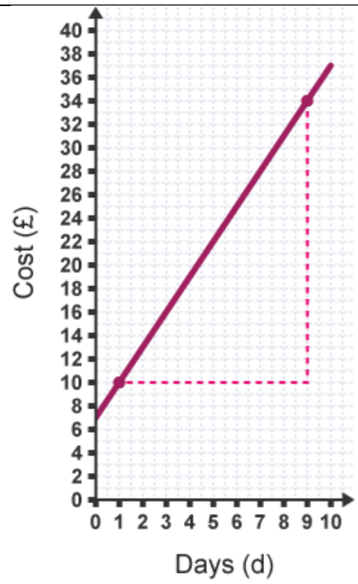
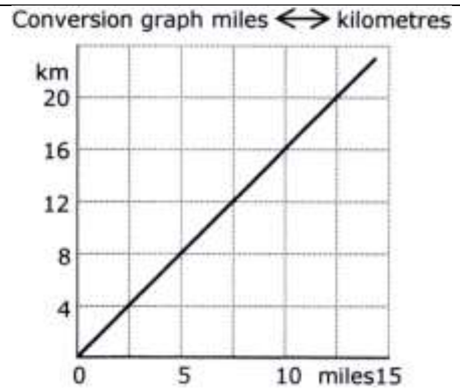
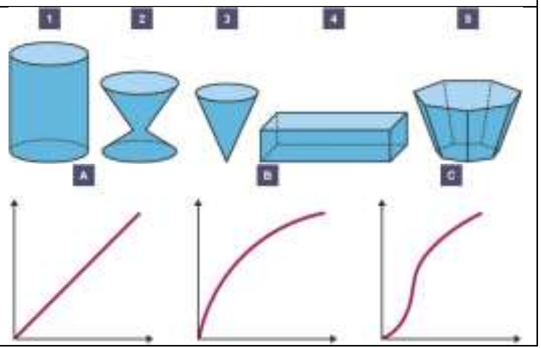
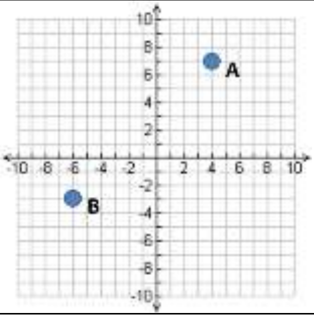
Knowledge Organiser Y10 Maths Real Life Graph

Key vocabulary	Definition/Tips	Example
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 Y10 Maths Coordinates and Linear Graphs

<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>

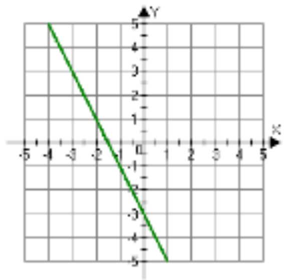
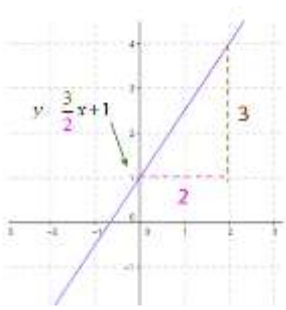
A: (4,7)
B: (-6,-3)</td></tr>
<tr><td>2. Midpoint of a Line</td><td>Method 1: add the x coordinates and divide by 2, add the y coordinates and divide by 2

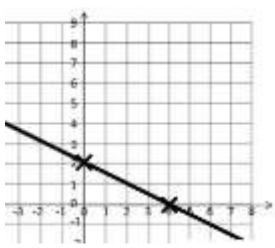
Method 2: Sketch the line and find the values half way between the two x and two y values.</td><td>Find the midpoint between (2,1) and (6,9)

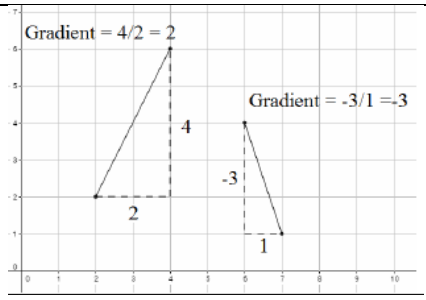
$\frac{2+6}{2} = 4$ and $\frac{1+9}{2} = 5$

So, the midpoint is (4,5)</td></tr>
<tr><td>3. Linear Graph</td><td>Straight line graph.

