Knowledge Organiser

MATHS

Maths

Non-Calculator Arithmetic

Question:	Answer:
What does BIDMAS stand for?	Brackets, Indices, Divide, Multiply, Add and Subtract
What does BIDMAS tell us?	The order of operations we use to do calculation
What order do we do division and multiplication, or addition and subtraction?	If we have a string of multiplications and/or divisions, we work it out from left to right (and the same with addition and/or subtraction)
What are synonyms for add?	Total, sum, plus, more than
What are synonyms for subtract?	Difference, take away, minus, less than
What are synonyms for multiply?	Repeated addition, lots of, times, product
What are synonyms for divide?	Split into equal groups, share equally
What are positive numbers?	Numbers that are greater than 0. They have no sign or a + sign.
What are negative numbers?	Numbers that are less than 0. They have a – sign.
What happens we add a negative number?	It is the same as subtracting a positive number
What happens when we subtract a negative number?	It is the same as adding a positive number
When we multiply or divide a positive and negative number, is the answer positive or negative?	Negative
When we multiply or divide two negative numbers, is the answer positive or negative?	Positive
Short division	'Bus stop' method. Divide each number from left to right.
What is an integer?	A whole number that can be positive or negative
What is a decimal?	A number that contains a decimal point
Multiplying by 0.1 is equivalent to …	Dividing by 10
Multiplying by 0.01 is equivalent to …	Dividing by 100
Multiplying by 0.5 is equivalent to …	Dividing by 2
Dividing by 0.1 is equivalent to …	Multiplying by 10
Dividing by 0.01 is equivalent to …	Multiplying by 100

Approximations

Question	Answer
What does round mean?	Make a number simpler but keep its value close to what it was.
What is the rule for rounding?	Identify the position of the last digit that you want to keep – the 'rounding digit' If the digit to the right of the rounding digit is: less than 5, round down: rounding digit stays the same 5 or more, round up: add 1 to the rounding digit
What are whole numbers?	A number with no decimal places
What are decimal places (dp)?	Position of a number after the decimal point
What are significant figures (sf)?	The digits in a number except zeros at the start of the number
What does estimate mean?	Find an answer close to the true answer but easier to calculate
How do we estimate a calculation?	Round each number to 1 significant figure Use your rounded figures to calculate the sum
What does underestimate mean?	The estimate is less than the actual answer
What does overestimate mean?	The estimate is more than the actual answer
What symbol means 'approximately equal to'?	$\approx$
What is the lower bound?	The smallest value that would round up the estimate value
What is the upper bound?	The smallest value that would round up the next estimated value
What is an error interval?	The range of values that a number could have taken before being rounded
How do we write error intervals?	Lower bound ≤ n < Upper bound

What does truncate mean?	Miss off digits past a certain point in the number.

Powers and Roots	
What does square mean?	Multiply by itself
What are the first 15 square numbers?	1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225
What does square root mean and what symbol do we use for it?	The number you multiply by itself to get another number. The inverse (opposite) of squaring. The symbol is $\sqrt{}$
What does cube mean?	Multiply a number by itself 3 times.
What are the first 5 cube numbers?	1, 8, 27, 64, 125
What does cube root mean and what symbol do we use for it?	The number you multiply by itself three times to get a value. The inverse of cubing a number. The symbol is $\sqrt[3]{}$
What is an index (indices) or power?	The small number on the top-right; the number of times a value is multiplied by itself.
What is the base number?	The big number on the left. The number that will be multiplied by itself.
What is index notation?	A number written with a base number and index
Anything to the power of 1 is ...	Itself $(p^1 = p)$
Anything to the power of 0 is …	1 $(p^0 = 1)$
A negative power means we…	Take the reciprocal i.e. we 'flip' the number
What is the reciprocal?	1/number i.e. we 'flip' the number
What does simplify mean?	Make simpler – with indices this means write it as one number where possible
What is standard form?	$A \times 10^b$ where $1 \leq A < 10$, b is an integer

Multiples and Factors	
What is a multiple?	The **times tables** of a number.
What is a common multiple?	A multiple of two or more numbers
What is a factor?	A number that **divides exactly** into another number without a remainder. Factors come in pairs.
What is a common factor?	A factor of two or more numbers
What is a prime number?	A number with **exactly two factors,** one and itself.
What are the first 10 prime numbers?	2, 3, 5, 7, 11, 13, 17, 19, 23, 29
What is prime factor decomposition?	**Product** means multiply so write your answer as a multiplication.
How do we write numbers as a product of primes?	1. Use a **prime factor tree** to find the prime factors 2. Write your answer as a multiplication, with repeated factors written in index notation
What is the unique factorisation theorem?	The prime factorisation of each number is unique – it has only one prime factorisation and no two numbers have the same one
What is a lowest common multiple?	The **smallest** number that is in the **times tables** of each of the numbers given.
What is a highest common factor?	The **biggest** number that **divides exactly** into two or more numbers.

