Year 5

Maths Curriculum

JAMES COOK
LEARNING TRUST

KNOW IT

New Learning | Prior Learning

YEAR 5

PLACE VALUE

- Roman Numerals to 1000.
- Roman Numerals 1-100.
- Know the value of each digit in a 7-digit number.
- Know the value of each digit in 4-digit numbers.
- Count forwards/backwards in steps of powers of 10 for any given number up to 1,000,000.
- Count forwards and backwards crossing zero.
- Count in multiples of 7, 9, 25 and 1000.
- Find 1000 more or less.
- Count backwards through 0 to include negative numbers.

CALCULATIONS

- Know the prime numbers to 20 are 2,3,5,7,11,13,17,19.
- Know all times tables up to 12 x 12.
- Know all division facts for times tables up to 12 x 12.

FRACTIONS, DECIMALS & PERCENTAGES

- $0.1 = {}^{1}/_{10} = 10\%$
- $0.01 = {}^{1}/_{100} = 1\%$
- $0.5 = {}^{50}/_{100} = 50\%$
  $0.25 = {}^{25}/_{100} = 25\%$
- $0.2 = {}^{1}/_{5} = 20\%$
  $0.4 = {}^{2}/_{5} = 40\%$, etc
- Recognise the per cent symbol (%) means number of parts per 100.
- ${}^{1}/_{10} = 0.1$, ${}^{1}/_{100} = 0.01$, $¼ = 0.25$, $½ = 0.5$, $¾ = 0.75$ ${}^{100}/_{100} = 1$ whole
- Count in thousandths forwards and backwards.
- Count in hundredths forwards and backwards.

MEASURES

- Area of a rectangle = l x w
  Perimeter of a rectangle = (2 x l) + (2 x w)
- 1000ml = 1l
- 1 litre = 1.75 pints
- inch = 2.5 cm; 1 foot = 12 inches
- 1 kg = 2.2lb
- 1000m=1km

GEOMETRY

- Angles at a point (1 whole turn) total 360°.
- Angles on a straight line (and half a turn) total 180°.
- Reflex angles are greater than 180° and less than 360°.
- Acute angles are less than 90°.
- Obtuse angles are between 90° and 180°.
- Know isosceles, equilateral, right angle and scalene triangle.
- Identify rhombus.

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TEACH IT: NUMBER & PLACE VALUE

YEAR 5

Key Objectives

- Read, write, order and compare numbers to at least 1,000,000 and determine the value of each digit.
- Read, write, order and compare numbers beyond 1000.
- Recognise the place value of each digit in a 4-digit number.
- Count forwards or backwards in steps of power of 10 for any given number up to 1,000,000.
- Count in multiples of 6, 7, 9, 25 & 1000.
- Find 1000 more/less than a given number.
- Round any number up to 1,000,000 to the nearest 10, 100, 1000, 10,000 and 100,000.
- Round any number to the nearest 10, 100 or 1000.
- Interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers, including through zero.
- Count backwards through 0 to include negative numbers.
- Read Roman numerals to 1000 (M) and recognise years written in Roman numerals.
- Read Roman numerals to 100 (I to C).

Possible Teaching Sequence

Read, write, order and compare...

⇒ Know the value of TTh, HTh and M.

⇒ Read and write up to 7-digit numbers and estimate their position on number lines including blank ones.

⇒ Partition into different combinations e.g. 1, 256,000 is equal to 12 HTh and 56 thousands.

⇒ Use <, >, = signs.

⇒ Order a given set of numbers-could include Roman numerals in a list.

Count forwards and backwards...

⇒ Recognise powers of 10 and associate with place value columns.

⇒ Count in steps of powers of 10 from a multiple of 10; count from any given multiple.

⇒ Bridge TTh, HTh and M.

Round any number up to 1,000,000...

⇒ Identify the digit within the number we are rounding to.

⇒ Recognise the position of the number in relation to the power of 10 either side and place on a number line.

⇒ Determine which multiple the number is closest to and round to the given multiple.

⇒ Spot patterns and apply when rounding e.g. 4 or below, round down.

Interpret negative numbers...

⇒ Understand the concept of zero and the concept of negative numbers in context e.g. temperature, money overdrafts etc.

⇒ Count backwards/forwards crossing zero in different steps e.g. 1, 5, 10, 100 etc.

⇒ Use the negative sign and terminology e.g. negative 4 not minus 4.

⇒ Estimate where negative numbers come on a number line.

Read Roman numerals...

⇒ Introduce Roman numerals M and D.

⇒ Know the rules of reading Roman numerals.

⇒ Apply to the reading and writing of years.

