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Year 5 LTP Maths

Upper KS2 Key Representations

Find out more…

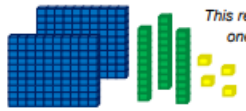
Watch the **Unit tutorial** before planning each unit and read the **Unit Narrative.**

Read the **planning guides** for suggestions of representations.

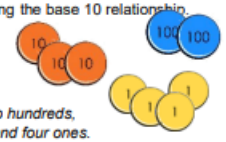
Make use of **PD videos** on unit pages and Progression in Calculations page.

Representations of number

Pupils are familiar with a range of concrete and pictorial representations of number with and without a place value chart. These are used to represent a number or calculation and should not be used as a counting tool. Pupils have also experienced representing decimal numbers using manipulatives including repurposing Dienes equipment, understanding the base 10 relationship.



This represents 2.34. It is 2 ones, 3 tenths and 4 hundredths.

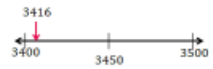


234 is two hundreds, three tens and four ones.

Tens	Ones	tenths	hundredths	thousandths
	2	3	4	

Number lines

Number lines can be used to represent and compare, demonstrating the continuous nature of the number system. When calculating, number lines may act as a jotting of the steps of a mental calculation and may begin 'empty' i.e. not have numbered divisions. They are also used as a representation for rounding.



Number fact knowledge

Pupils have an increasing range of number facts. Pupils should know all multiplication tables and related division facts.

Pupils make increasing use of number facts when considering larger integers.

I know 132 is a multiple of 4 because I can partition it into 120 and 12. These are both multiples of 4.

Equations

The phrase **'is equal to'** is used consistently to refer to the = symbol. Equations should be presented with symbols and missing numbers in different positions:

$38 = 25 + 13$

$\square = 37 + 44$

$12 \div \square = 4$

Deriving facts

Using known number bonds pupils derive more complex facts including deriving decimal bonds and facts.

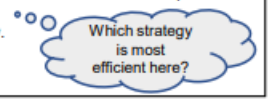
I know $1 + 3 = 4$ *so* $0.1 + 0.3 = 0.4$

I know $13 + 12 = 25$ *so* $1300 + 1200 = 2500$

Using strategies

Pupils are familiar with columnar addition and subtraction, short multiplication and short division written strategies and have developed conceptual understanding through concrete and pictorial representations. These strategies can be applied to larger integers and decimals. See PD videos for further exemplification.

Pupils should make use of a range of strategies, considering efficiency.



Mental strategies

Pupils have experienced a range of mental strategies for all four operations, including:

Applying number bonds to 10 and 100 to calculate how many more/less to the next multiple of ten, extending to 100 and 1000, using the 'make 10' strategy.

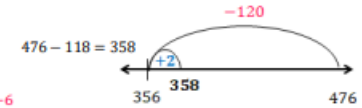
Identifying numbers close to a multiple of ten or 100 e.g. 28, 201 and using a round and adjust strategy, including for multiplication. *"If I know 20 x 4 is 80, then 19 x 4 is 76".*

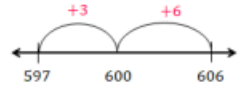
Identifying near doubles for addition. *43 and 45 can be seen as 'double 43 plus two.*

Subtracting numbers close together in value, through counting on to find the difference.

Once secure, these can be applied to larger integers and decimal values.

$336 + 127 = ?$ *I can partition 27 into 123 and 4.*
336 plus 4 is equal to 340. 340 plus 123 is equal to 463.

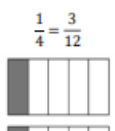


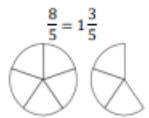


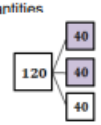
$606 - 597 = ?$ *I can count on from* 597 *to* 606. *The difference is* 9.

Representing fractions

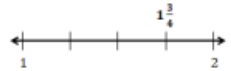
Pupils will have represented unit, non-unit and improper fractions in a variety of ways including area, part of a set and on a number line. Through representations they understand equivalence. They have identified non-unit fractions of quantities.







