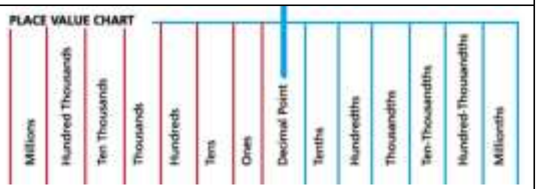
Knowledge Organisers Y9 Maths Calculations checking and Rounding

<table>
<tr><th>Key Vocabulary</th><th>Definition/Tips</th><th>Example</th></tr>
<tr><td>BIDMAS</td><td>An acronym for the order you should do calculations in.
BIDMAS stands for ‘Brackets, Indices, Division, Multiplication, Addition and Subtraction’.
Indices are also known as ‘powers’ or ‘orders’.
With strings of division and multiplication, or strings of addition and subtraction, and no brackets, work from left to right.</td><td>$6 + 3 \times 5 = 21, not\ 45$

$5^2 = 25$, where the 2 is the index/power.

$12 \div 4 \div 2 = 1.5, not\ 6$</td></tr>
<tr><td>Place Value</td><td>The value of where a digit is within a number.</td><td>In 726, the value of the 2 is 20, as it is in the ‘tens’ column.</td></tr>
<tr><td>Place Value Columns</td><td>The names of the columns that determine the value of each digit.

The ‘ones’ column is also known as the ‘units’ column.</td><td>
</td></tr>
<tr><td>Rounding</td><td>To make a number simpler but keep its value close to what it was.

If the digit to the right of the rounding digit is less than 5, round down.
If the digit to the right of the rounding digit is 5 or more, round up.</td><td>74 rounded to the nearest ten is 70, because 74 is closer to 70 than 80.

152,879 rounded to the nearest thousand is 153,000.</td></tr>
<tr><td>Decimal Place</td><td>The position of a digit to the right of a decimal point.</td><td>In the number 0.372, the 7 is in the second decimal place.

0.372 rounded to two decimal places is 0.37, because the 2 tells us to round down.

Careful with money - don’t write £27.4, instead write £27.40</td></tr>
<tr><td>Significant Figure</td><td>The significant figures of a number are the digits which carry meaning (ie. are significant) to the size of the number.

The first significant figure of a number cannot be zero.

In a number with a decimal, trailing zeros are not significant.</td><td>In the number 0.00821, the first significant figure is the 8.

In the number 2.740, the 0 is not a significant figure.

0.00821 rounded to 2 significant figures is 0.0082.

19357 rounded to 3 significant figures is 19400. We need to include the two zeros at the end to</td></tr>
</table>

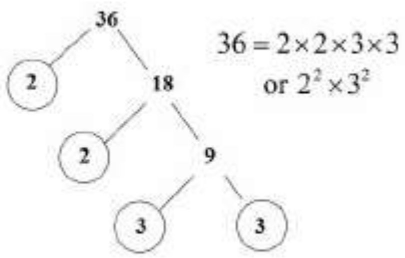
		keep the digits in the same place value columns.
Truncation	A method of approximating a decimal number by **dropping all decimal places** past a certain point **without rounding**.	3.14159265… can be truncated to 3.1415 (note that if it had been rounded, it would become 3.1416)
Error Interval	A **range of values** that a number could have taken before being rounded or truncated. An error interval is written using inequalities, with a **lower bound** and an **upper bound**. Note that the lower bound inequality can be 'equal to', but the upper bound cannot be 'equal to'.	0.6 has been rounded to 1 decimal place. The error interval is: $0.55 \le x < 0.65$ The lower bound is 0.55 The upper bound is 0.65
Estimate	To find something **close to the correct answer**.	An estimate for the height of a man is 1.8 metres.
Approximation	When using approximations to estimate the solution to a calculation, **round each number in the calculation to 1 significant figure**. ≈ means 'approximately equal to'	$\frac{348 + 692}{0.526} \approx \frac{300 + 700}{0.5} = 2000$ 'Note that dividing by 0.5 is the same as multiplying by 2'

Key Vocabulary	Definition/Tips	Example
1. Square Number	The number you get when you **multiply a number by itself**.	**1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225…** $9^2 = 9 \times 9 = 81$
2. Square Root	The **number you multiply by itself** to get another number. The reverse process of squaring a number.	$\sqrt{36} = 6$ because $6 \times 6 = 36$
3. Solutions to $x^2 =$ ….	**Equations** involving **squares** have **two solutions**, one **positive** and one **negative**.	Solve $x^2 = 25$ $x = 5 \text{ or } x = -5$ This can also be written as $x = \pm 5$
4. Cube Number	The number you get when you **multiply a number by itself and itself again**.	1, 8, 27, 64, 125… $2^3 = 2 \times 2 \times 2 = 8$
5. Cube Root	The **number you multiply by itself and itself again** to get another number. The reverse process of cubing a number.	$\sqrt[3]{125} = 5$ because $5 \times 5 \times 5 = 125$
6. Powers of…	The powers of a number are that **number raised to various powers**.	The powers of 3 are: $3^1 = 3$ $3^2 = 9$ $3^3 = 27$ $3^4 = 81$ etc.
7. Multiplication Index Law	When **multiplying** with the same base (number or letter), **add the powers**. $\boldsymbol{a^m \times a^n = a^{m+n}}$	$7^5 \times 7^3 = 7^8$ $a^{12} \times a = a^{13}$ $4x^5 \times 2x^8 = 8x^{13}$
8. Division Index Law	When **dividing** with the same base (number or letter), **subtract the powers**. $\boldsymbol{a^m \div a^n = a^{m-n}}$	$15^7 \div 15^4 = 15^3$ $x^9 \div x^2 = x^7$ $20a^{11} \div 5a^3 = 4a^8$
9. Brackets Index Laws	When raising a power to another power, multiply the powers together. $\boldsymbol{(a^m)^n = a^{mn}}$	$(y^2)^5 = y^{10}$ $(6^3)^4 = 6^{12}$ $(5x^6)^3 = 125x^{18}$
10. Notable Powers	$\boldsymbol{p = p^1}$ $\boldsymbol{p^0 = 1}$	$99999^0 = 1$
11. Negative Powers	A negative power performs the reciprocal. $\boldsymbol{a^{-m} = \frac{1}{a^m}}$	$3^{-2} = \frac{1}{3^2} = \frac{1}{9}$
12. Fractional Powers	The denominator of a fractional power acts as a 'root'. The numerator of a fractional power acts as a normal power. $a^{\frac{m}{n}} = \left(\sqrt[n]{a}\right)^m$	$27^{\frac{2}{3}} = \left(\sqrt[3]{27}\right)^2 = 3^2 = 9$ $\left(\frac{25}{16}\right)^{\frac{3}{2}} = \left(\frac{\sqrt{25}}{\sqrt{16}}\right)^3 = \left(\frac{5}{4}\right)^3 = \frac{125}{64}$

Knowledge Organisers Y9 Maths Standard Form and Surds

Key Vocabulary	Definition/Tips	Example
Standard Form	$\boldsymbol{A \times 10^b}$ $where\ \mathbf{1 \le A < 10}, \quad \boldsymbol{b = integer}$	8400 = 8.4 x 10^3 0.00036 = 3.6 x 10^{-4}
Multiplying or Dividing with Standard Form	Multiply: **Multiply the numbers** and **add the powers.** Divide: **Divide the numbers** and **subtract the powers.**	$(1.2 \times 10^3) \times (4 \times 10^6) = 8.8 \times 10^9$ $(4.5 \times 10^5) \div (3 \times 10^2) = 1.5 \times 10^3$
Adding or Subtracting with Standard Form	**Convert** in to **ordinary** numbers, **calculate** and then **convert back** in to standard form	$2.7 \times 10^4 + 4.6 \times 10^3$ $= 27000 + 4600 = 31600$ $= 3.16 \times 10^4$
Rational Number	A number of the form $\frac{p}{q}$, where $\boldsymbol{p}$ **and** $\boldsymbol{q}$ **are integers** and $\boldsymbol{q \neq 0}$. A number that cannot be written in this form is called an 'irrational' number	$\frac{4}{9}, 6, -\frac{1}{3}, \sqrt{25}$ are examples of rational numbers. $\pi, \sqrt{2}$ are examples of an irrational numbers.
Surd	The **irrational number** that is a **root of a positive integer,** whose value cannot be determined exactly. Surds have **infinite non-recurring decimals**.	$\sqrt{2}$ is a surd because it is a root which cannot be determined exactly. $\sqrt{2} = 1.41421356 \ldots$ which never repeats.
Rules of Surds	$\sqrt{\boldsymbol{ab}} = \sqrt{\boldsymbol{a}} \times \sqrt{\boldsymbol{b}}$ $\sqrt{\frac{\boldsymbol{a}}{\boldsymbol{b}}} = \frac{\sqrt{\boldsymbol{a}}}{\sqrt{\boldsymbol{b}}}$ $\boldsymbol{a}\sqrt{\boldsymbol{c}} \pm \boldsymbol{b}\sqrt{\boldsymbol{c}} = (\boldsymbol{a} \pm \boldsymbol{b})\sqrt{\boldsymbol{c}}$ $\sqrt{\boldsymbol{a}} \times \sqrt{\boldsymbol{a}} = \boldsymbol{a}$	$\sqrt{48} = \sqrt{16} \times \sqrt{3} = 4\sqrt{3}$ $\sqrt{\frac{25}{36}} = \frac{\sqrt{25}}{\sqrt{36}} = \frac{5}{6}$ $2\sqrt{5} + 7\sqrt{5} = 9\sqrt{5}$ $\sqrt{7} \times \sqrt{7} = 7$
Rationalise a Denominator	The process of rewriting a fraction so that the **denominator contains only rational numbers**.	$\frac{\sqrt{3}}{\sqrt{2}} = \frac{\sqrt{3} \times \sqrt{2}}{\sqrt{2} \times \sqrt{2}} = \frac{\sqrt{6}}{2}$ $\frac{6}{3+\sqrt{7}} = \frac{6(3-\sqrt{7})}{(3+\sqrt{7})(3-\sqrt{7})}$ $= \frac{18 - 6\sqrt{7}}{9-7}$ $= \frac{18 - 6\sqrt{7}}{2}$ $= 9 - 3\sqrt{7}$

