/5 , what is the question	**Another and another** Write down two fractions which have a difference of 1 2/… and another, … and another, … **Another and another** Write down 2 fractions with a total of 3 4/5. … and another, … and another, …
Multiplication and division of fractions					**Continue the pattern** ¼ x 3 = ¼ x 4 = ¼ x 5 = Continue the pattern for five more number sentences. How many steps will it take to get to 3? 5/3 of 24 = 40 Write a similar sentence where the answer is 56. The answer is 2 ¼ , what is the question Give your top tips for multiplying fractions.	**Continue the pattern** 1/3 ÷ 2 = 1/6 1/6 ÷ 2 = 1/12 1/12 ÷ 2 = 1/24 What do you notice? ½ x ¼ = The answer is 1/8 , what is the question (involving fractions / operations) Give your top tips for dividing fractions.

	Y1	Y2	Y3	Y4	Y5	Y6
Multiplication and division of decimals				**Undoing** I divide a number by 100 and the answer is 0.3. What number did I start with? **Another and another** Write down a number with one decimal place which when multiplied by 10 gives an answer between 120 and 130. ... and another, … and another, …	**Undoing** I divide a number by 100 and the answer is 0.33 What number did I start with? **Another and another** Write down a number with two decimal places which when multiplied by 100 gives an answer between 33 and 38. ... and another, … and another, …	**Undoing** I multiply a number with three decimal places by a multiple of 10. The answer is approximately 3.21 What was my number and what did I multiply buy? When I divide a number by 1000 the resulting number has the digit 6 in the units and tenths and the other digits are 3 and 2 in the tens and hundreds columns. What could my number have been?
Ratio and proportion						**What else do you know?** In a flower bed a gardener plants 3 red bulbs for every 4 white bulbs. How many red and white bulbs might he plant? If she has 100 white bulbs, how many red bulbs does she need to buy? If she has 75 red bulbs, how many white bulbs does she need to buy? If she wants to plant 140 bulbs altogether, how many of each colour should she buy? **Do, then explain** Purple paint is made from read and blue paint in the ratio of 3:5. To make 40 litres of purple paint how much would I need of each colour? Explain your thinking. **What else do you know?** 88% of a sum of money = £242. Make up some other statements. Write real life problems for your number sentences.

	Y1	Y2	Y3	Y4	Y5	Y6

						Undoing I think of a number and then reduce it by 15%. The number I end up with is 306. What was my original number? In a sale where everything is reduced by 15% I paid the following prices for three items. £255, £850, £4.25 What was the original selling price?
						Unpicking A recipe needs to include three times as much apple than peach. The total weight of apples and peaches in a recipe is 700 grammes. How much apple do I need?
						Other possibilities A 50 seater coach travels to the match. Most of the seats are taken. Junior tickets cost £13 and Adult tickets cost £23. The only people on the coach are Juniors and Adults. The total amount paid for tickets is approximately £900 How many people on the coach were adults and how many were juniors?

	Y1	Y2	Y3	Y4	Y5	Y6
Equations	Solve one step missing number problems involving: • addition and subtraction eg 7 = □ - 9 (from Addition and Subtraction) • **number facts;** • **place value.**	Solve missing number problems involving: • addition and subtraction; • **multiplication and division;** • **number facts;** • **place value.**	Solve missing number problems involving: • the 4 operations; • **number facts;** • **place value.**	**Solve missing number problems involving:** • **the 4 operations;** • **number facts;** • **place value.**	**Solve missing number problems involving:** • **the 4 operations;** • **number facts;** • **place value;** • Use of = to indicate equivalence eg 13 + 24 = 12 + 25 33 = 5 x □ • missing lengths and angles (from Properties of Shapes)	Express missing number problems algebraically. Solve missing number problems including: • **4 operations;** • **number facts;** • **place vale;** • ratio; • lengths; • angles; • co-ordinates.
Function machines	**Use one-step function machines using addition and subtraction.**	**Use one-step function machines using all 4 operations.**	**Use two-step function machines using all 4 operations.**	**Use two-step function machines (using all 4 operations including negative numbers).**	**Use multi-steps function machines starting with an answer (include 4 operations, negative numbers).**	**Use multi-steps function machines starting with an answer (include 4 operations, negative numbers).**
Balance puzzles	Calculate number sentences with one unknown eg 7 = □ - 9 (from Addition and subtraction)	**Calculate number sentences with one or more unknowns which are on one side of the balance eg** △ **+ 3 = 20** □ **+** □ **= 35**	**Calculate number sentences with two unknowns which are on one side of the balance eg** **120 =** △ **x** ○ □ **+** □ **= 460**	**Calculate number sentences with two unknowns (including fractions and decimals with 1 decimal place) which are on one side of the balance eg** **6.5 =** □ **+** △ ○ **x** ○ **= 400**	**Calculate number sentences with two unknowns which are on different sides of the balance eg** □ **+ 3 = 20 -** △	Find pairs of numbers that satisfy number sentences involving two unknowns **50 -** □ **=** △ **+ 10**
Formula				Perimeter can be expressed algebraically as 2(a + b) where a and b are the dimensions in the same unit. (from Measurement).	Find missing lengths eg a rectangle with a perimeter of 20cm and sides 2 cm and bcm is 4 + 2b = 20 (from Measurement).	Use simple formulae. Enumerate all possibilities of combinations of two variables **4a + 6b = 50** Recognise when it is possible to use formulae for area and volume of shapes (from in Measurement). Calculate the area of parallelograms and triangles (from in Measurement).

