ST MARY'S CE PRIMARY SCHOOL

Nurture • Grow • Achieve
MASON MOOR
PRIMARY SCHOOL

VALENTINE
PRIMARY SCHOOL

# Year 6 LTP Maths

# Upper KS2 Key Representations

## Find out more…

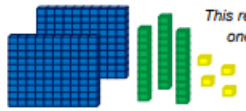
Watch the **Unit tutorial** before planning each unit and read the **Unit Narrative.**

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

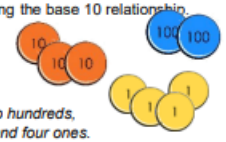
Make use of **PD videos** on unit pages and Progression in Calculations page.


## 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.*

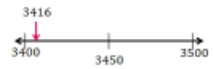


*234 is two hundreds, three tens and four ones.*

| 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.

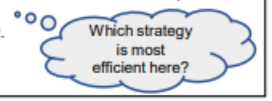
*I know* $1 + 3 = 4$ *so* $0.1 + 0.3 = 0.4$

*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.

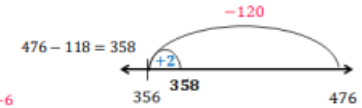
Identifying numbers close to a multiple of ten or 100 e.g. 28, 201 and using a round and adjust strategy, including for multiplication. *"If I know 20 x 4 is 80, then 19 x 4 is 76".*

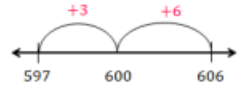
Identifying near doubles for addition. *43 and 45 can be seen as 'double 43 plus two.*

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.*

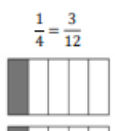



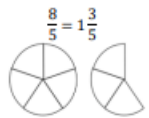



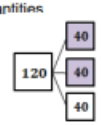

$606 - 597 = ?$ *I can count on from* 597 *to* 606. *The difference is* 9.

## Representing fractions

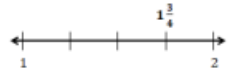
Pupils will have represented unit, non-unit and improper fractions in a variety of ways including area, part of a set and on a number line. Through representations they understand equivalence. They have identified non-unit fractions of quantities.




*Two thirds of* 120 *is* 40




*numerator*

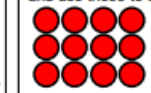
*vinculum*

*denominator*

$\frac{1}{4}$

## Representing multiplicative relationships

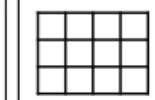
Pupils have used an increasing range of models to represent multiplicative relationships and use these to describe inverse relationships and commutativity.



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

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

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



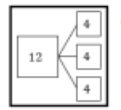

*Three groups of four are equal to 12.*
*Four groups of three are equal to 12.*

## 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.

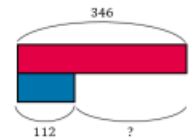



*There are three equal parts with a value of four. The whole is* 12. *Three multiplied by four is equal to* 12. 12 *divided into three equal parts is equal to four.*
*One third of* 12 *is four.*

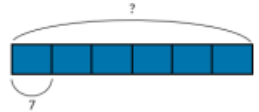
Close links are made between this and bar model representations.

## 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.



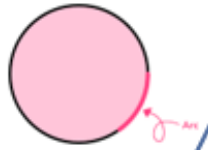

*The value of each part is seven and there are six equal parts. The whole is unknown. Six groups of seven is equal to 42. The whole is 42.*

# Year 6 Maths Vocabulary

**Formula**
An algebraic expression of a rule

The area of a rectangle can be found by multiplying the width and height.
$a = w \times h$

**Arc**
A portion of a circumference of a circle



**Brackets**
Symbols used to separate parts of a multi-step calculation

$(10 - 2) \times 3 = 24$

**Compasses**
A tool for creating curved lines, arcs and circles

**Common Fraction**
A fraction written with a numerator and denominator, separated by a vinculum.

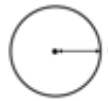
One quarter as a common fraction is ¼

**Intersect**
The point at where two or more lines meet, is where they intersect

The x and y axis intersect at point (0,0)

**Circumference**
The perimeter of a circle

**Radius**
A line from one point of the circumference of a circle to the centre of the circle.



**Quadrant**
One of four regions into which a coordinates grid is divided.

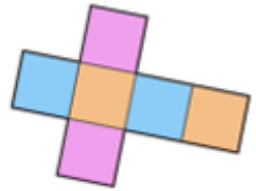
**Equivalent Expression**
An expression, which can be algebraic, that is equal in value to another expression

18 + 9 is an equivalent expression to 17 + 10

**Diameter**
A line from one point of the circumference of a circle to another on the opposite side, passing through the circle's centre.

