

**Name:**

**Class:**

Order	Unit	Links	Pre-requisite skills
1	Integers, powers & roots		
2	Lines, angles & shape		
3	Simplifying & substituting	Unit 1	Using powers, listing factors, understanding product / sum.
4	Area and perimeter	Unit 2	Forming expressions for area/perimeter algebraically through use of brackets, correct notation and simplifying expressions.
5	Calculations & Accuracy	Unit 1	Understanding numbers.
6	FDP	Unit 1	Using powers, understanding lowest common multiples.
7	Sequences, functions and graphs	Unit 3/5	Substituting into a function applying BIDMAS to calculate coordinates, factorising for roots of quadratics, understanding powers and all 4 operations with negatives.
8	Ratio & Proportion	Unit 1/6	Decimals/powers as multipliers, calculating/understanding fractions as parts.
9	Transformations	Unit 2/7	Identifying 90/180/270 degrees, plotting mirror lines of basic functions.
10	Pythagoras and Trigonometry	Unit 1/2/3/4/5	Powers/surds, types of triangles, use in area/perimeter problems to find required lengths, rounding answers.
11	Forming and solving	Unit 3/4	Properties of 2d shapes, angle facts including polygons & parallel lines, algebraic notation and simplifying, forming expressions.
12	Measures	Unit 1/6	Calculating, multiplying decimals and powers of 10 for metric conversions.
13	Volume and Surface area	Unit 4/5/12	Area of 2d shapes, rounding/calculating with bounds, conversion of units (length/area/volume), calculating missing sides using pythagoras/ trigonometry.
14	Probability	Unit 1/6	Types of numbers, calculating with fractions & decimals.
15	Inequalities	Unit 11/7/5/6	Solving equations, rounding, plotting graphs for regions, calculating with fractions.
16	Statistics	Unit 1/5/8/15	Using a protractor for pie charts, proportion to calculate angles for a pie chart, use of inequality symbols for recording data.

**Homework 1 Due**

**Homework 2 Due**

**Homework 3 Due**



## Year 10 - Term 3: Higher

Overview	Learning Objectives		
<b>Topic: Fractions, decimals and percentages</b>  <b>Big Questions</b> <ul style="list-style-type: none"> <li>- What is the same/different about: <math>120 \times 1.06 \times 1.06</math> and <math>120 \times (1.06)^2</math></li> <li>- A top was reduced by 20% in a sale, then increased by 20% after the sale. What % of it's original price is it now?</li> </ul>	<ul style="list-style-type: none"> <li>- Calculate compound interest/ depreciation</li> <li>- Calculate percentage change.</li> <li>- Work out reverse percentage problems.</li> </ul>	<ul style="list-style-type: none"> <li>- Convert recurring decimals to fractions</li> </ul>	<ul style="list-style-type: none"> <li>-proof of recurring decimals.</li> </ul>
<b>Topic: Sequences, functions and graphs</b>  <b>Big Questions</b> <ul style="list-style-type: none"> <li>- Show me an example of an equation of a quadratic curve which does not touch the x-axis.</li> <li>- Show me an example of an equation of a parabola (quadratic curve) which (i) is symmetrical about the y-axis, (ii) is not symmetrical about the y-axis</li> </ul>	<ul style="list-style-type: none"> <li>- Transform the graphs of <math>y = f(x)</math>, such as linear, quadratic, cubic, sine and cosine functions, using the transformations <math>y = f(x) + a</math>, <math>y = f(x + a)</math>, <math>y = f(ax)</math> and <math>y = af(x)</math>.</li> <li>- Sketch graphs of exponential functions.</li> <li>- Recognise and use the equation of a circle centred at the origin.</li> <li>-</li> </ul>	<ul style="list-style-type: none"> <li>- Recognises the shapes of graphs of functions, including trigonometric functions.</li> <li>- Calculate the nth term of a quadratic sequence.</li> <li>- Recognise and use geometric sequences where the common ratio may be a surd.</li> <li>- Use <math>y = mx + c</math> to identify perpendicular lines.</li> </ul>	<ul style="list-style-type: none"> <li>- Interpret the reverse process as the 'inverse function'.</li> <li>- Interpret the succession of two functions as a 'composite function'.</li> <li>- Estimate gradients of graphs by drawing the tangent and calculating its gradient.</li> <li>- Estimate the area under a graph by calculating the area of the trapezium bounded by a chord.</li> <li>- Find an equation of a tangent to a circle at a given point, using the fact that it is perpendicular to the radius.</li> </ul>
<b>Topic: Ratio and Proportion</b>  <b>Big Questions</b> <ul style="list-style-type: none"> <li>- Two similar shapes have volumes of 5m and 125m. The surface area of the smaller shape is 50m<sup>2</sup>. What is the surface area of the larger shape?</li> <li>- 3 men take 4 days to complete a job. How long would the same job have taken 2 men?</li> </ul>	<ul style="list-style-type: none"> <li>-Similar shapes area &amp; volume.</li> <li>- Solve ratio problems involving percentages &amp; fractions.</li> </ul>	<ul style="list-style-type: none"> <li>- Use direct and inverse proportion graphically.</li> <li>- Calculate direct and inverse proportion algebraically.</li> </ul>	