Two thirds of 120 *is* 40



numerator

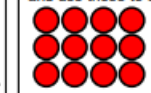
vinculum

denominator

$\frac{1}{4}$

Representing multiplicative relationships

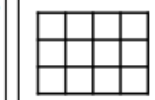
Pupils have used an increasing range of models to represent multiplicative relationships and use these to describe inverse relationships and commutativity.



There are three rows with a value of four. There are four columns with a value of 3.

$3 \times 4 = 12 \quad 4 \times 3 = 12$

$12 \div 4 = 3 \quad 12 \div 3 = 4$



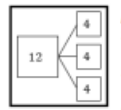
Three groups of four are equal to 12.
Four groups of three are equal to 12.

Part-whole language and representations

A part-whole model is used to represent the relationship between numbers in all four operations. The model is made of a **whole** and two or more **parts**.

The whole is ten. One part is six and one part is four. Six plus four is equal to ten.

Using multiple equal parts represents multiplication, division and fractions of quantities.

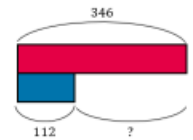


There are three equal parts with a value of four. The whole is 12. *Three multiplied by four is equal to* 12. 12 *divided into three equal parts is equal to four.*
One third of 12 *is four.*

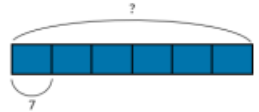
Close links are made between this and bar model representations.

Bar models

Pictorial bar models and concrete Cuisenaire as bar models are used to represent **part-whole relationships** and **knowns and unknowns** within problems in all four operations. See PD videos for further exemplification.



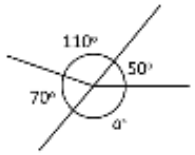
I know the whole is 346, *and one of the parts is* 112. *I do not know the value of the missing part. I can subtract* 112 *from* 346.



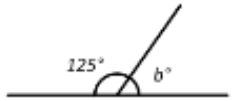
The value of each part is seven and there are six equal parts. The whole is unknown. Six groups of seven is equal to 42. The whole is 42.

Year 5 Maths Vocabulary

Angles at a Point
Angles that meet at a point total 360°



Angles on a Line
Angles formed on a straight line total 180°



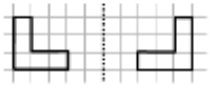
Prime Factor
A factor that is also a prime number

3 and 2 are prime factors of 6

Square Number
The product of two equal factors

9 is a square number because $9 = 3 \times 3 = 3^2$

Reflection
A mirror image that is equidistant from a mirror line.



Diagonal
A straight line segment that joins one vertex to another.

The diagonals of a kite are perpendicular

Polygon
A 2-D shape with three or more straight sides.

Triangles and rectangles are examples of polygons

Common Factor
A factor of two (or more) given numbers

A common factor of 12 and 9 is 3 because $3 \times 4 = 12$ and $3 \times 3 = 12$.

Degree
A unit of measurement for angles

A right angle is equal to 90 degrees (90°)

Percentage
The number of parts per hundred which is written using the % symbol.

30% means for every 100 there are 30.

Remainder
The amount remaining after division when a whole number answer is needed.

21 divided by four is equal to five with a remainder of 1.

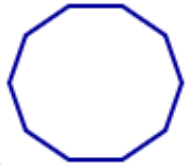
Cube Number
The product of three equal factors

Eight is a cube number because $8 = 2 \times 2 \times 2 = 2^3$.

Dodecagon
A polygon with 12 sides and 12 angles

Congruent
Used to describe two shapes or figures which are exactly the same size

Decagon
A polygon with 10 sides and 10 angles



Long Division
The formal written algorithm that can be used to divide by a number with two or more digits.

```
  3 4
12|4 0 8
  3 6
    4 8
    4 8
    0
```

Nonagon
A polygon with 9 sides and 9 angles

Negative Integer
A whole number with a value less than zero.

