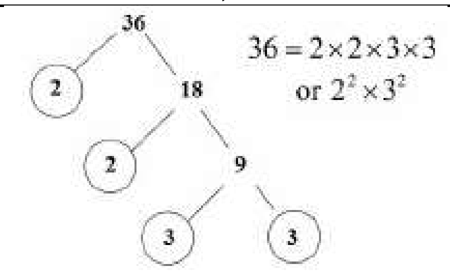
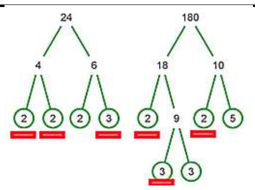
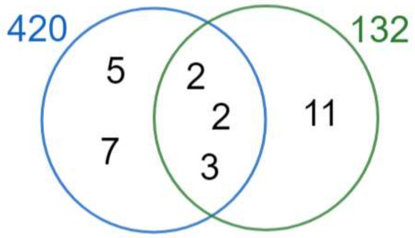
Knowledge Organiser Y8 Maths: Primes, Factors and Multiples

Key Vocabulary	Definition/Tips	Example
1. Multiple	The result of multiplying a number by an integer. The **times tables** of a number.	The first five multiples of 7 are: $7, 14, 21, 28, 35$
2. 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: $1, 18$ $2, 9$ $3, 6$
3. 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.
4. 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.
5. 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: $2, 3, 5, 7, 11, 13, 17, 19, 23, 29$
6. Determine if a number is prime	If the number is prime, you will not be able to find any factors other than 1 and itself.	Attempt to divide your number by 2,3,5,7,11... (the prime numbers)
7. Prime Factor	A factor which is also a prime number.	The prime factors of 18 are: $2, 3$
8. 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'.	
9. Prime factors and HCF	To find the HCF, find any prime factors that are in **common** between the products. The HCF is then found by multiplying those **common** prime factors.	 HCF = $2 \times 2 \times 3 = 12$
10. Prime factors and LCM	To find the LCM, multiply the HCF by all the numbers in the products that have not yet been used.	LCM = $12 \times 2 \times 3 \times 5 = 360$

11. Prime factors and HCF, LCM with Venn diagrams	Find the prime factors of your original numbers and represent in a Venn diagram showing the common prime factors of the originals. HCF is the multiplication of the common prime factors (intersection). LCM is the multiplication of all the factors within the Venn diagram	$420 = 2 \times 2 \times 3 \times 5 \times 7$ $132 = 2 \times 2 \times 3 \times 11$  HCF = 2 x 2 x 3 = 12 LCM = 5 x 7 x 2 x 2 x 3 x 11 = 4620

Knowledge Organiser Y8 Maths: Standard Form and Rounding

Key Vocabulary	Definition/Tips	Example
1. Standard Form	$\boldsymbol{A \times 10^b}$ $where\ \boldsymbol{1 \leq A < 10}, \quad \boldsymbol{b = integer}$	$8400 = 8.4 \times 10^3$ $0.00036 = 3.6 \times 10^{-4}$
2. Multiplying or Dividing with Standard Form	Multiply: **Multiply the numbers** and **add the powers**. Divide: **Divide the numbers** and **subtract the powers**.	$(1.2 \times 10^3) \times (4 \times 10^6) = 8.8 \times 10^9$ $(4.5 \times 10^5) \div (3 \times 10^2) = 1.5 \times 10^3$
3. Adding or Subtracting with Standard Form (using ordinary numbers)	**Convert** into **ordinary** numbers, **calculate,** and then **convert back** into standard form	$2.7 \times 10^4 + 4.6 \times 10^3$ $= 27000 + 460$ $= 31600$ $= 3.16 \times 10^4$
4. Adding or Subtracting with Standard Form	**Convert** each number so the powers of 10 are the same, **calculate,** and then **convert back** into standard form.	$2.7 \times 10^4 + 4.6 \times 10^3$ $27 \times 10^3 + 4.6 \times 10^3$ $= (27 + 4.6) \times 10^3$ $= 31.6 \times 10^3$ $= 3.16 \times 10^4$
5. 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.

6. 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.
7. Significant Figure	The significant figures of a number are the digits which **carry meaning** (i.e. 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.
8. 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)
9. 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

Knowledge Organiser Y8 Maths: Calculating

Key Vocabulary	Definition/Tips	Example
1. Integer	A **whole number** that can be positive, negative or zero.	$-3, 0, 92$
2. Decimal	A number with a **decimal point** in it. Can be positive or negative.	$3.7, 0.94, -24.07$
3. Negative Number	A number that is **less than zero**. Can be decimals.	$-8, -2.5$
4. Addition with negative numbers	To find the **total**, or **sum**, of two or more negative numbers. 'add', 'plus', 'sum'	$3 + (-2) + (-7)$ $3 - 2 - 7$ $= -6$
5. Subtraction with negative numbers	To find the **difference** between two numbers. 'minus', 'take away', 'subtract'	$10 - (-3)$ $10 + 3$ $= 13$
6. Multiplication with negative numbers	Can be thought of as **repeated addition**. 'multiply', 'times', 'product'	$3 \times (-6) = -6 + (-6) + (-6)$ $= -6 - 6 - 6$ $= -18$
7. Squares and cubes of negative numbers	**Square** number is the number multiplied by itself. **Cubed** number is the number multiplied by itself 3 times.	$(-5) \times (-5) = (-5)^2$ $= 25$ $(-5) \times (-5) \times (-5) = (-5)^3$ $= -125$
8. Division with negative numbers	Splitting into equal parts or groups. The process of calculating the **number of times one number is contained within another one**. 'divide', 'share'	$20 \div (-4) = -5$ $\frac{20}{(-4)} = -5$
9. BIDMAS	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.	$6 + 3 \times 5 = 21, not\ 45$ $5^2 = 25$, where the 2 is the index/power. $12 \div 4 \div 2 = 1.5, not\ 6$
1o. 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**. This is called the 'multiplicative inverse'.	The reciprocal of 5 is $\frac{1}{5}$ The reciprocal of $\frac{2}{3}$ is $\frac{3}{2}$, because $\frac{2}{3} \times \frac{3}{2} = 1$

Knowledge Organiser Y8 Maths: Definitions and Simplifying

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. Equation	An ***equation*** says that two things are equal. It will have an equals sign "="	4y + 2 = 18
4. Identity	An equation that is true no matter what values are chosen	2 x + 3 x = 5 x
5. Expression	An **expression** is a set of terms combined using operations +, –, x or ÷	4x–3 or 2x–xy+17
6. Formula	A **formula** is a fact or rule that uses mathematical symbols	$a^2 + b^2 = c^2$
7. 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. $7b^2 - 5 = 7 \times 2^2 - 5 = 23$
8. Simplify	To reduce (an equation, fraction, etc) to a simpler form by cancellation of common factors, regrouping of terms in the same variable, etc.	Simplify 3x + 2y – 2x + 6 Solution: 3x + 2y – 2x + 6 = 3x– 2x + 2y + 6 = (3 – 2)x + 2y + 6 = x + 2y + 6
9. Factorise	To ***factorise*** an expression, we need to take out any factors that are common to each term.	Factorise 10x + 25 Find the HCF of 10x and 25. The biggest number both terms can be divided by is 5, so the HCF is 5. This is what goes outside the bracket: 5(? + ?) To identify the terms that need to go inside the bracket, divide each term by the highest common factor. 10x ÷ 5 = 2x 25 ÷ 5 = 5 So, we have $5(2x + 5)$