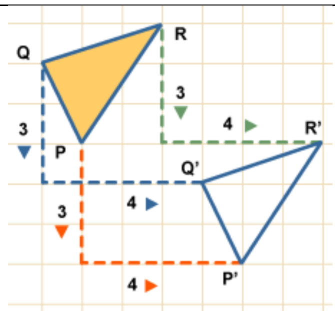
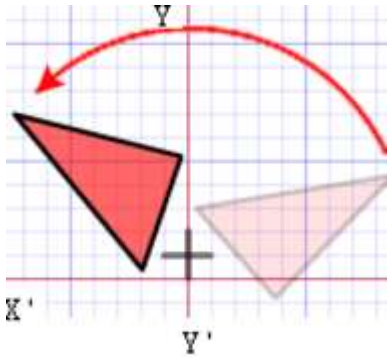
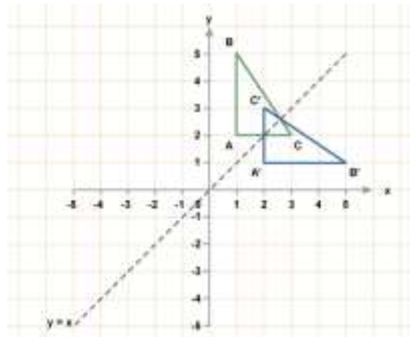
The general equation of a linear graph is
$$\boldsymbol{y = mx + c}$$
where $\boldsymbol{m}$ is the gradient and c is the y-intercept.

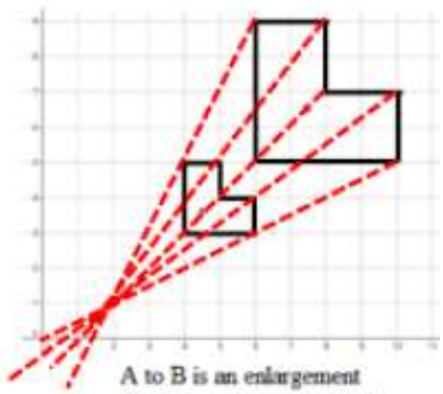
The equation of a linear graph can contain an x-term, a y-term and a number.</td><td>Example:

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 $y - axis$.</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>



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

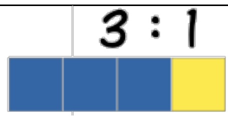
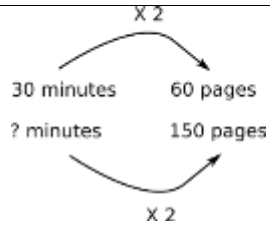
	3. Draw a line through the two points plotted.	
5. Gradient	The gradient of a line is how **steep** it is. **Gradient =** $$\frac{\boldsymbol{Change\ in\ y}}{\boldsymbol{Change\ in\ x}} = \frac{\boldsymbol{Rise}}{\boldsymbol{Run}}$$ The gradient can be positive (sloping upwards) or negative (sloping 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 $3x + x - 7 = 0$

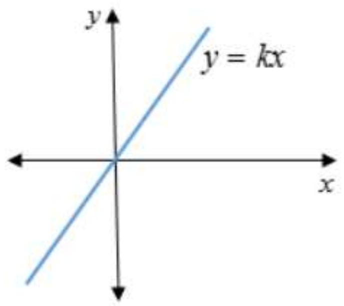
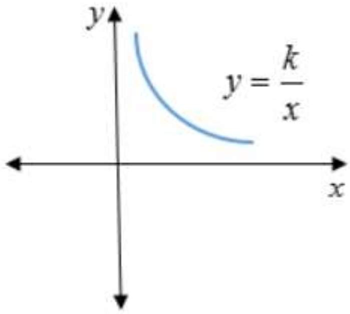
Knowledge Organiser Y10 Maths Transformations

Key Vocabulary	Definition/Tips	Example
1. Translation	**Translate** means to **move a shape**. The shape does not change **size** or **orientation**.	
2. Column Vector	In a column vector, the **top** number moves **left (-) or right (+)** and the **bottom** number moves **up (+) or down (-)**	$\begin{pmatrix}2\\3\end{pmatrix}$ means '2 right, 3 up' $\begin{pmatrix}-1\\-5\end{pmatrix}$ means '1 left, 5 down'
3. Rotation	The size does not change, but the **shape is turned around a point**. Use tracing paper.	Rotate Shape A 90° anti-clockwise about (0,1) 
4. Reflection	The size does not change, but the shape is '**flipped'** like in a **mirror**. Line x =? is a **vertical line**. Line y =? is a **horizontal line**. Line $y = x$ is a **diagonal line**.	Reflect shape C in the line $y = x$ 
5. 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'