	Y1	Y2	Y3	Y4	Y5	Y6

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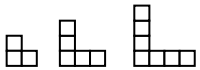
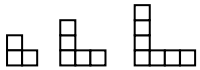
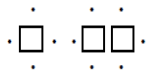
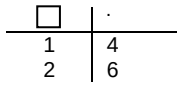
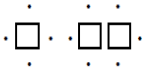
Sequences Linear	**Describe and continue linear number sequences using the word term (eg link to work on counting, multiplication tables).**	**Describe and continue linear number sequences using the word term (eg link to work on counting, multiplication tables).**	**Generate, describe and continue linear number sequences using the word 'term' (eg link to work on counting, multiplication tables).**	**Generate, describe and continue linear number sequences using the word 'term' (eg link to work on counting, multiplication tables).**	**Generate, continue,** recognise and describe linear number sequences (eg 3, 3 ½, 4, 4 ½ ....), including those involving fractions and decimals, **and negative numbers** and find the term-to-term rule in words (eg add ½) (from Number and Place Value).	Generate, describe **and continue** linear number sequences.
Non linear					**Recognise and describe non linear sequences (eg square numbers, triangular numbers, primes, Fibonacci etc).**	**Recognise and describe non linear sequences (eg square numbers, triangular numbers, Fibonacci etc).**
Events	Sequence events in chronological order using language such as: before and after, next, first, today, yesterday, tomorrow, morning, afternoon and evening (from Measurement).	Compare and sequence intervals of time (from Measurement).				
Patterns	Recognise and create repeating patterns **with up to 3 colours**, objects and shapes (from Number and Place Value, also in Properties of Shapes).	Order and arrange combinations of mathematical objects in patterns and sequences (from Position and Direction). Work with patterns of shapes including those in different orientations (from Position and Direction).	**Recognise and continue growing patterns** 	**Continue and describe growing patterns in words.** 	**Continue and describe growing patterns.** **Record results in a table and predict next terms.**   1 4 2 6	**Continue and describe growing patterns (eg** 
n^{th} term						**Generate a formula to describe the n^{th} term in a pattern eg 2n + 2**

	Y1	Y2	Y3	Y4	Y5	Y6

NCETM Reasoning

Equations	Connected Calculations	Connected Calculations	Connected Calculations	Connected Calculations	Connected Calculations	Connected Calculations
	11 = 3 + 8 12 = 4 + 8 13 = □ + 8 14 = □ + 8 What numbers go in the boxes? Can you continue this sequence of calculations?	Put the numbers 19, 15 and 4 in the boxes to make the number sentences correct. □ = □ - □ □ = □ + □	Put the numbers 3, 12, 36 in the boxes to make the number sentences correct. □ = □ x □ □ = □ ÷ □	Put the numbers 7.2, 8, 0.9 in the boxes to make the number sentences correct. □ = □ x □ □ = □ ÷ □	The number sentence below represents the angles in degrees of an isosceles triangle. A + B + C = 180 degrees A and B are equal and are multiples of 5. Give an example of what the 3 angles could be. Write down 3 more examples	p and q each stand for whole numbers. p + q = 1000 and p is 150 greater than q. Work out the values of p and q.
Formulae				**Undoing** If the longer length of a rectangle is 13cm and the perimeter is 36cm, what is the length of the shorter side? Explain how you got your answer.	**Undoing** The perimeter of a rectangular garden is between 40 and 50 metres. What could the dimensions of the garden be?	**Undoing** The diagram below represents two rectangular fields that are next to each other. Field A | Field B Field A is twice as long as field B but their widths are the same and are 7.6 metres. If the perimeter of the small field is 23m what is the perimeter of the entire shape containing both fields? If y stands for a number complete the table below *y* | 3*y* | 3*y* + 1 25 | | | | 28 What is the largest value of y if the greatest number in the table was 163?
Sequences		**True or false?** The largest three digit number that can be made from the digits 2, 4 and 6 is 264. Is this true or false? Explain your thinking.				**Generalising** Write a formula for the 10^{th}, 100^{th} and nth terms of the sequences below. 4, 8, 12, 16 …… 0.4, 0.8, 1.2, 1.6, ……

	Y1	Y2	Y3	Y4	Y5	Y6
Solving problems involving money and measures	Solve practical problems for: • lengths and heights; • mass/weight; • capacity and volume; • time; • **money.**	**Solve practical problems for:** • **lengths and heights;** • **mass;** • **capacity and volume;** • **time.** Solve simple problems in a practical context including addition and subtraction of money of the same unit, including giving change.	**Solve practical problems for:** • **lengths and heights;** • **mass;** • **capacity and volume;** • **time;** • **money;** • **temperature.**	Solve practical problems involving fractions and decimals to 2 decimal places (from Decimals) for: • lengths and heights; • mass; • capacity and volume; • time; • money; • **perimeter** • **temperature.** (from Decimals) Solve problems involving converting from hours to minutes; minutes to seconds; years to months; weeks to days.	Use all four operations to solve problems involving measure, using decimal notation: • length; • mass; • volume; • money using decimal notation • scaling; • **area** • **perimeter** • time (using conversions) • **temperature.** Solve problems involving converting between units of time.	Solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate.
Reading scales	**Read the numbered divisions on a scale and interpret the divisions between them (eg on a scale 0-20 with intervals of 1 shown but only the divisions 5, 10, 15, and 20 numbered).**	**Read to the nearest division scales that are numbered or partially numbered.**	**Read to the nearest division and half division scales that are numbered or partially numbered.**	**Interpret intervals and divisions on partially numbered scales.**	**Interpret a reading that lies between two numbered divisions on a scale.**	**Interpret a reading that lies between two numbered divisions on a scale.**
Length/height Measure and calculate	Measure and begin to record lengths and heights, moving from using non-standard units to manageable common standard units). Use appropriate measuring tools: rulers, **metre sticks, measuring tapes and trundle wheels.**	Choose and use appropriate standard units to estimate and measure length/height in any direction (m/cm) to the nearest appropriate unit using rulers, **metre sticks, measuring tape, trundle wheels.** Draw lines and shapes using a straight edge (from Properties of Shapes).	**Estimate**, measure, add and subtract lengths (m/cm/mm). Connect decimals and rounding to drawing and measuring straight lines in cm in a variety of contexts (from Properties of Shapes).	Estimate and calculate lengths.	**Use, read and write standard units of length using decimal notation to two decimal places.** Draw accurate lines with a ruler to the nearest millimetre (from Properties of Shapes). Use conventional markings for parallel lines. (from Properties of Shapes).	Use, read and write standard units of length using decimal notation to three decimal places.
Compare and order	Compare and describe lengths and heights (for example, long/short, longer/shorter, tall/short, double/half) moving from comparing non-standard units to manageable common standard units.	Compare and order lengths and record the results using >, < and = Comparing measures including simple multiples such as 'half as high'; 'twice as wide'.	Compare lengths (m/cm/mm) including: • mixed units eg 2m, 5cm; • simple scaling by integers eg twice as long, five times as high.	Compare a range of different lengths: • **against each other;** • **against key benchmarks (eg 1m, 1 km);** **Order a range of lengths.**		