Maths

Fractions	
What is a fraction?	Tells us how many parts of a whole we have
What does a fraction represent?	Division: $\frac{a}{b} = a \div b$
What is the numerator?	The top number in a fraction : how many parts we have
What is the denominator?	The bottom number in a fraction: how many equal parts the whole is divided into
What is a unit fraction?	A fraction where the numerator is 1 e.g. $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$
What does equivalent mean?	Two things are equal – they represent the same value
How do we find equivalent fractions?	Multiply or divide the numerator and denominator by the same number
How do we simplify fractions?	Divide the numerator and denominator by a common factor
What does it mean if a fraction is in 'simplest form'?	The fraction cannot be simplified any more – the numerator and denominator are co-prime so there are no common factors except 1
How do we find a fraction of an amount?	Divide by the denominator, multiply by the numerator.
What is a mixed number?	A number formed of both an integer part and a fraction part e.g. $3\frac{1}{2}$
What is an improper fraction?	A fraction greater than one where the numerator is larger than the denominator e.g. $\frac{7}{2}$
What does convert mean?	Change e.g. from a mixed number to an improper fraction
What does ascending mean?	Increasing in size (smallest to largest)
What does descending mean?	Decreasing in size (largest to smallest)

Equivalent fractions, decimals, percentages	
What does convert mean?	Change e.g. from a decimal to a percentage
What is a fraction?	Tells us how many parts of a whole we have
What is a decimal?	A number that contains a decimal point
What is a percentage?	Parts per 100
What does equivalent mean?	Equal, they have the same value

Percentages	
What is a percentage?	Parts 'per 100'. %
How do we express a number as a percentage of another number?	$\frac{\text{Number 1}}{\text{Number 2}} \times 100$
How do we find 10% of a number?	$\div 10$
How do we find 1% of a number?	$\div 100$
NON-CALCULATOR: How do we increase by a percentage?	Calculate the percentage and add it on to the original
NON-CALCULATOR: How do we decrease by a percentage?	Calculate the percentage and subtract it from the original
What is the multiplier?	A single number we can multiply the amount by that represents the percentage change. It is the decimal equivalent of the percentage
How do we find a percentage of an amount using a calculator?	Amount x percentage $\div 100$

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What is the multiplier for a percentage increase?	$1 + \frac{\% \text{ increase}}{100}$
What is the multiplier for a percentage decrease?	$1 - \frac{\% \text{ increase}}{100}$
What is interest?	Money that is paid regularly at a particular percentage when money has been lent or borrowed
What is simple interest?	Interest is calculated as a percentage of the original amount borrowed
What is compound interest?	Interest is calculated on both the amount borrowed and any previous interest
What does appreciate mean?	Increase in value or price
What does depreciate mean?	Decrease in value or price
What does 'per annum' mean?	Annually; per year

Ratio	
What is a ratio?	**Relationship** between the number of parts. Has a colon (:).
What does simplify mean?	Make simpler. In this case, divide by a common factor
What does it mean if a ratio is in simplest form?	There are no common factors of the parts in the ratio except 1 – the numbers are co-prime. The parts must be integers
What does equivalent mean?	Equal, the same value. They have the same simplest form.
How do we find equivalent ratios?	Multiply or divide every part of the ratio by the same number
How do we write the ratio a : b in the form 1 : n?	Divide each part by the number a to get $1 : \frac{b}{a}$. We can have a decimal.
How do we write a ratio as a fraction?	Add together the total number of parts – this goes in the denominator The number of parts you want is the numerator
What does share mean?	Split into parts, but not necessarily equally, in a predefined ratio
How do we share an amount in a ratio?	1. Add together the total number of parts 2. Divide the amount by the total number of parts 3. Multiply by the number of parts you want

Algebraic Expressions	
What is a 'variable'?	A **letter** that represents any number. It can take on any value.
What is a 'coefficient'?	The **number before** the variable (letter).
What is a 'term'?	The **variable**(s), **coefficient** and **symbol** (+/-) before it.
What are 'like terms'?	Terms with the **same variable**(s) (letters) with the same powers.
What is an 'expression'?	A collection of **terms** (variables, coefficients, operator symbols $(+, -, \times, \div)$, but **no equals** (=) sign.
What does 'simplify' mean in algebra?	Collect '**like terms**' by adding/subtracting the coefficients
What is a 'power' or 'index'?	The **small number** on the top-right; the **number of times** a value/term is multiplied by itself.
What is the 'base number'?	The big number on the left. The number/term that will be multiplied by itself.
What is the law of indices for multiplying with the same base?	$a^m \times a^n = a^{m+n}$ (add the powers, base stays the same)
What is the law of indices for dividing with the same base?	$a^m \div a^n = a^{m-n}$ (subtract the powers, base stays the same)