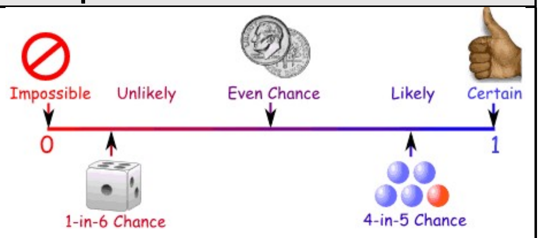
10. Changing the Subject	**Use inverse operations** on both sides of the formula (balancing method) until you find the expression for the letter you want to make the subject.	Make x the subject of $y = \frac{2x-1}{z}$ Multiply both sides by z $yz = 2x - 1$ Add 1 to both sides $yz + 1 = 2x$ Divide by 2 on both sides $\frac{yz+1}{2} = x$ We now have x as the subject.
11. Create and expression or formula	**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

Knowledge Organiser Y8 Maths: Indices

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.	$\sqrt{36} = 6$ 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 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.	$\sqrt[3]{125} = 5$ 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: $3^1 = 3$, $3^2 = 9$, $3^3 = 27$ 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. $$\boldsymbol{a^{-m} = \frac{1}{a^m}}$$	$3^{-2} = \frac{1}{3^2} = \frac{1}{9}$

Knowledge Organiser Y8 Maths: Probability

Key vocabulary	Definition/Tips	Example
1. Probability	The **likelihood/chance** of something happening. Is expressed as a number **between 0 (impossible) and 1 (certain)**. Can be expressed as a fraction, decimal, percentage or in words (likely, unlikely, even chance etc.)	
2. Probability Notation	**P(A)** refers to the **probability that event A will occur**.	P(Red Queen) refers to the probability of picking a Red Queen from a pack of cards.
3. Theoretical Probability	$\frac{\textit{Number of Favourable Outcomes}}{\textit{Total Number of Possible Outcomes}}$	Probability of rolling a 4 on a fair 6-sided die = $\frac{1}{6}$.
4. Relative Frequency	$\frac{\textit{Number of Successful Trials}}{\textit{Total Number of Trials}}$	A coin is flipped 50 times and lands on Tails 29 times. The relative frequency of getting Tails = $\frac{29}{50}$.
5. Expected Outcomes	To find the number of expected outcomes, **multiply** the **probability** by the **number of trials**.	The probability that a football team wins is 0.2 How many games would you expect them to win out of 40? $0.2 \times 40 = 8\ games$
6. Exhaustive	Outcomes are **exhaustive** if they **cover the entire range of possible outcomes**. The **probabilities** of an **exhaustive** set of outcomes **adds up to 1**.	When rolling a six-sided die, the outcomes 1, 2, 3, 4, 5 and 6 are exhaustive, because they cover all the possible outcomes.

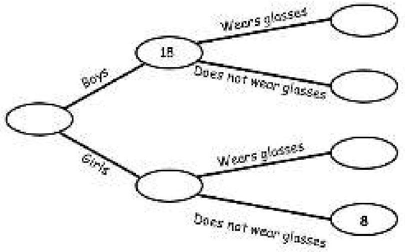
<table>
<tr><td>7. Mutually Exclusive</td><td>Events are mutually exclusive if they cannot happen at the same time.

The probabilities of an exhaustive set of mutually exclusive events adds up to 1.</td><td>Example of mutually exclusive events:

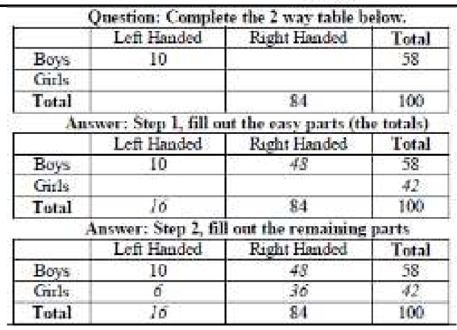
- Turning left and right

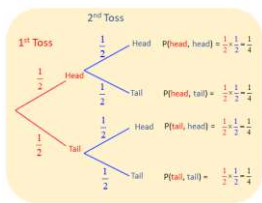
Examples of non-mutually exclusive events:

- King and Hearts from a deck of cards, because you can pick the King of Hearts</td></tr>
<tr><td>8. Frequency Tree</td><td>A diagram showing how information is categorised into various categories.

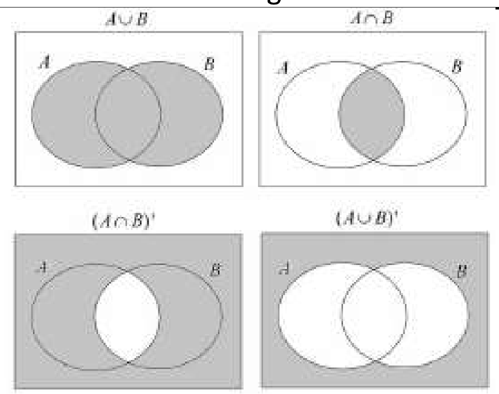
The numbers at the ends of branches tells us how often something happened (frequency).</td><td>
</td></tr>
<tr><td>9. Two Way Tables</td><td>A table that organises data around two categories.

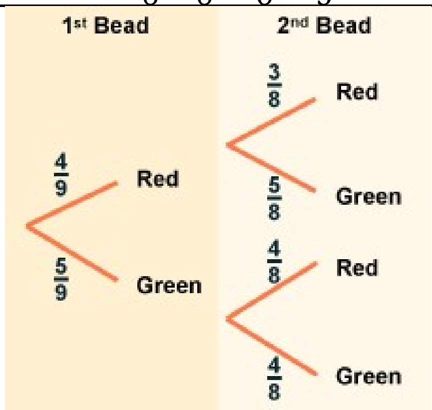
Fill out the information step by step using the information given.

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>10. Tree Diagrams</td><td>Tree diagrams show all the possible outcomes of an event and calculate their probabilities.

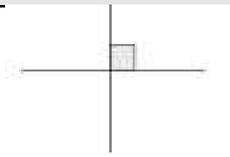
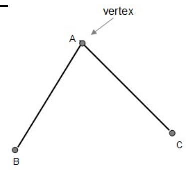
All branches must add to 1 when adding downwards.</td><td>Tree diagram to show the probabilities when a coin is tossed twice.