Knowledge Organisers Y9 Maths Factors Multiples and Primes

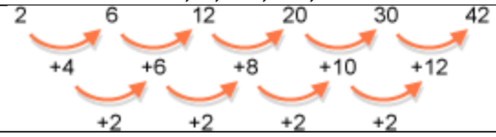
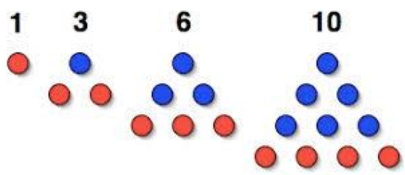
Key Vocabulary	Definition/Tips	Example
Multiple	The result of multiplying a number by an integer. The **times tables** of a number.	The first five multiples of 7 are: $7, 14, 21, 28, 35$
Factor	A number that **divides exactly** into another number without a remainder. It is useful to write factors in pairs	The factors of 18 are: $1, 2, 3, 6, 9, 18$ The factor pairs of 18 are: $1, 18$ $2, 9$ $3, 6$
Lowest Common Multiple (LCM)	The **smallest** number that is in the **times tables** of each of the numbers given.	The LCM of 3, 4 and 5 is 60 because it is the smallest number in the 3, 4 and 5 times tables.
Highest Common Factor (HCF)	The **biggest** number that **divides exactly** into two or more numbers.	The HCF of 6 and 9 is 3 because it is the biggest number that divides into 6 and 9 exactly.
Prime Number	A number with **exactly two factors**. A number that can only be divided by itself and one. The number **1 is not prime**, as it only has one factor, not two.	The first ten prime numbers are: $2, 3, 5, 7, 11, 13, 17, 19, 23, 29$
Prime Factor	A factor which is a prime number.	The prime factors of 18 are: $2, 3$
Product of Prime Factors	Finding out which **prime numbers multiply** together to make the **original** number. Use a **prime factor tree.** Also known as 'prime factorisation'.	

Knowledge Organiser: Equations, Formulae and Quadratics

Key Vocabulary	**Definition/Tips**	**Example**
1. Solve	To find the **answer**/value of something **Use inverse operations** on both sides of the equation (balancing method) until you find the value for the letter.	Solve $2x - 3 = 7$ Add 3 on both sides $2x = 10$ Divide by 2 on both sides $x = 5$
2. Inverse	**Opposite**	The inverse of addition is subtraction. The inverse of multiplication is division.
3. Rearranging Formulae	**Use inverse operations** on both sides of the formula (balancing method) until you find the expression for the letter.	Make x the subject of $y = \frac{2x-1}{z}$ Multiply both sides by z $yz = 2x - 1$ Add 1 to both sides $yz + 1 = 2x$ Divide by 2 on both sides $\frac{yz + 1}{2} = x$ We now have x as the subject.
4. Writing Formulae	**Substitute letters for words** in the question.	Bob charges £3 per window and a £5 call out charge. $C = 3N + 5$ Where N=number of windows and C=cost
5. Substitution	**Replace letters with numbers**. Be careful of $5x^2$. You need to square first, then multiply by 5.	$a = 3, b = 2 \; and \; c = 5$. Find: 1. $2a = 2 \times 3 = 6$ 2. $3a - 2b = 3 \times 3 - 2 \times 2 = 5$ 3. $7b^2 - 5 = 7 \times 2^2 - 5 = 23$
1. Quadratic	A quadratic expression is of the form $\boldsymbol{ax^2 + bx + c}$ where a, b and c are numbers, $\boldsymbol{a \neq 0}$	Examples of quadratic expressions: x^2 $8x^2 - 3x + 7$ Examples of non-quadratic expressions: $2x^3 - 5x^2$ $9x - 1$
2. Factorising Quadratics	When a quadratic expression is in the form $x^2 + bx + c$ find the two numbers that **add to give b** and **multiply to give c**.	$x^2 + 7x + 10 = (x + 5)(x + 2)$ (because 5 and 2 add to give 7 and multiply to give 10) $x^2 + 2x - 8 = (x + 4)(x - 2)$ (because +4 and -2 add to give +2 and multiply to give -8)

3. Difference of Two Squares	An expression of the form $\boldsymbol{a^2 - b^2}$ can be factorised to give $(\boldsymbol{a+b})(\boldsymbol{a-b})$	$x^2 - 25 = (x+5)(x-5)$ $16x^2 - 81 = (4x+9)(4x-9)$
4. Solving Quadratics ($ax^2 = b$)	Isolate the x^2 term and square root both sides. Remember there will be a **positive and a negative solution**.	$2x^2 = 98$ $x^2 = 49$ $x = \pm 7$
5. Solving Quadratics ($ax^2 + bx = 0$)	**Factorise** and then **solve = 0**.	$x^2 - 3x = 0$ $x(x-3) = 0$ $x = 0 \text{ or } x = 3$
6. Solving Quadratics by Factorising ($a = 1$)	**Factorise** the quadratic in the usual way. **Solve = 0** Make sure the equation = 0 before factorising.	Solve $x^2 + 3x - 10 = 0$ Factorise: $(x+5)(x-2) = 0$ $x = -5 \text{ or } x = 2$
7. Factorising Quadratics when $a \neq 1$	When a quadratic is in the form $ax^2 + bx + c$ 1. Multiply a by c = ac 2. Find two numbers that add to give b and multiply to give ac. 3. Re-write the quadratic, replacing bx with the two numbers you found. 4. Factorise in pairs – you should get the same bracket twice 5. Write your two brackets – one will be the repeated bracket, the other will be made of the factors outside each of the two brackets.	Factorise $6x^2 + 5x - 4$ 1. $6 \times -4 = -24$ 2. Two numbers that add to give +5 and multiply to give -24 are +8 and -3 3. $6x^2 + 8x - 3x - 4$ 4. Factorise in pairs: $2x(3x+4) - 1(3x+4)$ 5. Answer = $(3x+4)(2x-1)$
8. Solving Quadratics by Factorising ($a \neq 1$)	**Factorise** the quadratic in the usual way. **Solve = 0** Make sure the equation = 0 before factorising.	Solve $2x^2 + 7x - 4 = 0$ Factorise: $(2x-1)(x+4) = 0$ $x = \frac{1}{2} \text{ or } x = -4$