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What is the law of indices for brackets?	$(a^m)^n = a^{mn}$ (multiply the powers, base stays the same)
What does 'expand' mean?	**Multiply** each term in the bracket by what is outside the bracket.
What does 'square' mean?	Multiply by itself.
What does 'factorise' mean?	Put into brackets. Look for the **highest common factor (HCF)** of all the terms. It is the opposite of expanding brackets.
What is the 'highest common factor' (HCF)?	The biggest number/term that divides exactly into two or more numbers/terms
What is a 'quadratic expression'?	An expression where the highest power of the variable (e.g. x) is 2.
What is the general form of a quadratic expression?	$x^2 + bx + c$ where b and c are numbers

Algebra - Equations and identities	
What is an 'expression'?	A collection of **terms** (variables, coefficients, operator symbols $(+, -, \times, \div)$ but **no equals** (=) sign.
What is a 'coefficient'?	The **number before** the variable (letter).
What is a 'variable'?	A **letter** that represents any number. It can take on any value.
What is a 'term'?	The **variable**(s), **coefficient** and **symbol** (+/-) before it.
What is an 'equation'?	One or more terms with an equals (=) sign. Can be **solved.**
What is a 'linear equation'?	The **highest power of the variable is 1**.
What does 'solve' mean?	Find the answer/value of an **unknown** letter.
What is the 'solution?	The **value** of the **unknown** in an equation.
What does 'inverse' mean?	**Opposite**
How do you solve a linear equation?	Use **BIDMAS** backwards and **inverse** operations on both sides of the equation (balancing method) to **undo** each step.
How do you solve a linear equation where the variable appears twice?	Rearrange to get all the x-terms on one side and all the numbers on the other. Get the x's on the side with the most to start with.
How can you check your solution is correct?	Substitute your solution into the equation and see if it works, i.e. is the answer correct.
What is an 'identity'?	An equation that is **true for all values** of the variables
What symbol do we use for an identity and what does it mean?	An identity uses the symbol: ≡ which means 'always equal to'
What does 'prove' mean?	Demonstrate that something is true or false
What is a 'counterexample'?	An example where the statement doesn't work so we can show it is false

Inequalities	
What is an 'inequality'?	It compares two values, showing if one is less than, greater than or not equal to another value
What does this symbol mean <?	Less than
What does this symbol mean >?	Greater than
What does this symbol mean ≤?	Less than or equal to
What does this symbol mean ≥?	Greater than or equal to
What are strict inequalities?	Greater than > or less than <

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How are strict inequalities(< >) represented on a number line?	An empty circle
How are not strict inequalities (≤ ≥) represented on a number line?	A solid circle
What does 'solve' mean?	Find the answer/value of an **unknown** letter.
What is the 'solution?	The **value(s)** of the **unknown** in an equation or inequality.
What is a compound inequality?	Multiply inequalities combined in one e.g. 3 < x < 9

Formulas	
What is a 'formula'?	A rule or relationship between two or more variables
What is an 'expression'?	A collection of **terms** (variables, coefficients, operator symbols $(+, -, \times, \div)$ but **no equals** (=) sign.
What does 'evaluate' mean?	Work out the value of. The answer is a number.
What does 'substitute' mean?	Replace a variable (letter) with a number and use BIDMAS to evaluate.
What is a 'variable'?	A **letter** that represents any number. It can take on any value.
What do we use BIDMAS for?	Knowing the order of operations
What do the letters in BIDMAS stand for?	Brackets, Indices, Division, Multiplication, Addition, Subtraction
What are 'units'?	It tells us what the number means e.g. is it a length, weight. It could be cm, kg, m²
What does 'rearrange' mean?	Change the position of (in this case, the subject)
What is the 'subject of the formula'?	The letter on its own on one side of the equals sign.

Sequences	
What is a sequence?	A list of numbers or shapes that follows a particular rule
What is a term in a sequence?	Each number or shape in the sequence is called a term
What is the term-to-term rule?	The rule that tells us how to go from one term to the next
What is an arithmetic sequence?	The term-to-term rule is add or subtract the same number. E.g. add 3 or subtract 6.
What is the common difference?	The number you add in the term-to-term rule in an arithmetic sequence
What is a geometric sequence?	The term-to-term rule is multiply or divide by the same number each time.
What is the common ratio?	The number you multiply by in the term-to-term rule for a geometric sequence
What is a quadratic sequence?	There is a common second difference so the difference between terms changes by the same amount each time.
What is a Fibonacci-type sequence?	The term-to-term rule is 'add together the previous two terms'.
What are the first 10 square numbers?	1, 4, 9, 16, 25, 36, 49, 64, 81, 100
What are the first 5 cube numbers?	1, 8, 27, 64, 125
What are triangular numbers?	Start at 1, then add 2, then 3, then 4, then 5 etc. to each new term so the sequence is 1, 3, 6, 10, 15, ….
What is the 'nth term'?	n is the position in the sequence so it is a rule that tells us how to find the term that is in position *n.* It is a 'position-to-term' rule.
What does substitute mean?	Replace a variable (letter) by a number