**Net**
A group of 2-D shapes which, when folded and connected, forms a 3-D polyhedron.

The net of a cube is comprised of 6 connected squares



**Factorise**
To identify factors of a given number.

I can factorise 12 by looking at its factor pairs
$1 \times 12 = 12$
$2 \times 6 = 12$
$3 \times 4 = 12$

**Ratio**
A comparison between two or more parts of a whole or group.

For every 4 tulips there are 7 daffodils. The ratio of tulips to daffodils is 4:7.


**Pie Chart**
A representation of a set of data where each segment represents one group in proportion to the whole.

**Order of Operations**
The agreed order to complete operations in a multi-step equation with multiple operations.

$(3 + 4) \times 2 =$
The order of operations dictates that the operation within the brackets is completed first.

**Vertically Opposite Angles**
Angles which are positioned opposite to one another when two lines intersect.

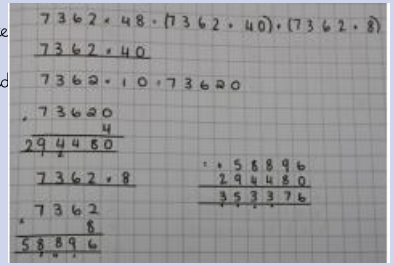
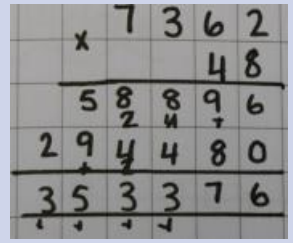
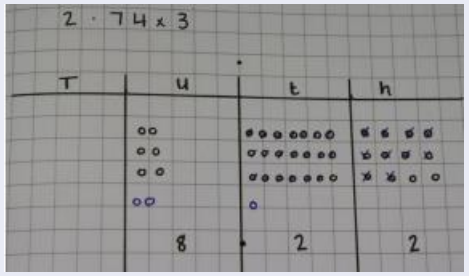
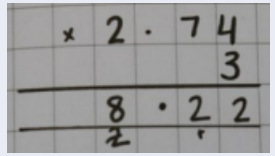
The purple angles are vertically opposite angles.

ST MARY'S CE PRIMARY SCHOOL

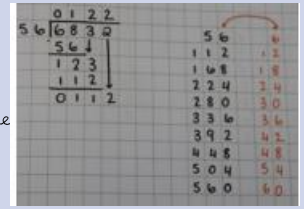
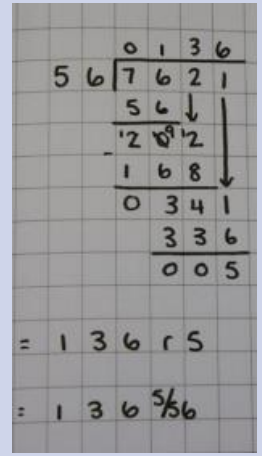
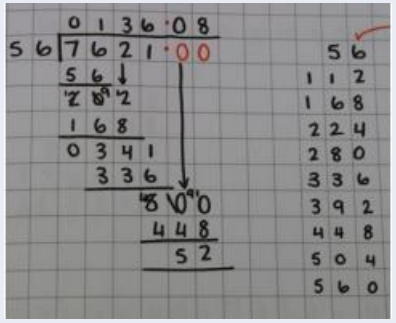
MASON MOOR PRIMARY SCHOOL