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

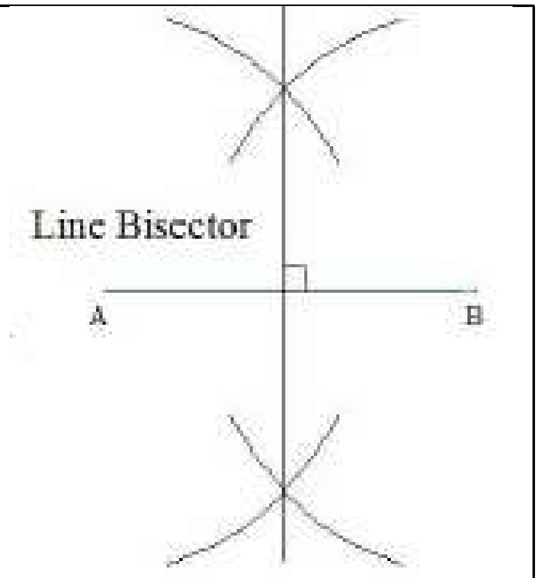
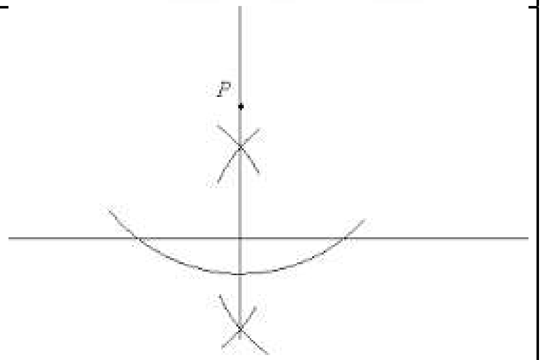
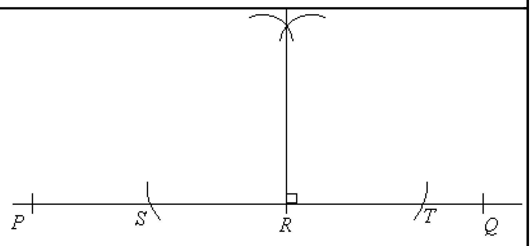
Knowledge Organiser Y8 Maths: Events and Venn Diagrams

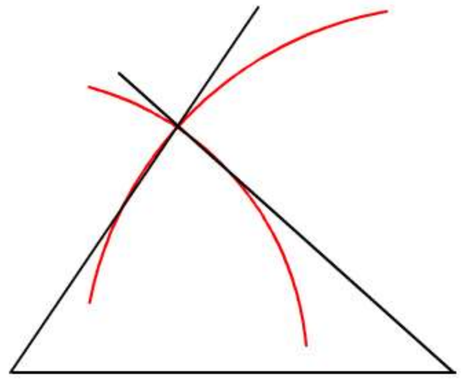
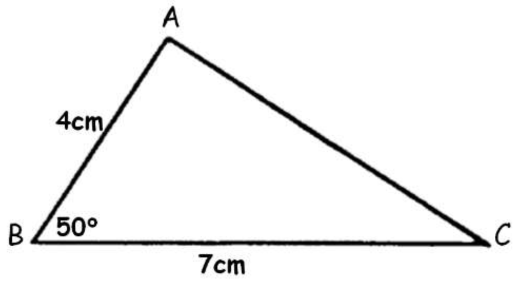
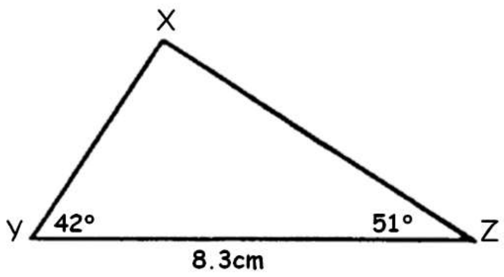
Key vocabulary	Definition/Tips	Example
1. Independent Events	The outcome of a **previous event does not influence/affect the outcome of a second event**.	An example of independent events could be <u>replacing</u> a counter in a bag after picking it.
2. Dependent Events	The outcome of a **previous event does influence/affect the outcome of a second event**.	An example of dependent events could be not replacing a counter in a bag after picking it. '<u>Without replacement</u>'
3. Probability Notation	**P(A)** refers to the **probability that event A will occur**. **P(A')** refers to the **probability that event A will <u>not</u> occur**. **P(A ∪ B)** refers to the **probability that event A <u>or</u> B <u>or</u> both will occur.** **P(A ∩ B)** refers to the **probability that <u>both</u> events A and B will occur.**	P(Red Queen) refers to the probability of picking a Red Queen from a pack of cards. P(Blue') refers to the probability that you do not pick Blue. P(Blonde ∪ Right Handed) refers to the probability that you pick someone who is Blonde or Right Handed or both. P(Blonde ∩ Right Handed) refers to the probability that you pick someone who is both Blonde and Right Handed.
4. Venn Diagrams	A Venn Diagram shows the **relationship between a group of different things** and how they overlap. You may be asked to shade Venn Diagrams as shown below to the right.	
5. Venn Diagram Notation	∈ means '**element of a set**' { } means the collection of values in the set. ξ means the '**universal set**' (all the values to consider in the question) **A ∪ B means Union** **A ∩ B means Intersection**	Set A is the even numbers less than 10. A = {2, 4, 6, 8} Set B is the prime numbers less than 10. B = {2, 3, 5, 7} A ∪ B = {2, 3, 4, 5, 6, 7, 8} A ∩ B = {2}

6. AND rule for Probability	When two events, A and B, are **independent**: $$\boldsymbol{P(A\ and\ B) = P(A) \times P(B)}$$	What is the probability of rolling a 4 and flipping a Tails? $$P(4\ and\ Tails) = P(4) \times P(Tails)$$ $$= \frac{1}{6} \times \frac{1}{2} = \frac{1}{12}$$
7. OR rule for Probability	When two events, A and B, are **mutually exclusive**: $$\boldsymbol{P(A\ or\ B) = P(A) + P(B)}$$	What is the probability of rolling a 2 or rolling a 5? $$P(2\ or\ 5) = P(2) + P(5)$$ $$= \frac{1}{6} + \frac{1}{6} = \frac{2}{6} = \frac{1}{3}$$
8. Conditional Probability	The probability of an event A happening, **given that** event B has already happened. With conditional probability, check if the numbers on the second branches of a tree diagram changes. For example, if you have 4 red beads in a bag of 9 beads and pick a red bead on the first pick, then there will be 3 red beads left out of 8 beads on the second pick.	

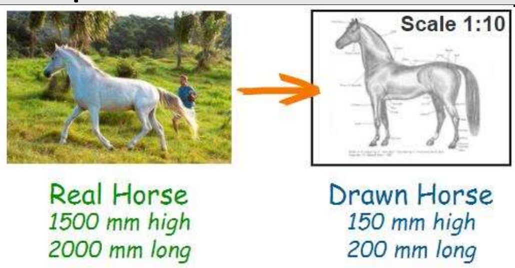
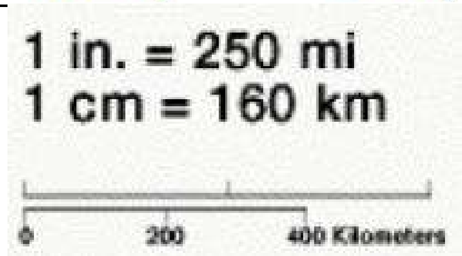
Knowledge Organiser Y8 Maths: Constructions

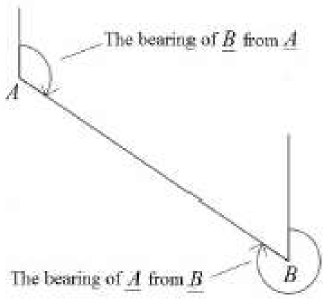
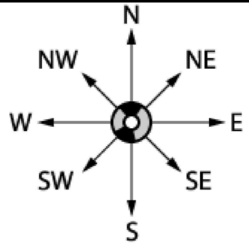
Key vocabulary	Definition/Tips	Example
1. Perpendicular	Perpendicular lines are at right angles. There is a 90° angle between them.	
2. Vertex	A corner or a point where two lines meet.	
3. Angle Bisector	**Angle Bisector: Cuts the angle in half.** 1. Place the sharp end of a pair of compasses on the vertex. 2. Draw an arc, marking a point on each line. 3. Without changing the compass put the compass on each point and mark a centre point where two arcs cross over. 4. Use a ruler to draw a line through the vertex and centre.	