Maths

Straight line graphs	
What are axes (axis, singular)?	Two perpendicular, labelled lines on a graph.
Is the x-axis horizontal or vertical?	Horizontal (across)
Is the y-axis horizontal or vertical?	Vertical (up/down)
What is a quadrant?	The x- and y-axis divide a coordinate grid into four quarters called quadrants
What is a coordinate?	A pair of numbers **(x, y)**. Along the corridor and up the stairs.
What does plot mean?	Draw. Put an X on each co-ordinate then join together.
What is the origin?	(0,0) on the graph
What is a line segment?	A part of a line between two points
What does the line x = a look like?	A **vertical** line through the **x-axis at a**
What does the line y = b look like?	A **horizontal** line through the **y-axis at b**
What is a table of values?	A table we use to **plot** a graph. It contains values of x to **substitute** into the equation to work out the value of y.
What is the gradient?	How steep a line is. The gradient can be positive (sloping upwards) or negative (sloping downwards).
How do you calculate the gradient?	$$\frac{Change\ in\ y}{Change\ in\ x} = \frac{Rise}{Run}$$
What is the y-intercept?	Where the graph crosses the y-axis. The x-value if 0.
What is the general equation of a straight line?	$$y = mx + c$$ where m **is the gradient** and c **is the y-intercept**.
What does it mean if two lines are parallel?	The lines never meet and they have the **same gradient**.
What does intersect mean?	Where two lines meet or cross one another
What are simultaneous equations?	Two equations which contain two variables. The solution is a pair of values that make both equations true.

Other graphs	
What is a 'quadratic expression'?	An expression where the highest power of the variable (e.g. x) is 2.
What does a quadratic graph look like?	It is a curve called a parabola. It is either u-shaped if the coefficient of x² is positive, or n-shaped if the coefficient of x² is negative.
What is a parabola?	A smooth u-shaped curve (or upside down u)
What is a table of values?	A table we use to **plot** a graph. It contains values of x to **substitute** into the equation to work out the value of y.
What does plot mean?	Draw. Put an X on each co-ordinate then join together with a ruler if it is a straight line graph, or with a smooth curve otherwise.
What does estimate mean?	Find an answer close to the actual answer, a best guess.
What are the roots of a quadratic equation?	The solutions to the equation. Where y = 0 so where the graph intersects the x-axis. There can be 0, 1 or 2 roots
How can we solve a quadratic equation graphically?	Find where the graph crosses the x-axis (where y = 0). Read off the 0, 1 or 2 x-values
What is the turning point?	The minimum point of a u-shaped curve or maximum point of a y-shaped curve
What is a cubic expression?	An expression where the highest power of the variable is 3.
What does a cubic graph look like?	A curve with a 'wiggle' in the middle

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What is the general equation of a reciprocal graph?	$y = \frac{A}{x}$
What do reciprocal graphs look like?	Two curves that are symmetrical about the lines y = x and y = -x and don't touch either the x- or y-axis.
What do real life straight line graphs show?	How one thing changes in relation to another when the rate of change is fixed
What is the rate of change?	Shows how a variable changes over time
What does convert mean?	Change
What might we discuss when describing straight line graphs?	The **direction** of the graph (increasing or decreasing) The **gradient** (steepness)
What does the gradient represent?	The rate of change

Proportion	
What does it mean if two variables are proportional?	A change in one variable is always accompanied by a change in the other
What does it mean if two variables are in 'direct proportion'?	As one variable increases, the other increases at the same rate
What is the unitary method?	Find the value of **one item** and then scale up
What does a graph showing direct proportion look like?	A straight line through the origin with positive gradient
What is the general equation of two quantities in direct proportion?	$y = Ax$
What does it mean if two variables are in 'inverse proportion'?	As one variable increases, the other **decreases** at the same rate
What does a graph showing inverse proportion look like?	A reciprocal graph – a curved downward sloping graph that never touches the x- or y-axis
What is the general equation of two quantities in inverse proportion?	$y = \frac{A}{x}$

| Angles in parallel lines	
What is an 'angle'?	The amount of turn from one straight line to another straight line connected at a point
What are the three ways of describing an angle?	Angle ABC, <ABC, $A\hat{B}C$
What UNITS are used for measuring an angle?	Degrees °
What is a right angle?	A 90° angle
Angles around a point sum to ___	360°
Angles on a straight line at a point sum to ___	180°
What does 'sum' mean?	Add
What are 'parallel lines'?	Straight lines that will never meet, no matter how far they are extended
Alternate angles are _____	Equal
Corresponding angles are _____	Equal
Co-interior (or allied angles) _____	Sum to 180°