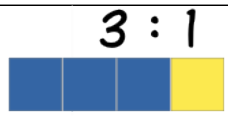
6. Finding the Centre of Enlargement	Draw **straight lines** through **corresponding corners** of the two shapes. The centre of enlargement is the point **where all the lines cross over**. Be careful with negative enlargements as the corresponding corners will be the other way around.	 A to B is an enlargement SF 2 about the point (2,1)
7. 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**

Knowledge Organisers Y10 Maths Ratio and Proportion

Key Vocabulary	Definition/Tips	Example
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. Use only if you **know the total**.	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.

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 $\boldsymbol{y \propto \frac{1}{x}}$ An equation of the form $\boldsymbol{y = \frac{k}{x}}$ represents inverse proportion.	

Knowledge Organisers: Proportion

Key Vocabulary	Definition/Tips	Example
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 $\frac{9}{22}$
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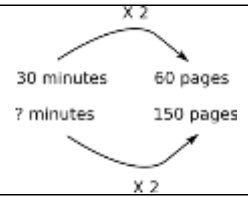
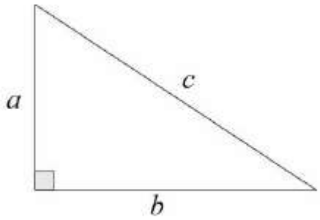
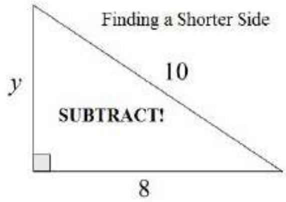
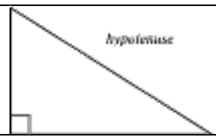
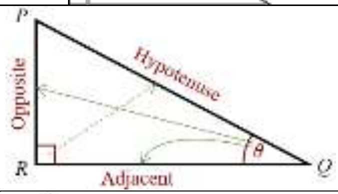
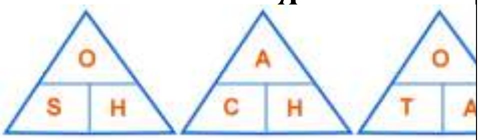
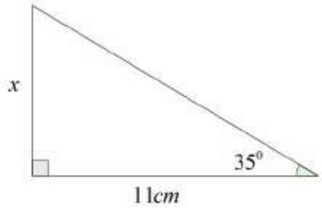
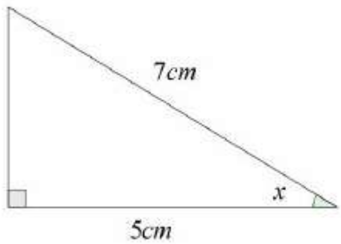
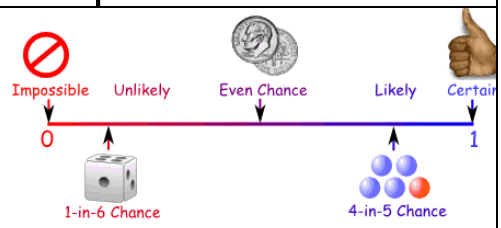
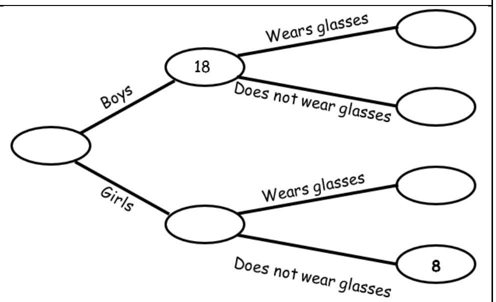
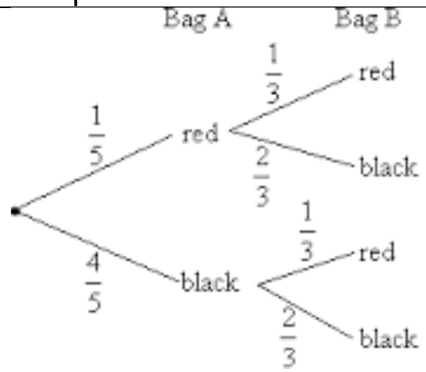
6. Proportional Reasoning	Comparing two things using **multiplicative reasoning** and applying this to a new situation. Identify one multiplicative link and use this to find missing quantities.	
7. Unitary Method	Finding the **value of a single unit** and then finding the necessary value by **multiplying** 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, 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.