4. Perpendicular Bisector	**Perpendicular Bisector: Cuts a line in half and at right angles**. 1. Put the sharp point of a pair of compasses on A. 2. Open the compass over halfway on the line. 3. Draw an arc above and below the line. 4. Without changing the compass, repeat from point B. 5. Draw a straight line through the two intersecting arcs.	
5. Perpendicular from an External Point	The **perpendicular distance** from a point to a line is the **shortest distance** to that line. 1. Put the sharp point of a pair of compasses on the point. 2. Draw an arc that crosses the line twice. 3. Place the sharp point of the compass on one of these points, open over halfway and draw an arc above and below the line. 4. Repeat from the other point on the line. 5. Draw a straight line through the two intersecting arcs.	
6. Perpendicular from a Point on a Line	Given line PQ and point R on the line: 1. Put the sharp point of a pair of compasses on point R. 2. Draw two arcs either side of the point of equal width (giving points S and T) 3. Place the compass on point S, open over halfway and draw an arc above the line. 4. Repeat from the other arc on the line (point T). 5. Draw a straight line from the intersecting arcs to the original point on the line.	

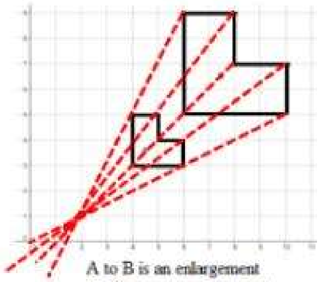
7. Constructing Triangles (Side, Side, Side)	1. Draw the base of the triangle using a ruler. 2. Open a pair of compasses to the width of one side of the triangle. 3. Place the point on one end of the line and draw an arc. 4. Repeat for the other side of the triangle at the other end of the line. 5. Using a ruler, draw lines connecting the ends of the base of the triangle to the point where the arcs intersect.	
8. Constructing Triangles (Side, Angle, Side)	1. Draw the base of the triangle using a ruler. 2. Measure the angle required using a protractor and mark it. 3. Draw a line of the exact length required in line with the angle mark drawn. 4. Connect the end of this line to the end of the base of the triangle.	
9. Constructing Triangles (Angle, Side, Angle)	1. Draw the base of the triangle using a ruler. 2. Measure one of the angles required using a protractor and mark this angle. 3. Draw a straight line through this point from the same point on the base of the triangle. 4. Repeat this for the other angle on the other end of the base of the triangle.	

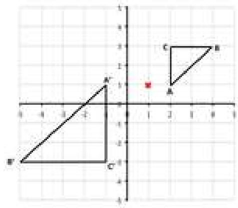
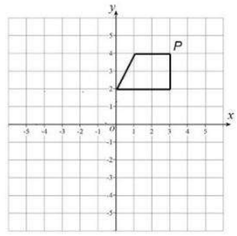
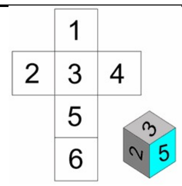
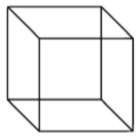
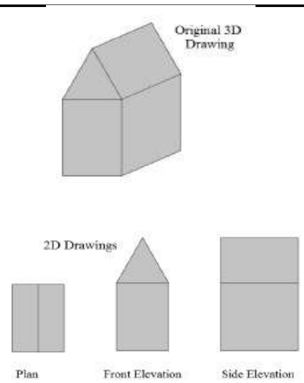
Knowledge Organiser Y8 Maths: Bearings and Scale

Key vocabulary	Definition/Tips	Example
1. Scale	The **ratio** of the **length** in a **model** to the length of the **real** thing.	
2. Scale (Map)	The **ratio** of a **distance on the map** to the actual **distance in real life**.	

3. Bearings	1. Measure from **North** (draw a North line) 2. Measure **clockwise** 3. Your answer must have **3 digits** (e.g., 047°) Look out for where the bearing is measured from.	
4. Compass Directions	You can use an acronym such as **'Never Eat Shredded Wheat'** to remember the order of the compass directions in a clockwise direction. Bearings: $NE = 045°, W = 270°\ etc.$	

Knowledge Organiser Y8 Maths: Enlargements and Plans

Key vocabulary	Definition/Tips	Example
1. Enlargement	The shape will get **bigger or smaller**. Multiply each side by the **scale factor**.	Scale Factor = 3 means '3 times larger = multiply by 3' Scale Factor = ½ means 'half the size = divide by 2'
2. Finding the Centre of Enlargement	Draw **straight lines** through **corresponding corners** of the two shapes. The centre of enlargement is the point **where all the lines cross over**. Be careful with negative enlargements as the corresponding corners will be the other way around.	 A to B is an enlargement SF 2 about the point (2,1)
3. Describing Transformations	Give the following information when describing each transformation: Look at the number of marks in the question for a hint of how many pieces of information are needed. If you are asked to describe a 'transformation', you need to say the **name of the type of transformation** as well as the other details.	**- Translation, Vector** **- Rotation, Direction, Angle, Centre** **- Reflection, Equation of mirror line** **- Enlargement, Scale factor, Centre of enlargement**

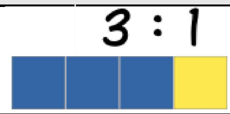
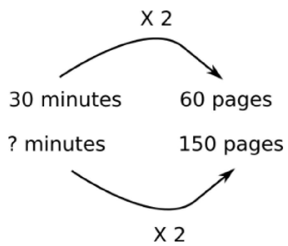
4. Negative Scale Factor Enlargements	Negative enlargements will **look like they have been rotated**. $SF = -2$ will be rotated, and also twice as big.	Enlarge ABC by scale factor -2, centre (1,1) 
5. Invariance	A point, line or shape is invariant if it **does not change/move** when a transformation is performed. An invariant point 'does not vary'.	If shape P is reflected in the $y - axis$, then exactly one vertex is invariant. 
6. Net	A pattern that you can **cut and fold** to make a **model** of a **3D shape**.	
7. Properties of Solids	**Faces = flat surfaces** **Edges = sides/lengths** **Vertices = corners**	A cube has 6 faces, 12 edges and 8 vertices. 
8. Plans and Elevations	This takes 3D drawings and produces 2D drawings. **Plan View**: from **above** **Side Elevation**: from the **side** **Front Elevation**: from the **front**	