Knowledge Organiser: Sequences

Key Vocabulary	Definition/Tips	Example
1. Linear Sequence	A number pattern with a **common difference**.	2, 5, 8, 11… is a linear sequence
2. Term	**Each value** in a sequence is called a term.	In the sequence 2, 5, 8, 11…, 8 is the third term of the sequence.
3. Term-to-term rule	A rule which allows you to **find the next term** in a sequence if you **know the previous term**.	First term is 2. Term-to-term rule is 'add 3' Sequence is: 2, 5, 8, 11…
4. nth term	A rule which allows you to **calculate the term** that is in the **nth position** of the sequence. Also known as the 'position-to-term' rule. **n** refers to the **position** of a term in a sequence.	nth term is $3n - 1$ The 100th term is $3 \times 100 - 1 = 299$
5. Finding the nth term of a linear sequence	1. Find the **difference**. 2. **Multiply that by n.** 3. Substitute $n = 1$ to **find out what number you need to add or subtract to get the first number in the sequence**.	Find the nth term of: 3, 7, 11, 15… 1. Difference is +4 2. Start with $4n$ 3. $4 \times 1 = 4$, so we need to subtract 1 to get 3. nth term = $4n - 1$
6. Fibonacci type sequences	A sequence where the next number is found by **adding up the previous two terms**	The Fibonacci sequence is: 1,1,2,3,5,8,13,21,34 … An example of a Fibonacci-type sequence is: $4, 7, 11, 18, 29 \ldots$
7. Quadratic Sequence	A sequence of numbers where the **second difference is constant**. A quadratic sequence will have a n^2 term.	
8. nth term of a quadratic sequence	1. Find the first and second differences. 2. Halve the second difference and multiply this by n^2. 3. Substitute $n = 1,2,3,4 \ldots$ into your expression so far. 4. Subtract this set of numbers from the corresponding terms in the sequence from the question. 5. Find the nth term of this set of numbers. 6. Combine the nth terms to find the overall nth term of the quadratic sequence. Substitute values in to check your nth term works for the sequence.	Find the nth term of: 4, 7, 14, 25, 40.. Answer: Second difference = +4 → nth term = $2n^2$ Sequence: 4, 7, 14, 25, 40 $2n^2$ 2, 8, 18, 32, 50 Difference: 2, -1, -4, -7, -10 Nth term of this set of numbers is $-3n + 5$ Overall nth term: $2n^2 - 3n + 5$
9. Triangular numbers	The sequence which comes from a pattern of dots that form a triangle. $1, 3, 6, 10, 15, 21 \ldots$	

Knowledge Organiser: Averages and range

<table>
<tr><th>Key Vocabulary</th><th>Definition/Tips</th><th>Example</th></tr>
<tr><td>1. Types of Data</td><td>Continuous Data – data that can take any numerical value within a given range.
Discrete Data – data that can take only specific values within a given range.</td><td>Continuous Data – weight, voltage etc.
Discrete Data – number of children, shoe size etc.</td></tr>
<tr><td>2. Grouped Data</td><td>Data that has been bundled in to categories.
Seen in grouped frequency tables, histograms, cumulative frequency etc.</td><td><table><tr><th>Foot length, l, (cm)</th><th>Number of children</th></tr><tr><td>$10 \leqslant l < 12$</td><td>5</td></tr><tr><td>$12 \leqslant l < 17$</td><td>53</td></tr></table></td></tr>
<tr><td>3. Mean</td><td>Add up the values and divide by how many values there are.</td><td>The mean of 3, 4, 7, 6, 0, 4, 6 is
$\frac{3+4+7+6+0+4+6}{7} = 5$</td></tr>
<tr><td>4. Mean from a Table</td><td>1. Find the midpoints (if necessary)
2. Multiply Frequency by values or midpoints
3. Add up these values
4. Divide this total by the Total Frequency
If grouped data is used, the answer will be an estimate.</td><td><table><tr><th>Height in cm</th><th>Frequency</th><th>Midpoint</th><th>F × M</th></tr><tr><td>$0 < h \leq 10$</td><td>8</td><td>5</td><td>8×5=40</td></tr><tr><td>$10 < h \leq 30$</td><td>10</td><td>20</td><td>10×20=200</td></tr><tr><td>$30 < h \leq 40$</td><td>6</td><td>35</td><td>6×35=210</td></tr><tr><td>Total</td><td>24</td><td>Ignore!</td><td>450</td></tr></table>Estimated Mean height: 450 ÷ 24 = 18.75cm</td></tr>
<tr><td>5. Median Value</td><td>The middle value.
Put the data in order and find the middle one.
If there are two middle values, find the number half way between them by adding them together and dividing by 2.</td><td>Find the median of: 4, 5, 2, 3, 6, 7, 6
Ordered: 2, 3, 4, 5, 6, 6, 7
Median = 5</td></tr>
<tr><td>6. Median from a Table</td><td>Use the formula $\frac{(n+1)}{2}$ to find the position of the median.
n is the total frequency.</td><td>If the total frequency is 15, the median will be the $\left(\frac{15+1}{2}\right) = 8th$ position</td></tr>
<tr><td>7. Mode /Modal Value</td><td>Most frequent/common.
Can have more than one mode (called bi-modal or multi-modal) or no mode (if all values appear once)</td><td>Find the mode: 4, 5, 2, 3, 6, 4, 7, 8, 4
Mode = 4</td></tr>
<tr><td>8. Range</td><td>Highest value subtract the Smallest value
Range is a ‘measure of spread’. The smaller the range the more <u>consistent</u> the data.</td><td>Find the range: 3, 31, 26, 102, 37, 97.
Range = 102-3 = 99</td></tr>
<tr><td>9. Lower Quartile</td><td>Divides the bottom half of the data into two halves.
$\textbf{LQ} = \boldsymbol{Q_1 = \frac{(n+1)}{4} th}$ value</td><td>Find the lower quartile of: 2, <u>3</u>, 4, 5, 6, 6, 7
$Q_1 = \frac{(7+1)}{4} = 2nd$ value → 3</td></tr>
<tr><td>10. Lower Quartile</td><td>Divides the top half of the data into two halves.
$\textbf{UQ} = \boldsymbol{Q_3 = \frac{3(n+1)}{4} th}$ value</td><td>Find the upper quartile of: 2, 3, 4, 5, 6, <u>6</u>, 7
$Q_3 = \frac{3(7+1)}{4} = 6th$ value → 6</td></tr>
<tr><td>11. Interquartile Range</td><td>The difference between the upper quartile and lower quartile.
$\boldsymbol{IQR = Q_3 - Q_1}$
The smaller the interquartile range, the more consistent the data.</td><td>Find the IQR of: 2, 3, 4, 5, 6, 6, 7
$IQR = Q_3 - Q_1 = 6 - 3 = 3$</td></tr>
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Knowledge Organiser Y9 Maths Data