VALENTINE PRIMARY SCHOOL

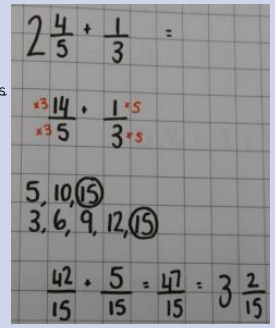
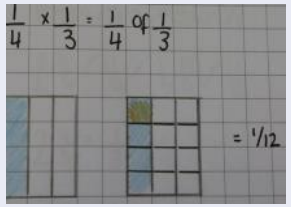
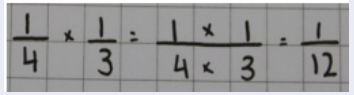
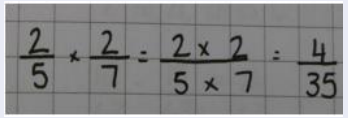
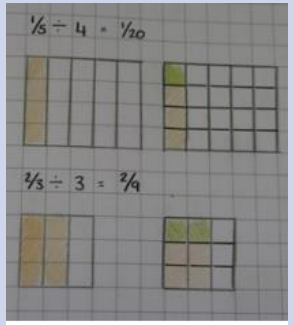
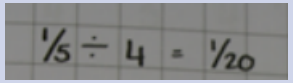
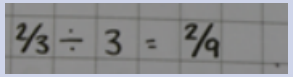
# Calculation Policy Year 6

| NC statement and guidance | CPA |
| --- | --- |
| **Multiply numbers up to four digits by a two-digit number use long multiplication**<br>Children base their conceptual understanding on previous years. This can be reinforced prior to beginning teaching. 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. There are multiplying by the number of ones, multiplying by the number of tens and then adding these value together.<br><br>This can be seen in the example (right).<br>7362 is multiplied by 40 (by multiplying by 10 and then multiplying by 4).<br>7362 is multiplied by 8.<br>These values are then added together.<br>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.<br><br>  <br><br><br>Children move onto the formal written method by understanding that they first multiply their 4-digit number by the number of ones.<br><br>Following their discussions from the previous method, a 0 is placed in the ones column before continuing multiplying by the tens.<br><br>These two calculations are then added together to reach the final answer.<br><br>  |
| **Multiply a one-digit number with 2 decimal places by a one-digit number**<br>When introducing multiplying decimals that children are secure in their place value knowledge. 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 | When introducing multiplying a decimal number by a one-digit number, a pictorial method is first introduced.<br><br>In the example (right) 3 groups of 2.74 have been drawn in. It is then established that there are 12 hundredths which make 1 tenth and 2 hundredths and therefore 1 tenth is carried over.<br><br>There are now 22 tenths which make 2 ones and 2 tenths and so 2 tenths are carried over. This gives 8.22 as an answer.<br><br>  <br><br><br>Children move onto a formal written version of this however the same place value based conversations are still have. E.g. 3 lots of 4 hundredths equals 12 hundredths - place 2 in the hundredths column and carry the 1 tenth over and so on.<br><br>  |

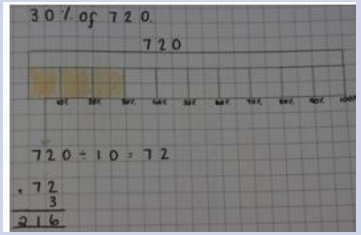
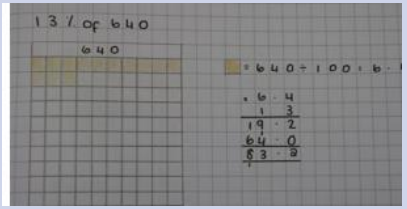
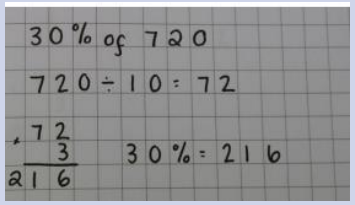
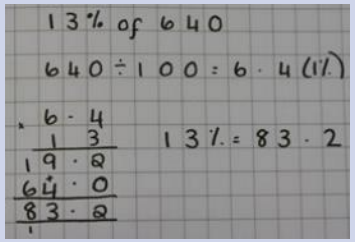
# Calculation Policy Year 6