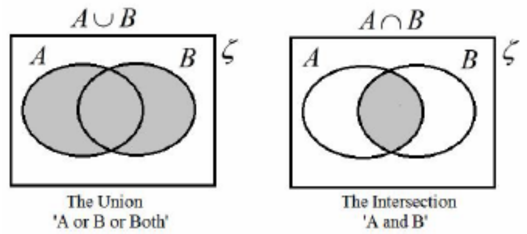
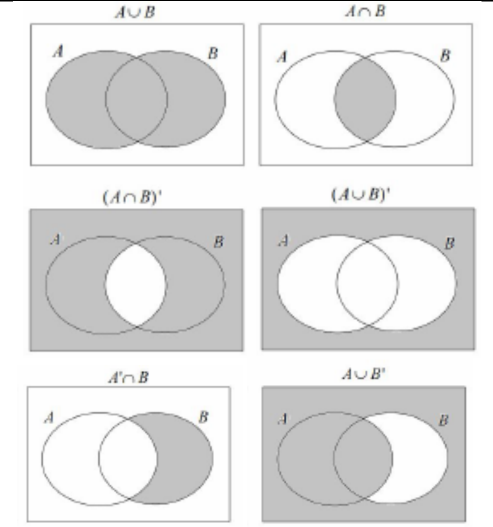
Knowledge Organiser: Right-angled triangles

Key Vocabulary	**Definition/Tips**	**Example**
1. Pythagoras' Theorem	For any **right angled triangle**: $\boldsymbol{a^2 + b^2 = c^2}$  Used to find **missing lengths**. a and b are the shorter sides, c is the **hypotenuse (longest side)**.	 $a = y,\ b = 8,\ c = 10$ $a^2 = c^2 - b^2$ $y^2 = 100 - 64$ $y^2 = 36$ $y = 6$
2. Trigonometry	The **study** of **triangles**.	
3. Hypotenuse	The **longest side** of a **right-angled triangle**. Is always **opposite** the **right angle**.	
4. Adjacent	**Next to**	
5. Trigonometric Formulae	Use **SOHCAHTOA**. $\boldsymbol{\sin\theta = \frac{O}{H}}$ $\boldsymbol{\cos\theta = \frac{A}{H}}$ $\boldsymbol{\tan\theta = \frac{O}{A}}$  When finding a missing angle, use the 'inverse' trigonometric function by pressing the 'shift' button on the calculator.	 Use 'Opposite' and 'Adjacent', so use 'tan' $\tan 35 = \frac{x}{11}$ $x = 11\tan 35 = 7.70cm$  Use 'Adjacent' and 'Hypotenuse', so use 'cos' $\cos x = \frac{5}{7}$ $x = cos^{-1}\left(\frac{5}{7}\right) = 44.4°$

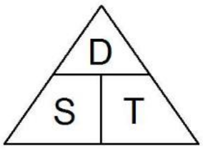
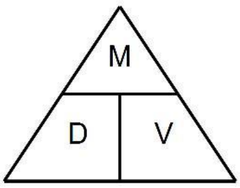
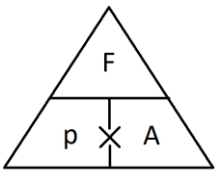
Knowledge Organiser Y10 Maths Probability

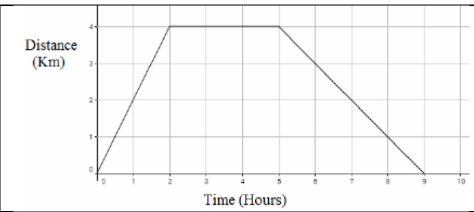
Topic/Skill	Definition/Tips	Example
1. Probability	The **likelihood/chance** of something happening. Is expressed as a number **between 0 (impossible) and 1 (certain)**. Can be expressed as a fraction, decimal, percentage or in words (likely, unlikely, even chance etc.)	
2. Probability Notation	**P(A)** 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	$\frac{\textbf{Number of Favourable Outcomes}}{\textbf{Total Number of Possible Outcomes}}$	Probability of rolling a 4 on a fair 6-sided die = $\frac{1}{6}$.
4. Relative Frequency	$\frac{\textbf{Number of Successful Trials}}{\textbf{Total Number of Trials}}$	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.
7. Mutually Exclusive	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**.	Examples of mutually exclusive events: - Turning left and right - Heads and Tails on a coin Examples of non mutually exclusive events: - King and Hearts from a deck of cards.
8. Frequency Tree	A diagram showing how information is categorised into various categories. The **numbers** at the ends of branches tells us how often something happened (**frequency**). The **lines** connected the numbers are called **branches**.	