	Y1	Y2	Y3	Y4	Y5	Y6
Convert			Use simple equivalence of mixed units eg 5m = 500cm.	Convert between different units of measure (eg kilometre to metre).	Convert between different units of metric measure (for example, kilometre and metre; centimetre and metre, centimetre and millimetre).	Convert between standard units, converting measurements of length from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to three decimal places.
Metric and Imperial					Understand and use approximate equivalences between metric and common imperial units such as inches.	Convert between miles and kilometres. Read graphs to convert Km to miles (from Statistics).
Perimeter			Measure the perimeter of simple 2-D shapes.	Measure and calculate the perimeter of a rectilinear figure (including squares) in centimetres and metres. Perimeter can be expressed algebraically as 2(a + b) where a and b are the dimensions in the same unit (also in Algebra).	Measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres. Find missing lengths eg a rectangle with a perimeter of 20cm and sides 2cm and bcm is 4 + 2b = 20 (also in Algebra).	Recognise that shapes with the same areas can have different perimeters and vice versa.
Area	**Find the approximate areas of everyday objects using non-standard units eg measuring leaves and hands with cubes and counters.**	**Find the approximate area of everyday objects by counting whole squares, ½ squares.**	**Find the approximate area of everyday objects by counting whole squares, ½ squares and combining squares.**	Find the area of rectilinear shapes by counting squares. Relate area to arrays and multiplication.	Calculate and compare the area of rectangles (including squares), and including using standard units, square centimetres (cm^2) and square metres (m^2) and estimate the area of irregular shapes. Calculate the area from scale drawings using given measurements. **Calculate the area of composite rectilinear shapes by splitting into rectangles.**	Calculate the area of parallelograms and triangles (also in Algebra). Recognise when it is possible to use the formulae for area of shapes (also in Algebra). Recognise that shapes with the same areas can have different perimeters and vice versa.

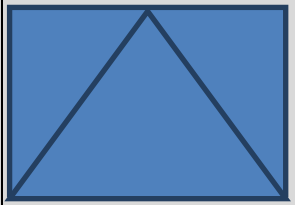
	Y1	Y2	Y3	Y4	Y5	Y6
Mass Measure and calculate	Measure and begin to record mass/weight, moving from using non-standard units to manageable common standard units. Use appropriate measuring tools eg weighing scales.	Choose and use appropriate standard units to estimate and measure mass (kg/g) to the nearest appropriate unit using scales.	**Estimate,** measure, add and subtract mass (kg/g).	Estimate and calculate mass.	**Use, read and write standard units of mass using decimal notation to two decimal places.**	Use, read and write standard units of mass using decimal notation to three decimal places.
Compare and order	Compare and describe mass/weight (for example, heavy/light, heavier than, lighter than) moving from comparing non-standard units to manageable common standard units.	Compare and order mass and record the results using >, < and = Compare measures including simple multiples such as half as heavy, twice as heavy.	Compare mass (kg/g) including: • mixed units eg 1 kg and 200g; • simple scaling by integers eg 3 times as heavy.	Compare a range of different masses. • **against each other;** • **against key benchmarks (eg 100g, 1 kg).** **Order a range of masses.**	.	
Convert			Use simple equivalence of mixed units eg 2kgs = 2000g	Convert between different units of metric measure (eg gram and kilogram).	Convert between different units of metric measure (eg gram and kilogram).	Convert between standard units converting measurement of mass from a smaller unit to a larger unit and vice versa (using decimal notation up to 3 decimal places).
Metric and imperial					Understand and use approximate equivalences between metric and common imperial units such as pounds.	
Capacity/volume Measure and calculate	Measure and begin to record capacity and volume moving from using non-standard units to manageable common standard units. Use appropriate measuring tools eg containers.	Choose and use appropriate standard units to estimate and measure capacity and volume (litres/ml) to the nearest appropriate unit using measuring vessels.	**Estimate,** measure, add and subtract volume/capacity (l/ml).	Estimate and calculate volume/ capacity.	Estimate **and calculate** volume (for example, using 1 cm^3 blocks to build cuboids (including cubes) and capacity (for example, using water). **Use, read and write standard units of volume using decimal notation to two decimal places.**	Use, read and write standard units of volume using decimal notation to three decimal places. Calculate and estimate volume of cubes and cuboids using standard units, including cubic centimetres (cm^3) and cubic metres (m^3) and extending to other units (for example, mm^3 and km^3). Recognise when it is possible to use the formulae for volume of shapes (also in Algebra).