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Quantitative Data – numerical data
Continuous Data – data that can take any numerical value within a given range.
Discrete Data – data that can take only specific values within a given range.</td><td>Qualitative Data – eye colour, gender etc.
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<tr><td>3. Primary /Secondary Data</td><td>Primary Data – collected yourself for a specific purpose.
Secondary Data – collected by someone else for another purpose.</td><td>Primary Data – data collected by a student for their own research project.
Secondary Data – Census data used to analyse link between education and earnings.</td></tr>
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Range = 102-3 = 99</td></tr>
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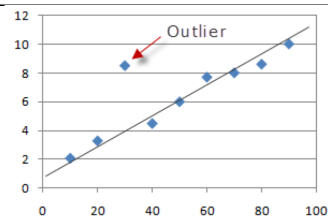
An outlier is much smaller or much larger than the other values in a set of data.</td><td>
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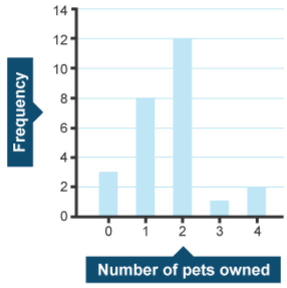
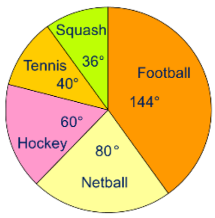
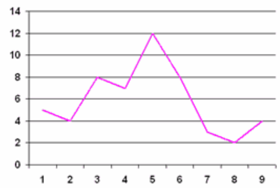
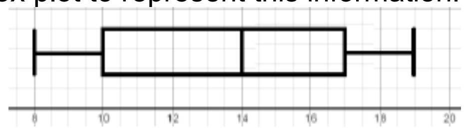
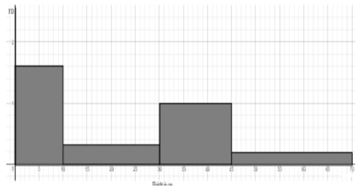
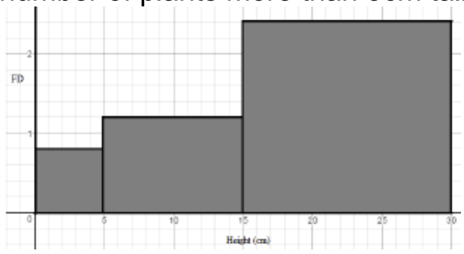
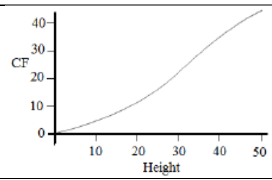
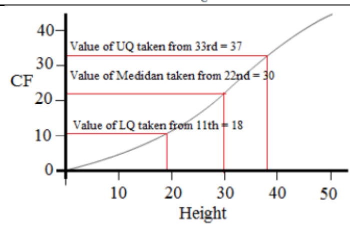
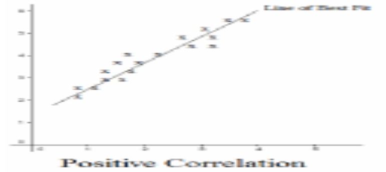
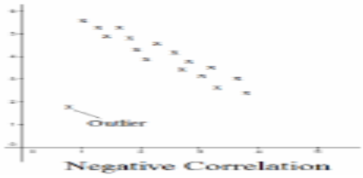
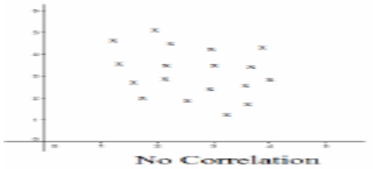
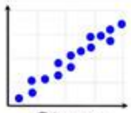
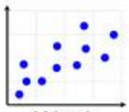
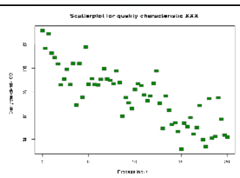
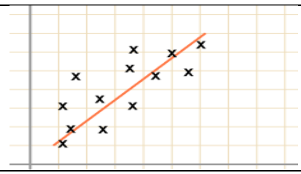
<td>12. Lower Quartile</td>
<td>Divides the top half of the data into two halves. UQ = $\boldsymbol{Q_3 = \frac{3(n+1)}{4} th}$ value</td>
<td>Find the upper quartile of: 2, 3, 4, 5, 6, <u>6</u>, 7 $Q_3 = \frac{3(7+1)}{4} = 6th$ value à 6</td>
</tr>
<tr>
<td>13. Interquartile Range</td>
<td>The difference between the upper quartile and lower quartile.
$$\boldsymbol{IQR = Q_3 - Q_1}$$
The smaller the interquartile range, the more consistent the data.</td>
<td>Find the IQR of: 2, 3, 4, 5, 6, 6, 7
$IQR = Q_3 - Q_1 = 6 - 3 = 3$</td>
</tr>
<tr>
<td>14. Frequency Table</td>
<td>A record of how often each value in a set of data occurs.</td>
<td><table>
<tr><th>Number of marks</th><th>Tally marks</th><th>Frequency</th></tr>
<tr><td>1</td><td>𝍸 II</td><td>7</td></tr>
<tr><td>2</td><td>𝍸</td><td>5</td></tr>
<tr><td>3</td><td>𝍸 I</td><td>6</td></tr>
<tr><td>4</td><td>𝍸</td><td>5</td></tr>
<tr><td>5</td><td>III</td><td>3</td></tr>
<tr><td>Total</td><td></td><td>26</td></tr>
</table></td>
</tr>
<tr>
<td>15. Bar Chart</td>
<td>Represents data as vertical blocks.
$\boldsymbol{x-axis}$ shows the type of data
$\boldsymbol{y-axis}$ shows the frequency for each type of data
Each bar should be the same width
There should be gaps between each bar
Remember to label each axis.</td>
<td>
</td>
</tr>
<tr>
<td>16. Pie Chart</td>
<td>Used for showing how data breaks down into its constituent parts.
When drawing a pie chart, divide 360° by the total frequency. This will tell you how many degrees to use for the frequency of each category.
Remember to label the category that each sector in the pie chart represents.</td>
<td>

If there are 40 people in a survey, then each person will be worth 360÷40=9° of the pie chart.</td>
</tr>
<tr>
<td>17. Line Graph</td>
<td>A graph that uses points connected by straight lines to show how data changes in values.
This can be used for time series data, which is a series of data points spaced over uniform time intervals in time order.</td>
<td>
</td>
</tr>
<tr>
<td>18. Two Way Tables</td>
<td>A table that organises data around two categories.
Fill out the information step by step using the information given.
Make sure all the totals add up for all columns and rows.</td>
<td>Question: Complete the 2 way table below.
<table>
<tr><th></th><th>Left Handed</th><th>Right Handed</th><th>Total</th></tr>
<tr><td>Boys</td><td>10</td><td></td><td>58</td></tr>
<tr><td>Girls</td><td></td><td></td><td></td></tr>
<tr><td>Total</td><td></td><td>84</td><td>100</td></tr>
</table>
Answer: Step 1, fill out the easy parts (the totals)
<table>
<tr><th></th><th>Left Handed</th><th>Right Handed</th><th>Total</th></tr>
<tr><td>Boys</td><td>10</td><td>48</td><td>58</td></tr>
<tr><td>Girls</td><td></td><td></td><td>42</td></tr>
<tr><td>Total</td><td>16</td><td>84</td><td>100</td></tr>
</table>
Answer: Step 2, fill out the remaining parts
<table>
<tr><th></th><th>Left Handed</th><th>Right Handed</th><th>Total</th></tr>
<tr><td>Boys</td><td>10</td><td>48</td><td>58</td></tr>
<tr><td>Girls</td><td>6</td><td>36</td><td>42</td></tr>
<tr><td>Total</td><td>16</td><td>84</td><td>100</td></tr>
</table></td>
</tr>
<tr>
<td>19. Box Plots</td>
<td>The minimum, lower quartile, median, upper quartile and maximum are shown on a box plot.
A box plot can be drawn independently or from a cumulative frequency diagram.</td>
<td>Students sit a maths test. The highest score is 19, the lowest score is 8, the median is 14, the lower quartile is 10 and the upper quartile is 17. Draw a box plot to represent this information.

</td>
</tr>
</table>

<table>
<tr>
<td>20. Comparing Box Plots</td>
<td>Write two sentences.
1. Compare the averages using the medians for two sets of data.
2. Compare the spread of the data using the range or IQR for two sets of data.
The <u>smaller</u> the range/IQR, the <u>more consistent</u> the data.
You must compare box plots in the context of the problem.</td>
<td>‘On average, students in class A were more successful on the test than class B because their median score was higher.’
‘Students in class B were more consistent than class A in their test scores as their IQR was smaller.’</td>
</tr>
<tr>
<td>21. Histograms</td>
<td>A visual way to display frequency data using bars.
Bars can be unequal in width.
Histograms show frequency density on the y-axis, not frequency.
$$\boldsymbol{Frequency\ Density = \frac{Frequency}{Class\ Width}}$$
<table>
<tr><th>Height(cm)</th><th>Frequency</th></tr>
<tr><td>$0 < h \le 10$</td><td>8</td></tr>
<tr><td>$10 < h \le 30$</td><td>6</td></tr>
<tr><td>$30 < h \le 45$</td><td>15</td></tr>
<tr><td>$45 < h \le 70$</td><td>5</td></tr>
</table></td>
<td><table>
<tr><th>Frequency Density (FD)</th></tr>
<tr><td>$8 \div 5 = 1.6$</td></tr>
<tr><td>$6 \div 20 = 0.3$</td></tr>
<tr><td>$15 \div 15 = 1$</td></tr>
<tr><td>$5 \div 25 = 0.2$</td></tr>
</table>
</td>
</tr>
<tr>
<td>22. Interpreting Histograms</td>
<td>The area of the bar is proportional to the frequency of that class interval.
$$\boldsymbol{Frequency = Freq\ Density \times Class\ Width}$$</td>
<td>A histogram shows information about the heights of a number of plants. 4 plants were less than 5cm tall. Find the number of plants more than 5cm tall.