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Alternate angles are equal
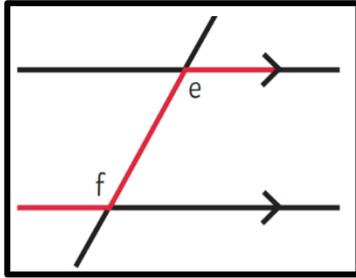
Corresponding angles are equal
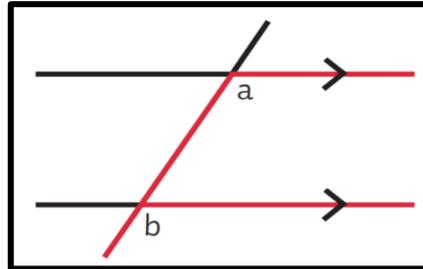
Co-interior angles sum to 180°
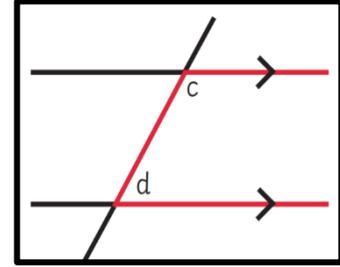
2D shapes and angles	
What is a triangle?	A polygon with 3 straight sides and 3 angles
Angles in a triangle sum to _____	180°
What is an EQUILATERAL triangle?	A triangle with 3 equal sides and 3 equal 60° angles
What is an ISOSCELES triangle?	A triangle with 2 equal sides and 2 equal base angles
What is a SCALENE triangle?	A triangle with all different side lengths and angles
What is a 'quadrilateral'?	A polygon with 4 straight sides and 4 angles
What is a 'square'?	A quadrilateral with 4 equal sides and 4 equal 90° angles
What is a 'rectangle'?	A quadrilateral with 2 pairs of equal (opposite) sides and 4 equals 90° angles
What is a 'parallelogram'?	A quadrilateral with 2 pairs of equal, parallel sides
What is a 'rhombus'?	A quadrilateral with 4 equal sides and diagonals that bisect and cross at a right angle
Opposite angles in parallelograms and rhombuses are _____	Equal
What is a 'kite'?	A quadrilateral with 2 pairs of equal sides and 1 pair of equal angles in opposite corners
What is a 'trapezium'?	A quadrilateral with 1 pair of parallel sides
What does 'bisect' mean?	Cut in two exactly equal halves
What is a 'polygon'?	A 2D shape with 3 or more straight sides
What is a 'regular polygon'?	A 2D shape with 3 or more equal straight sides and equal angles
What is a polygon with 5 sides called?	Pentagon
What is a polygon with 6 sides called?	Hexagon
What is a polygon with 7 sides called?	Heptagon
What is a polygon with 8 sides called?	Octagon
What is a polygon with 9 sides called?	Nonagon
What is a polygon with 10 sides called?	Decagon
What are 'interior angles'?	The angles inside each vertex (corner)
What are 'exterior angles'?	The angle between the side of the shape and a line extended from the next side
What is the formula to calculate the sum of interior angles in a polygon?	(n – 2) x 180° where n = number of sides
Exterior angles sum to _____	360°

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The exterior angle and neighbouring interior angle sum to _____	180° (they make a straight line)
What is a 'line of symmetry'?	A mirror line where you can fold the shape so that both halves match up exactly
What is 'the order of rotational symmetry'?	The number of positions you can rotate (turn) the shape into so that it looks exactly the same

Compound Measures	
What is a compound measure?	Combine measures of two different quantities
What is a formula?	A relationship or rule linking different variables
What is speed?	The distance travelled in an amount of time
What is the formula for speed?	$\text{Speed} = \frac{\text{distance}}{\text{time}}$
What units is speed usually measured in?	m/s, km/h, mph
What is density?	The mass of substance contained in a certain volume
What is the formula for density?	$\text{Density} = \frac{\text{mass}}{\text{volume}}$
What units is density usually measured in?	g/cm³ or kg/m³
What is pressure?	The force applied over an area
What is the formula for pressure?	$\text{Pressure} = \frac{\text{force}}{\text{area}}$
What units is pressure usually measured in?	N/m² (also known as pascals, Pa) or N/cm²

Distance – Time Graphs	
What do distance-time graphs show?	How far an object has travelled in a period of time, from a starting point
What does it show if a distance-time graph is going up (positive gradient)?	The object is moving away from the starting point
What does it show if a distance-time graph is going down (negative gradient)?	The object is coming back towards the starting point
What does a straight line mean on a distance-time graph?	The object is moving at a constant speed
What does a horizontal line mean on a distance-time graph?	The object is stationery (it is not moving)
What does the gradient represent on a distance-time graph?	The speed
How can we calculate average speed from a distance-time graph?	$\frac{\text{Total distance}}{\text{Total time}}$

Scale Drawings and Bearings	
What is a scale drawing?	A drawing that shows a real object with accurate sizes reduced or enlarged by a certain amount
What is a scale?	A ratio that shows the relationship between a length on a drawing or map and the actual length in real life
What does convert mean?	Change
How can we use a scale to convert map distances to real life distances?	Multiply the map distance by the scale

