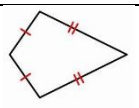
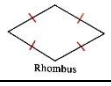
# YEAR 10 HIGHER

KNOWLEDGE ORGANISERS

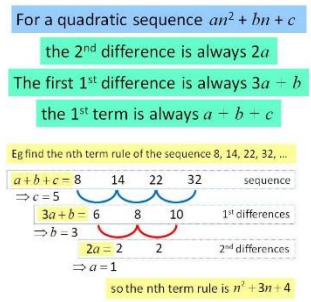
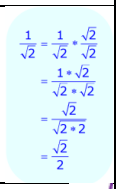
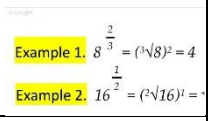
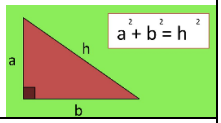
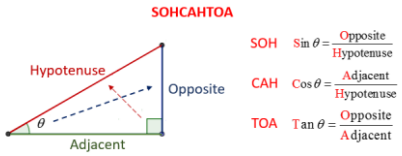
**Year 10 Term 1**

| | Term | Definition |
|---|---|---|
| **Number** | | |
| 1 | Percentage change | $Percentage\ Change = \frac{change}{original} \times 100$ |
| 2 | Reverse percentages | When you are given a percentage that is not 100% and a value, and you need to work out the original value (100%).<br>E.g. 40% = 24.<br>So 10% = 6<br>So 100% = 60. |
| 3 | Percentage multiplier | A number you can multiply by to do percentage increase or decrease in one step.<br>E.g. Increase by 7% = Multiply by 1.07<br>Decrease by 8% = Multiply by 0.92 |
| 4 | Simple interest | Simple interest is where you calculate the first year of interest, and this is simply added on each year for a given number of years. |
| **Geometry and measures** | | |
| 5 | Upper bound | The upper limit of what a number could be.<br>E.g. I weight 80kg to the nearest 5kg.<br>The upper bound would be 82.5kg |
| 6 | Lower bound | The lower limit of what a number could be.<br>E.g. I weight 80kg to the nearest 5kg.<br>The lower bound would be 77.5kg |
| 7 | 1cm | 10mm |
| 8 | 1m | 100cm |
| 9 | 1km | 1000m |
| 10 | 1kg | 1000g |
| 11 | 1 tonne | 1000kg |
| 12 | 1 litre | 1000ml |
| 13 | 1 litre | 100cl |
| 14 | 1ml | 1cm^3 |
| 15 | Speed | $Speed = \frac{distance}{time}$ |
| 16 | Density | $Density = \frac{mass}{volume}$ |
| 17 | Pressure | $Pressure = \frac{force}{area}$ |
| **Number** | | |
| 18 | Surd | A number that can't be simplified to remove a square root (or cube root etc).<br><br>Examples: √2 |
| 19 | Rationalise the denominator | "Rationalizing the denominator" is when we move a root (like a square root or cube root) from the bottom of a fraction to the top.<br>$\frac{1}{\sqrt{2}} = \frac{1}{\sqrt{2}} * \frac{\sqrt{2}}{\sqrt{2}} = \frac{1 * \sqrt{2}}{\sqrt{2} * \sqrt{2}} = \frac{\sqrt{2}}{\sqrt{2 * 2}} = \frac{\sqrt{2}}{2}$ |
| 20 | Geometric progressions | Also known as a geometric sequence, is a sequence of numbers where each term after the first is found by multiplying the previous one by a fixed, non-zero number called the common ratio. E.g. 2, 6, 18, 54,... |