When the temperature falls below 0° a negative integer is used to record it.

Long Multiplication
The formal written algorithm that can be used to multiply a number by a number with two or more digits.

```
  3 4
× 1 2
  6 8
3 4 0
```

Average (Mean)
The mean average of a set of data is the sum of the quantities divided by the number of quantities.

The mean average of the set 4, 5, 5, 6 is 5 because $(4 + 5 + 5 + 6) \div 4 = 5$.

Translation
When a shape moves so that it is in a different position but retains the same size, area, angles and side length and so is congruent.

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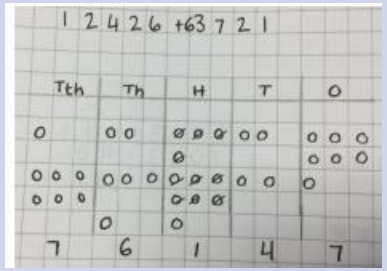
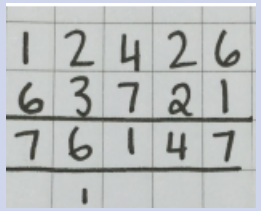
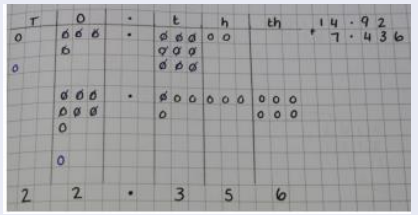
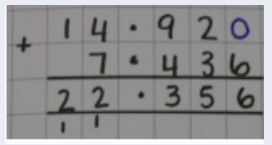
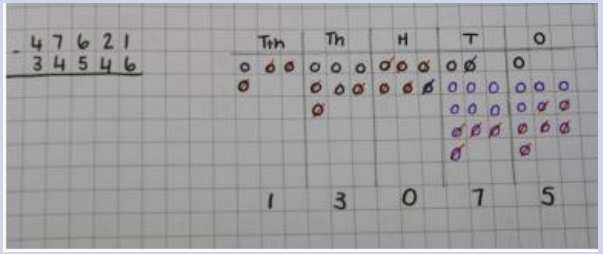
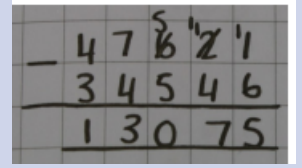
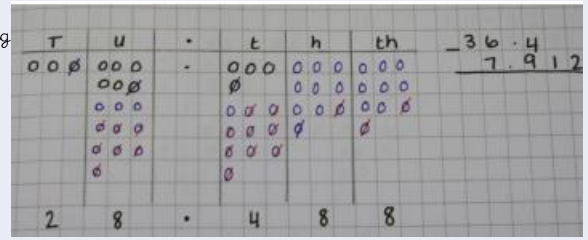
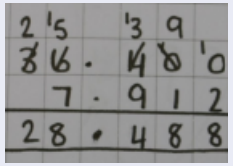
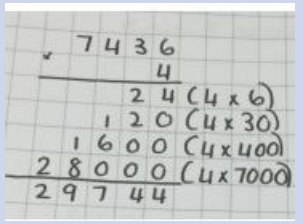
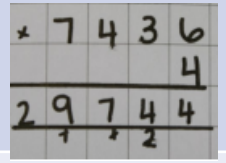
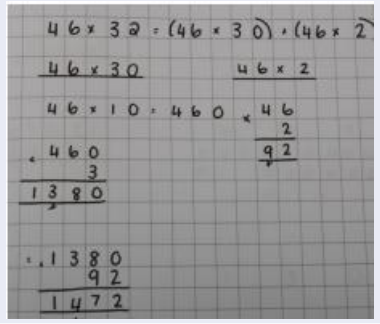
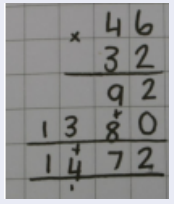
Calculation Policy Year 5