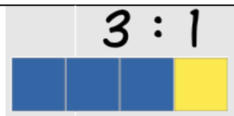
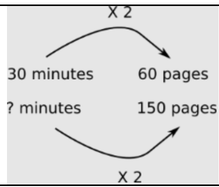
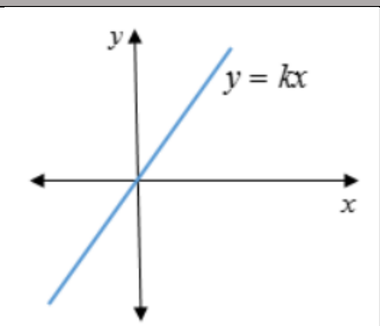
Above 5cm:
1.2 x 10 + 2.4 x 15 = 12 + 36 = 48</td>
</tr>
<tr>
<td>23. Cumulative Frequency</td>
<td>Cumulative Frequency is a running total.
<table>
<tr><th>Age</th><th>Frequency</th></tr>
<tr><td>$0 < a \le 10$</td><td>15</td></tr>
<tr><td>$10 < a \le 40$</td><td>35</td></tr>
<tr><td>$40 < a \le 50$</td><td>10</td></tr>
</table></td>
<td><table>
<tr><th>Cumulative Frequency</th></tr>
<tr><td>15</td></tr>
<tr><td>$15 + 35 = 50$</td></tr>
<tr><td>$50 + 10 = 60$</td></tr>
</table></td>
</tr>
<tr>
<td>24. Cumulative Frequency Diagram</td>
<td>A cumulative frequency diagram is a curve that goes up. It looks a little like a stretched-out S shape.
Plot the cumulative frequencies at the end-point of each interval.</td>
<td>
</td>
</tr>
<tr>
<td>25. Quartiles from Cumulative Frequency Diagram</td>
<td>Lower Quartile (Q1): 25% of the data is less than the lower quartile.
Median (Q2): 50% of the data is less than the median.
Upper Quartile (Q3): 75% of the data is less than the upper quartile.
Interquartile Range (IQR): represents the middle 50% of the data.</td>
<td>

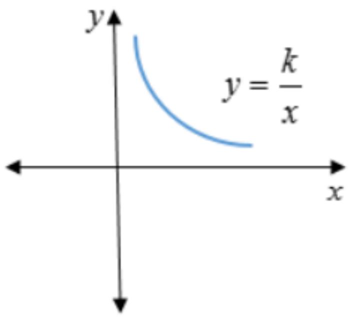
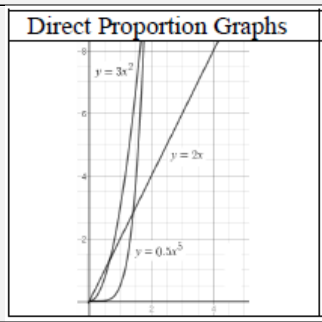
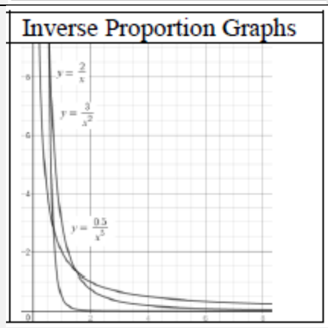
$IQR = 37 - 18 = 19$</td>
</tr>
</table>

26. Hypothesis	**A statement that might be true, which can be tested.**	Hypothesis: 'Large dogs are better at catching tennis balls than small dogs'. We can test this hypothesis by having hundreds of different sized dogs try to catch tennis balls.
27. Correlation	Correlation between two sets of data means they are **connected** in some way.	There is correlation between temperature and the number of ice creams sold.
28. Causality	When one variable **influences** another variable.	The more hours you work at a particular job (paid hourly), the higher your income from that job will be.
29. Positive Correlation	As one value **increases** the other value **increases**.	
30. Negative Correlation	As one value **increases** the other value **decreases**.	
31. No Correlation	There is **no linear relationship** between the two.	
32. Strong Correlation	When two sets of data are **closely linked**.	 Strong Positive Correlation
33. Weak Correlation	When two sets of data have correlation, but are **not closely linked**.	 Weak Positive Correlation
34. Scatter Graph	A graph in which values of **two variables** are plotted along two axes to **compare** them and see if there is any **connection** between them.	
35. Line of Best Fit	A **straight line** that **best represents the data** on a scatter graph.	

Knowledge Organiser Y9 Maths H Fractions, Percentages, ratios

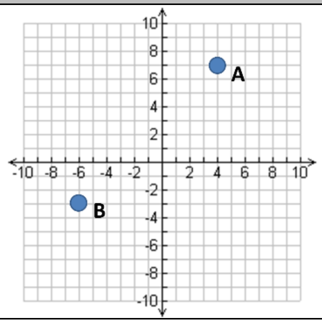
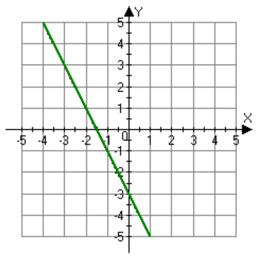
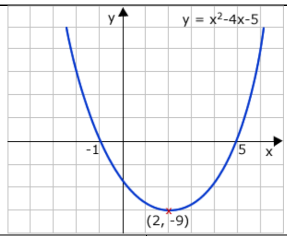
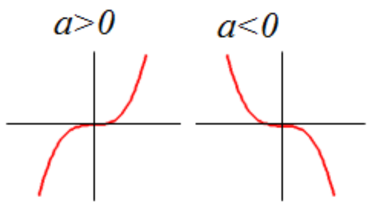
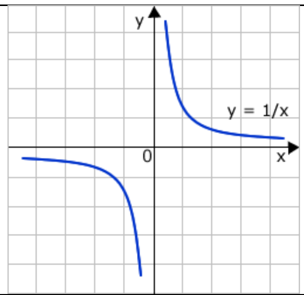
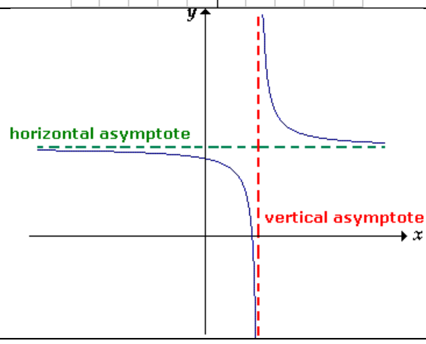
Key Vocabulary	Definition/Tips	Example
Fraction	A mathematical expression representing the division of one integer by another.	$\frac{2}{7}$ is a 'proper' fraction. $\frac{9}{4}$ is an 'improper' or 'top-heavy' fraction.
Unit Fraction	A fraction where the numerator is one and the denominator is a positive integer.	$\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$ $etc.$ are examples of unit fractions.
Reciprocal	The reciprocal of a number is 1 divided by the number. The reciprocal of x is $\frac{1}{x}$ When we multiply a number by its reciprocal we get 1.	The reciprocal of 5 is $\frac{1}{5}$ The reciprocal of $\frac{2}{3}$ is $\frac{3}{2}$, because $\frac{2}{3} \times \frac{3}{2} = 1$
Mixed Number	A number formed of both an integer part and a fraction part.	$3\frac{2}{5}$ is an example of a mixed number.
Simplifying Fractions	Divide the numerator and denominator by the highest common factor.	$\frac{20}{45} = \frac{4}{9}$
Equivalent Fractions	Fractions which represent the same value.	$\frac{2}{5} = \frac{4}{10} = \frac{20}{50} = \frac{60}{150}$ $etc.$
Comparing Fractions	To compare fractions, they each need to be rewritten so that they have a common denominator. Ascending means smallest to biggest. Descending means biggest to smallest.	Put in to ascending order : $\frac{3}{4}, \frac{2}{3}, \frac{5}{6}, \frac{1}{2}$. Equivalent: $\frac{9}{12}, \frac{8}{12}, \frac{10}{12}, \frac{6}{12}$ Correct order: $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{5}{6}$
Fraction of an Amount	Divide by the bottom, times by the top	Find $\frac{2}{5}$ of £60 $60 \div 5 = 12$ $12 \times 2 = 24$
Adding or Subtracting Fractions	Find the LCM of the denominators to find a common denominator. Use equivalent fractions to change each fraction to the common denominator. Then just add or subtract the numerators and keep the denominator the same.	$\frac{2}{3} + \frac{4}{5}$ Multiples of 3: 3, 6, 9, 12, 15.. Multiples of 5: 5, 10, 15.. LCM of 3 and 5 = 15 $\frac{2}{3} = \frac{10}{15}$ $\frac{4}{5} = \frac{12}{15}$ $\frac{10}{15} + \frac{12}{15} = \frac{22}{15} = 1\frac{7}{15}$
Multiplying Fractions	Multiply the numerators together and multiply the denominators together.	$\frac{3}{8} \times \frac{2}{9} = \frac{6}{72} = \frac{1}{12}$
Dividing Fractions	'Keep it, Flip it, Change it – KFC' Keep the first fraction the same Flip the second fraction upside down Change the divide to a multiply	$\frac{3}{4} \div \frac{5}{6} = \frac{3}{4} \times \frac{6}{5} = \frac{18}{20} = \frac{9}{10}$
Ratio		