**Year 10 Term 2**

| | Term | Definition |
|---|---|---|
| **Statistics** | | |
| 1 | Median | The middle of an ordered set of values. |
| 2 | Mode | The most common value in a dataset |
| 3 | Range | The difference between the largest and smallest data value. |
| 4 | Mean | The average given when you add up all the values and divide by how many values there are. |
| 5 | Quartiles | Quartiles are the values that divide a list of numbers into quarters: Put the list of numbers in order. Then cut the list into four equal parts. |
| 6 | Inter-quartile range | The interquartile range is the range between the first and third quartiles. |
| 7 | Spread | The differences between the ranges of different datasets.<br>If the range is large, the spread is large.<br>If the range is small, the spread is small. |
| 8 | Primary data | Data collected yourself.<br>E.g. you design and complete a survey of students yourself. |
| 9 | Secondary data | Data collected from somewhere else that you did not collect.<br>E.g. data from a Government census. |
| 10 | Discrete data | Data that can only take certain values.<br>E.g. the number of students in a class, your shoe size, number of cars in the car park. |
| 11 | Continuous data | Data that can take any value.<br>E.g. temperature, time taken to run a race, height. |
| 12 | Sampling | A sample is a selection taken from a larger group. |
| **Number** | | |
| 13 | Integer | A whole number. A positive number, a negative number or zero but not a fraction or a decimal. |
| 14 | Roots | The root of a number X is another number, which when multiplied by itself a given number of times, equals x.<br>For example, the square root of 100 = 10. $\sqrt{100} = 10$. This is because 10 x 10 = 100.<br>For example, the cube root of 8 = 2. $\sqrt[3]{8} = 2$ |
| 15 | Powers | A small number to tell you how many times to multiply the number by itself. It is usually at the top right of the base number.<br>E.g. $10^6$ = 10 x 10 x 10 x 10 x 10 x 10<br>E.g. $2^5$ = 2 x 2 x 2 x 2 x 2 |
| 16 | Powers of 2 | 2,4,8,16,32,64,128,256… |
| 17 | Powers of 3 | 3,9,27,81,243,729,2187… |
| 18 | Powers of 4 | 4,16,64,256,1024,4096… |
| 19 | Powers of 5 | 5,125,625,3125,15625… |
| 20 | Square numbers | 1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225.<br>These form a square. |
| 21 | Fractional indices | The denominator of the fraction is the root of the number or letter, and the numerator of the fraction is the power to raise the answer to.<br>Example 1. $8^{\frac{2}{3}} = (\sqrt[3]{8})^2 = 4$<br>Example 2. $16^{\frac{1}{2}} = (\sqrt[2]{16})^1 =$ |
| **Geometry and measures** | | |
| 22 | Angles in a triangle | Angles in a triangle add up to 180. |
| 23 | Angle sum of a polygon | Sum of interior angles= $180\times (n-1)$ |
| 24 | Regular polygon | A polygon is regular when all angles are equal and all sides are equal (otherwise it is "irregular"). |
| 25 | Isosceles triangle | An isosceles triangle is a triangle that has two sides of equal length. |
| 26 | Equilateral triangle | An equilateral triangle is a triangle that has three sides of equal length. |
| 27 | Scalene triangle | A scalene triangle is a triangle that has three unequal length and unequal angles. |
| 28 | Right-angled triangle | A right angle triangle is a triangle with a right angle. |
| 29 | Obtuse-angled triangle | An obtuse-angled triangle is a triangle with an angle more than 90 degrees. |
| 30 | Acute-angled triangle | An acute-angled triangle is a triangle with every angle less than 90 degrees. |
| 31 | Pentagon | A pentagon is a polygon which has 5 sides. |
| 32 | Hexagon | A hexagon is a polygon which has 6 sides. |
| 33 | Octagon | An Octagon is a polygon which has 8 sides. |
| 34 | Decagon | A decagon is a polygon which has 10 sides. |
| 35 | Kite | A kite is a quadrilateral with two distinct pairs of adjacent sides that are congruent. The diagonals of a kite are perpendicular.<br>  |
| 36 | Rhombus | •A rhombus is a quadrilateral with all four sides having equal length.<br>  <br>Rhombus |