	Y1	Y2	Y3	Y4	Y5	Y6
Compare and order	Compare and describe capacity and volume (for eg, full/empty, more than, less than, half, half full, quarter), moving from comparing non standard units to manageable common standard units.	Compare and order volume/capacity and record the results using >, < and = Compare measures including simple multiples such as half as full, twice as full.	Compare volume/capacity (l/ml) including: • mixed units eg 1l and 450ml; • simple scaling by integers eg holds 4 times as much	Compare a range of different volumes/ capacities: • **against each other** • **against key benchmarks (eg 100ml, 1 L).** **Order a range of volume/capacity measures.**		Compare volume of cubes and cuboids using standard units, including cubic centimetres (cm^3) and cubic metres (m^3) and extending to other units (eg mm^3 and km^3).
Convert			Use simple equivalence of mixed units eg 3L = 3000ml.	Convert between different units of metric measure (for example, litre and millilitre).	Convert between different units of metric measure (for example, litre and millilitre).	Convert between standard units, converting measurements of volume from a smaller unit to a larger unit and vice versa (using decimal notation up to 3 decimal places).
Metric and imperial					Understand and use approximate equivalences between metric and common imperial units such as pints.	
Temperature		Choose and use appropriate standard units to estimate and measure temperature to the nearest degree (°C) using thermometers.	**Choose and use appropriate standard units to estimate and measure temperature to the nearest degree (°C) using thermometers.**	**Order temperatures (positive and negative) using a number line.**	**Order temperatures (positive and negative) using a number line.**	Using the number line, add and subtract positive and negative integers for measures such as temperature.
Time Language/time duration	Recognise and use language relating to dates, including days of the week, weeks, months, **seasons** and years.		Use vocabulary such as o'clock, am/pm, morning, afternoon, noon and midnight.			
	Measure and begin to record time (hours, minutes, and seconds).	Know the number of minutes in an hour and the number of hours in a day.	Know the number of seconds in a minute, and the number of days in each month, year and leap year.	**Interpret and use information on a calendar to identify dates in the past or future.**	**Complete, read and interpret information on timetables.**	
Compare	Compare and describe time (eg quicker, slower, earlier, later). Sequence events in chronological order using language eg before and after, next, first, today, yesterday, tomorrow, morning, afternoon and evening (also in Algebra - Sequences).	Compare and sequence intervals of time (also in Algebra – Sequences).	Record and compare time in terms of seconds, minutes and hours. Compare durations of events (eg to calculate the time taken by particular events or tasks).	**Compare a range of times using a mixture of analogue/12 hr/24 hr clock.**	**Compare a range of times using a mixture of analogue/12 hr/24 hr clock.**	**Compare a range of times using a mixture of analogue/12 hr/24 hr clock.**

	Y1	Y2	Y3	Y4	Y5	Y6
Telling the time	Tell the time to the hour and half past the hour and draw the hands on a clock face to show these times. Tell the time during the day. Make whole, half, quarter, three quarter turns in both directions and connect turning clockwise with movement on a clock face (from Position and Direction).	Tell and write the time to five minutes, including quarter past/to the hour and draw the hands on a clock face to show these times.	Tell and write the time from an analogue clock, including: • using Roman numerals from I to XII; • 12-hour clock; • 24- hour clock. Use digital 12 hour clocks. Estimate and read time with increasing accuracy to the nearest minute.	Read and write time on analogue and digital 12- and 24-hour clocks.	**Read and write time on analogue and digital 12- and 24-hour clocks.**	Use, read and write standard units of time.
Convert				Convert between different units of time (eg hour to minute). Convert time between analogue and digital 12- and 24-hr clocks.	**Convert between different units of time (eg hour to minute).** **Convert between analogue and digital 12- and 24-hr clocks.**	Convert measurement of time from a smaller unit to a larger unit and vice versa. Introduce to compound units of speed eg miles per hour.
Money Recognise	Recognise and know the value of different denominations of coins and notes.	Recognise and use symbols for pounds (£) and pence (p).				
Calculate	**Add together 2 or more coins and notes.**	Combine amounts to make a particular value Find different combinations of coins that equal the same amounts of money.	Add and subtract amounts of money (including mixed units) to give change, using both £ and p in practical contexts, initially recording £ and p separately, **leading to decimal notation when appropriate.**	Estimate, compare and calculate money in pounds and pence.		