Knowledge Organiser Y8 Maths: Fractions, Decimals and Percentages

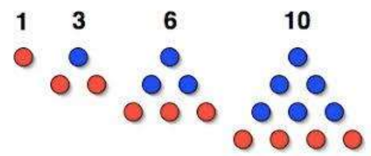
Key Vocabulary	Definition/Tips	Example
1. Fraction	A mathematical expression representing the **division** of one integer by another. Fractions are written as **two numbers separated by a horizontal line**.	$\frac{2}{7}$ is a 'proper' fraction. an 'improper' or 'top-heavy' fraction. $\frac{9}{4}$
2. Numerator	The **top** number of a fraction.	In the fraction $\frac{3}{5}$, 3 is the numerator.
3. Denominator	The **bottom** number of a fraction.	In the fraction $\frac{3}{5}$, 5 is the denominator.
4. 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.
5. Reciprocal	The reciprocal of a number is **1 divided by the number**. The reciprocal of x is $\frac{1}{x}$	The reciprocal of 5 is $\frac{1}{5}$ The reciprocal of $\frac{2}{3}$ is $\frac{3}{2}$,
6. 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.
7. Simplifying Fractions	**Divide the numerator and denominator by the highest common factor**.	$\frac{20}{45} = \frac{4}{9}$
8. Equivalent Fractions	Fractions which represent the **same value**.	$\frac{2}{5} = \frac{4}{10} = \frac{20}{50} = \frac{60}{150}$ *etc.*
9. 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: $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{5}{6}$
10. Fraction of an Amount	**Divide** by the **bottom**, **times** by the **top**	Find $\frac{2}{5}$ of £60 $60 \div 5 = 12,\ 12 \times 2 = 24$
11. 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 $\frac{2}{3} = \frac{10}{15}$ $\frac{4}{5} = \frac{12}{15}$ $\frac{10}{15} + \frac{12}{15} = \frac{22}{15} = 1\frac{7}{15}$
12. Multiplying Fractions	**Multiply** the **numerators** together and **multiply** the **denominators** together.	$\frac{3}{8} \times \frac{2}{9} = \frac{6}{72} = \frac{1}{12}$
13. 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 Multiply by the reciprocal of the second fraction.	$\frac{3}{4} \div \frac{5}{6} = \frac{3}{4} \times \frac{6}{5} = \frac{18}{20} = \frac{9}{10}$

14. Percentage	**Number of parts per 100.**	31% means $\frac{31}{100}$
15. Finding 10%	To find **10%, divide by 10**	10% of £36 = 36÷10=£3.60
16. Finding 1%	To find **1%, divide by 100**	1% of £8 = 8÷100 = £0.08
17. Percentage Change	$\frac{\boldsymbol{Difference}}{\boldsymbol{Original}} \times \mathbf{100}\%$	A games console is bought for £200 and sold for £250. % change = $\frac{50}{200} \times 100 = 25\%$
18. Fractions to Decimals	**Divide the numerator by the denominator** with the bus stop method.	$\frac{3}{8} = 3 \div 8 = 0.375$
19. Decimals to Fractions	**Write as a fraction** over 10, 100 or 1000 and simplify.	$0.36 = \frac{36}{100} = \frac{9}{25}$
20. Percentages to Decimals	**Divide by 100**	$8\% = 8 \div 100 = 0.08$
21. Decimals to Percentages	**Multiply by 100**	$0.4 = 0.4 \times 100\% = 40\%$
22. 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**.	$\frac{3}{25} = \frac{12}{100} = 12\%$ $\frac{9}{17} \times 100 = 52.9\%$
23. Percentages to Fractions	Percentage is just a fraction out of 100. **Write the percentage over 100** and simplify.	$14\% = \frac{14}{100} = \frac{7}{50}$
24. 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
25. 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
26. Reverse Percentage	Find the **correct percentage given in the question**, then work backwards to **find 100%**	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
27. 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 = $3 \times £100 = £300$

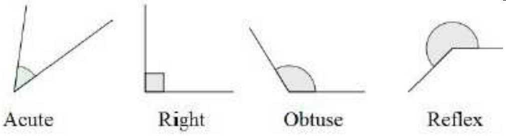
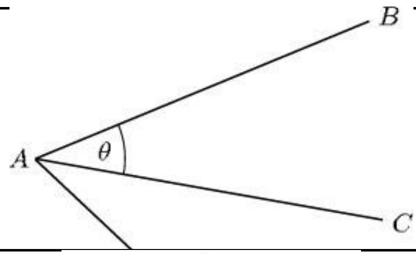
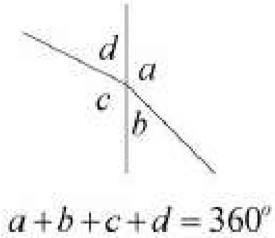
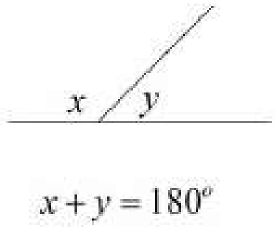
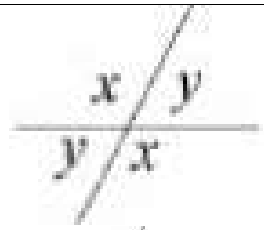
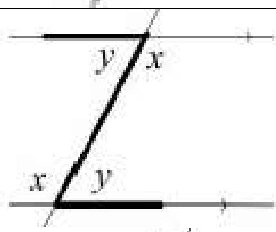
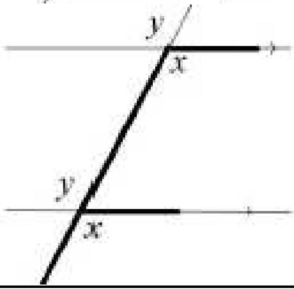
Knowledge Organiser Y8 Maths: Proportional Reasoning