					Fraction	Decimal	Percentage						
Add	$\frac{1}{2} + \frac{1}{3} = \frac{1 \times 3}{2 \times 3} + \frac{1 \times 2}{3 \times 2} = \frac{3}{6} + \frac{2}{6} = \frac{5}{6}$	6 is the lowest common denominator for 2 and 3	A £200 loan pays 15% simple interest over 5 years	$\frac{1}{1} = 1$	1	100%							
Subtract	$\frac{7}{8} - \frac{1}{3} = \frac{7 \times 3}{8 \times 3} - \frac{1 \times 8}{3 \times 8} = \frac{21}{24} - \frac{8}{24} = \frac{13}{24}$	24 is the lowest common denominator for 8 and 3	Work out 15% of £200 = £30 $\begin{array}{l} \text{£30} \times 5 \text{ years} = \text{£150} \\ \text{£200} + \text{£150} \end{array}$ Answer: £350	$\frac{1}{2}$	0.5	50%							
Multiply	$\frac{3}{4} \times \frac{1}{3} = \frac{3}{12} = \frac{1}{4}$	Simplify where possible	Simple interest	$\frac{1}{4}$	0.25	25%							
Divide (KFC)	$\frac{1}{2} \div \frac{1}{3} = \frac{1}{2} \times \frac{3}{1} = \frac{3}{2} = 1\frac{1}{2}$	KFC method	Compound interest	$\frac{1}{8}$	0.125	12.5%							
Top heavy to mixed number & visa versa	$\frac{14}{3}$ How many 'whole' 3's fit into 14?	$4\frac{2}{3}$	Decrease £200 by 15% 15% of 200 = 30 Subtract it or use the multiplier(0.85) (200 x 0.85) Answer: £170	$\frac{37}{5}$ When dividing, use the KFC method. <table border="1"><tr><td>Keep</td><td>the first fraction 'as is'</td></tr><tr><td>Flip</td><td>the second fraction</td></tr><tr><td>Change</td><td>the sign to multiply</td></tr></table>	Keep	the first fraction 'as is'	Flip	the second fraction	Change	the sign to multiply	1.50 $\frac{1.50}{7.50} \times 100 = 20\%$	Difference ÷ original amount × 100	How to calculate Reverse Percentage
Keep	the first fraction 'as is'												
Flip	the second fraction												
Change	the sign to multiply												
% of an amount	10% = 20 5% = 10 Answer: £30	Let us multiply the 0.2 by 10, which shifts the decimal point out of the way: $\begin{array}{l} \text{→ } 0.2 \times 10 = 2 \\ \text{→ } 15 \times 10 = 150 \end{array}$	So 15 ÷ 0.2 has become 150 ÷ 2 (they are both 10 times larger): $150 \div 2 = 75$										
Decrease by a %	Increase £200 by 15% 15% of 200 = 30 Add it on or use the multiplier(1.12) (200 x 1.12) Answer: £230	But we must also do it to the 15: $15 \times 10 = 150$	It was 20% less than the original price. What was the original price? $\begin{array}{l} \text{£200} = 80\% \\ \text{£50} = 20\% \\ \text{£250} = 100\% \end{array}$ x5 Answer: £250										