	Y1	Y2	Y3	Y4	Y5	Y6

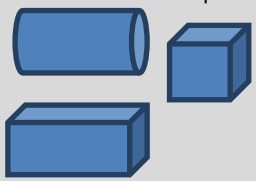
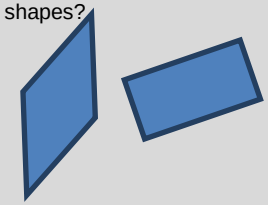
NCETM Reasoning						
Comparing and Estimating	**Top tips** How do you know that this (object) is heavier / longer / taller than this one? Explain how you know.	**Top tips** Put these measurements in order starting with the smallest. 75 g 85 g 100 g Explain your thinking **Position the symbols** Place the correct symbol between the measurements > or < 36cm ☐ 63cm 130ml ☐ 103ml Explain your thinking	**Top Tips** Put these measurements in order starting with the largest. Half a litre Quarter of a litre 300 ml Explain your thinking **Position the symbols** Place the correct symbol between the measurements > or < 306cm ☐ Half a metre 930 ml ☐ 1 litre Explain your thinking	**Top Tips** Put these amounts in order starting with the largest. Half of three litres Quarter of two litres 300 ml Explain your thinking **Position the symbols** Place the correct symbols between the measurements > or < £23.61 2326p 2623p Explain your thinking	**Top Tips** Put these amounts in order starting with the largest. 130000cm^2 1.2 m^2 13 m^2 Explain your thinking	**Top Tips** Put these amounts in order starting with the largest. 100 cm^3 1000000 mm^3 1 m^3 Explain your thinking
Sequences and intervals of time	**Explain thinking** Ask pupils to reason and make statements about to the order of daily routines in school e.g. daily timetable e.g. we go to PE **after** we go to lunch. Is this true or false? What do we do before break time? etc.	**Undoing** The film finishes two hours after it starts. It finishes at 4.30. What time did it start? Draw the clock at the start and the finish of the film. **Explain thinking** The time is 3:15pm. Kate says that in two hours she will be at her football game which starts at 4:15. Is Kate right? Explain why.	**Undoing** A programme lasting 45 minutes finishes at 5.20. At what time did it start? Draw the clock at the start and finish time. **Explain thinking** Salha says that 100 minutes is the same as 1 hour. Is Salha right? Explain why.	**Undoing** Imran's swimming lesson lasts 50 mins and it takes 15 mins to change and get ready for the lesson. What time does Imran need to arrive if his lesson finishes at 6.15pm? **Explain thinking** The time is 10:35 am. Jack says that the time is closer to 11:00am than to 10:00am. Is Jack right? Explain why.	**Undoing** A school play ends at 6.45pm. The play lasted 2 hours and 35 minutes. What time did it start? **Other possibilities** (links with geometry, shape and space) A cuboid is made up of 36 smaller cubes.  If the cuboid has the length of two of its sides the same what could the dimensions be? Convince me	**Undoing** A film lasting 200 minutes finished at 17:45. At what time did it start? **Other possibilities** (links with geometry, shape and space) A cuboid has a volume between 200 and 250 cm cubed. Each edge is at least 4cm long. List four possibilities for the dimensions of the cuboid..
Measuring and Calculating	**Application** (Can be practical) Which two pieces of string are the same length as this book?	**Application** (Practical) Draw two lines whose lengths differ by 4cm.	**Write more statements** (You may choose to consider this practically) If there are 630ml of water in a jug. How much water do you need to add to end up with a litre of water? What if there was 450 ml to start with? Make up some more questions like this	**Write more statements** One battery weighs the same as 60 paperclips; One pencil sharpener weighs the same as 20 paperclips. Write down some more things you know. How many pencil sharpeners weigh the same as a battery?	**Write more statements** Mr Smith needs to fill buckets of water. A large bucket holds 6 litres and a small bucket holds 4 litres. If a jug holds 250 ml and a bottle holds 500 ml suggest some ways of using the jug and bottle to fill the buckets.	**Write more statements** Chen, Megan and Sam have parcels. Megan's parcel weighs 1.2kg and Chen's parcel is 1500g and Sam's parcel is half the weight of Megan's parcel. Write down some other statements about the parcels. How much heavier is Megan's parcel than Chen's parcel?

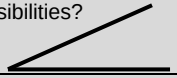
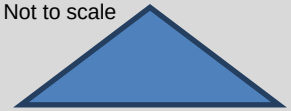
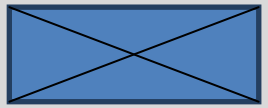
	Y1	Y2	Y3	Y4	Y5	Y6
Perimeter			**Testing conditions** A square has sides of a whole number of centimeters. Which of the following measurements could represent its perimeter?8cm 18cm 24cm 25cm	**Testing conditions** If the width of a rectangle is 3 meters less than the length and the perimeter is between 20 and 30 meters, what could the dimensions of the rectangle lobe? Convince me.	**Testing conditions** Shape A is a rectangle that is 4m long and 3m wide. Shape B is a square with sides 3m. The rectangles and squares are put together side by side to make a path which has perimeter between 20 and 30 m. For example  Can you draw some other arrangements where the perimeter is between 20 and 30 metres?	**Testing conditions** A square has the perimeter of 12 cm. When 4 squares are put together, the perimeter of the new shape can be calculated. For example:  What arrangements will give the maximum perimeter?
Money	**Possibilities** Ella has two silver coins. How much money might she have?	**Possibilities** How many different ways can you make 63p using only 20p, 10p and 1p coins?	**Possibilities** I bought a book which cost between £9 and £10 and I paid with a ten pound note. My change was between 50p and £1 and was all in silver coins. What price could I have paid?	**Possibilities** Adult tickets cost £8 and Children's tickets cost £4. How many adult and children's tickets could I buy for £100 exactly? Can you find more than one way of doing this?		
Area				**Always, sometimes, never** If you double the area of a rectangle, you double the perimeter. *See also Geometry Properties of Shape*	**Always, sometimes, never** When you cut off a piece of a shape you reduce its area and perimeter. *See also Geometry Properties of Shape*	**Always, sometimes, never** The area of a triangle is half the area of the rectangle that encloses it:  *See also Geometry Properties of Shape*
Time		**Working backwards** Draw hands on the clock faces to show when break started and when it finished 15 minutes later at 10:35.	**Working backwards** Tom's bus journey takes half an hour. He arrives at his destination at 9:25. At what time did his bus leave? 9:05 8:55 8:45	**Working backwards** Put these times of the day in order, starting with the earliest time. A: Quarter to four in the afternoon B: 07:56 C: six minutes to nine in the evening D: 14:36	**Working backwards** Put these lengths of time in order starting with the longest time. 105 minutes 1 hour 51 minutes 6360 seconds	

	Y1	Y2	Y3	Y4	Y5	Y6
Converting		**The answer is ….** 3 hours What is the question? **What do you notice?** What do you notice? 1 hour = 60 minutes ½ hour = 30 minutes ¼ hour = 15 minutes Write down some more time facts like these	**The answer is ….** 25 minutes What is the question? **What do you notice?** What do you notice? 1 minute = 60 seconds 2 minutes = 120 seconds Continue the pattern Write down some more time facts like these	**The answer is ….** 225 metres What is the question? **What do you notice?** What do you notice? 1:00pm = 13:00 2:00pm = 14:00 Continue the pattern	**The answer is ….** 0.3km What is the question? **What do you notice?** What do you notice? 1 minute = 60 seconds 60 minutes = ☐ seconds Fill in the missing number of seconds down some more time facts like this.	**The answer is ….** 24 metres cubed What is the question? **What do you notice?** 8 km = 5 miles 16km = ☐ miles 4 km = ☐ miles Fill in the missing number of miles. Write down some more facts connecting kilometres and miles.