Stem Sentences

- 'There are ten thousands in a ten thousand.'
- 'There are ten, ten thousands in a hundred thousand.'
- 'There are ten hundred thousands in a million.'
- '4,321,000 is 4 millions and 321 thousands;

  4,321,000 is 43 hundred thousands and 21 thousands etc.'
- 'When rounding to the nearest___, the _____digit is the digit to consider. If the digit is 4 or less, round down. If it is 5 or more then round up.'

Vocabulary

- **Represent**
- **Representation**
- **Value**
- **Sequence**
- **Identify**
- **Estimate/Approximate**
- **Ten thousands (see STEM sentence)**
- **Hundred thousands**
- **Millions**
- **Roman Numerals**
- **Digit**
- **Partition**
- **Inequality symbol**
- **Ascending**
- **Descending**

Common Misconceptions

- Saying digits instead of reading a number e.g. reading 56,078 as 5, 6, 0, 7, 8 rather than 56 thousands and seventy eight.
- Reading thousands digits as a hundreds number e.g. in 2,432,107 '432' saying 432 rather than 432 thousands.
- Dropping the digits prior to the value you are rounding e.g. round 123,456 to the nearest 1000, pupil gives answer of 3000.
- Looking at the wrong column when rounding e.g. looking at 10,000 column when rounding to the nearest 10,000.

Key Definitions

⇒ **Round** - giving a number a nearby value when you don't need it to be exact.

⇒ **Negative number** - any number less than zero written with a negative sign.

⇒ **Positive number** - any number greater than zero.

⇒ **Multiple** - product of one number multiplied by another number.

⇒ **Power of 10** - ten multiplied by itself a certain number of times.

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TEACH IT: ADDITION & SUBTRACTION

YEAR 5

KEY OBJECTIVES

- Add and subtract numbers mentally with increasingly large numbers.
- Add, subtract numbers mentally including:
  - ⇒ 4-digit number and ones;
  - ⇒ 4-digit number and tens;
  - ⇒ 4-digit number and hundreds.
- Add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction).
- Add and subtract numbers with up to 4 digits using formal written methods of columnar addition and subtraction.
- Use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy.

POSSIBLE TEACHING SEQUENCE

Add and subtract mentally including…

- ⇒ Count forwards and backwards in ones, tens, thousands, tens of thousands and hundreds of thousands.
- ⇒ Know the place value of numbers up to 1 million.
- ⇒ Use place value to add and subtract multiples of 10, 100, 1,000, 10,000, 100,000 and 1 without bridging. *Moving onto including bridging.*
- ⇒ Use knowledge of number bonds to help to bridge.
- ⇒ Use rounding and adjusting to add numbers close to multiples of 10.
- ⇒ Use visual aids such as number lines and jottings to help keep track of calculations.

Add and subtract numbers with more than 4 digits…

- ⇒ Read and write numbers up to 1 million.
- ⇒ Use knowledge of place value to line the numbers accurately (up to 1 million).
- ⇒ Use a range of manipulatives to demonstrate understanding, including pictorial representations.
- ⇒ Add/subtract numbers up to 6 digits with no regrouping/exchanging.
- ⇒ Add/subtract numbers up to 6 digits with one regroup/ exchange.
- ⇒ Add/subtract numbers up to 6 digits with more than one exchange.
- ⇒ Know '0' as a place holder.

For above addition & subtraction also refer to Calculation Policy.

Use rounding to check…*See Place Value for Rounding Guidance.*

- ⇒ Round to the nearest 10, 100, 1000, 10,000, and 100,000.
- ⇒ Use knowledge of rounding to estimate and give approximate answers.

STEM SENTENCES

- 'I know that 6 hundreds + 7 hundreds = 13 hundreds/1300 so I know that 6 thousands + 7 thousands = 13 thousands/13,000.'
- 'I know that 13 - 6 = 7 so I know that 130 - 60 = 70 and 1300 - 600=700.'
- 'For calculations that involve both + and - steps, we can + then - or - then +; the final answer is the same.'
- 'In column addition/subtraction, we start at the right hand side.'
- 'If the column sum is equal to 10 or more then we must regroup.'
- 'Subtraction cannot be done in any order.'
- 'When using column subtraction, if the digit on the top is lower in value than that of the digit on the bottom then exchange.'

VOCABULARY

- **Mental**
- **Efficient**
- **Calculate**
- **Calculation**
- **Partition**
- **Add**
- **Addition**
- **Sum**
- **Total**
- **Plus**
- **Altogether**
- **Subtract**
- **Difference**
- **Fewer**
- **Less**
- **Takeaway**
- **Minus**
- **More**
- **Combined**
- **Column**
- **Row**
- **Exchange**
- **Regroup**

COMMON MISCONCEPTIONS

- Children may be unsure which number to place on top of the calculation and why this matters. For example: 3,454 – 3,212. Some children may place the smallest number on top and therefore complete the calculation incorrectly.
- Failing to understand place value in a calculation (*see figure 1*).
- Inaccurate application of number bonds when calculating mentally e.g. 4000-570=3530.
- Using formal written methods for every calculation rather than choosing the most efficient method.