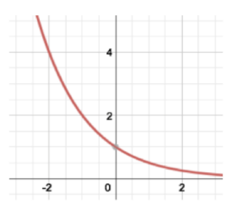
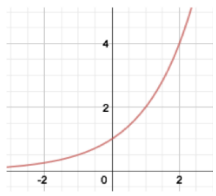
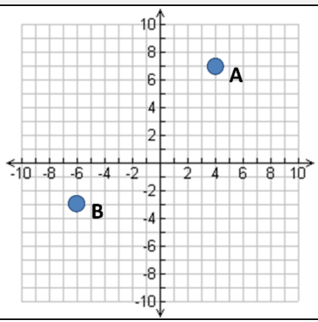
1. Ratio	Ratio compares the size of one part to another part. Written using the ':' symbol.	
2. Proportion	Proportion compares the size of one part to the size of the whole. Usually written as a fraction.	In a class with 13 boys and 9 girls, the proportion of boys is $\frac{13}{22}$ and the proportion of girls is $\frac{9}{22}$
3. Simplifying Ratios	Divide all parts of the ratio by a common factor.	5 : 10 = 1 : 2 (divide both by 5) 14 : 21 = 2 : 3 (divide both by 7)
4. Ratios in the form $1 : n$ or $n : 1$	Divide both parts of the ratio by one of the numbers to make one part equal 1.	5 : 7 = 1 : $\frac{7}{5}$ in the form 1 : n 5 : 7 = $\frac{5}{7}$: 1 in the form n : 1
5. Sharing in a Ratio	1. Add the total parts of the ratio. 2. Divide the amount to be shared by this value to find the value of one part. 3. Multiply this value by each part of the ratio.	Share £60 in the ratio 3 : 2 : 1. 3 + 2 + 1 = 6 60 ÷ 6 = 10 3 x 10 = 30, 2 x 10 = 20, 1 x 10 = 10 £30 : £20 : £10
6. Proportional Reasoning	Comparing two things using multiplicative reasoning and applying this to a new situation. Identify one multiplicative link and use this to find missing quantities.	
7. Unitary Method	Finding the value of a single unit and then finding the necessary value by multiplying the single unit value.	3 cakes require 450g of sugar to make. Find how much sugar is needed to make 5 cakes. 3 cakes = 450g So 1 cake = 150g (÷ by 3) So 5 cakes = 750 g (x by 5)
8. Ratio already shared	Find what one part of the ratio is worth using the unitary method.	Money was shared in the ratio 3:2:5 between Ann, Bob and Cat. Given that Bob had £16, found out the total amount of money shared. £16 = 2 parts So £8 = 1 part 3 + 2 + 5 = 10 parts, so 8 x 10 = £80
9. Best Buys	Find the unit cost by dividing the price by the quantity. The lowest number is the best value.	8 cakes for £1.28 → 16p each (÷by 8) 13 cakes for £2.05 → 15.8p each (÷by 13) Pack of 13 cakes is best value.
Proportion		
1. Direct Proportion	If two quantities are in direct proportion, **as one increases**, the **other increases** by the **same percentage**. If y is directly proportional to x, this can be written as $\boldsymbol{y \propto x}$ An equation of the form $\boldsymbol{y = kx}$ represents direct proportion, where k **is the constant of proportionality**.	

2. Inverse Proportion	If two quantities are inversely proportional, **as one increases**, the **other decreases** by the **same percentage**. If y is inversely proportional to x, this can be written as $\boldsymbol{y} \propto \frac{\boldsymbol{1}}{\boldsymbol{x}}$ An equation of the form $\boldsymbol{y} = \frac{\boldsymbol{k}}{\boldsymbol{x}}$ represents inverse proportion.	
3. Using proportionality formulae	**Direct**: **y = kx** or **y** ∝ **x** **Inverse**: **y =** $\frac{k}{x}$ or **y** ∝ $\frac{1}{x}$ 1. **Solve to find k** using the pair of values in the question. 2. **Rewrite the equation** using the k you have just found. 3. **Substitute the other given value** from the question in to the equation to **find the missing value**.	p is directly proportional to q. When p = 12, q = 4. Find p when q = 20. 1. p = kq 12 = k x 4 so k = 3 2. p = 3q 3. p = 3 x 20 = 60, so p = 60
4. Direct Proportion with powers	Graphs showing **direct proportion** can be written in the form $\boldsymbol{y = kx^n}$ Direct proportion graphs will always start at the origin.	
5. Inverse Proportion with powers	Graphs showing **inverse proportion** can be written in the form $\boldsymbol{y = \frac{k}{x^n}}$ Inverse proportion graphs will never start at the origin.	
Percentages		
1.Percentage	Number of parts per 100.	31% means $\frac{31}{100}$
2. Finding 10%	To find 10%, divide by 10	10% of £36 = 36÷10=£3.60
3. Finding 1%	To find 1%, divide by 100	1% of £8 = 8÷100 = £0.08
4. Percentage Change	$\frac{Difference}{Original} \times 100\%$	A games console is bought for £200 and sold for £250. % change = $\frac{50}{200} \times 100 = 25\%$

5. Fractions to Decimals	Divide the numerator by the denominator using the bus stop method.	$\frac{3}{8} = 3 \div 8 = 0.375$
6. Decimals to Fractions	Write as a fraction over 10, 100 or 1000 and simplify.	$0.36 = \frac{36}{100} = \frac{9}{25}$
7. Percentages to Decimals	Divide by 100	$8\% = 8 \div 100 = 0.08$
8. Decimals to Percentages	Multiply by 100	$0.4 = 0.4 \times 100\% = 40\%$
9. Fractions to Percentages	Percentage is just a fraction out of 100. Make the denominator 100 using equivalent fractions. When the denominator doesn't go in to 100, use a calculator and multiply the fraction by 100.	$\frac{3}{25} = \frac{12}{100} = 12\%$ $\frac{9}{17} \times 100 = 52.9\%$
10. Percentages to Fractions	Percentage is just a fraction out of 100. Write the percentage over 100 and simplify.	$14\% = \frac{14}{100} = \frac{7}{50}$
Calculating with percentages		
1. Increase or Decrease by a Percentage	Non-calculator: **Find the percentage** and **add** or **subtract** it from the **original** amount. Calculator: Find the **percentage multiplier** and multiply.	<u>Increase 500 by 20% (Non Calc):</u> 10% of 500 = 50 so 20% of 500 = 100 500 + 100 = 600 <u>Decrease 800 by 17% (Calc):</u> 100%-17%=83% 83% ÷ 100 = 0.83 0.83 x 800 = 664
2. Percentage Multiplier	The **number** you **multiply** a quantity by to **increase or decrease** it by a **percentage**.	The multiplier for increasing by 12% is 1.12 The multiplier for decreasing by 12% is 0.88 The multiplier for increasing by 100% is 2.
3. Reverse Percentage	Find the **correct percentage given in the question**, then work backwards to **find 100%** Look out for words like '**before**' or '**original**'	A jumper was priced at £48.60 after a 10% reduction. Find its original price. 100% - 10% = 90% 90% = £48.60 1% = £0.54 100% = £54
4. Simple Interest	Interest calculated as a **percentage of the original** amount.	£1000 invested for 3 years at 10% simple interest. 10% of £1000 = £100 Interest = $3 \times £100 = £300$

Knowledge Organiser Year 9 Higher: Graphs

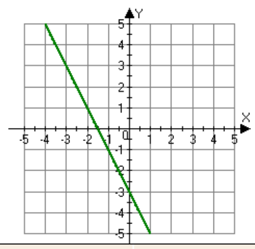
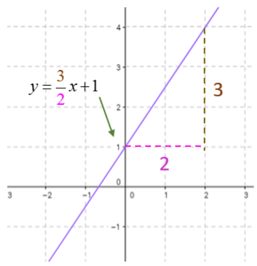
Key vocabulary	Definition/Tips	Example
TYPES OF GRAPH		
1. Coordinates	Written in **pairs**. The **first** term is the **x-coordinate** (movement **across**). The **second** term is the **y-coordinate** (movement **up or down**)	 A: (4,7) B: (-6,-3)
2. Linear Graph	**Straight line** graph. The **equation** of a linear graph can contain an **x-term**, a **y-term** and a **number**.	Example:  Other examples: $x = y$ $y = 4$ $x = -2$ $y = 2x - 7$ $y + x = 10$ $2y - 4x = 12$
3. Quadratic Graph	A **'U-shaped'** curve called a **parabola**. The equation is of the form $y = \boldsymbol{ax^2 + bx + c}$, where a, b and c are numbers, $\boldsymbol{a \neq 0}$. If $\boldsymbol{a < 0}$**,** the parabola is **upside down**.	
4. Cubic Graph	The equation is of the form $\boldsymbol{y = ax^3 + k}$, where $\boldsymbol{k}$ **is an number**. If $\boldsymbol{a > 0}$, the curve is **increasing**. If $\boldsymbol{a < 0}$, the curve is **decreasing**.	
5. Reciprocal Graph	The equation is of the form $\boldsymbol{y = \frac{A}{x}}$, where $\boldsymbol{A}$ **is a number** and $\boldsymbol{x \neq 0}$. The graph has **asymptotes** on the **x-axis and y-axis**.	
6. Asymptote	A **straight line** that a graph **approaches** but **never touches**.	