	Y1	Y2	Y3	Y4	Y5	Y6
	Read and write names for shapes that are appropriate for their word reading and spelling.					
Identifying shapes and their properties 2-D shapes	Recognise and name common 2-D shapes including: • rectangles; • squares; • circles; • triangles. Handle 2-D shapes, naming them and related everyday objects. Recognise 2-D shapes in different orientations and sizes.	Identify and describe the properties of 2-D shapes, including the number of sides and line symmetry in a vertical line. Handle and name a wide variety of 2D shapes including quadrilaterals, polygons.	**Identify** and describe the properties of 2-D shapes, using: • accurate language; • length of lines; • acute and obtuse angles. Identify horizontal and vertical lines and pairs of perpendicular and parallel lines.	**Identify and describe the properties of 2D shapes:** • **language;** • **length of lines;** • **angles;** • **symmetry.**	Identify 3-D shapes, including cubes and other cuboids, from 2-D representations. **Identify and describe the properties of 2D shapes:** • **language;** • **length of lines;** • **angles;** • **symmetry.**	**Identify and describe the properties of 2D shapes:** • **language;** • **length of lines;** • **angles;** • **symmetry.** Illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius d = 2 x r
Symmetry			Extend knowledge of properties of shape to symmetrical and non symmetrical polygons.	Complete a simple symmetric figure with respect to a specific line of symmetry. Identify lines of symmetry in 2-D shapes presented in different orientations. Draw symmetric patterns using a variety of media to become familiar with different orientations of lines of symmetry. Recognise line symmetry in a variety of diagrams, including where the line of symmetry does not dissect the original shape.		
3-D shapes	Recognise and name common 3-D shapes including: • cuboids; • cubes; • pyramids; • spheres.	Identify and describe the properties of 3-D shapes, including the number of edges, vertices and faces.	**Identify** and describe the properties of 3-D shapes, including • **number of edges, vertices and faces** • accurate language • length of lines • acute and obtuse angles	**Identify and describe the properties of 3-D shapes, including the number of edges, vertices and faces, length of lines and acute and obtuse angles.**	**Identify and describe the properties of 3-D shapes, including the number of edges, vertices and faces, length of lines and acute and obtuse angles.**	**Identify and describe the properties of 3-D shapes, including the number of edges, vertices and faces, length of lines and acute and obtuse angles.**

	Y1	Y2	Y3	Y4	Y5	Y6
	Handle 3-D shapes, naming them and related everyday objects. Recognise 3D shapes in different orientations and sizes.	Handle and name a wide variety of common 3D shapes including cuboids, prisms, and cones. Identify 2-D shapes on the surface of 3-D shapes, [for example, a circle on a cylinder and a triangle on a pyramid].	Recognise 3-D shapes in different orientations and describe them. Extend knowledge of properties of shape to symmetrical and non symmetrical polyhedra.			
Angles	Describe position, direction and movement, including whole, half, quarter and three-quarter turns. (Also in Position and Direction)	Use mathematical vocabulary to describe position, direction and movement including movement in a straight line and distinguishing between rotation as a turn and in terms of right angles for quarter, half and three-quarter turns (clockwise and anti-clockwise). To include practical contexts eg pupils themselves moving in turns giving instructions to other pupils to do so and programming robots using instructions given in right angles . (from Position and Direction)	Recognise angles as a property of shape or a description of a turn. Identify right angles, recognise that two right angles make a half-turn, three make three quarters of a turn and four a complete turn. Identify whether angles are greater than or less than a right angle. Use acute and obtuse.	Identify acute and obtuse angles and compare and order angles up to two right angles by size .	Know angles are measured in degrees: estimate and compare. acute, obtuse and reflex angles Identify: • angles at a point and one whole turn (total 360^{o}) • angles at a point on a straight line and ½ a turn (total 180^{o}) • other multiples of 90^{o} Use the term diagonal and make conjectures about the angles formed between sides, and between diagonals and parallel sides, and other properties of quadrilaterals. Use symbol for right angle. Use angle sum facts and other properties to make deductions about missing angles and relate these to missing number problems.	Recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles. Describe the properties of shapes and explain how unknown angles and lengths can be derived from known measurements. Express algebraically eg a = 180 – (b + c)

	Y1	Y2	Y3	Y4	Y5	Y6
Comparing and classifying	**Interpret and sort shapes using Venn and Carroll diagrams** (from Statistics).	Identify, compare and sort common 2-D and 3-D shapes and everyday objects, on the basis of their properties and use vocabulary precisely such as sides, edges, vertices and faces. **Interpret and sort shapes using Venn and Carroll diagrams** (from Statistics).	**Compare and sort common 2-D and 3-D shapes and everyday objects.** **Interpret, sort and present data with shapes using Venn and Carroll diagrams** (from Statistics).	Compare and classify geometric shapes, including quadrilaterals and triangles, based on their properties and sizes. Compare lengths and angles to decide if a polygon is regular or irregular.	Use the properties of rectangles to deduce related facts and find missing lengths and angles (also in Algebra) . 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.
Drawing and constructing		Draw lines and shapes using a straight edge	Draw 2-D shapes and make 3-D shapes using modelling materials. Connect decimals and rounding to drawing and measuring straight lines in cm in a variety of contexts		Draw given angles, and measure them in degrees (^{o}). Draw accurate lines with a ruler to the nearest millimetre. Use conventional markings for parallel lines.	Draw 2-D shapes using given dimensions and angles. Recognise, describe and build simple 3-D shapes, including making nets.
Patterns with shapes	Recognise and create repeating patterns **with up to 3 colours,** objects and shapes (from Number and Place Value, also in Algebra).	Order and arrange combinations of mathematical objects in patterns and sequences (from Position and Direction, also in Algebra). Work with patterns of shapes in different orientations (from Position and Direction, also in Algebra).				
NCETM Reasoning						
Identifying shapes and their properties	**What's the same, what's different?** Find a rectangle and a triangle in this set of shapes. Tell me one thing that's the same about them. Tell me one thing that is different about them.	**What's the same, what's different?** Pick up and look at these 3-D shapes. 	**What's the same, what's different?** What is the same and different about these three2-D shapes? 	**What's the same, what's different?** What is the same and what is different about the diagonals of these 2-D shapes? 	**What's the same, what's different?** What is the same and what is different about the net of a cube and the net of a cuboid?	**What's the same, what's different?** What is the same and what is different about the nets of a triangular prism and a square based pyramid?