**Knowledge Recall**

**Date Due:**

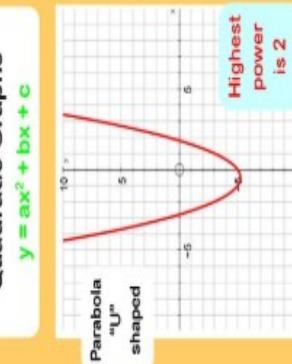
**Score to beat:**

Section A: Number	Section B: Algebra Geometry & measures	Section C: Using and applying
1. Write $\frac{1}{3}$ as a recurring decimal	11. Factorise: $a^2 - 17a + 30$	21. Linear-Quadratic-Cubic-Reciprocal Which function is represented by this graph?
2. Write $0.\overline{5}$ as a fraction	12. Factorise: $p^2 - 1$	
3. Work out the balance for £400 invested for 6 years at 12% per annum	14. Multiply & simplify: $(2a - 3)(2a + 1)$	22. What inequality is represented here?
4. The value of a bike depreciates by 55% per year. Work out the current value of a bike bought 2 years ago for £1300.	14. Multiply & simplify: $(a + b)^2$	
5. In a '30% off' sale, a coat was £210. Work out the original price.	15. Make w the subject of the formula: $P = 7w - \frac{10}{60}$	23. On a spinner: $P(3) = \frac{1}{5}$ and the $P(4) = \frac{1}{5}$ What is the probability of getting 3 or 4
6. The cost of a phone has increased by 10% to £352. Work out the original price.	16. Make a the subject of the formula: $ab - cd = ac$	24. A courgette seed and a pumpkin seed is planted. $P(\text{courgette seed germinates}) = \frac{3}{5}$ $P(\text{pumpkin seed germinates}) = \frac{2}{5}$ What is the probability that BOTH seeds germinate?
7. Write 475000 in standard form:	17. $A = \pi r^2 - \pi rs$ . Find A when $r = 2.7$ $s = 1.6$	
8. Write $5 \times 10^{-3}$ as an ordinary number	18. $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$ Find f when $u=2\frac{1}{2}$ & $v=3\frac{1}{3}$	
9. Work out $(8 \times 10^6) \times (9 \times 10^7)$ Give your answer in standard form	19. If $\cos 35^\circ = \frac{8}{x}$ , find x (3sf)	25. Show on the cumulative frequency graph how to take the inter-quartile range reading
10. Work out $(3.1 \times 10^4)^2$ Give your answer in standard form	20. Each of these measures is rounded to nearest whole: $a = 8\text{cm}$ and $b = 4\text{cm}$ Calculate the upper bound of $a - b$	80 Cf
Total (A)	Total (B)	Total (C)
Test Total (A+B+C)	R (0-9)	G (20-25)

## Sequences, Functions and Graphs

$$y = mx + c$$

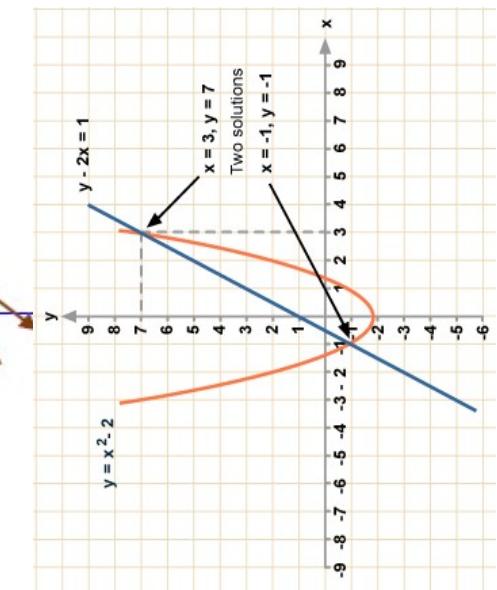
### Quadratic Graphs



1. Find the second difference.  
Because the second difference is 2, the sequence is based around the  $n^2$  sequence.  
(1, 4, 9, 16, 25)

2. Subtract the  $n^2$  sequence from the original sequence: 12, 15, 18, 21  
3. This new is itself a linear sequence with rule:  
 $3n + 9$