**Year 10 Term 3**

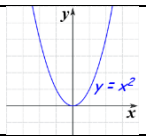
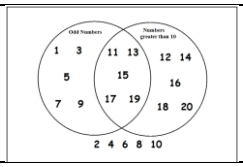
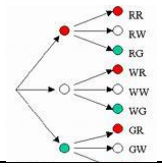
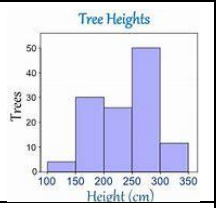
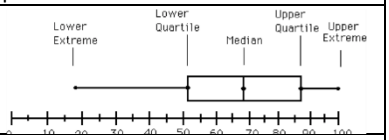
| | Term | Definition |
|---|---|---|
| **Number** | | |
| 1 | Recurring decimals | A number in which a digit or group of digits is repeated indefinitely after the decimal point.<br>E.g. . $\frac{1}{9} = 0.11111111 \ldots \ldots$ |
| 2 | Terminating decimals | A number that contains a finite number of digits after the decimal point.<br>E.g. $\frac{1}{2} = 0.5$ |
| 3 | Upper bound | The upper limit of what a number could be.<br>E.g. I weight 80kg to the nearest 5kg.<br>The upper bound would be 82.5kg |
| 4 | Lower bound | The lower limit of what a number could be.<br>E.g. I weight 80kg to the nearest 5kg.<br>The lower bound would be 77.5kg |
| 5 | Nth term of Quadratic sequences | Finding an nth term rule for a quadratic sequence<br>  |
| 6 | Geometric progressions | Also known as a geometric sequence, is a sequence of numbers where each term after the first is found by multiplying the previous one by a fixed, non-zero number called the common ratio. E.g. 2, 6, 18, 54,... |
| 7 | Rationalise denominators | "Rationalizing the denominator" is when we move a root (like a square root or cube root) from the bottom of a fraction to the top.<br>  |
| 8 | Roots | A number that can't be simplified to remove a square root (or cube root etc).<br>Examples: √2<br>  |
| 9 | Fractional indices | The denominator of the fraction is the root of the number or letter, and the numerator of the fraction is the power to raise the answer to.<br>  |
| **Geometry and measures** | | |
| 10 | Congruent triangles | Shapes that are exactly the same shape and size.<br>Congruent triangles:<br>SSS (Side, Side, Side)<br>SAS (Side, Angle, Side)<br>ASA (Angle, Side, Angle)<br>RHS (Right Angle, Hypotenuse, Side) |
| 11 | Similar shapes (Length, area and volume) | It is the same shape but a different size. |
| 12 | Pythagoras' theorem | This is used when you have two sides of a right-angled triangle and you need to find out the third side.<br>$a^2 + b^2 = h^2$<br>  |
| 13 | Trigonometry |  |

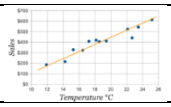
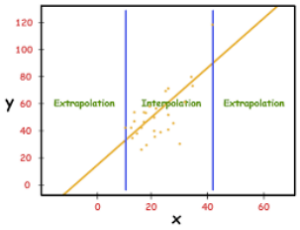
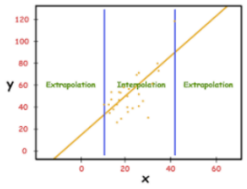
| | | |
|---|---|---|
| 14 | Exact trigonometric values | |

*Exact Values of Trigonometric Functions*

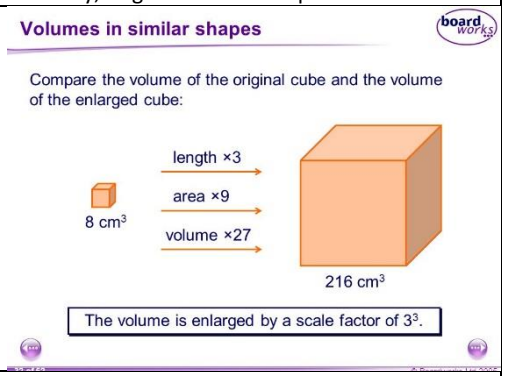
| Angle ($\theta$) | | $\sin(\theta)$ | $\cos(\theta)$ | $\tan(\theta)$ |
|---|---|---|---|---|
| Degrees | Radians | | | |
| $0°$ | $\mathbf{0}$ | $0$ | $1$ | $0$ |
| $30°$ | $\frac{\pi}{6}$ | $\frac{1}{2}$ | $\frac{\sqrt{3}}{2}$ | $\frac{1}{\sqrt{3}}$ |
| $45°$ | $\frac{\pi}{4}$ | $\frac{1}{\sqrt{2}}$ | $\frac{1}{\sqrt{2}}$ | $1$ |
| $60°$ | $\frac{\pi}{3}$ | $\frac{\sqrt{3}}{2}$ | $\frac{1}{2}$ | $\sqrt{3}$ |
| $90°$ | $\frac{\pi}{2}$ | $1$ | $0$ | Not Defined |