	Th	H	T	O
	3	6	2	9
	7	8	3	
+				

Figure 1

KEY DEFINITIONS

- ⇒ **Approximate** - an estimation of an answer or rounding a number to its nearest place value.
- ⇒ **Commutative law** - In addition and multiplication, numbers can be added or multiplied in any order.
- ⇒ **Multi-step** - mathematical problems that require more than one operation.
- ⇒ **Equation** - a mathematical statement containing an = sign to show 2 expressions are equal.
- ⇒ **Expression** - a mathematical statement that contains letters, numbers and symbols.

New Learning | Prior Learning

TEACH IT: MULTIPLICATION & DIVISION

YEAR 5

KEY OBJECTIVES

- Identify multiples and factors, including finding all factor pairs of a number, and common factors of 2 numbers.
- Recognise and use factor pairs and commutativity in mental calculations e.g. 7 x 6 = 7 x 3 x 2.
- 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.
- 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.
- Use the distributive law to multiply 2 digit numbers by 1 digit.
- Multiply two digit and 3 digit numbers by a one digit number using formal written methods. (See Calculation Policy).
- Multiply and divide numbers mentally, drawing upon known facts.
- Recall multiplication and division facts from multiplication tables up to 12 x 12.
- Use place value, known and derived facts to multiply and divide mentally including, multiplying by 0 and 1; dividing by 1; multiplying together 3 numbers.
- 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.
- Multiply and divide whole numbers and those involving decimals by 10, 100 and 1,000.
- Recognise and use square numbers and cube numbers, and the notation for squared (^{2}) and cubed (^{3}).

POSSIBLE TEACHING SEQUENCE

Identify multiples and factors...

⇒ Continue to embed rapid recall of times tables and related division facts.

⇒ Use the vocabulary factor, multiple and product and identify all the factors of a given number e.g. the factors of 20 are 1, 2, 4, 5, 10 and 20.

⇒ Identify factors systematically so that none are missed out.

Know and use the vocabulary of prime numbers.... Establish whether a...

⇒ Recognise that numbers with only 2 factors are prime numbers & apply knowledge of multiples and divisibility tests to identify prime numbers less than 100.

⇒ Understand that 73 children can only be organised as 1 group of 73 or 73 groups of 1 because 73 is prime, whereas 44 children could be organised as 1 group of 44, 2 groups of 22, 4 groups of 11, 11 groups of 4 etc.

⇒ Explore the pattern of primes on a 100-square, explaining why there will never be a prime number in the tenth column and the fourth column.

Multiply numbers up to 4-digits...

⇒ Develop and refine written methods for multiplication. Moving from expanded layouts (such as the grid method) towards a compact layout for HTO × O and TO × TO calculations.

⇒ Approximate the answer before starting a calculation and use this to check the answer sounds sensible e.g. 56 × 27 is approximately 60 × 30 = 1800.

Multiply and divide numbers mentally...

⇒ Rehearse multiplication facts and use these to derive division facts, in order to find factors of two-digit numbers and to multiply multiples of 10 and 100 e.g. 40 × 50.

⇒ Use factors to work out a calculation such as 16 × 6 by thinking of it as 16 × 2 × 3.

⇒ Use strategies such as round and adjust e.g. 39 x 20 calculate 40 x 20 then subtract 20 and doubling and halving e.g. 3.5 x 12 = 7 x 6.

Divide numbers up to 4 digits by...

⇒ Extend written methods for division to include HTO ÷ O, including calculations with remainders. Increase efficiency of methods used: see calculation policy.

Recognise and use square and cube numbers...

⇒ Use knowledge of multiplication facts to derive quickly squares of numbers to 12 × 12 and the corresponding squares of multiples of 10.

STEM SENTENCES

- 'For every group of 10, there are 2 groups of five.'
- 'If I double one factor, I must halve the other factor for the product to stay the same.'
- 'If I multiply one factor by two, I must halve the other factor for the product to stay the same.'
- 'If I multiply the dividend by __, I must multiply the divisor by __ for the quotient to stay the same.'
- 'If I divide the dividend by 2, I must divide the divisor by 2 for the quotient to stay the same.'
- '1 is a factor of all positive integers.'
- 'Every positive integer is a factor of itself.'
- 'The smallest factor of a positive number is always 1.'
- 'The largest factor of a positive integer is always itself.'
- 'Numbers that have more than two factors are composite numbers.'
- 'If you change the order of factors, the product always remains the same.'
- 'When a number is divided by 10, the digits move one place to the right.'
- 'When a number is multiplied by 10, the digits move one place to the left.'