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How can we use a scale to convert real life distances to map distances?	Divide the real life distance by the scale
What does construct mean?	Draw accurately using a ruler
What does it mean if a scale drawing is accurate?	The proportions are the same as in real life. So if we enlarged it, we would get the real life version
What is a bearing?	The direction of a line in relation to the North line
Which direction do we measure a bearing in and from where?	Clockwise from North
How many digits do we write for a bearing?	3 digits e.g. 63° becomes 063°
Where do we draw our North line for a bearing 'of B, from A' from?	The North line goes at A
Angles around a point sum to ___	360°
Angles on a straight line at a point sum to ___	180°
What are 'parallel lines'?	Straight lines that will never meet, no matter how far they are extended
Alternate angles are _____	Equal
Corresponding angles are _____	Equal
Co-interior (or allied angles) _____	Sum to 180°

Pythagoras	
What is a theorem?	A statement that has been proven to be true.
What is Pythagoras' theorem?	**a² + b² = c²** where c is the hypotenuse.
How do we use Pythagoras' theorem to find the hypotenuse?	1) **Add** the squares of the two short sides together 2) **Square root** the answer
How do we use Pythagoras' theorem to find the shorter side?	1) **Subtract** the square of the short side from the square of the hypotenuse 2) **Square root** the answer
How can we tell if a triangle is right-angled?	If the sides satisfy Pythagoras' theorem, then it is right-angled.
What are Pythagorean triples?	3 integers that satisfy Pythagoras' theorem. E.g. 3, 4, 5 and 5, 12, 13.

| Trigonometry	
What is trigonometry?	The study of triangles.
What do we use trigonometry for?	We use it to find missing side lengths or angles in right-angled triangles.
When do we use trigonometry?	When we have a right-angled triangle with either: A. 2 known side lengths and an unknown angle; or B. 1 known side length, 1 known angle and an unknown side length
What letter do we give to the angle?	Theta θ
What is the hypotenuse?	The **longest side** of a **right-angled triangle**. It is opposite the right-angle.
What is the adjacent side?	The side **next to** the angle θ marked.
What is the opposite side?	The side **opposite** the angle θ marked.

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How do we use find a missing side?	1) Label the sides H, O, A and cross off the one we don't need 2) Find the ratio we need that contains the 2 sides we have 3) Substitute the values into that ratio and work out
To find an angle, what button do we use?	'Shift' button, which means the 'inverse' function e.g. $\sin^{-1}$
What is the angle of elevation?	The angle between the horizontal line and the line of sight looking up
What is the angle of depression?	The angle between the horizontal line and the line of sight looking down
What mnemonic do we use for trigonometry?	SOH CAH TOA
What is the sine ratio?	$\sin\theta = \frac{O}{H}$
What is the cosine ratio?	$\cos\theta = \frac{A}{H}$
What is the tan ratio?	$\tan\theta = \frac{O}{A}$

Vectors	
What is a 'vector'?	A vector has magnitude and direction.
What is a 'column vector'?	x-component = horizontal direction y-component = vertical direction
What is 'magnitude'?	Magnitude is the size or length of the vector
What are the four ways vectors can be written?	(1) As an arrow on a diagram; (2) using their end points with an arrow over the top ($\overrightarrow{AB}$); (3) a bold letter (**a**); (4) an underlined letter (<u>a</u>)
When are two vectors equal?	When they have the same magnitude and direction. They can be in different positions.
What is a scalar?	A normal number. Has magnitude but non direction.
How do you multiply a vector by a scalar?	Multiply each of the vector's components by the scalar
When are vectors parallel?	If a vector is multiplied by a scalar
What happens if we multiply a vector by a negative scalar?	The direction of the vector is reversed
How do we add or subtract vectors?	Add or subtract the x-components and y-components separately
What is the 'resultant vector'?	The sum of two or more vectors

Circles	
What is the 'diameter'?	A chord that passes through the centre of the circle
What is the 'radius?	The distance from the centre to the edge of the circle
What does 'radii' mean?	The plural of radius
What formula links radius and diameter?	Diameter = 2 x radius
What is 'circumference'?	The distance around the outside of a circle
What is an arc?	Part of the circumference
What is a chord?	A line between two points on the edge of the circle (doesn't need to go through the centre)
What is a tangent?	A straight line outside the circle that just touches the circle once
What is a sector?	A 'slice' of a circle – the area between two radii and the connecting arc
What is a segment?	An area of a circle between an arc and a chord