| NC statement and guidance | CPA |
| --- | --- |
| **Divide numbers up to four-digit by a two-digit number using long division writing remainders as whole numbers, fractions or rounding**<br>Time is spent to discuss the method used. Children understand the place value implications of the method being taught. 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 | As a pre-curser to teaching long division children are taught a range of methods to find the first ten multiplies of a two-digit number.<br>Children look at the relationship between how the first ten multiples in the ones column end the same as the first ten multiplies of the two-digit number.<br>Children are encouraged as much as possible to find these first ten multiples mentally. However, where this is not possible informal jottings are used.<br>When dividing by a two digit number, children first look in the thousands column. How many groups of 56 can you get out of 6? The answer is 0 so 0 groups written at the top.<br>Children then move along - how many groups of 56 can I get out of 68? The answer is 1 so 1 group is written and the top and then taken away underneath leaving 12.<br>Children can not take any groups of 56 from 12 and therefore the 3 from the tens column is bought down. How many groups of 56 can we get from 123? The answer is 2. Two groups are written at the top and then taken away underneath leaving 11.<br>We can not get any groups of 56 from 11 so we bring down the 2. How many groups of 56 can we get from 112? The answer is 2. 2 groups are written at the tip and take away underneath leaving no remainders.<br>  <br>Using the long division taught children then interpret the remainder to fit the context that they have.<br><br>When interpreting the remainder as a fraction, children look at how many are left out of the group they were trying to make.<br><br>In this example there were 5 left out of a group of 56.<br>  |
| **Use written division in cases where the answer has up to decimal places**<br>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 writing the first ten multiplies. Although children are encouraged to do this mentally as possible jottings can be used to support this.<br><br>Children then follow the same division rules as previously demonstrated.<br><br>In order to write the remainder as a decimal children place a decimal point as a 0 as a place holder in the tenths column.<br><br>This 0 can be then bought down to form part of the calculation - no groups of 56 can be taken away from 50 so another 0 is placed as a place holder in the hundredths column. This 0 can then be bought down.<br><br>Eight groups of 56 can be taken away from 500. Groups written at the top and taken away at the bottom. Children complete this process up to two decimal places.<br>  |

# Calculation Policy Year 6

| NC statement and guidance | CPA | | | |
|---|---|---|---|---|
| **Add and subtract fractions (including mixed numbers) with different denominators**<br>When adding and subtracting fractions pictorial methods from previous year may be used to support conceptual understanding. | When calculating with mixed numbers, these are converted into improper fractions first.<br><br>Children will recognise that they can not add the fractions straight away as the denominators are not the same nor are the denominators multiples of each other.<br><br>Children find the lowest common multiple. If confident, children do not need to write this step to find the lowest common multiple.<br><br>Using this children convert so that the denominators are the same and then use this to add. |  | Children will recognise that they can not subtract the fractions straight away as the denominators are not the same nor are the denominators multiples of each other.<br><br>Children find the lowest common multiple. If confident, children do not need to write this step to find the lowest common multiple.<br><br>Using this children convert s that the denominators are the same and then use this to subtract. |  |
| **Multiply pairs of proper fractions** | Children understand the multiplication as finding a fraction of another fraction. As seen in the example 1/4 of 1/3 (1/4 x 1/3).<br><br>Children begin drawing a fraction bar of their starting fraction. In this case 1/3, as they are finding 1/4 **of** 1/3.<br><br>They then share each third in quarters and shade in 1 as they want 1/4. Resulting in 1/12.<br><br>This example is extended (right) where children are now finding 2/5 of each of the 2/7 that they have been shaded. |  <br>  | Children move on to an abstract approach.<br><br>Using the understanding gained from the pictorial method, children multiply to the numerators and denominator to answer the multiplication. |  <br>  |
| **Divide proper fractions by a whole number** | Children use fraction bars to represent division of fractions. They draw the fraction they are starting with as shown in orange.<br><br>They then split each equal piece into the divisor. We would receive one of each of the new pieces.<br><br>In the first example we would receive 1 out of now 20 equal pieces.<br><br>In the second example, we would receive 1 piece from each of the thirds we started with. This would give out 2 out of now 9 equal pieces. |  | Children move on to not using a pictorial method and understand that when dividing the numerator stays the same as we will still receive the same number of equal pieces.<br><br>We multiply the denominator as the size of those pieces gets smaller. |  <br>  |