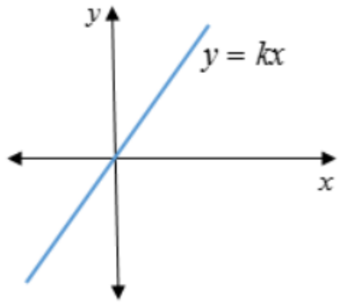
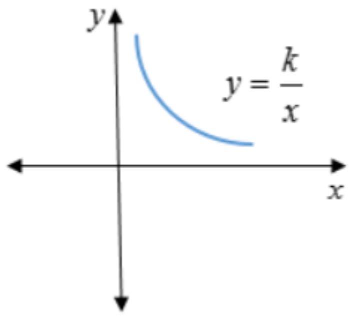
<table>
<tr><td>9. Sample Space</td><td>The set of all possible outcomes of an experiment.</td><td><table><tr><td>+</td><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td></tr><tr><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr><tr><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td></tr><tr><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr><tr><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td></tr><tr><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td></tr></table></td></tr>
<tr><td>10. Sample</td><td>A sample is a small selection of items from a population.
A sample is biased if individuals or groups from the population are not represented in the sample.</td><td>A sample could be selecting 10 students from a year group at school.</td></tr>
<tr><td>11. Sample Size</td><td>The larger a sample size, the closer those probabilities will be to the true probability.</td><td>A sample size of 100 gives a more reliable result than a sample size of 10.</td></tr>
<tr><td>12. Tree Diagrams</td><td>Tree diagrams show all the possible outcomes of an event and calculate their probabilities.
All branches must add up to 1 when adding downwards.
This is because the probability of something not happening is 1 minus the probability that it does happen.
Multiply going across a tree diagram.
Add going down a tree diagram.</td><td>
</td></tr>
<tr><td>13. Independent Events</td><td>The outcome of a previous event does not influence/affect the outcome of a second event.</td><td>An example of independent events could be <u>replacing</u> a counter in a bag after picking it.</td></tr>
<tr><td>14. Dependent Events</td><td>The outcome of a previous event does influence/affect the outcome of a second event.</td><td>An example of dependent events could be not replacing a counter in a bag after picking it. ‘<u>Without replacement</u>’</td></tr>
<tr><td>15. Probability Notation</td><td>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.</td><td>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.</td></tr>
</table>

16. 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 and to the right. 	
17. Venn Diagram Notation	∈ means '**element of a set**' (a value in the set) { } means the collection of values in the set. ξ means the '**universal set**' (all the values to consider in the question) **A' means 'not in set A' (called complement)** **A ∪ B means 'A or B or both' (called Union)** **A ∩ B means 'A and B (called 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}
18. 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? $P(4\ and\ Tails) = P(4) \times P(Tails)$ $= \frac{1}{6} \times \frac{1}{2} = \frac{1}{12}$
19. 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? $P(2\ or\ 5) = P(2) + P(5)$ $= \frac{1}{6} + \frac{1}{6} = \frac{2}{6} = \frac{1}{3}$

Knowledge Organiser Y10 Maths F Multiplicative Reasoning

Key Vocabulary	**Definition/Tips**	**Example**
1. Metric System	A system of measures based on: - the metre for length - the kilogram for mass - the second for time **Length: mm, cm, m, km** **Mass: mg, g, kg** **Volume: ml, cl, l**	$1 kilometres = 1000\ metres$ $1\ metre = 100\ centimetres$ $1\ centimetre = 10\ millimetres$ $1\ kilogram = 1000\ grams$
2. Imperial System	A system of weights and measures originally developed in England, usually based on human quantities **Length: inch, foot, yard, miles** **Mass: lb, ounce, stone** **Volume: pint, gallon**	$1 lb = 16\ ounces$ $1\ foot = 12\ inches$ $1\ gallon = 8\ pints$
3. Metric and Imperial Units	Use the **unitary method** to convert between metric and imperial units.	$5\ miles \approx 8\ kilometres$ $1\ gallon \approx 4.5\ litres$ $2.2\ pounds \approx 1\ kilogram$ $1\ inch = 2.5\ centimetres$
4. Speed, Distance, Time	**Speed = Distance ÷ Time** **Distance = Speed x Time** **Time = Distance ÷ Speed**  Remember the correct units.	Speed = 4mph Time = 2 hours Find the Distance. $D = S \times T = 4 \times 2 = 8\ miles$
5. Density, Mass, Volume	**Density = Mass ÷ Volume** **Mass = Density x Volume** **Volume = Mass ÷ Density**  Remember the correct units.	Density = 8kg/m³ Mass = 2000g Find the Volume. $V = M \div D = 2 \div 8 = 0.25m^3$
6. Pressure, Force, Area	**Pressure = Force ÷ Area** **Force = Pressure x Area** **Area = Force ÷ Pressure**  Remember the correct units.	Pressure = 10 Pascals Area = 6cm² Find the Force $F = P \times A = 10 \times 6 = 60\ N$