NC statement and guidance	CPA
Add whole numbers with more than 4 digits using the formal written method of addition Children develop their understanding of formal addition based methods taught in previous years. Concrete methods are used to develop conceptual understanding before moving on the pictorial and abstract methods used below. Note – as part of calculation, children are taught to estimate and use rounding to check answers to calculations and determine, the context of a problem levels of accuracy	Children use a pictorial method to aid conceptual understanding of addition of whole numbers with more than four digits. Examples are carefully structured to begin with those that do not require regrouping. When modelled this method, children's place value knowledge is reinforced. E.g. 6 ones plus 1 one is 7 ones. 2 tens plus 2 tens is 4 tens.  Once children have a secure conceptual understanding of addition of whole numbers, they move onto the formal written. As with previous methods, children's place value knowledge is reinforced through the modelling of this method. 
Add decimals with up to 3 decimal places using the formal written method Children continue to building addition of decimals taught in Year 4. Concrete methods are used to develop conceptual understanding before moving on to the methods taught below. Note – as part of calculation, children are taught to estimate and use rounding to check answers to calculations and determine, the context of a problem levels of accuracy	Children use visual maths to add numbers with up to three decimal places. They use place holders where necessary. Examples are carefully structured beginning with questions that do not require regrouping. When modelling this method, children's place value knowledge is reinforced. E.g. 0 thousandths plus 6 thousandths is 6 thousandths, 2 hundredths plus 3 hundredths is 5 hundredths, 9 tenths plus 4 tenths is 13 tenths. This is one unit and 3 tenths – we carry one unit over to the units column and so on.  Once children have a secure conceptual understanding of addition of decimals, they move onto a formal written method. As with previous methods, children's place value knowledge is reinforced through the modelling of this method. 

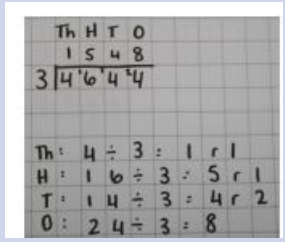
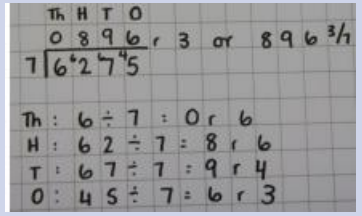
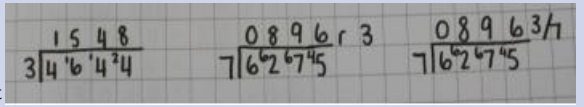
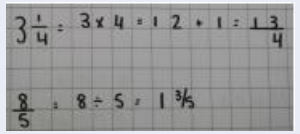
Calculation Policy Year 5

NC statement and guidance	CPA
Subtract numbers with more than four digits using the formal written method of subtraction Children develop their understanding of formal subtraction based on method taught in previous years. Concrete methods are used to develop conceptual understanding before moving onto the methods below. Note – as part of calculation, children are taught to estimate and use rounding to check answers to calculations and determine, the context of a problem levels of accuracy	Children use a pictorial method to aid conceptual understanding of subtraction of whole numbers with more than four digits. Examples are carefully constructed to begin with those that do not require exchange. When modelling this method, children's place value knowledge is reinforced. E.g. one unit take away 6 units, we can not do this and therefore we need to exchange from the tens column.  Once children have a secure conceptual understanding of subtracting whole numbers, they move onto the formal written method. As with previous methods, children's place value knowledge is reinforced through the modelling of this method. 
Subtract numbers with 3 decimal places using the formal written method of subtraction Children continue to building up subtraction of decimals taught in Year 4. Concrete methods are used to develop conceptual understanding before moving onto the methods taught below. Note – as part of calculation, children are taught to estimate and use rounding to check answers to calculations and determine, the context of a problem levels of accuracy	Children use visual maths to subtract numbers with up to three decimal places. They use place holders where necessary. Examples are carefully structured beginning with questions that do not require exchange. When modelling this method, children's place value knowledge is reinforced. E.g. 0 thousandths take away 2 thousandths  Once children have a secure conceptual understanding of subtraction of decimals, they move onto a formal written method. As with previous methods, children's place value knowledge is reinforced through the modelling of this method. 