# Calculation Policy Year 6

| NC statement and guidance | CPA |
| --- | --- |
| Solve problems involving the calculation of percentages | Children begin by using a bar to understand that there is 100% in a whole. Using this they find 10% and use this to find percentages of other multiples of ten.<br><br>When finding and using 1% children begin to understand this by using a hundreds square. With each square representing 1%.<br><br>Children begin finding 1% and then move onto using 1% to find other percentages.<br><br>  <br><br>  <br><br><br>Children move on to not using the percentage bar or the percentages square as a representation.<br><br>  <br><br>  <br> |

| | Week 1 | Week 2 | Week 3 | Week 4 | Week 5 | Week 6 | Week 7 | Week 8 |
|---|---|---|---|---|---|---|---|---|
| Autumn 1 | Previous misconception | **Number and Place Value**<br>[Key] Read, write, order and compare numbers to 10,000,000 and determine the value of each digit.<br>[Key] Solve number and practical problems that involve large numbers, rounding and negative numbers<br>AMM link - Unit 1 (lessons 1-4) not all covered by AMM | **Multiplication and Division**<br>[Key] Solve addition and subtraction multi-step problems in context, deciding which operations and methods to use and why<br>[Key] Perform mental calculations including with mixed operations and large numbers<br>[Key] Divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting according to the context<br>FROM SPRING Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication<br>AMM link - Unit 1 (lessons 6-9)<br>And Unit 2 (lessons 5-13) | | | **Fractions**<br>Identify the value of each digit in numbers given to three decimal places and multiply and divide numbers 10, 100 and 1000 giving answers up to three decimal places<br>Use common factors to simplify fractions; use common multiples to express fractions in the same denomination<br>Compare and order fractions including fractions greater than 1<br>[Key] Recall and use equivalences between simple fractions, decimals and percentages, including different contexts<br>FROM SPRING [Key] Associate a fraction with division and calculate decimal fraction equivalents for a simple fraction<br>AMM link - Unit 2 (lessons 1-2)<br>And Unit 4 (lessons 1-7)<br>Not all covered by AMM | | – – – – – – – –<br>– – – – – – – –<br>– – – – – – – –<br>– – – – – – – –<br>– – – – – – – –<br>– – – – – – – –<br>– – – – – – – –<br>– – – – – – – – |
| Autumn 2 | **Shape and Position**<br>[Key] Compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals and regular polygons.<br>[Key] recognise angles where they meet at a point, are on a straight line, or vertically opposite and find missing angles<br>AMM link - Unit 5 (lessons 1-5) | Test week | **Statistics**<br>Interpret and construct pie charts and line graphs and use them to solve problems<br>Calculate and interpret the mean as an average<br>AMM link - Unit 9 (lessons 5-10) | **Ratio**<br>[Key] Solve problems involving the calculation of percentages and use the use of percentages for comparison<br>FROM SPRING Understand the relative size of two quantities where missing values can be found by using integer multiplication and division facts<br>FROM SPRING Solve problems involving similar shapes where the scale factor is known or can be found<br>AMM link - Unit 9 (lessons 1-4)<br>And Unit 10 (lessons 1-4) | | **Measure**<br>FROM SPRING Recognise when it is possible to use formulae for area and volume of shapes<br>FROM SPRING Recognise that shapes with the same areas can have different perimeters and vice versa<br>FROM SPRING Calculate the area of parallelograms and triangles<br>FROM SPRING Begin to convert between miles and kilometres<br>AMM link - Unit 8 (1-8) | | – – – – – – – –<br>– – – – – – – –<br>– – – – – – – –<br>– – – – – – – –<br>– – – – – – – –<br>– – – – – – – – |