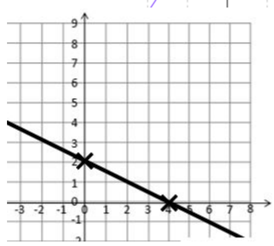
<table>
<tr><td>7. Exponential Graph</td><td>The equation is of the form $\boldsymbol{y = a^x}$, where a is a number called the base.
If $\boldsymbol{a > 1}$ the graph increases.
If $\boldsymbol{0 < a < 1}$, the graph decreases.
The graph has an asymptote which is the x-axis.</td><td></td><td></td></tr>
<tr><td colspan="4">LINEAR GRAPHS IN MORE DEPTH</td></tr>
<tr><td>1. Coordinates</td><td>Written in pairs. The first term is the x-coordinate (movement across). The second term is the y-coordinate (movement up or down)</td><td colspan="2">

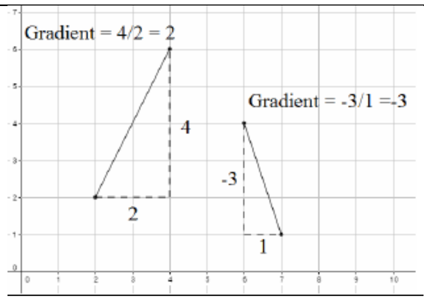
A: (4,7)
B: (-6,-3)</td></tr>
<tr><td>2. Midpoint of a Line</td><td>Method 1: add the x coordinates and divide by 2, add the y coordinates and divide by 2

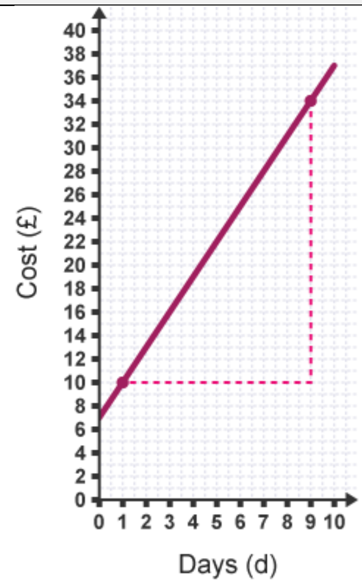
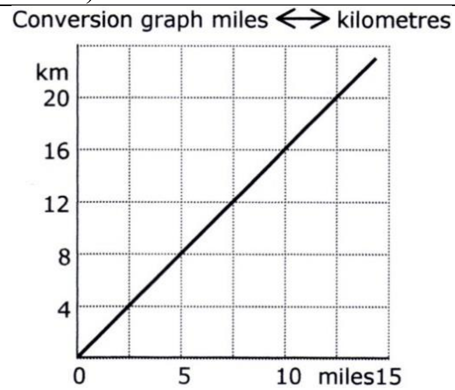
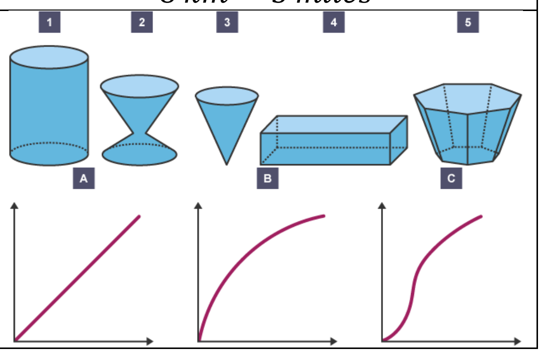
Method 2: Sketch the line and find the values half way between the two x and two y values.</td><td colspan="2">Find the midpoint between (2,1) and (6,9)

$\frac{2+6}{2} = 4$ and $\frac{1+9}{2} = 5$

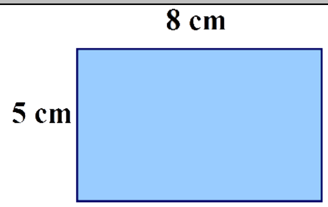
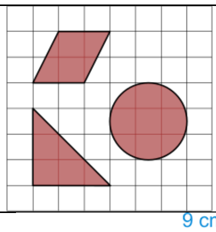
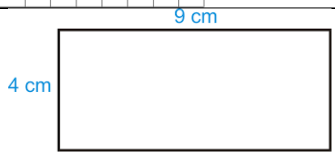
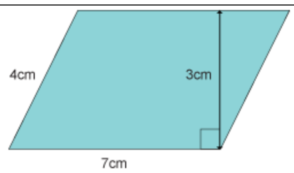
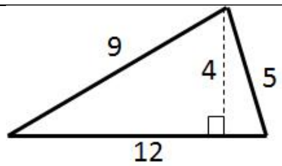
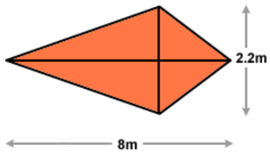
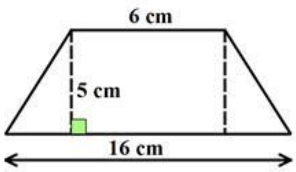
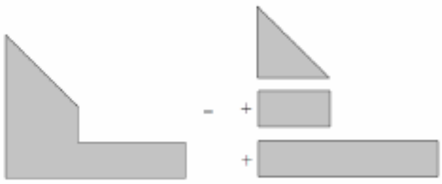
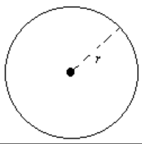
So, the midpoint is (4,5)</td></tr>
<tr><td>3. Linear Graph</td><td>Straight line graph.
The general equation of a linear graph is
$\boldsymbol{y = mx + c}$
where $\boldsymbol{m}$ is the gradient and c is the y-intercept.
The equation of a linear graph can contain an x-term, a y-term and a number.</td><td colspan="2">Example:
Other examples:

$x = y$
$y = 4$
$x = -2$
$y = 2x - 7$
$y + x = 10$
$2y - 4x = 12$</td></tr>
<tr><td>4. Plotting Linear Graphs</td><td>Method 1: Table of Values
Construct a table of values to calculate coordinates.
Method 2: Gradient-Intercept Method (use when the equation is in the form $y = mx + c$)
1. Plots the y-intercept
2. Using the gradient, plot a second point.
3. Draw a line through the two points plotted.
Method 3: Cover-Up Method (use when the equation is in the form $ax + by = c$)
1. Cover the x term and solve the resulting equation. Plot this on the $x - axis$.
2. Cover the y term and solve the resulting equation. Plot this on the $y - axis$.
3. Draw a line through the two points plotted.</td><td colspan="2"><table><tr><td>x</td><td>-3</td><td>-2</td><td>-1</td><td>0</td><td>1</td><td>2</td><td>3</td></tr><tr><td>y= x +3</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr></table>

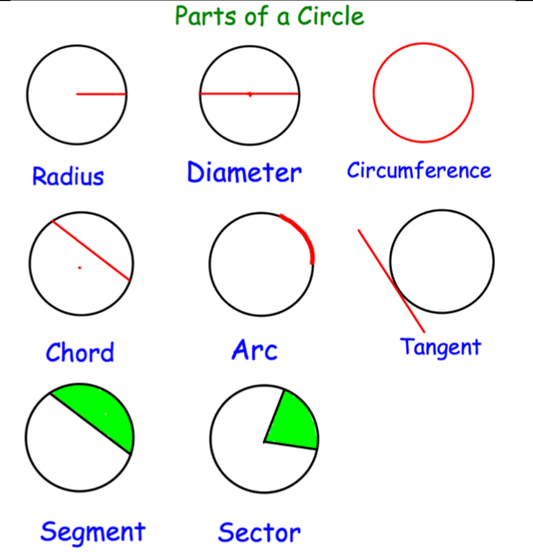
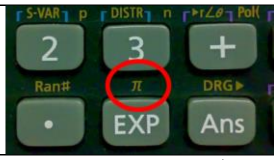
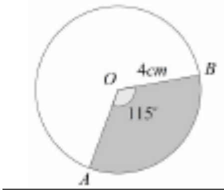
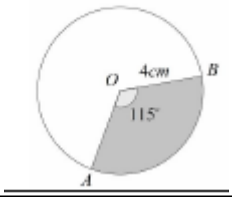
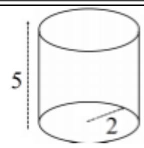
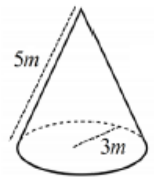