VOCABULARY

- **Multiples**
- **Factors**
- **Common Factors**
- **Prime**
- **Composite**
- **Squared (^{2}) number**
- **Cubed (^{3}) number**
- **Dividend**
- **Divisor**
- **Quotient**
- **Integer**
- **Product**
- **Tenth**
- **Hundredth**
- **Thousandth**
- **Commutative**

COMMON MISCONCEPTIONS

- Just adding a zero when multiplying by powers of 10. Making reference to decimal numbers where this '*cheat*' does not work, i.e. 0.7 x 10 = 7 ***not*** 0.70.
- Not using a 'place holder' when multiplying by a 2-digit number.
- Confusing a multiple and a factor.
- When finding the product of a squared number (^{2}), children may 'x' the number by 2 and not by itself.
- When finding the product of a cubed number (^{3}), children may 'x' the number by 3 and not by itself and itself again.

PATTERNS

- Please refer to the Y3 and Y4 curriculum for multiplication patterns.

KEY DEFINITIONS

⇒ **Product** - the result when two numbers are multiplied together.

⇒ **Multiple** - the product of one number multiplied by another.

⇒ **Factor** - a whole number that divides exactly into another number.

⇒ **Prime number** - a number divisible by only 2 factors: 1 and itself.

⇒ **Composite number** - has factors in addition to 1 and itself.

⇒ The number that is divided is called the **dividend** and the number which the **dividend** is being divided by is the **divisor**. The answer to a division problem is the **quotient.**

⇒ **Integer** - a whole number.

⇒ **Squared number** (^{2}) - the product of a number multiplied by itself.

⇒ **Cubed number** (^{3}) - the product of the same number multiplied by itself, then multiplied by itself again.

New Learning | Prior Learning

TEACH IT: FRACTIONS, DECIMALS & PERCENTAGES

YEAR 5

KEY OBJECTIVES

- Identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths.
- Compare and order fractions whose denominators are all multiples of the same number.
- Recognise and show, using diagrams, families of equivalent fractions.
- Recognise mixed numbers and improper fractions and convert from one form to the other and write mathematical statements > 1 as a mixed number.
- Add and subtract fractions with the same denominator and denominators that are multiples of the same number.
- Add and subtract fractions with the same denominator beyond one whole.
- Multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams.
- Read and write decimal numbers as fractions.
- Recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents.
- Recognise and write decimal equivalents for tenths, hundredths, ¼, ½, ¾.
- Recognise and write decimal equivalents of any number of tenths or hundredths.
- Count up and down in hundredths recognising that hundredths arise when dividing an object by a hundred and dividing tenths by tens.
- Read, write, order and compare numbers with up to 3 decimal places.
- Compare and order numbers with the same number of decimal places up to two decimal places.
- Round decimals with 2 decimal places to the nearest whole number and to 1 decimal place.
- Round decimals with one decimal place to the nearest whole.
- Recognise the percent symbol and understand that percent relates to number of parts in 100 and write percentages as a fraction (with denominator 100) and as a decimal.
- Find the effect of dividing a 1 or 2 digit number by 10 and 100, identifying the value of the digit in the answer as ones, tenths and hundredths.
- Know percentage and decimal equivalents of ½, ¼, $^1/_5$, $^2/_5$, $^4/_5$ and those fractions with a denominator of a multiple of 10 and 25.
- Calculate quantities involving fractions and use fractions to divide quantities including non-unit fractions where the answer is a whole number.

POSSIBLE TEACHING SEQUENCE

Identify, name… Compare and order…

⇒ Explore visual representations of equivalent fractions, linking to common factors and multiples.

⇒ Apply knowledge of equivalent fractions to ensure a given set of values all have the same denominator.

⇒ Compare and order fractions in ascending and descending order, and using <, > and = signs.

⇒ Count up and down in fraction steps, including mixed numbers e.g. 1, 1½, 2, 2½.

Recognise mixed…

⇒ Building on prior learning that equivalent numerators and denominators equal a whole, recognise proper and improper fractions.

⇒ Use bar models to show how many parts are in an improper fraction/mixed number and use to convert between two, recording as mathematical statements.

Add and subtract…

⇒ Use equivalence to convert denominators to the same multiple.

⇒ Recognise we subtract/add parts (numerator) that we have, writing answer as a mixed number.

Multiply proper fractions…

⇒ Recognise a multiplication sentence as repeated addition and represent this visually, counting the number of parts that result.

⇒ Extend this to mixed numbers, multiplying wholes and parts separately.

Read and write decimals…Recognise and use thousandths…

⇒ Recognise a decimal as a fraction of a whole.

⇒ Recognise value of t, h, th in relation to diving a whole by 10, 100, 1000.

⇒ Link knowledge of fractions to decimals e.g. 23 ÷ 1000 = $^{23}/_{100}$= 0.023.