| | Week 1 | Week 2 | Week 3 | Week 4 | Week 5 | Week 6 | Week 7 | Week 8 |
|---|---|---|---|---|---|---|---|---|
| Spring 1 | **Number and Place Value**<br>Use negative numbers in context, and calculate across zero<br>Round any whole number to a required degree of accuracy<br>AMM link - not covered by AMM no link | **Multiplication and Division**<br>Identify common factors, common multiples and prime numbers<br>FROM AUTUMN [Key] Use their knowledge of the order of operations to carry out calculations involving the four operations<br>FROM AUTUMN [Key] Solve problems involving addition, subtraction, multiplication and division.<br>Use estimation to check answers to calculation sand determine, the context of a problem an appropriate degree of accuracy<br>Divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting according to the context<br>Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication<br>AMM link - Unit 2 (lessons 3-4)<br>And Unit 3 (lessons 1-3)<br>Not all covered by AMM | | **Fractions**<br>[Key] Add and Subtract fractions with different denominators and numbers, using the concept of equivalent fractions<br>FROM AUTUMN [Key] Multiply one-digit numbers with up to two decimal places by a whole number<br>[Key] use written division methods in cases where the answer has up to two decimal places<br>AMM link - Unit 4 (lessons 8-9) not all covered by AMM | **Shape and Position**<br>FROM AUTUMN DRAW 2D shapes using given dimension<br>Recognise, describe and build simple 3D shapes including making nets<br>Describe positions on the full coordinate grid (all four quadrants)<br>Draw and translate simple shapes on the coordinate plane and reflect them in the axes<br>Illustrate and name parts of circles including radius diameter and circumference and know that the diameter is twice the radius<br>AMM link - Unit 6 (lessons 1-10) | | | |
| Spring 2 | **Fractions**<br>FROM AUTUMN [Key] Multiply simple pairs of proper fractions writing the answers in its simplest form<br>FROM AUTUMN [Key] Divide proper fractions by whole numbers<br>AMM link - Unit 7 (lessons 1-4) | **Measure**<br>FROM AUTUMN Calculate, estimate and compare volume of cubes and cuboids using standard units<br>FROM AUTUMN [Key] Use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure a larger unit and vice versa (using decimal notation to up to three decimal places)<br>FROM AUTUMN [Key] solve problems involving calculation and conversion of units of measure (using decimal notation to up to three decimal places)<br>AMM link - Unit 8 (9-15) | Test week | **Ratio**<br>Solve problems involving the relative size of two quantities where missing values can be found by using integer multiplication and division facts<br>Solve problems involving unequal sharing and grouping using knowledge of fractions and multiples<br>AMM link - Unit 10 (5-9) | **Algebra**<br>[Key] Use simple formulae<br>[Key] Find pairs of numbers that satisfy an equation with two unknowns<br>Generate and describe linear number sequences<br>Express missing number problems algebraically<br>Enumerate possibilities of combinations of two variables<br>AMM link - Unit 3 (lessons 4-8) | | |

| | Week 1 | Week 2 | Week 3 | Week 4 | Week 5 | Week 6 | Week 7 | Week 8 |
|---|---|---|---|---|---|---|---|---|
| Summer 1 | Revision based on gap analysis | | | | KS2 SATS Week | **Number and Place Value**<br>Revisit areas that have been previously taught (through investigations and projects id needed) - gap analysis from previous tests to drive this<br>AMM link - not covered by AMM no link | - - - - - - - -<br>- - - - - - - -<br>- - - - - - - -<br>- - - - - - - -<br>- - - - - - - -<br>- - - - - - - -<br>- - - - - - - -<br>- - - - - - - - | - - - - - - - -<br>- - - - - - - -<br>- - - - - - - -<br>- - - - - - - -<br>- - - - - - - -<br>- - - - - - - -<br>- - - - - - - -<br>- - - - - - - - |
| Summer 2 | **Multiplication and Division**<br>Revisit areas that have been previously taught (through investigations and projects id needed) - gap analysis from previous tests to drive this<br>AMM link - not covered by AMM no link | **Fractions**<br>Revisit areas that have been previously taught (through investigations and projects id needed) - gap analysis from previous tests to drive this<br>AMM link - not covered by AMM no link | **Measure**<br>Revisit areas that have been previously taught (through investigations and projects id needed) - gap analysis from previous tests to drive this<br>AMM link - not covered by AMM no link | **Shape and Position**<br>Revisit areas that have been previously taught (through investigations and projects id needed) - gap analysis from previous tests to drive this<br>AMM link - not covered by AMM no link | **Statistics**<br>Revisit areas that have been previously taught (through investigations and projects id needed) - gap analysis from previous tests to drive this<br>AMM link - not covered by AMM no link | **Algebra**<br>Revisit areas that have been previously taught (through investigations and projects id needed) - gap analysis from previous tests to drive this<br>AMM link - not covered by AMM no link | **Ratio**<br>Revisit areas that have been previously taught (through investigations and projects id needed) - gap analysis from previous tests to drive this<br>AMM link - not covered by AMM no link | **Year 7 Prep**<br>Revisit and apply based on gaps in learning<br>AMM link - not covered by AMM |