$2x + 4y = 8$</td></tr>
</table>

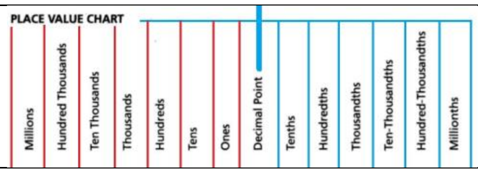
5. Gradient	The gradient of a line is how **steep** it is. **Gradient =** $\frac{\boldsymbol{Change\ in\ y}}{\boldsymbol{Change\ in\ x}} = \frac{\boldsymbol{Rise}}{\boldsymbol{Run}}$ The gradient can be positive (sloping upwards) or negative (sloping downwards)	
6. Finding the Equation of a Line <u>given a point and a gradient</u>	**Substitute** in the **gradient (m)** and **point (x,y)** in to the equation $\boldsymbol{y = mx + c}$ and **solve for c**.	Find the equation of the line with gradient 4 passing through (2,7). $y = mx + c$ $7 = 4 \times 2 + c$ $c = -1$ $y = 4x - 1$
7. Finding the Equation of a Line <u>given two points</u>	Use the two points to **calculate the gradient**. Then **repeat the method above** using the gradient and either of the points.	Find the equation of the line passing through (6,11) and (2,3) $m = \frac{11 - 3}{6 - 2} = 2$ $y = mx + c$ $11 = 2 \times 6 + c$ $c = -1$ $y = 2x - 1$
8. Parallel Lines	If two lines are **parallel**, they will have the **same gradient**. The value of m will be the same for both lines.	Are the lines $y = 3x - 1$ and $2y - 6x + 10 = 0$ parallel? Answer: Rearrange the second equation in to the form $y = mx + c$ $2y - 6x + 10 = 0 \rightarrow y = 3x - 5$ Since the two gradients are equal (3), the lines are parallel.
9. Perpendicular Lines	If two lines are **perpendicular**, the **product** of their **gradients** will always equal **-1**. The gradient of one line will be the **negative reciprocal** of the gradient of the other line. You may need to rearrange equations of lines to compare gradients (they need to be in the form $y = mx + c$)	Find the equation of the line perpendicular to $y = 3x + 2$ which passes through (6,5) Answer: As they are perpendicular, the gradient of the new line will be $-\frac{1}{3}$ as this is the negative reciprocal of 3. $y = mx + c$ $5 = -\frac{1}{3} \times 6 + c$ $c = 7$ $y = -\frac{1}{3}x + 7$ Or $3x + x - 7 = 0$

REAL LIFE GRAPHS		
1. Real Life Graphs	Graphs that are supposed to model some real-life situation. The actual meaning of the values depends on the labels and units on each axis. The **gradient** might have a contextual meaning. The **y-intercept** might have a contextual meaning. The **area** under the graph might have a contextual meaning.	 A graph showing the cost of hiring a ladder for various numbers of days. The gradient shows the cost per day. It costs £3/day to hire the ladder. The y-intercept shows the additional cost/deposit/fixed charge (something not linked to how long the ladder is hired for). The additional cost is £7.
2. Conversion Graph	A line graph to **convert one unit to another**. Can be used to convert units (eg. miles and kilometres) or currencies ($ and £) Find the value you know on one axis, read up/across to the conversion line and read the equivalent value from the other axis.	 $8\ km = 5\ miles$
3. Depth of Water in Containers	Graphs can be used to show how the depth of water changes as different shaped containers are filled with water at a constant rate.	

Knowledge Organiser Year 9 Higher Half Term 6

Key vocabulary	Definition/Tips	Example
Perimeter and Area		
1. Perimeter	The **total distance** around the **outside** of a shape. Units include: mm, cm, m etc.	 $P = 8 + 5 + 8 + 5 = 26cm$
2. Area	The amount of **space inside** a shape. Units include: mm^2, cm^2, m^2	
3. Area of a Rectangle	**Length x Width**	 $A = 36cm^2$
4. Area of a Parallelogram	**Base x Perpendicular Height** Not the slant height.	 $A = 21cm^2$
5. Area of a Triangle	**Base x Height ÷ 2**	 $A = 24cm^2$
6. Area of a Kite	Split in to **two triangles** and use the method above.	 $A = 8.8m^2$
7. Area of a Trapezium	$\frac{(a+b)}{2} \times h$ "Half the sum of the parallel side, times the height between them. That is how you calculate the area of a trapezium"	 $A = 55cm^2$
8. Compound Shape	A shape made up of a **combination of other known shapes** put together.	
Circles and 3D solids with circular aspects		
1. Circle	A circle is the locus of all points equidistant from a central point.	

2. Parts of a Circle	**Radius** – the **distance** from the **centre** of a circle to the **edge** **Diameter** – the total **distance** across the **width** of a circle **through the centre**. **Circumference** – the **total distance** around the **outside** of a circle **Chord** – a **straight line** whose **end points lie on a circle** **Tangent** – a **straight line** which **touches** a circle at exactly **one point** **Arc** – a **part of the circumference** of a circle **Sector** – the **region** of a circle enclosed by **two radii** and their intercepted **arc** **Segment** – the **region** bounded by a **chord** and the **arc** created by the chord	
3. Area of a Circle	$\boldsymbol{A = \pi r^2}$ which means 'pi x radius squared'.	If the radius was 5cm, then: $A = \pi \times 5^2 = 78.5cm^2$
4. Circumference of a Circle	$\boldsymbol{C = \pi d}$ which means 'pi x diameter'	If the radius was 5cm, then: $C = \pi \times 10 = 31.4cm$
5. π ('pi')	Pi is the circumference of a circle divided by the diameter. $\boldsymbol{\pi \approx 3.14}$	
6. Arc Length of a Sector	The arc length is part of the circumference. Take the **angle** given **as a fraction over 360°** and **multiply** by the **circumference**.	Arc Length $= \frac{115}{360} \times \pi \times 8 = 8.03cm$ 
7. Area of a Sector	The area of a sector is part of the total area. Take the **angle** given **as a fraction over 360°** and **multiply** by the **area**.	Area $= \frac{115}{360} \times \pi \times 4^2 = 16.1cm^2$ 
8. Surface Area of a Cylinder	**Curved Surface Area =** $\boldsymbol{\pi dh}$ or $\boldsymbol{2\pi rh}$ **Total SA =** $\boldsymbol{2\pi r^2 + \pi dh}$ or $\boldsymbol{2\pi r^2 + 2\pi rh}$	 $Total\ SA = 2\pi(2)^2 + \pi(4)(5) = 28\pi$
9. Surface Area of a Cone	**Curved Surface Area =** $\boldsymbol{\pi rl}$ where $l = slant\ height$ **Total SA =** $\boldsymbol{\pi rl + \pi r^2}$ You may need to use Pythagoras' Theorem to find the slant height	 $Total\ SA = \pi(3)(5) + \pi(3)^2 = 24\pi$

10. Surface Area of a Sphere	$\boldsymbol{SA = 4\pi r^2}$ Look out for hemispheres – halve the SA of a sphere and add on a circle (πr^2)	Find the surface area of a sphere with radius 3cm. $SA = 4\pi(3)^2 = 36\pi cm^2$
Accuracy and bounds		
1. Place Value	The **value** of where a **digit** is within a number.	In 726, the value of the 2 is 20, as it is in the 'tens' column.
2. Place Value Columns	The names of the columns that **determine the value of each digit**. The 'ones' column is also known as the 'units' column.	
3. Rounding	To make a number simpler but keep its value close to what it was. If the **digit to the right** of the rounding digit is **less than 5, round down**. If the **digit to the right** of the rounding digit is **5 or more, round up**.	74 rounded to the nearest ten is 70, because 74 is closer to 70 than 80. 152,879 rounded to the nearest thousand is 153,000.
4. Decimal Place	The **position** of a digit to the **right of a decimal point**.	In the number 0.372, the 7 is in the second decimal place. 0.372 rounded to two decimal places is 0.37, because the 2 tells us to round down. Careful with money - don't write £27.4, instead write £27.40
5. Significant Figure	The significant figures of a number are the digits which **carry meaning** (ie. are significant) to the size of the number. The **first significant figure** of a number **cannot be zero**. In a number with a decimal, trailing zeros are not significant.	In the number 0.00821, the first significant figure is the 8. In the number 2.740, the 0 is not a significant figure. 0.00821 rounded to 2 significant figures is 0.0082. 19357 rounded to 3 significant figures is 19400. We need to include the two zeros at the end to keep the digits in the same place value columns.
6. Truncation	A method of approximating a decimal number by **dropping all decimal places** past a certain point **without rounding**.	3.14159265… can be truncated to 3.1415 (note that if it had been rounded, it would become 3.1416)
7. Error Interval	A **range of values** that a number could have taken before being rounded or truncated. An error interval is written using inequalities, with a **lower bound** and an **upper bound**. Note that the lower bound inequality can be 'equal to', but the upper bound cannot be 'equal to'.	0.6 has been rounded to 1 decimal place. The error interval is: $0.55 \leq x < 0.65$ The lower bound is 0.55 The upper bound is 0.65