Read, write, order…

⇒ Recognise the value of t, h, th in relation to a whole through use of visual representations and apply knowledge when comparing.

⇒ Recognise what 2 or 3 decimal places means.

Round decimals…

⇒ Recognise which whole or tenth are either side of the decimal being rounded and place the decimal in relation to those on a number line, recognising which value it is closest to.

Recognise percent…Know percentage…

⇒ Know and understand % symbol, linking to place value knowledge of decimal tenths, hundredths and fraction out of 100.

⇒ Use knowledge to convert between fractions, decimals and percentages.

⇒ Use equivalence to convert common fractions to out of 100 and changes these to decimals and percentages.

STEM SENTENCES

- 'When adding/subtracting fractions, check that the denominators are the same, then add/subtract the parts.'
- 'To find an equivalent fraction, you must multiply/divide both the numerator and denominator in the same way.'
- 'When comparing fractions with the same denominators, the greater the numerator, the greater the fraction.'
- 'If numerators are the same, the greater the denominator, the smaller the fraction.'
- 'I know that $/_{1000}$ is the same as ÷1000.'
- '1 whole is a thousand, thousandths.'

VOCABULARY

- **Fraction**
- **Tenths**
- **Hundredths**
- **Thousandths**
- **Equal**
- **Part**
- **Equivalent**
- **Whole**
- **Factors**
- **Multiples**
- **Decimal point**
- **Improper fraction**
- **Decimal**
- **Numerator**
- **Denominator**

COMMON MISCONCEPTIONS

- Not fully understanding that a whole can be made up of parts, such as in the context of mixed numbers.
- Only converting denominators and not numerators or vice-versa
- Adding/subtracting the denominators e.g. ¾ + ⅝ = $^8/_{12}$
- Multiplying <u>both</u> numerator and denominator by a whole e.g. ½ x 3 = $^3/_6$
- Reading a decimal as zero point three hundred and 24 instead of zero point three two four.
- Thinking a thousandth is greater than a tenth e.g. 0.1 < 0.009.

KEY DEFINITIONS

⇒ **Mixed number** - a number made up of a whole number and a fraction.

⇒ **Percent/Percentage** - a part out of a hundred.

⇒ **Decimal place** - the position of a digit to the right of the decimal point.

⇒ **Proper fraction** - a fraction where the numerator is less than the denominator.

⇒ **Improper fraction** - a fraction where the numerator is greater than the denominator; a fraction larger than a whole.

New Learning | Prior Learning

TEACH IT: MEASURE

YEAR 5

KEY OBJECTIVES

- Convert between different units of metric measure (for example, kilometre and metre; centimetre and metre; centimetre and millimetre; gram and kilogram; litre and millilitre).

- Convert between different units of measure e.g. km to m/ hours to minutes.
- Estimate, compare and calculate different measures including money in pounds and pence.

- Understand and use approximate equivalences between metric units and common imperial units such as inches, pounds and pints.
- Measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres.
- Calculate and compare the area of rectangles (including squares), and including using standard units, square centimetres (cm2) and square metres (m2) and estimate the area of irregular shapes.

- Measure and calculate the perimeter of a rectilinear figure (including squares) in cm and m.
- Find the area of rectilinear shapes by counting squares.

- Estimate volume [for example, using 1 cm3 blocks to build cuboids (including cubes)] and capacity [for example, using water].
- Solve problems involving converting between units of time.

- Read, write and convert time between analogue and digital 12- and 24-hour clocks.

POSSIBLE TEACHING SEQUENCE

Convert between different units of measure…

⇒ Throughout use practical equipment and take measurements themselves.
⇒ Identify what kilo means.
⇒ Convert from km to m and kg to g and vice versa. Use dividing and x by 1000.
⇒ Convert fractions of km to m.
⇒ Use bar models and double number lines to visualise conversions.
⇒ Compare m with km etc.
⇒ Milli means 1000. Repeat above for mm to m and ml to l and vice versa.
⇒ Repeat for cm and m.

Understand and use approximate equivalences between metric...

⇒ Physically use the measurements in the classroom alongside metric units.
⇒ Use given stem sentences to compare measurements given in different units.
⇒ Use bar models to help with conversions.

Measure and calculate the perimeter...

⇒ Measure the perimeter of rectangles and rectilinear (compound) shapes using a ruler accurately.
⇒ Encourage marking off of sides as they are added up to prevent repetition of counting or omission of sides.
⇒ Consider alternative methods when dealing with rectangles e.g. l + w + l + w or (l + w) x 2.
⇒ Use perimeter and labelled sides to work out unknown lengths.

Calculate and compare the area of rectangles...