	Y1	Y2	Y3	Y4	Y5	Y6
	Visualising Put some shapes in a bag. Find me a shape that has more than three edges.	Do they all have straight edges and flat faces? What is the same and what is different about these shapes? **Visualising** In your head picture a rectangle that is twice as long as it is wide. What could its measurements be?	**Visualising** I am thinking of a 3-dimensional shape which has faces that are triangles and squares. What could my shape be?	**Visualising** Imagine a square cut along the diagonal to make two triangles. Describe the triangles. Join the triangles on different sides to make new shapes. Describe them. (you could sketch them) Are any of the shapes symmetrical? Convince me.	**Visualising** I look at a large cube which is made up of smaller cubes.  If the larger cube is made up of between 50 and 200 smaller cubes what might it look like?	**Visualising** Jess has 24 cubes which she builds to make a cuboid. Write the dimensions of cuboids that she could make. List all the possibilities.
Drawing and Constructing			**Other possibilities** One face of a 3-D shape looks like this.  What could it be? Are there any other possibilities?	**Other possibilities** Can you draw a non-right angled triangle with a line of symmetry? Are there other possibilities.	**Other possibilities** Here is one angle of an isosceles triangle. You will need to measure the angle accurately. What could the other angles of the triangle be? Are there any other possibilities? 	**Other possibilities** If one angle of an isosceles triangle is 36 degrees. What could the triangle look like – draw it. Are there other possibilities . Draw a net for a cuboid that has a volume of 24 cm^3.
Comparing and Classifying	**True or false?** All 2-D shapes have at least 4 sides **Other possibilities** Can you find shapes that can go with the set with this label? "Have straight sides"	**Always, sometimes, never** Is it always, sometimes or never true that when you fold a square in half you get a rectangle. **Other possibilities** Can you find shapes that can go with the set with this label? "Have straight sides and all sides are the same length"	**Always, sometimes, never** Is it always, sometimes or never that all sides of a hexagon are the same length. **Other possibilities** Can you find shapes that can go with the set with this label? "Have straight sides that are different lengths."	**Always, sometimes, never** Is it always, sometimes or never true that the two diagonals of a rectangle meet at right angles. **Other possibilities** Can you show or draw a polygon that fits both of these criteria? What do you look for? "Has exactly two equal sides." "Has exactly two parallel sides."	**Always, sometimes, never** Is it always, sometimes or never true that the number of lines of reflective symmetry in a regular polygon is equal to the number of its sides n. **Other possibilities** A rectangular field has a perimeter between 14 and 20 metres . What could its dimensions be?	**Always, sometimes, never** Is it always, sometimes or never true that, in a polyhedron, the number of vertices plus the number of faces equals the number of edges. **Other possibilities** Not to scale  The angle at the top of this isosceles triangle is 110 degrees. What are the other angles in the triangle?
Angles			**Convince me** Which capital letters have perpendicular and / or parallel lines? Convince me.	**Convince me** Ayub says that he can draw a right angled triangle which has another angle which is obtuse. Is he right? Explain why.	**Convince me** What is the angle between the hands of a clock at four o clock? At what other times is the angle between the hands the same? Convince me	**Convince me**  One angle at the point where the diagonals of a rectangle meet is 36 degrees What could the other angles be?

	Y1	Y2	Y3	Y4	Y5	Y6
Location, movement co-ordinates	Describe position, direction and movement, including whole,half, quarter and three-quarter turns (also in Properties of Shapes) (left and right, top, middle and bottom, on top of, in front of, above, between, around, near, close and far, up and down, forwards and backwards, inside and outside). Make whole, half, quarter and three quarter turns in both directions and connect turning clockwise with movement on a clock face (also in Telling the Time).	Use mathematical vocabulary to describe position, direction and movement including movement in a straight line and distinguishing between rotation as a turn and in terms of right angles for quarter, half and three-quarter turns (clockwise and anti-clockwise). To include practical contexts (eg pupils themselves moving in turns giving instructions to other pupils to do so and programming robots using instructions given in right angles (also in Angles).	Recognise that two right angles make a half-turn; three make three quarters of a turn and four a complete turn (from Properties of Shapes).	Describe positions on a 2-D grid as coordinates in the first quadrant. Draw a pair of axes in one quadrant with equal scales and integer labels. Plot specified points and draw sides to complete a given polygon.	**Describe positions on the full coordinate grid (all four quadrants).** **Identify the co-ordinates of a missing vertex of a shape on an unlabelled axis.**	Describe positions on the full coordinate grid (all four quadrants). Draw and label a pair of axes in the 4 quadrants with equal scaling. Draw and label rectangles (including squares), parallelograms and rhombuses, specified by coordinates in the four quadrants, predicting missing coordinates using the properties of shapes. These might be expressed algebraically for eg, translating vertex (a, b) to (a – 2, b + 3); (a, b) and (a + d, b + d) being opposite vertices of a square of side d.
Translation				Describe movements between positions as translations of a given unit to the left/right and up/down.	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.	Draw and translate simple shapes on the coordinate plane, and reflect them in the axes.
NCETM Reasoning						
Position, direction and movement	**Working backwards** The shape below was turned three quarter of a full turn and ended up looking like this.  What did it look like when it started? (practical)	**Working backwards** If I face forwards and turn three quarter turns clockwise then a quarter turn anti-clockwise describe my finishing position.	**Working backwards** If I make the two opposite sides of a square 5 cm longer the new lengths of those sides are 27cm. What was the size of my original square? What is the name and size of my new shape?	**Working backwards** Here are the co-ordinates of corners of a rectangle which has width of 5. (7, 3) and (27, 3) What are the other two co-ordinates?	**Working backwards** A square is translated 3 squares down and one square to the right. Three of the coordinates of the translated square are: (3, 6) (8, 11) (8, 6) What are the co-ordinates of the original square?	**Working backwards** Two triangles have the following co-ordinates: Triangle A: (3, 5) (7, 5) (4, 7) Triangle B: (3, 1) (7, 1) (4, 3) Describe the translation of triangle A to B and then from B to A.
Pattern	What comes next?  Explain why					