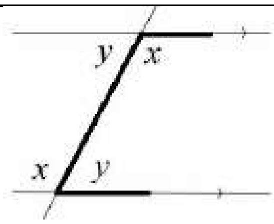
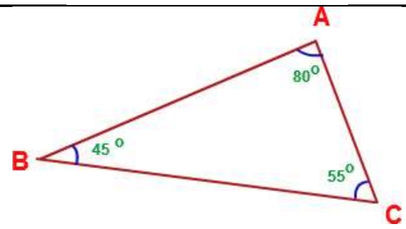
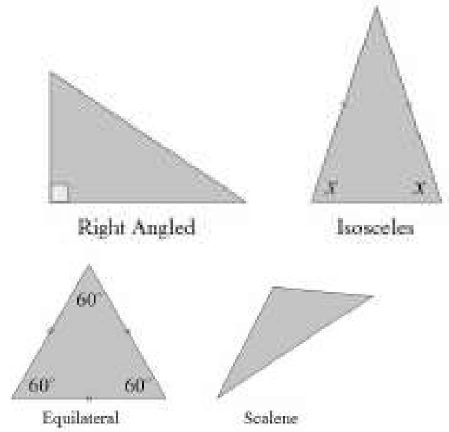
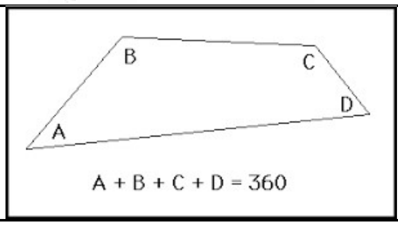
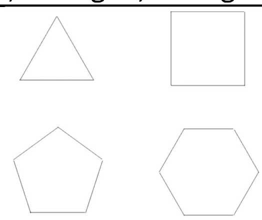
Key Vocabulary	Definition/Tips	Example
1. Ratio	Ratio compares the size of **one part** to **another part**.	
2. Proportion	Proportion compares the size of **one part** to the size of the **whole**. Usually written as a fraction.	In a class with 13 boys and 9 girls, the proportion of boys is $\frac{13}{22}$ 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. 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 is shared in the ratio 3:2:5 between Ann, Bob, and Cat. If Bob had £16, find out the total amount of money shared. £16 = 2 parts, So, £8 = 1 part 3 + 2 + 5 = 10 parts, 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 13 cakes for £2.05 → 15.8p each Pack of 13 cakes is best value.

Knowledge Organiser Y8 Maths: Exploring Patterns

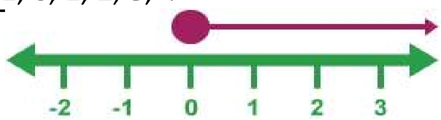
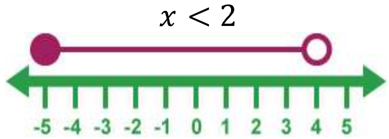
Key Vocabulary	Definition/Tips	Example
1. Linear Sequence	A number pattern with a **common difference**.	2, 5, 8, 11… is a linear sequence
2. Term	**Each value** in a sequence is called a term.	In the sequence 2, 5, 8, 11…, 8 is the third term of the sequence.
3. Term-to-term rule	A rule which allows 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 to **calculate the term** that is in the **nth position** of a sequence. **n** is 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… 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: $1,1,2,3,5,8,13,21,34\ldots$ An example is: $4,7,11,18,29\ldots$
7. Triangular numbers	The sequence which comes from a pattern of dots that form a triangle. $1,3,6,10,15,21\ldots$	
8. Geometric Sequence	A sequence of numbers where each term is found by **multiplying the previous one** by a number called the **common ratio, r**.	An example of a geometric sequence is: $2,10,50,250\ldots$ The common ratio is 5 Another example of a geometric sequence is: $81,-27,9,-3,1\ldots$ The common ratio is $-\frac{1}{3}$

Knowledge Organiser Y8 Maths: Investigating Angles

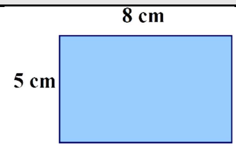
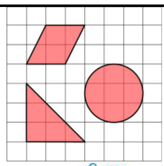
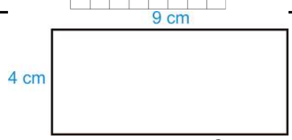
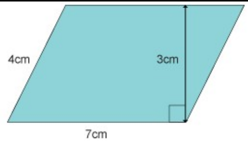
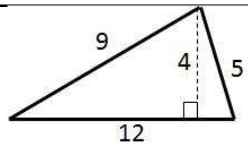
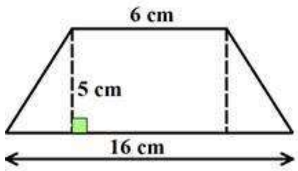
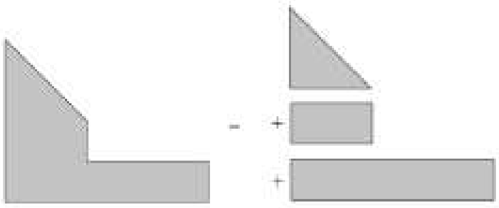
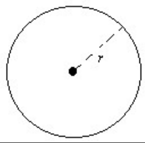
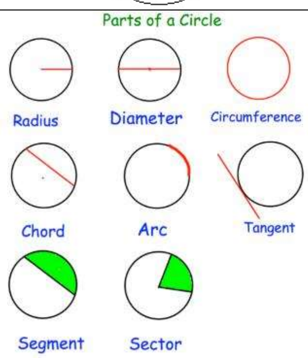
Key Vocabulary	Definition/Tips	Example
1. Types of Angles	**Acute angles** are less than 90°. **Right angles** are exactly 90°. **Obtuse angles** are greater than 90° but less than 180°. **Reflex angles** are greater than 180° but less than 360°.	
2. Angle Notation	Can use **one lower-case** letters, e.g., θ or x Can use **three upper-case** letters, e.g., BAC	
3. Angles at a Point	**Angles around a point add up to 360°**.	
4. Angles on a Straight Line	**Angles around a point on a straight line add up to 180°**.	
5. Opposite Angles	**Vertically opposite angles are equal**.	
6. Alternate Angles	**Alternate angles are equal**. They look like Z angles, but never say this in the exam.	
7.Corresponding Angles	**Corresponding angles are equal**. They look like F angles, but never say this in the exam.	

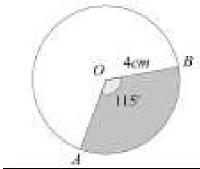
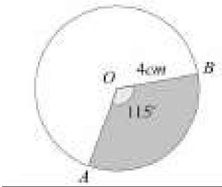
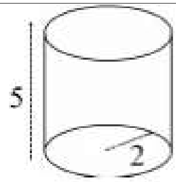
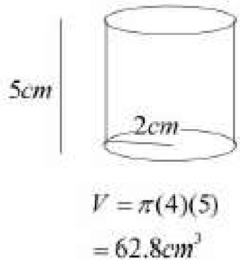
8. Co-Interior Angles	**Co-Interior angles add up to 180°**. They look like C angles, but never say this in the exam.	
9. Angles in a Triangle	**Angles in a triangle add up to 180°.**	
10. Types of Triangles	**Right Angle** Triangles have a **90°** angle in. **Isosceles** Triangles have **2 equal sides** and **2 equal base angles**. **Equilateral** Triangles have **3 equal sides** and **3 equal angles (60°)**. **Scalene** Triangles have **different sides** and **different angles**.	
11. Angles in a Quadrilateral	**Angles in a quadrilateral add up to 360°.**	
12. Polygon	A **2D** shape with **only straight edges**.	Rectangle, Hexagon, Decagon, Kite etc.
13. Regular	A shape is regular if all the **sides** and all the **angles** are **equal**.	
14. Sum of Interior Angles	$\boldsymbol{(n-2)\times 180}$ where n is the number of sides.	Sum of Interior Angles in a Decagon = $(10-2)\times 180 = 1440°$
15. Size of Interior Angle in a Regular Polygon	$\boldsymbol{\frac{(n-2)\times 180}{n}}$ You can also use the formula: $\boldsymbol{180 - Size\ of\ Exterior\ Angle}$	Size of Interior Angle in a Regular Pentagon = $\frac{(5-2)\times 180}{5} = 108°$
16. Size of Exterior Angle in a Regular Polygon	$\boldsymbol{\frac{360}{n}}$ You can also use the formula: $\boldsymbol{180 - Size\ of\ Interior\ Angle}$	Size of Exterior Angle in a Regular Octagon = $\frac{360}{8} = 45°$