⇒ Recap counting squares to find the area and know that area is the amount of space a shape covers and that it is measured in squared units (cm^2 and m^2).
⇒ Find area of irregular shapes by counting squares – identify whole and part squares; find 2 parts that can make an approximate whole.
⇒ Use a formula to calculate the area: area = l x w.
⇒ Estimate the areas of rectangles then calculate and compare / order.
⇒ Investigate: is a square a rectangle? How should we calculate its area?
⇒ Investigate: can we use Area = l x w for any shape?
⇒ Calculate the area of compound shapes – split into 2 separate rectangles.
⇒ Split compound shapes in different ways and calculate the areas.
⇒ Find the area of a compound shape by making it a complete rectangle and use subtraction of the area of the added piece.

Estimate volume and capacity…

⇒ Understand that volume is the amount of solid space something takes up.
⇒ Use cm cubes to make solid shapes & relate to the units for volume – cm^3.
⇒ Make different shapes with the same volume and discuss how the volume is the same / still takes up the same amount of space.
⇒ Compare and order different solids that are made of cubes.
⇒ Begin to calculate volume without counting cubes.
⇒ Identify how volume and capacity differ.
⇒ Estimate, measure and compare both volumes and capacities.
⇒ Explore how containers can be different shapes but still hold the same capacity.

STEM SENTENCES

- 'To convert km to m/kg to g/l to ml multiply by 1000.'
- 'To convert m to km/g to kg/ml to l divide by 1000.'
- 'To convert cm to m divide by 100.'
- 'To convert m to cm multiply by 100.'
- '1 inch is approximately 2.5cm.'
- '1kg is approximately 2 pounds.'
- '1 pint is approximately ½ a litre.'
- 'Perimeter is the distance around the outside of a 2D shape.'
- 'Area is the amount of space a shape covers and is measured in squared units.'
- 'Capacity is the amount a container or object can hold.'
- 'Volume is the amount of solid space occupied by an object.'

VOCABULARY

- **Mass**
- **Weight**
- **Scale**
- **Length**
- **Volume**
- **Capacity**
- **Perimeter**
- **Increments/divisions · a.m. · p.m. ·**
- **Distance**
- **Area**
- **Analogue · Digital · Standard units · Non-standard units**
- **Regular/irregular**
- **Rectilinear/compound shapes**
- **Approximate**
- **Inches, pints, pounds**

COMMON MISCONCEPTIONS

- Not knowing the difference between perimeter and area.
- Not knowing the difference between volume and capacity.
- Thinking that 100g = 1kg and 100 m = 1km or 1000cm = 1m.
- Difficulties converting between minutes and hours e.g. 0.75 hours = 75 minutes.
- Believing time is a decimal and using the column method to calculate differences in time.

KEY DEFINITIONS

⇒ **Capacity** - the amount a container or object can hold, (measured in ml/l).
⇒ **Volume** - amount of solid space occupied by an object (measured in cm^3).
⇒ **Perimeter** - the distance around the outside of a 2D shape.
⇒ **Area** - the amount of space a shape covers.
⇒ **Rectilinear** - a shape where all sides meet at right angles.
⇒ **Formula** - a mathematical rule to show the relationship between a calculation and an answer.

New Learning | Prior Learning

TEACH IT: GEOMETRY

YEAR 5

Key Objectives

- Identify 3D shapes, including cubes and cuboids from 2D representations.
- Use the properties of rectangles to deduce related facts and find missing lengths and angles.
- Distinguish between regular and irregular polygons based on reasoning about equal sides and angles.

- Compare and classify geometric shapes, including quadrilaterals and triangles, based on their properties and sizes.
- Complete a simple symmetrical figure with respect to a specific line of symmetry.
- Identify lines of symmetry in 2D shapes, presented in different orientations.

- Know that angles are measured in degrees: estimate and compare acute, obtuse and reflex angles.
- Draw given angles and measure them in degrees.
- Identify:
  - ⇒ angles at a point and one whole turn-360°;
  - ⇒ angles at a point on a straight line and ½ a turn;
  - ⇒ other multiples of 90°.

- Identify acute and obtuse angles and compare and order angles up to two right angles by size.

- 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.

- Describe positions on a 2D grid as coordinates in the first quadrant.
- Plot specified points and draw sides to complete a given polygon.
- Describe movements between positions as translations of a given unit to the left/right and up/down.

Possible Teaching Sequence

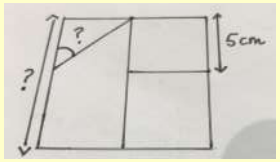
Identify 3D shapes...

⇒ Know terminology associated with 3D shapes e.g. faces, edges, vertices, base and parallel faces.

⇒ Identify how 3D shapes are constructed from faces consisting of 2D shapes.

⇒ Recognise specific features of 3D shapes from different representations, including 2D images.

Use the properties...



Children should use the idea that they can form another square within the rectangle to determine that angle ? is ½ a right angle and use ideas such as, parallel sides in rectangles are equal lengths to determine the length of the missing side.