	Y1	Y2	Y3	Y4	Y5	Y6
Problem Solving	**Solve one-step questions using information presented in pictograms, tally charts, block diagrams and tables.**	**Solve one-step leading to two-step questions using information presented in pictograms, tally charts, block diagrams and tables.**	Solve one-step and two-step questions [eg 'How many more?' and 'How many fewer?'] using information presented in scaled bar charts and pictograms and tables.	Solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs.	Solve comparison, sum and difference problems using information presented in a line graph.	**Solve problems from a range of graphical representations.**
Interpreting, constructing and presenting data	**Interpret and construct simple pictograms, tally charts, block diagrams and simple tables.** **Interpret and sort numbers and shapes using Venn and Carroll diagrams** (also in Properties of Shapes). **Ask and answer simple questions by counting the number of objects in each category and sorting the categories by quantity.** **Ask and answer questions about totalling and comparing categorical data.**	Interpret and construct simple pictograms with simple ratio 2, 5 and 10 tally charts, block diagrams and simple tables. **Interpret and sort numbers and shapes using Venn and Carroll diagrams** (also in Properties of Shapes). Ask and answer simple questions by counting the number of objects in each category and sorting the categories by quantity. Ask and answer questions about totalling and comparing categorical data.	Interpret and present data using bar charts, pictograms tables, **Venn and Carroll diagrams** (also in Properties of Shapes).	Interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs.	Complete, read and interpret information in tables, including timetables Describe which representation of data is most appropriate and why.	Interpret and construct pie charts and line graphs and use these to solve problems (connect to work on angles and fractions). Read graphs to convert Km to miles (also in Measurement). Draw graphs relating to variables arising from own work.
Reading scales			Understand and use simple scales eg 2, 5, 10 units per cm in pictograms and bar charts.	Understand and use a greater range of scales in representations.	**Understand and use a greater range of scales in their representations.**	**Understand and use a greater range of scales in their representations.**
	Read the numbered divisions on a scale and interpret the divisions between them (eg on a scale 0-20 with intervals of 1 shown but only the divisions 5, 10, 15, and 20 numbered).	**Read to the nearest division scales that are numbered or partially numbered.**	**Read to the nearest division and half division scales that are numbered or partially numbered.**	**Interpret intervals and divisions on partially numbered scales.**	**Interpret a reading that lies between two numbered divisions on a scale.**	**Interpret a reading that lies between two numbered divisions on a scale.**
Mean, median, mode and range				**Collate and interpret the mode, median and range.**	**Collate and interpret the mode, median and range.**	Calculate and interpret the mean as an average.

	Y1	Y2	Y3	Y4	Y5	Y6
NCETM Reasoning						
Interpreting, constructing and presenting data		**True or false?** (Looking at a simple pictogram) "More people travel to work in a car than on a bicycle". **Is this true or false? Convince me.** Make up your own 'true/false' statement about the pictogram **What's the same, what's different ?** Pupils identify similarities and differences between different representations and explain them to each other	**True or false?** (Looking at a bar chart) "Twice as many people like strawberry than lime". **Is this true or false? Convince me.** Make up your own 'true/false' statement about the bar chart. **What's the same, what's different?** Pupils identify similarities and differences between different representations and explain them to each other	**True or false?** (Looking at a graph showing how the class sunflower is growing over time) "Our sunflower grew the fastest in July". **Is this true or false? Convince me.** Make up your own 'true/false' statement about the graph. **What's the same, what's different?** Pupils identify similarities and differences between different representations and explain them to each other	**True or false?** (Looking at a train time table) "If I want to get to Exeter by 4 o'clock this afternoon, I will need to get to Taunton station before midday". **Is this true or false? Convince me.** Make up your own 'true/false' statement about a journey using the timetable. **What's the same, what's different?** Pupils identify similarities and differences between different representations and explain them to each other	**True or false?** (Looking at a pie chart) "More than twice the number of people say their favourite type of T.V. programme is soaps than any other" **Is this true or false? Convince me.** Make up your own 'true/false' statement about the pie chart. **What's the same, what's different?** Pupils identify similarities and differences between different representations and explain them to each other
Solving problems		**Create a question** Pupils ask (and answer) questions about different statistical representations using key vocabulary relevant to the objectives.	**Create a question** Pupils ask (and answer) questions about different statistical representations using key vocabulary relevant to the objectives.	**Create a question** Pupils ask (and answer) questions about different statistical representations using key vocabulary relevant to the objectives.	**Create a question** Pupils ask (and answer) questions about different statistical representations using key vocabulary relevant to the objectives.	**Create a question** Make up a set of five numbers with a mean of 2.7 **Missing information** The mean score in six test papers in a spelling test of 20 questions is 15.Five of the scores were 13 12 17 18 16 What was the missing score?