The  $n^{\text{th}}$  term is  $n^2 + 3n + 9$   
PARALLEL lines have the **same** gradient



A line passes through two points (4 ; 7) and (8 ; 19)

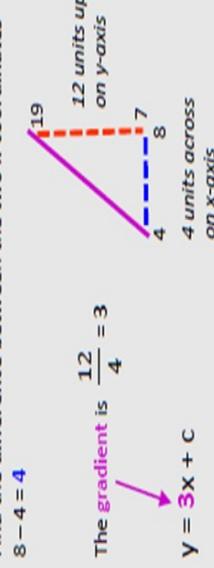
Work out the EQUATION of the line

Find the difference between the two y-coordinates

$$19 - 7 = 12$$

Find the difference between the two x-coordinates

$$8 - 4 = 4$$



Now find 'c' value (y-intercept)

$$(4; 7)$$

$$7 = 3 \times 4 + c$$

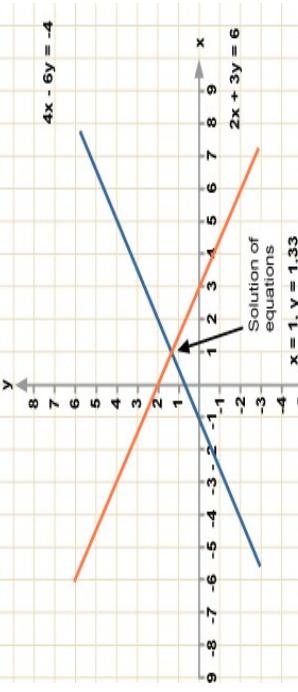
$$7 = 12 + c$$

$$7 - 12 = c$$

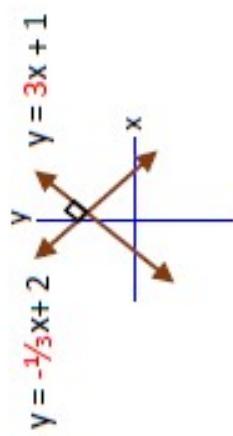
$$-5 = c$$

Substitute either of the sets of coordinates into the equation (go for the easiest):  $y = 3x \pm c$

Write the full equation:  $y = 3x - 5$



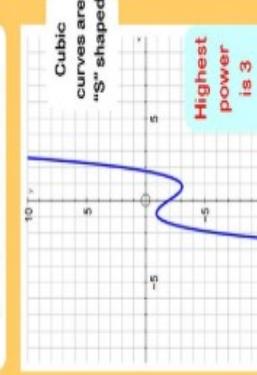
PERPENDICULAR lines have a negative reciprocal gradient and opposite sign (+ or - )



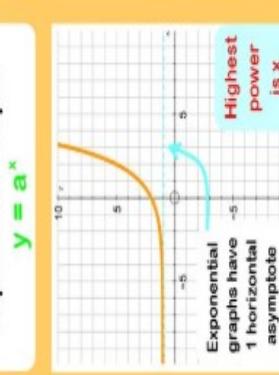
An exponential function is a function of the form  $y = a \cdot b^x$ , where  $a \neq 0, b > 0, b \neq 1$ , and  $x$  is a real number.

$a \neq 0, b > 0, b \neq 1$ , and  $x$  is a real number.

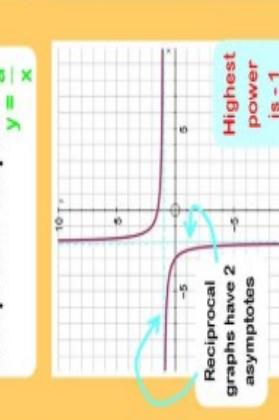
### Cubic Graphs



### Exponential Graphs



### Reciprocal Graphs



### Key Points

1. A function only has an inverse if it is a one-one mapping
2. The graph of the inverse is the reflection of the graph of the function in the line  $y = x$
3. The domain of the inverse function is the same as the range of the function
4. The range of the inverse function is the same as the domain of the function
5. We find the inverse function by putting the original function equal to  $y$  and rearranging to make  $x$  the subject
6. We use the notation  $f^{-1}(x)$  for the inverse function

**Knowledge Recall**

Date Due:

Knowledge Recall		Score to beat:
Section A: Number	Section B: Algebra Geometry & measures	Section C: Using and applying
1. Write $\frac{2}{3}$ as a recurring decimal	11. Factorise: $a^2 - 3a - 28$	21. Linear-Quadratic-Cubic-Reciprocal Which function is represented by this graph?
2. Write 0. <del>06</del> as a fraction	12. Factorise: $p^2 - q^2$	
3. Work out the balance for £500 invested for 3 years at 4.2% per annum	14. Multiply & simplify: $(b + 5)(2b + 3)$	22. What inequality is represented here?
4. The value of a Wii depreciates by 24% per year. Work out the current value of a Wii bought 3 years ago for £240.	14. Multiply & simplify: $(a - b)^2$	
5. In a '40% off' sale, a dress was £36. Work out the original price.	15. Make w the subject of the formula: $P = \frac{2w+7}{12}$	23. On a spinner: $P(3) = \frac{3}{8}$ and the $P(4) = \frac{3}{8}$ What is the probability of getting 3 or 4
6. The cost of a phone has increased by 15% to £161. Work out the original price.	16. Make d the subject of the formula: $ad = dx + cx$	
7. Write 0.076 in standard form:	17. $A = \pi r^2 - \pi rs$ - Find A when $r = 4.2$ $s = 3.8$	24. A courgette seed and a pumpkin seed is planted. $P(\text{courgette seed germinates}) = \frac{3}{8}$ $P(\text{pumpkin seed germinates}) = \frac{1}{8}$ What is the probability that BOTH seeds germinate?
8. Write $4.44 \times 10^7$ as an ordinary number	18. $\frac{1}{n} + \frac{1}{v} = \frac{1}{f}$ Find f when $u=1\%$ & $v=2\%$	
9. Work out $(4 \times 10^8) \div (8 \times 10^2)$ Give your answer in standard form	19. If $\sin 52^\circ = \frac{x}{10}$ , find x (3sf)	25. Show on the cumulative frequency graph how to take the inter-quartile range reading
10. Work out $(3.72 \times 10^6) - (2.8 \times 10^4)$ Give your answer in standard form	20. Each of these measures is rounded to nearest whole: $a = 8\text{cm}$ and $b = 4\text{cm}$ Calculate the lower bound of $a - b$	200 cf
Total (A)	Total (B)	Total (C)
Test Total (A+B+C)	R (0-9)	Y (10-19)
		G (20-25)

### Curriculum Flowchart - Similarity



The exchange rate is £1 to \$1.70. I need to convert my £56 into US Dollars.

$$\text{£}56 \times 1.7 = \$95.20$$

Inverse proportion is when one value increases as the other value decreases.

$$\boxed{\text{£}1 = \$1.70}$$

$K$  is the constant of proportionality

### How to Calculate Area & Volume using SIMILARITY

#### AREA (ASF)

##### FIND the missing area

1. Find LSF:  $16/8 = 2$

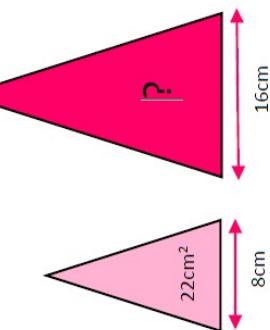
2. **Square** linear scale factor to find the ASF:

$$2^2 = 4$$

3. Multiply  $22 \times 4 = 88\text{cm}^2$



3. Divide  $640 \div 8 = 80\text{cm}^3$



#### VOLUME (VSF)

##### FIND the missing volume

1. Find LSF:  $20/10 = 2$

2. **Cube** the linear scale factor to find the volume

$$2^3 = 8$$

3. Divide  $640 \div 8 = 80\text{cm}^3$

### How do I answer the question?

#### Key Facts

If two quantities are in direct proportion, as one increases, the other increases by the **same multiplier/scale factor**.

Direct proportion

Inverse proportion is when one value increases as the other value decreases.

Inverse proportion

### How do I answer the question?

#### Key Facts

A ball falls vertically after being dropped.  
The ball falls a distance  $d$  metres in a time of  $t$  seconds.

$d$  is directly proportional to the square of  $t$ .