Maths
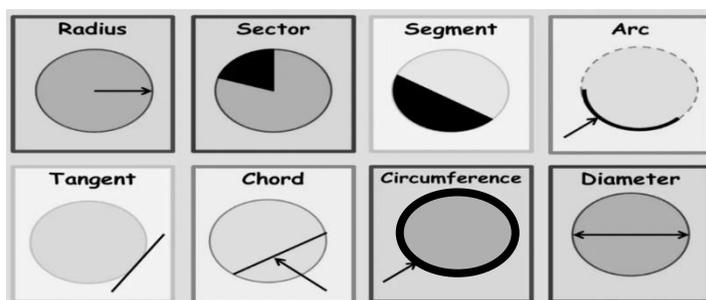
Constructions	
What is a ruler used for?	Measuring lengths
What is a protractor used for?	Measuring angles
What is a pair of compasses used for?	Drawing circles or arcs
What are the three ways of describing an angle?	Angle ABC, <ABC, $A\hat{B}C$
What does construct mean?	Draw accurately, using a ruler and a pair of compasses
What are construction lines?	Working out lines drawn with the compass. They must not be rubbed out.
How do we construct a triangle ASA?	Given angle, side, angle you can construct with a ruler and protractor
How do we construct a triangle SAS?	We need two sides and the angle in between to construct with a ruler and protractor
How do we construct a triangle SSS?	We need three sides to construct with a ruler and compass
What does bisect mean?	Cut in half exactly
What does perpendicular mean?	At right angles (90°)
What is a perpendicular bisector?	The lines that cuts another exactly in half at right angles
What is an angle bisector?	The line that cuts an angle exactly in half
What is a locus?	The set of all points that satisfy a certain condition
What is the plural for locus?	Loci
What does equidistant mean?	Equal distance

Maths

Area and Perimeter	
What is 'perimeter'?	The distance around the outside of a shape
What is a 'formula'?	A relationship or rule linking different variables
What is a 'compound (composite) shape'?	A shape made up of two or more basic shapes
What is a 'quadrilateral'?	A polygon (shape) with 4 straight sides and 4 angles
What is 'area'?	The space inside the shape
What is the formula for area of a rectangle?	Base x height
What is the formula for area of a triangle?	Base x (perpendicular) height ÷ 2
What is the formula for area of a parallelogram?	Base x perpendicular height
What is the formula for area of a trapezium?	$$\frac{a+b}{2} \times h$$ where h is the perpendicular height, a and b are parallel

3D shapes	
What is a 'solid'?	Another name for a 3D shape
What is a 'face' of a 3D shape?	One of the flat surfaces of a 3D shape
What are 'vertices'?	A corner (one corner is called a vertex)
What is 'volume'?	The amount of space inside a 3D shape
What is the formula for the volume of a cube?	Length^3
What is the formula for the volume of a cuboid?	Length x width x height
What is the formula for the volume of a prism?	Area of cross-section x length
What is surface area?	The sum of the areas of each face of a 3D shape
What is the formula for the surface area of a cube?	6 x length^2
What is a 'net'?	A pattern that you can cut and fold to make a model of a 3D shape.
What is a 'plan'?	The 2D view of a 3D object from above
What is an 'elevation'?	The 2D view of a 3D object looking from the front (front elevation) or the side (side elevation)
What is a 'plane of symmetry'?	Where you could slide the 3D object into two identical halves that are mirror images of one another

Transformations	
What does 'transformation' mean?	**Change** – in this case the **size** or **position** of a shape
What is the 'object'?	The **original** shape
What is the 'image'?	The **new** transformed shape
What does 'reflection' mean?	The shape is '**flipped**' in a **mirror line**
What does the line x = a look like?	A **vertical** line through the **x-axis at a**
What does the line y = b look like?	A **horizontal** line through the **y-axis at b**
What does the line y = x look like?	A **diagonal** line through the **origin** that is **positive** (upward-sloping)

Maths

How do we describe a reflection?	The equation of the **mirror line**
What does 'rotation' mean?	**Turn** around a point
How do we describe a rotation?	(1) A **centre of rotation**; (2) the **angle**; and (3) the **direction**
How many degrees is a: (i) quarter-turn; (ii) half-turn; (iii) three-quarter turn?	(i) A quarter-turn is 90°; (ii) a half-turn is 180°; (iii) a three-quarter turn is 270°.
What does 'translation' mean?	**Move** the shape
How do we describe a translation?	A column **vector**
What is a 'column vector'?	Describes a **movement** from one point to another. It has both **direction** and **magnitude** (size). $\binom{x}{y}$
What does a vector tell us?	The **top** number moves **left (-) or right (+)** and the **bottom** number moves **up (+) or down (-)**
What is an 'enlargement'?	Change the **size** of the shape. Multiply each side by the scale factor.
How do we describe an enlargement?	(1) **The scale factor**; and (2) the **centre of enlar**gement
How do we find the centre of enlargement?	Use a ruler to draw straight lines through **corresponding corners** of the object and its image and find the point where all the lines cross
What is a 'scale factor'?	The **ratio of corresponding lengths** in similar shapes, ie how much larger or smaller the shapes are
What does it mean if 2 shapes are 'congruent'?	They are **identical**. The shape can be rotated, reflected or translated
What does it mean if 2 shapes are 'similar'?	One shape is an **enlargement** of the other. Each side has been multiplied by the same scale factor