Knowledge Organiser Y8 Maths: Equations and Inequalities

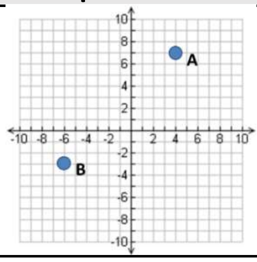
Key Vocabulary	Definition/Tips	Example
1. Inverse	**Opposite**	The inverse of + is -
2. Solve (unknown on one side)	**Use inverse operations** on both sides of the equation (balancing method) until you find the value for the letter.	Solve $2x - 3 = 7$ Add 3 on both sides $2x = 10$ Divide by 2 on both sides $x = 5$
3. Solve (unknown on both sides)	**Use inverse operations** on both sides of the equation (balancing method) until you find the value for the letter. Decide which side you want to collect the unknowns and collect the constants (numbers) on the other side.	Solve $7x + 3 = 2x + 13$ Collect x onto one side Subtract $2x$ from both sides $5x + 3 = 13$ Now collect all constants on the other side Subtract 3 from both sides $5x = 10$ Divide both sides by 5 $x = 2$
4. 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. $7b^2 - 5 = 7 \times 2^2 - 5 = 23$
5. Inequality symbols	$\boldsymbol{x > 2}$ **, x is greater than 2** $\boldsymbol{x < 3}$ **, x is less than 3** $\boldsymbol{x \geq 1}$ **, x is greater than or equal to 1** $\boldsymbol{x \leq 6}$ **, x is less than or equal to 6**	State the integers that satisfy $-2 < x \leq 4.$ -1, 0, 1, 2, 3, 4
6. Inequalities on a Number Line	Inequalities can be shown on a number line. **Open circles** are used for numbers that are **less than or greater than** $(< or >)$ **Closed circles** are used for numbers that are **less than or equal or greater than or equal** $(\leq or \geq)$	 $x \geq 0$  $x < 2$  $-5 \leq x < 4$

Knowledge Organiser Y8 Maths: Calculating Space

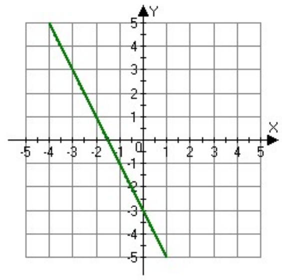
Key Vocabulary	Definition/Tips	Example
1. Perimeter	The **total distance** around the **outside** of a shape.	 $P = 8 + 5 + 8 + 5 = 26cm$
2. Area	The amount of **space inside** a shape.	
3. Area of a Rectangle	**Length x Width**	 $A = 36cm^2$
4. Area of a Parallelogram	**Base x Perpendicular Height** Not the slant height.	 $A = 21cm^2$
5. Area of a Triangle	**Base x Height ÷ 2**	 $A = 24cm^2$
6. Area of a Trapezium	$\frac{(\boldsymbol{a}+\boldsymbol{b})}{\mathbf{2}} \times \boldsymbol{h}$ "Half the sum of the parallel side, times the height between them."	 $A = 55cm^2$
7. Compound Shape	A shape made up of a **combination of other known shapes** put together.	
8. Circle	A circle is the locus of all points equidistant from a central point.	
9. Parts of a Circle	**Radius** **Diameter** **Circumference** **Chord** **Tangent** **Arc** **Sector** **Segment**	

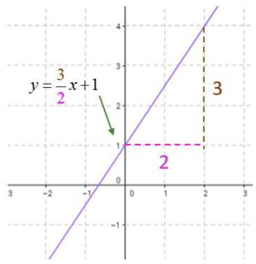
10. π ('pi')	Pi is the circumference of a circle divided by the diameter. $\boldsymbol{\pi \approx 3.1415926}$	
11. Circumference of a Circle	$\boldsymbol{C = \pi d}$ which means 'pi x diameter'	If the radius was 5cm, then: $C = \pi \times 10 = 31.4cm$
12.Calculate the radius if given the circumference	$\boldsymbol{d = C/\pi}$ which means 'circumference divided by pi'	If the circumference was 50cm, then: d = 50 / π = 15.9 cm
13. Area of a Circle	$\boldsymbol{A = \pi r^2}$ which means 'pi x radius squared'.	If the radius was 5cm, then: $A = \pi \times 5^2 = 78.5cm^2$
14.Calculate the radius if given the area.	$\boldsymbol{r = \sqrt{\frac{A}{\pi}}}$	If the Area was $50cm^2$, then: $\boldsymbol{r = \sqrt{\frac{50}{\pi}}}$ = 3.99 cm
15. 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 = $\frac{115}{360} \times \pi \times 8 = 8.03cm$ 
16. 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 = $\frac{115}{360} \times \pi \times 4^2 = 16.1cm^2$ 
17. 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 $\boldsymbol{2\pi r^2 + 2\pi rh}$	 $Total\ SA = 2\pi(2)^2 + \pi(4)(5) = 28\pi$
18. Volume of a Cylinder	$\boldsymbol{V = \pi r^2 h}$	

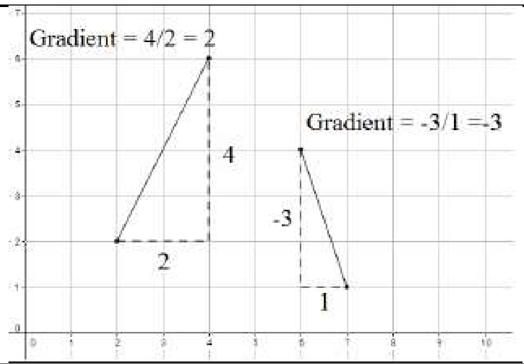
Knowledge Organiser Y8 Maths: Algebraic Proficiency

<table>
<tr><th>Key Vocabulary</th><th>Definition/Tips</th><th>Example</th></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>

A: (4,7)
B: (-6,-3)</td></tr>
<tr><td>2. Linear Graph</td><td>The general equation of a linear graph is
$\boldsymbol{y = mx + c}$
where $\boldsymbol{m}$ is the gradient and c is the y-intercept.

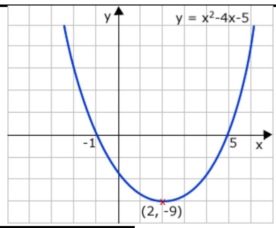
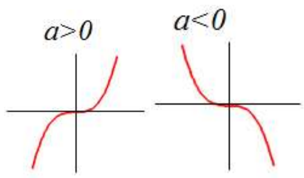
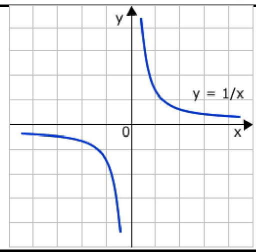
The equation of a linear graph can contain an x-term, a y-term, and a number.</td><td>
Examples:
$x = y$
$y = 2x - 7$</td></tr>
<tr><td>3. Plotting Linear Graphs</td><td>1: Table of Values
Construct a table of values to calculate coordinates.