The ball falls 20 metres in a time of 2 seconds.

(a) Find a formula for  $d$  in terms of  $t$ .

Write a statement

$$y \propto t^2$$

Write a formula (equation)

$$d = kt^2$$

Find  $K$  by substituting:  
Divide both sides by 4

$$20 = k2^2$$

$$20 = k4$$

$$5 = k$$

$$D=5t^2$$

(b) Calculate the distance the ball falls in 3 seconds.

You've worked out  $K$

Substitute 3 into  
equation

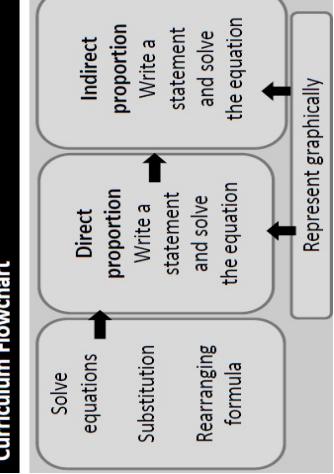
$$d = 5$$

$$d = 5 \times 3^2$$

$$d = 5 \times 9$$

$$d = 45$$

### Curriculum Flowchart



### Key Facts – Write a Ratio as a Fraction

Bill and Mary share £50 in the ratio  $\frac{2}{3}$

$$\frac{2}{5} \text{ and } \frac{3}{5}$$

$$\begin{aligned} 1200g &= 389p \\ \div 1200 &\quad \div 1200 \\ 1g &= 0.324p \end{aligned}$$

This is less money per gram, so it is the best buy

$K = 5$

$$d = 5$$

$$d = 5 \times 3^2$$

$$d = 5 \times 9$$

$$d = 45$$

Knowledge Recall		Date Due:	Score to beat:
Section A: Number	Section B: Algebra Geometry & measures	Section C: Using and applying	
1. Write $\frac{4}{11}$ as a recurring decimal	11. Factorise: $a^2 - 3a - 40$	21. Linear-Quadratic-Cubic-Reciprocal Which type of graph is represented by this equation? $y = x^2 - 2x - 3$	
2. Write $0.\overline{03}$ as a fraction	12. Factorise: $a^2 - b^2$	22. What inequality is represented here?	
3. Work out the balance for £1500 invested for 2 years at 3.7% per annum	13. Multiply & simplify: $(4b - 3)(2b + 1)$		
4. The value of a TV depreciates by 42% per year. Work out the current value of a TV bought 4 years ago for £425.	14. Multiply & simplify: $(2a - b)^2$		
5. In a '40% off' sale, a dress was £45. Work out the original price.	15. Make $r$ the subject of the formula: $S = 2r^2 - 1$	23. P(jack is late to school any day) = 0.4 What is the probability that Jack will be late 2 days running?	
6. The cost of a TV has increased by 15% to £437. Work out the original price.	16. Make $c$ the subject of the formula: $a = b + c^2$		
7. Write 765000 in standard form:	17. $h = ut - \frac{1}{2}gt^2$ Find $h$ when $u = 200$ $t = 1\frac{1}{2}$ & $g = 9.8$	24. Alf & Amy buy tickets in a raffle $P(\text{Alf wins 1st prize}) = 0.4$ $P(\text{Amy wins 1st prize}) = 0.1$ What is the probability that Alf or Amy win 1st prize?	
8. Write $1.9 \times 10^{-1}$ as an ordinary number	18. $T = 2\pi \sqrt{\frac{l}{g}}$ Find $T$ when $l = 1\frac{1}{2}$		
9. Work out $(4 \times 10^3) \times (1.3 \times 10^4)$ Give your answer in standard form	19. If $\sin 52^\circ = \frac{7}{x}$ , find $x$ (3sf)	25. Show on the cumulative frequency graph how to take the median reading 200 Cf	
10. Work out $(7.63 \times 10^5) + (3.89 \times 10^4)$ Give your answer in standard form	20. Each of these measures is rounded to 1dp: $a = 8.3\text{cm}$ and $b = 4.2\text{cm}$ Calculate the upper bound of $a + b$		
Total (A)	Total (B)	Total (C)	
Test Total (A+B+C)	R (0-9)	Y (10-19)	G (20-25)