**Year 10 Term 4**

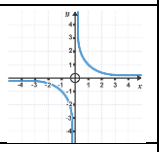
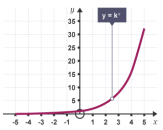
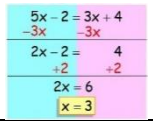
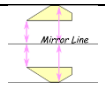
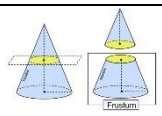
| | Term | Definition |
|---|---|---|
| **Algebra** | | |
| 1 | Simultaneous equations | **A** set of **equations** that are all satisfied by the same values of the variables. |
| 2 | Linear graph | The word **Linear** simply means straight, so if you have a **linear graph** it is a straight line graphed by the equation y=mx+b where m is the slope and b is the y intercept(the point where the line crosses the y-axis). |
| 3 | Quadratic graph | A graph drafted for a quadratic equation: $ax^2 + bx + c$<br>Y=$x^2$ is the simplest quadratic, it's graph looks like this:<br>  |
| **Probability** | | |
| 4 | Randomness | Randomness is the lack of pattern or predictability in events. A random sequence of events, symbols or steps has no order and does not follow an intelligible pattern or combination. |
| 5 | Fairness | In **mathematics** we say "fair dice" when we mean that there is an equally likely chance of landing on any face. |
| 6 | Bias | Bias is a statistical term which means a systematic deviation from the true value. |
| 7 | Probability | Probability is the likelihood of something happening in the future.<br>It is expressed as a number between 0 (impossible) and 1 (certain). |
| 8 | Mutually exclusive | Mutually exclusive outcomes cannot happen at the same time.<br><br>Flipping a coin has mutually exclusive outcomes, it can't be both heads and tails. |
| 9 | Theoretical probability | What is the probability of it happening in theory.<br>E.g. The theoretical probability of rolling a 3 on a dice is $\frac{1}{6}$ |
| 10 | Experimental probability | What was the probability of it in real life when you actually did the experiment.<br>This will differ from the theoretical probability initially but will get closer and closer with an increasing number of trials you do. |
| 11 | Venn diagrams | A **diagram** using circles or other shapes, to show the relationship between sets.<br>  |
| 12 | Tree diagrams | A **diagram** shaped like a **tree** used to display sample space by using one branch for each possible outcome in a probability exercise.<br>  |
| 13 | Sample space diagrams | A sample space is the set of all possible outcomes in the experiment. It is usually denoted by the letter S . Sample space can be written using the set notation, { }. |
| **Statistics** | | |
| 14 | Histograms | In math, a histogram is a visual way to display frequency data using bars. A feature of histograms is that they show the frequency of continuous data.<br>  |
| 15 | Cumulative frequency | Cumulative frequency is the running total of the frequencies. |
| 16 | Boxplots | Boxplot is a graphical representation of statistical measures like median, upper and lower quartiles, minimum and maximum data values.<br>  |
| 17 | Primary data | Data collected yourself.<br>E.g. you design and complete a survey of students yourself. |
| 18 | Secondary data | Data collected from somewhere else that you did not collect.<br>E.g. data from a Government census. |
| 19 | Continuous data | Data that can take any value.<br>E.g. temperature, time taken to run a race, height. |
| 20 | Discrete data | Data that can only take certain values.<br>E.g. the number of students in a class, your shoe size, number of cars in the car park. |
| 21 | Quartiles | Quartiles are the values that divide a list of numbers into quarters |
| 22 | Inter-quartile range | The interquartile **range** is a measure of where the "middle fifty" is in a data set. |
| 23 | Lines of best fit | A line drawn on a scatter graphs that has roughly the same number of points above the line as below the line, passing through as many points as possible. |

| | | |
|---|---|---|
| | |  |
| 24 | Interpolation | This is when you use estimate a value from within your data set. It is a useful skill to have.   |
| 25 | Extrapolation | Extrapolation is when you estimate a given value outside of your given data range. It is extremely dangerous to do this as you do not know for certain if the relationship you have identified continues before or outside of your data values.   |
| 26 | Sampling | A sample is a selection taken from a larger group. |