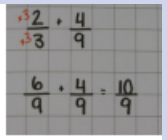
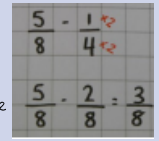
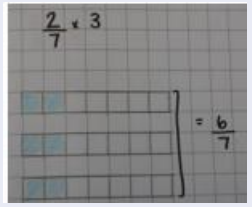
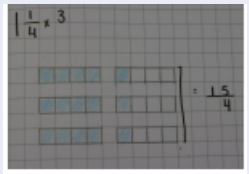
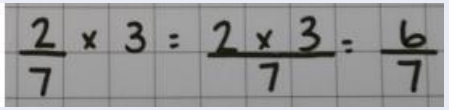
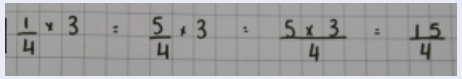
Calculation Policy Year 5

NC statement and guidance	CPA
Multiply a four-digit number by a one digit number using the formal written method of multiplication It is important when multiplying by a one-digit number that children are secure in their place value knowledge and can apply this to the method. If necessary, and to support conceptual understanding, refer to the concrete methods modelled for multiplying by a one-digit number in Year 4. Note - as part of calculation, children are taught to estimate and use rounding to check answers to calculations and determine, the context of a problem levels of accuracy	Children extend upon their understanding of multiplying by a one-digit number taught in previous years. In this example, four groups of 7436 have been drawn. Children then use their addition skills to find the total.  Children move onto a less formal abstract method to help bridge the gap between a pictorial method and the formal written method.  Children move onto a formal written version of this however the same place value based conversations are still had when discussing and modelling. 
Use long multiplication to multiply two two-digit numbers Children are first introduced to multiplying by a two-digit number. Children base their understanding on a secure place value understanding of multiplying by a one-digit number. Note - as part of calculation, children are taught to estimate and use rounding to check answers to calculations and determine, the context of a problem levels of accuracy	Children begin to understand multiplying by a 2-digit number as 2 calculations which are merged. They are multiplying by the number of ones, multiplying by the number of tens and the adding these values together. This can be seen in the example (right). 46 is multiplied by 30 (by multiplying by 3 and then multiplying by 10) 46 is then multiplied by 2. These values are then added together. Careful attention is made to the effect of multiplying by ten and why each time a whole number is multiplied by 10 there is a 0 in the ones column.  Children move onto the formal written method by understanding that they first multiplying their 2-digit number by the number of ones. Following their discussions from the previous method, a 0 is placed in the units column before continuing multiplying by the tens. These two calculations are then added together to reach the final answer. 

Calculation Policy Year 5

NC statement and guidance	CPA
Divide numbers with up to four digits by a one digit number and interpret remainders It is important that children are secure with their place value understanding of this method. Prior to modelling the formal method an abstract/pictorial method should be demonstrated. Note – as part of calculation, children are taught to estimate and use rounding to check answers to calculations and determine, the context of a problem levels of accuracy	Once children are secure with their conceptual understanding of this method a less formal abstract method is introduced and modelled alongside. As shown in the two examples (right), informal jottings are used for each process of the calculation. Children move into writing remainders and remainders as fractions. In this case there were 3 remainders out of a group of 7.   Finally, children move on to a formal written method with out the use of jottings.  They can effectively discuss and explain the method with their use of place value knowledge.
Convert between mixed numbers and improper fractions	Fraction bars are first used to develop conceptual understanding. 3 and 1/4 represents 3 whole bars and 1/4 of a bar which is altogether 13/4. When converting improper fractions to mixed numbers, children recognise that it is an improper fraction and therefore larger than one. They begin drawing fifths and shading eight in. One whole bar is shaded and 3/5 of another bar is shaded   Once conceptual understanding is developed, children move on to a more abstract approach. They understand that the whole number represents the whole number of bars that are shaded. Using the improper fractions they know how many equal pieces each bar is split into and therefore how many equal pieces are shaded in put the improper fraction.  When converting from improper to mixed numbers. Children know how they are trying to find how many whole bars are shaded in and what is left over. In the example (right), they are trying to make groups of 5. One whole group of 5 can be made from 8/5 and 3 left over which equals 1 whole and 3/5s.