Similarity and Congruence	
What does it mean if two shapes are 'congruent'?	They are **identical**. The shape can be rotated, reflected or translated
What are the four congruence conditions?	SSS, RHS, SAS, AAS where the corresponding sides and angles must be identical
How do we prove two triangles are congruent?	By showing that one of the four congruence conditions is satisfied
What are 'corresponding' sides or angles?	Matching sides or angles that are in the same position in two different shapes.
What is a right-angle?	A **90° angle.**
What is the hypotenuse?	The **longest side** of a **right-angled triangle**. It is opposite the right-angle.
What does it mean if two shapes are 'similar'?	One shape is an **enlargement** of the other. Each side has been multiplied by the same scale factor
What is a 'scale factor'?	The **ratio of corresponding lengths** in similar shapes, ie how much larger or smaller the shapes are
What is an 'enlargement'?	Change the **size** of the shape. Multiply each side by the scale factor.
What are the three similarity conditions?	SSS, AAA, ASA where the corresponding sides must be in the same ratio and the corresponding angles must be identical

Analysing data	
What are the three averages?	Mean, median, mode
How do we find the mean?	Add up all the values. Divide by how many values there are.
How do we find the median?	Put the values in order. Locate the middle value

Maths

How do we find the mode?	The value that occurs most often
How do we find the range?	Biggest value – smallest value
What is an outlier?	Extreme value that doesn't fit the overall pattern
What is frequency?	The number of times an event or value occurs
What is a bar chart?	A display of data where the bar heights show the frequencies
What is a pictogram?	A chart using pictures to represent quantities. Must have a key to say what each picture represents
What is a stem and leaf diagram?	A display of data that shows groups of data arranged by place value. Leaves are only the final digit of each number and must be ordered. The stem is the other digits. It must have a key.
What is a pie chart?	A circular chart where the sectors show the relative sizes of data.
How do we work out the size of a sector to construct a pie chart?	$$\frac{\text{Total frequency}}{360°} \times \text{Frequency}$$
How can we work out the frequency from a pie chart?	Find either: (a) the frequency represented by 1° or (b) the degrees that represent 1 item
What is a time series graph?	A line graph with time plotted on the horizontal axis
What is a scatter graph?	A graph with points plotted to show a relationship between two variables
What is correlation?	A relationship between two variables
What is positive correlation?	As one variable increases, the other variable increases
What is negative correlation?	As one variable increases, the other variable decreases
What is a line of best fit?	A straight line that passes through the middle of the points with a roughly equal number on either side.
What is interpolation?	Using a line of best fit to predict values **within** the range of the data. Usually accurate
What is extrapolation?	Using a line of best fit to predict values **outside** the range of the data. May not be accurate as we don't know if the pattern continues

Probability	
What is probability?	How likely an event is to occur
What values can probability take?	A value between 0 and 1. It can be a fraction, decimal or percentage
What does it mean if an event is certain?	It will definitely happen. The probability of the event is 1
What does it mean if an event is impossible?	It will definitely **not** happen. The probability of the event is 0.
How do we write the probability of A?	P(A)
What is an outcome or event?	A possible result of an experiment or trial
What does it mean if events are mutually exclusive?	They cannot happen at the same time.
What does it mean if events are exhaustive?	They cover all possible outcomes. The sum of the probabilities is 1.
What is the sample space?	All the possible outcomes for one or more events
What does frequency mean?	The number of times an event or value occurs
What is relative frequency?	In an experiment, how often something happens as a proportion of the number of trials. Also called experimental probability
As we do the experiment more times, what happens to our relative frequency?	It becomes more accurate
What is the expected frequency?	How often we expect to get a particular outcome

Maths

How can we work out expected frequency?	Probability x number of trials
What does it mean if events are independent?	If one of them happening has no effect on the probability of the other happening
What is the AND rule?	For independent events A and B, P(A and B) = P(A) x P(B)
What is the OR rule?	For mutually exclusive events A and B, P(A or B) = P(A) + P(B)
What is a frequency tree?	Shows the number of people who chose different options for different choices
What is a probability tree?	Shows combinations of outcomes and their probabilities.
What does it mean if outcomes are fair?	Each outcome is equally likely
What does it mean if outcomes are biased?	Some outcomes are more likely to occur
What is a set?	A collection of 'things'
What symbol shows a set of values?	{} (curly brackets)
What is an element?	A 'member' of a set
What symbol means 'is an element of'?	$\in$ e.g. $5 \in \{odd\ numbers\}$ means "5 is in the set of odd numbers"
How do we write "A intersection B" and what does it mean?	$A \cap B$ means all elements in A AND B
How do we write "A union B" and what does it mean?	$A \cup B$ means all elements in A OR B OR both
How do write the "complement of A" and what does it mean?	$'A$ means all the elements NOT in A
What is a Venn diagram?	A diagram that uses circles to represent sets. The space inside the circle represents everything in the set