7. Distance-Time Graphs	You can find the **speed** from the **gradient** of the line (Distance ÷ Time) The steeper the line, the quicker the speed. A **horizontal** line means the object is not moving (**stationary**).	
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 = $3 \times £100 = £300$
5. Exponential Growth	When we **multiply** a number **repeatedly** by the **same number** ($\neq 1$), resulting in the number **increasing by the same proportion** each time. The original amount can grow very quickly in exponential growth.	$1, 2, 4, 8, 16, 32, 64, 128$ ... is an example of exponential growth, because the numbers are being multiplied by 2 each time.
6. Exponential Decay	When we **multiply** a number **repeatedly** by the **same number** ($\mathbf{0 < x < 1}$), resulting in the number **decreasing by the same proportion** each time. The original amount can decrease very quickly in exponential decay.	$1000, 200, 40, 8$ ... is an example of exponential decay, because the numbers are being multiplied by $\frac{1}{5}$ each time.
7. Compound Interest	Interest paid on the **original amount and the accumulated interest**.	A bank pays 5% compound interest a year. Bob invests £3000. How much will he have after 7 years.

		$3000 \times 1.05^7 = £4221.30$
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 $\boldsymbol{y \propto \frac{1}{x}}$ An equation of the form $\boldsymbol{y = \frac{k}{x}}$ represents inverse proportion.	

Knowledge Organiser Y10F Quadratic Equations/expressions and their graphs

<table>
<tr><th>Key Vocabulary</th><th>Definition/Tips</th><th>Example</th></tr>
<tr><td>1. Quadratic</td><td>A quadratic expression is of the form

$\boldsymbol{ax^2 + bx + c}$

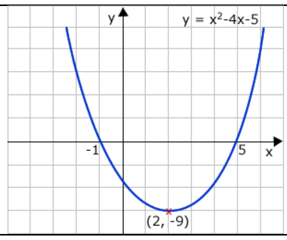
where a, b and c are numbers, $\boldsymbol{a \neq 0}$</td><td>Examples of quadratic expressions:
x^2
$8x^2 - 3x + 7$

Examples of non-quadratic expressions:
$2x^3 - 5x^2$
$9x - 1$</td></tr>
<tr><td>2. Expanding double brackets</td><td>A factorised quadratic takes the form of a pair of double brackets e.g

$(x + 4)(x - 2)$

These can be “expanded using grid multiplication (see example)</td><td><table><tr><td></td><td>x</td><td>-2</td></tr><tr><td>x</td><td>x^2</td><td>-2x</td></tr><tr><td>+4</td><td>4x</td><td>-8</td></tr></table>
Add tpgether all the elments, and the brackets have been fully expanded and simplified
$x^2 + 4x - 2x - 8$

$= x^2 + 2x - 8$</td></tr>
<tr><td>3. Factorising Quadratics</td><td>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.</td><td>$x^2 + 7x + 10 = (x + 5)(x + 2)$
(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)</td></tr>
<tr><td>4. Difference of Two Squares</td><td>An expression of the form $\boldsymbol{a^2 - b^2}$ can be factorised to give $(\boldsymbol{a} + \boldsymbol{b})(\boldsymbol{a} - \boldsymbol{b})$</td><td>$x^2 - 25 = (x + 5)(x - 5)$
$16x^2 - 81 = (4x + 9)(4x - 9)$</td></tr>
<tr><td>5. Quadratic Graph</td><td>A ‘U-shaped’ curve called a parabola.
The equation is of the form
$y = \boldsymbol{ax^2} + \boldsymbol{bx} + \boldsymbol{c}$, where a, b and c are numbers, $\boldsymbol{a \neq 0}$.
If $\boldsymbol{a < 0}$, the parabola is upside down.</td><td>
</td></tr>
</table>