2: Gradient-Intercept Method
1. Plots the y-intercept
2. Using the gradient, plot a second point.
3. Draw a line through the two points plotted.</td><td><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>

</td></tr>
<tr><td>4. Gradient</td><td>The gradient of a line is how steep it is.
Gradient =
$\boldsymbol{\frac{Change\ in\ y}{Change\ in\ x} = \frac{Rise}{Run}}$

The gradient can be positive (sloping upwards) or negative (sloping downwards)</td><td>
</td></tr>
<tr><td>5. Finding the Equation of a Line <u>given a point and a gradient</u></td><td>Substitute in the gradient (m) and point (x,y) in to the equation $\boldsymbol{y = mx + c}$ and solve for c.</td><td>Find the equation of the line with gradient 4 passing through (2,7).

$y = mx + c$
$7 = 4 \times 2 + c$
$c = -1$

$y = 4x - 1$</td></tr>
</table>

6. 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) $m = \frac{11-3}{6-2} = 2$ $y = mx + c$ $11 = 2 \times 6 + c$ $c = -1$ $y = 2x - 1$
7. 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? Rearrange the 2nd equation to the form $y = mx + c$ $2y - 6x + 10 = 0 \rightarrow y = 3x - 5$ Since the two gradients are equal, the lines are parallel.
8. 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.	Find the equation of the line perpendicular to $y = 3x + 2$ which passes through (6,5) As they are perpendicular, gradient of the new line will be $-\frac{1}{3}$ $y = mx + c$ $5 = -\frac{1}{3} \times 6 + c$ $c = 7$ $y = -\frac{1}{3}x + 7$
9. 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**.	
10. Cubic Graph	The equation is of the form $\boldsymbol{y = ax^3 + k}$, where $\boldsymbol{k}$ **is any number**. If $\boldsymbol{a > 0}$, the curve is **increasing**. If $\boldsymbol{a < 0}$, the curve is **decreasing**.	
11. 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**.	

Knowledge Organiser Y8 Maths: Presentation Of Data

<table>
<tr><th>Key Vocabulary</th><th>Definition/Tips</th><th>Example</th></tr>
<tr><td>1. Types of Data</td><td>Qualitative Data – non-numerical data
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.

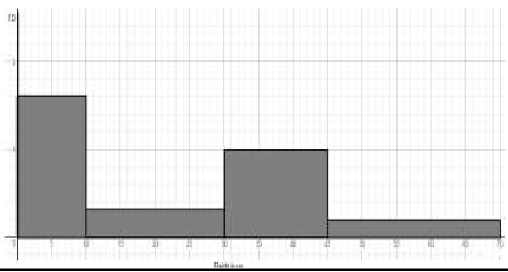
Continuous Data – weight, voltage etc.

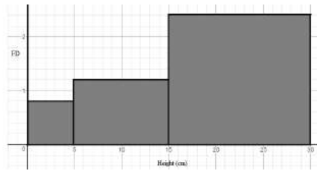
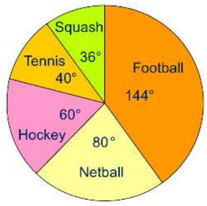
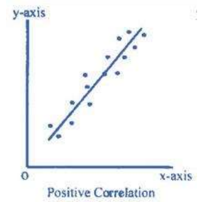
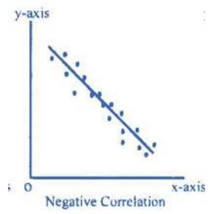
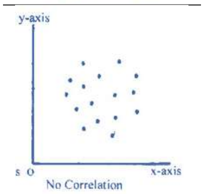
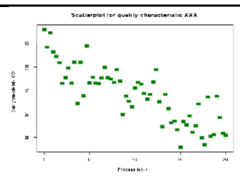
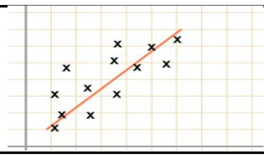
Discrete Data – number of children, shoe size etc.</td></tr>
<tr><td>2. Grouped Data</td><td>Data that has been bundled in to categories.</td><td><table><tr><th>Foot length, l, (cm)</th><th>Number of children</th></tr><tr><td>$10 \leqslant l < 12$</td><td>5</td></tr><tr><td>$12 \leqslant l < 17$</td><td>53</td></tr></table></td></tr>
<tr><td>3. 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>4. Grouped Frequency Table</td><td>A way of organising a large set of data into more manageable groups.

The groups that we organise the numerical data into are called class intervals. They can have the same or different class widths and must not overlap.</td><td><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></tr>
<tr><td>5. 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.

$$\textit{Frequency Density} = \frac{\textit{Frequency}}{\textit{Class Width}}$$</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>
</table>

6. Interpreting Histograms	The **area** of the bar is proportional to the **frequency** of that class interval. $$\boldsymbol{Frequency = Freq\ Density \times Class\ Width}$$	A histogram shows info. about the heights 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
7. Pie Chart	Used for showing **how data breaks down into** its constituent **parts**. When drawing a pie chart, **divide 360° by the total frequency**. This tells you how many degrees to use for the frequency of each category.	 If there are 40 people in a survey, then each person will be worth 360÷40=9° of the pie chart.
8. 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.
9. Types Of Correlation	Positive - As one value **increases** the other value **increases**. Negative - As one value **increases** the other value **decreases**. None - There is **no linear relationship** between the two.	  
10. 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.	
11. Line of Best Fit	A **straight line** that **best represents the data** on a scatter graph.	

Knowledge Organiser Y8 Maths: Summarising Data

<table>
<tr><th>Key Vocabulary</th><th>Definition/Tips</th><th>Example</th></tr>
<tr><td>1. 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>2. 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>3. 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 halfway between them.</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>4. 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
<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>
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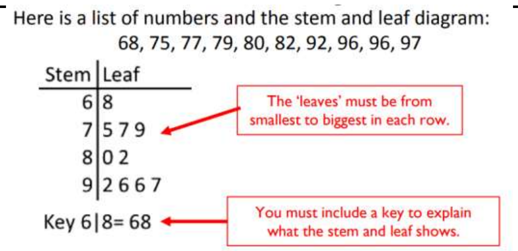
<tr><td>Total</td><td>24</td><td>Ignore!</td><td>450</td></tr>
</table>
Median is in the class 10 < h ≤ 30</td></tr>
<tr><td>5. Mode / Modal Value</td><td>Most frequent/common.
Can have more than one mode or no mode.</td><td>Find the mode: 4, 5, 2, 3, 6, 4, 7, 8, 4
Mode = 4</td></tr>
<tr><td>6. Range</td><td>Highest value subtract the Smallest value
Range is a ‘measure of spread’.</td><td>Find the range: 3, 31, 26, 102, 37, 97.
Range = 102-3 = 99</td></tr>
<tr><td>7. Stem And Leaf</td><td>Stem and leaf diagrams are used to display sets of discrete data.</td><td>
</td></tr>
</table>