Know angles... Draw given angles...

⇒ Building on acute and obtuse angles (Y4) identify angles that are greater than 180° and associate with terminology.

⇒ Recognise angles within a range of representations e.g. irregular shapes and state whether they are acute, obtuse or reflex.

⇒ Know angles are measured in degrees and how to use a protractor.

⇒ Estimate the size of and measure angles, including reflex, in a range of representations using angle knowledge to justify their answers.

Identify angles...

⇒ Building on knowledge from Y3 of turns and right angles, recognise a quarter turn as 90°, a ½ turn as 180° (straight line), a ¾ turn as 270° and a full turn as 360°.

Identify, describe and represent...

⇒ Know that the concept of translate is to move.

⇒ Calculate how many units a vertex has been translated by.

⇒ Translate each vertex and join to complete a shape.

⇒ Building on Y4, reflect shapes within 1 quadrant and write the new coordinates.

Stem Sentences

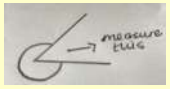
- 'A reflex angle is greater than 180° but less than 360°.'
- 'When we read coordinates, we read x then y.'
- 'Parallel lines are lines that never meet and are an equal distance apart.'
- 'Perpendicular lines meet at a right angle.'
- 'To translate a shape, count the jumps.'

Vocabulary

- **Acute**
- **Obtuse**
- **Regular**
- **Irregular**
- **Polygon**
- **Vertices**
- **Faces**
- **Base**
- **Edges**
- **Reflection**
- **Translation**
- **Parallel**
- **Protractor**
- **Perpendicular**
- **Diagonal**
- **Coordinate**

Common Misconceptions

- Not counting hidden vertices, faces and edges on a 2D representation of a 3D shape.
- Reading the wrong scale when measuring angles.
- Measuring acute angle instead of reflex e.g.



- Not recognising reflex angles within irregular shapes e.g.

- Counting squares not jumps when translating
- Translating, instead of flipping a shape around a mirror line.

Key Definitions

⇒ **Prism** - a 3D shape with two parallel faces that are the same 2D shape. All the other faces are rectangles.

⇒ **Pyramid** - a 3D shape with triangular sides that meet at a point. The base is a 2D shape.

⇒ **Regular** - a shape with all sides and angles equal.

⇒ **Irregular** - a shape where sides and angles are different sizes and lengths.

New Learning | Prior Learning

TEACH IT: STATISTICS

YEAR 5

KEY OBJECTIVES

- Solve comparison, sum and difference problems using information presented in a line graph.
- Solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs.
- 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.

POSSIBLE TEACHING SEQUENCE

Solve comparison, sum and difference problems...

⇒ Reading between intervals, giving an estimate of the value that is represented.
⇒ Use a ruler to support reading of axes.
⇒ Writing a story to explain what is happening in a line graph.
⇒ Draw axis with different scales, understanding which multiples are most appropriate for labelling intervals on axes and impact on accuracy.
⇒ Collect own data to represent in line graphs. Links to science e.g. measuring shadows over time, melting and dissolving substances or plant growth.
⇒ Solving comparison, sum and difference problems.
⇒ Determine highest and lowest values.
⇒ Calculate differences between highest and lowest values .
⇒ Calculate length of time taken for a certain event.
⇒ Generate own questions.

Complete, read and interpret information in tables...

⇒ Interpret discrete data from a table.
⇒ Collect, present and interpret own information.
⇒ Read and interpret two way tables.
⇒ Complete missing information on a two way table.
⇒ Extract information from a timetable.

STEM SENTENCES

- 'What does the x axis represent? The x axis represents...'
- 'What does the y axis represent? The y axis represents...'
- 'X runs along the bottom, y goes up the side.'

VOCABULARY

- **Interpret**
- **Represent**
- **Scale**
- **Data**
- **Intervals**
- **Table**
- **Timetable**
- **Interval**
- **Axis**
- **Multiples**
- **Constant rate**
- **Two way table**

COMMON MISCONCEPTIONS

- Mixing up the x and y axis.
- Uneven intervals when drawing their own graphs.
- Plotting information on the graph incorrectly.
- Believing that the larger durations of time on a timetable equate to the fastest.
- When reading two-way tables, pupils might just look at either the row or column but not both.
- When solving questions on a two-way table about bus/train times they may use column subtraction/addition to get a time instead of a number line.

KEY DEFINITIONS

⇒ **Interval** - between 2 points or values.
⇒ **Scale** - a series of marks equally spaced apart on an axis.
⇒ **Discrete** - data that has a finite value and does not change e.g. the number of people in each group in a completed survey.
⇒ **Continuous** - data that is continually changing as it is measured over time e.g. the temperature over a year.
⇒ **Line graph -** uses lines to join points that represent data.