**Year 10 Term 5**

| | Term | Definition |
|---|---|---|
| **Algebra** | | |
| 1 | Expanding double brackets | Expand and simplify...<br>$(x-9)(x+6)$<br>$x^2+6x-9x-54$ |
| 2 | Factorising quadratics | A quadratic expression can sometimes be factorised into two brackets in the form of $(x+a)(x+b)$ where $a$ and $b$ can be any term, positive, negative or zero. $a$ and $b$ can be found by using a product and sum method. |
| 3 | Sum | Sum is the addition of a sequence of numbers |
| 4 | Product | A **product** is the answer to any multiplication problem. |
| 5 | Indices | Powers |
| 6 | Re-arranging formulae | Rearrange formulae in order to change the subject. |
| **Geometry and measures** | | |
| 7 | Scale factors | The amount you multiply, or divide by, to get from one shape to another. |
| 8 | Similarity (Lengths, areas, volumes) | It is the same shape but a different size.   |
| 9 | Volume of a cuboid | V= $b^3$ |
| 10 | Volume of a cylinder | V=$\pi r^2 l$ |
| 11 | Volume of a sphere | V=$\frac{3}{4}\pi r^3$ |
| 12 | Volume of a pyramid | V=$\frac{1}{3}lwh$ |
| 13 | Volume of a cone | V=$\frac{1}{3}\pi r^2 l$ |
| 14 | “In terms of pi.” | It’s when you leave the answer with pi in. |

**Year 10 Term 6**

| | Term | Definition |
|---|---|---|
| **Algebra** | | |
| 1 | Y = mx +c | y=mx+c is the standard form of the equation of a straight line, where 'm' is the gradient of the line and 'c' is the y-intercept. |
| 2 | Parallel lines | **Lines** are **parallel** if they are always the same distance apart (called "equidistant"), and will never meet. |
| 3 | Perpendicular lines | **Lines** that are at right angles (90°) to each other. |
| 4 | Gradient | The Gradient (also called Slope) of a straight line shows how steep a straight line is.<br>Gradient = $\frac{change\ in\ y}{change\ in\ x}$ |
| 5 | Y-intercept | The y-intercept is the point in a function where a line or curve crosses the y-axis. In other words: the value of the x-coordinate is zero. |
| 6 | Reciprocal graphs | A graph of the form $y = \frac{1}{x}$ is known as a **reciprocal graph** and once drawn, looks like this:  |
| 7 | Exponential graphs | Exponential graphs are graphs in the form $y = k^x$. These graphs increase rapidly in the $y$ direction and will never fall below the $x$-axis. An exponential graph will look like this:  |
| 8 | Solve an equation with an unknown on both sides. |  |
| 9 | Cubic graph | A **cubic equation** contains only terms up to and including $x^3$. $y = x^3$  |
| 10 | Linear graph | The word **Linear** simply means straight, so if you have a **linear graph** it is a straight line graphed by the equation y=mx+b where m is the slope and b is the y intercept(the point where the line crosses the y-axis). |
| 11 | Solve a quadratic by factorising | $9x^2 + 30x + 25 = 0$<br>$(3x+5)(3x+5) = 0$<br>$3x+5=0$ or $3x+5=0$<br>$3x=-5$ $3x=-5$<br>$x=-\frac{5}{3}$ $x=-\frac{5}{3}$ |
| **Geometry and measures** | | |
| 12 | Similar shapes | The **shapes** have the same ratios between sides. |
| 13 | Congruent | Exactly the same shape and size |
| 14 | Transformations | TERRY: Translations, Enlargements, Reflections, Rotations, Yeah! |
| 15 | Translation | A transformation where a shape is just moved left/right and up/down.<br>It is usually written as a column vector.<br>For example, $\begin{pmatrix} 5 \\ -2 \end{pmatrix}$ means 5 right, 2 down. |
| 16 | Enlargement | A transformation where one shapes has been enlarged by a given scale factor (can be larger or smaller). You also require a centre of enlargement. |
| 17 | Reflection | Each point in a shape appears the same distance on the opposite side of a line (the line of reflection).   |
| 18 | Rotation | A circular movement around a point. A full rotation is a turn of $360^0$.  |
| 19 | Scale factor | The amount you multiply, or divide by, to get from one shape to another. |
| 20 | Surface area | The total area of the surface of a three-dimensional object. |
| 21 | Frustum | A frustum (plural: frusta or frustums) is the portion of a solid (normally a cone or pyramid) that lies between one or two parallel planes cutting it.   |