Calculation Policy Year 5

NC statement and guidance	CPA
Add and subtract fractions with denominators which are multiplies Children need to be secure in their addition and subtraction of fractions with the same denominator and why it is important that the denominator is the same before adding or subtracting.	Children recognise that in the two examples that are shown the calculation can not be completed yet because the denominators are not the same and therefore they are adding different sized pieces. Using fraction bars, they recognise that the fraction with the smallest denominator can be written as an equivalent fraction with the same denominator. Children draw fractions bars to represent and understand this process.   Children recognise that in the two examples that are shown the calculation can not be completed yet because the denominators are not the same and therefore they are adding different sized pieces. Looking at the fraction with the smallest denominator, using their multiplication knowledge, they see that they can multiply this fraction so that the denominator is the same as the same. Remembering that whatever is done to the denominator is also done to the numerator both are multiplied so that now both fractions have the same denominator. This can be seen in the orange on the examples. Once the denominators are the same, children can subtract.  
Multiply proper fractions and mixed numbers by a whole number	Children begin to understand multiplying proper and mixed number fractions by first using fraction bars. In the first example, 3 bards are drawn each representing 2/7. There are 6/7 shaded altogether. In the second example, mixed numbers are investigated. Three bars are drawn to represent 1 1/4. There are 15/5 shaded altogether.   When children conceptually understand this process, they move on to a more abstract method. They understand that the size of the pieces never changes and therefore the denominator doesn't change. The number of equal pieces increases by the value they are multiplying by. Therefore, the numerator is multiplied. When multiplying mixed numbers, this is first converted to an improper fraction and then the same method is applied.  

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
Autumn 1	Previous misconception	**Number and place value** [Key] Read, write, order and compare numbers to at least 1,000,000 and determine the value of each digit AMM link - Unit 1 (lessons 1-3, 5-7)	**Addition and subtraction** [Key] Add and subtract numbers mentally increasingly larger numbers. RECAP but no formal methods AMM link - Unit 2 (lessons 1-5)	**Multiplication and Division** [Key] Identify multiples and factors, including find all factor pairs of a number and common factors of two numbers. Multiply and divide numbers mentally, drawing upon known facts Multiply and divide whole numbers by 10, 100 and 1000 FROM SPRING - recognise and use square numbers and cube numbers and the notation of the squared (^{2}) and cubed (^{3}). FROM SPRING - [Key] solve problems involving multiplication and division including using their knowledge of factors and multiples, squares and cubes. FROM SPRING - Know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers FROM SPRING - Establish whether a number up to 100 is prime and recall prime numbers up to 19. RECAP but no formal methods AMM link - Unit 4 (lessons 1-8)		Test week	Consolidation week	- -
Autumn 2	**Measure** [Key] Measure and calculate the perimeter of composite rectilinear shapes in cm and m [Key] Calculate and compare the area of rectangles and including using standard units (cm^2 and m^2) and estimate the area of irregular shapes. FROM SPRING - Estimate volume and capacity. AMM link - Unit 5 (lessons 1-5) And Unit 13 - (lessons 1-4)		**Fractions** Identify, name and write equivalent fractions of a given fraction, represented visually including tenths and hundredths. [Key] Read, write, order and compare numbers with up to three decimal places [Key] Compare and order fractions whose denominators are all multiples of the same number. FROM SPRING - recognise mixed numbers and improper fractions and convert from one to the other and write mathematical statements greater than 1 as a mixed number [2 /5 + 4 /5 = 6 /5 = 1 1/5] FROM SUMMER [Key] Read and write decimal numbers as fractions. AMM link - Unit 6 (lessons 1-13)			**Shape and Position** Know angles are measured in degrees; estimate and compare acute, obtuse and reflex angles. [Key] Draw given angles, and measure them in degrees. Identify angles at a point and one whole turn (total 360°) Identify angles at a point on a straight line and a turn (total 180°) Identify other multiples of 90° AMM link - Unit 7 (lessons 1-8)		**Statistics [this unit will be taught in week 7 due to less lessons in other Autumn 2 units]** [Key] complete, read and interpret information in tables, including timetables. AMM link - Unit 3 (lessons 7-9)