New Learning | Prior Learning

APPLY IT: PROBLEM-SOLVING & REASONING YEAR 5

PROBLEM-SOLVING AND REASONING SHOULD BE APPLIED THROUGHOUT ALL TEACHING NOT JUST WITHIN ISOLATED LESSONS.

PROBLEM SOLVING AND REASONING

The following strategies are a very powerful way of developing pupils' problem-solving and reasoning skills and can be used flexibly across all strands of maths.

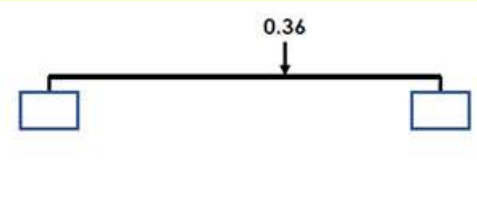
- **Spot the mistake/Which is different?**
- **True or false?**
- **What comes next?**
- **Do, then explain.**
- **Make up an example/Write more statements/Create a question/Another and another.**
- **Possible answers/other possibilities.**
- **Missing numbers/Missing symbols/Missing information.**
- **Working backwards/Use of inverse/Undoing/Unpicking.**
- **Hard and easy questions/Order from easiest to hardest.**
- **What else do you know?/Use a fact.**
- **Fact families.**
- **Convince me/Prove it/Generalising/Explain thinking**
- **Connected calculations.**
- **Make an estimate/Size of an answer.**
- **Always, sometimes, never.**
- **Making links/Application.**
- **Can you find?**
- **Odd one out.**
- **Complete/continue the pattern.**
- **Ordering.**
- **The answer is…**
- **Visualising**
- **Answer free zone.**
- **Justify.**

PROBLEM SOLVING AND REASONING EXAMPLES FOR YEAR 5

Place Value

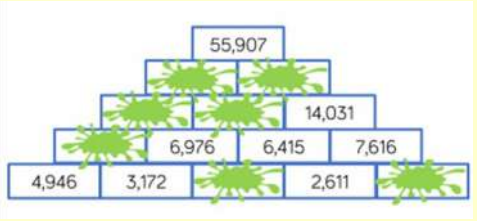
Different Ways

What could the start and end numbers be?

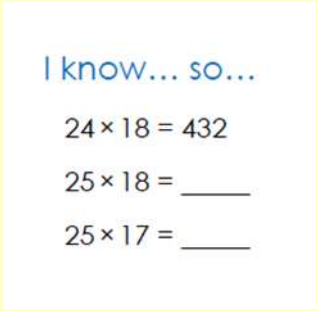


Addition & Subtraction

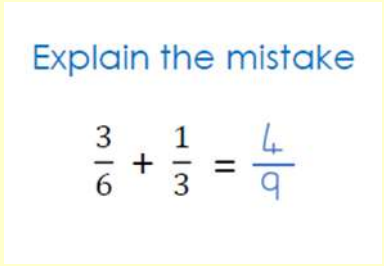
Complete the pyramid using addition and subtraction.



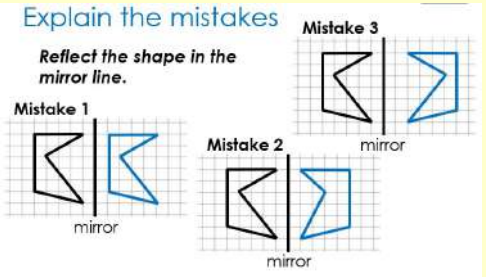
Multiplication & Division



Fractions

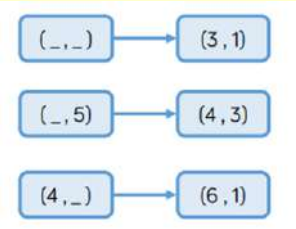


Geometry-Shape

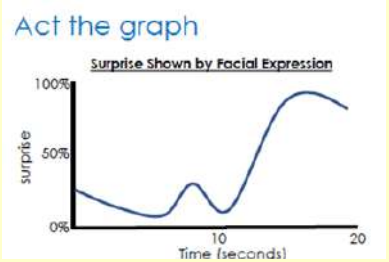


Geometry-Position & Direction

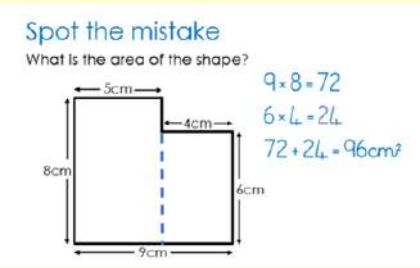
These coordinates have all been translated in the same way.
Can you work out the missing ones?



Statistics



Measures



True or false?

1·5 kg + 600 g = 2·1 kg + 300 g

32 cm + 1·05 m = 150 cm – 0·13 m

¾ ℓ + 0.05 ℓ = half of 1·6 ℓ

Explain your reasoning.