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
Spring 1	**Number and place value** [Key] Interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers, including through zero Count forward or backwards in steps of powers of 10 for any given number up to 1,000,000 AMM link - Unit 14 (lesson 1) not all covered by AMM.	**Addition and Subtraction** FROM AUTUMN [Key] Add and subtract whole numbers with more than 4 digits, using formal written methods. Solve addition and subtraction multi-step problems in context, deciding which operations and methods to use and why AMM link - Unit 2 (lessons 6-9)	**Multiplication and Division** FROM AUTUMN Multiply numbers up to 4 digits by one or two digits numbers using formal written method, including long multiplication. FROM AUTUMN Divide numbers up to 4 digits by a one digit number using the formal written method of short division, interpret remainders appropriately for the context. AMM link - Unit 4 (lessons 9-14) and Unit 14 (lesson 2 & 3)		**Statistics** Solve comparison, sum and difference problems using information presented in a line graph AMM link - Unit 3 (lessons 1-4)	Test week		
Spring 2	Consolidation week	**Fractions** Add and subtract fractions with the dame denominator and denominators that are multiples of the same number. AMM link - Unit 8 (lessons 1-3)	**Shape and Position** Identify 3D shapes, including cubes and other cuboids, from 2D representations Use the properties of rectangles to deduce related facts and find missing lengths and angles. [Key] Distinguish between regular and irregular polygons based on reasoning about equal sides and angles AMM link - Unit 12 (lessons 1-10)		**Measure** FROM AUTUMN [Key] Convert between different units of metric measure Use all four operations to solve problems involving measure FROM SUMMER Understand the use of approximate equivalences between metric units and common imperial units AMM link - Unit 10 (lessons 3-8) not all covered by AMM.			

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
Summer 1	**Number and place value** Round any number up to 1,000,000 to the nearest 10, 100, 1000, 10,000, 100,000 Read Roman numerals to 1000 (M) and recognise years written in Roman numerals AMM link - Unit 1 (lessons 4, 8-10)	**Fractions** [Key] solve problems which require knowing percentage and decimal equivalents of ½, ¼, 1/5, 2/5, 4/5 and those fractions with a denominator of a multiple of 10 or 25 [Key] Multiplication and division problems, including scaling by simple fractions and problems involving simple rates. Recognise the per cent symbol (%) and understand that per cent related to 'number of parts per hundred' and write percentages as a fraction with denominator 100 and as a decimal AMM link - Unit 8 (lessons 4-12).		**Addition, Subtraction, Multiplication and Division** Solve problems involving addition and subtraction and a combination of these, including understanding the meaning of the equals sign AMM link - Unit 14 (lesson 5) not all covered by AMM.	**Shape and Position** FROM SPRING 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 AMM link - Unit 9 (lessons 1-9)		- -	- -
Summer 2	**Measure** Solve problems involving converting between units of time Using all four operations to solve problems involving measure AMM link - Unit 10 (lessons 1-2 & 9)	Test week	Consolidation week	**Statistics** FROM SPRING Construct bar charts where needed across numerous subjects AMM link - Unit 3 (lessons 5 & 6) Unit 14 (lesson 4) not all covered by AMM	**Fractions & Multiplication and Division** Solve problems involving numbers up to three decimal places **Multiply and divide decimal numbers by** 10, 100, 1000 AMM link - Unit 11 (lessons 1-14)			**Year 6 prep** AMM link - Unit 14 (lessons 6-10)