

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	Construction and LOCI	Unit 2	Measuring angles for bearings, parallel line angle facts.
7	FDP	Unit 1	Using powers, understanding lowest common multiples.
8	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.
9	Ratio & Proportion	Unit 1/7	Decimals/powers as multipliers, calculating/understanding fractions as parts.
10	Transformations	Unit 2/8	Identifying 90/180/270 degrees, plotting mirror lines of basic functions.
11	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.
12	Forming and solving	Unit 3/4	Properties of 2d shapes, angle facts including polygons & parallel lines, algebraic notation and simplifying, forming expressions.
13	Measures	Unit 1/7	Calculating, multiplying decimals and powers of 10 for metric conversions.
14	Volume and Surface area	Unit 4/5/13	Area of 2d shapes, rounding/calculating with bounds, conversion of units (length/area/volume), calculating missing sides using pythagoras/ trigonometry.
15	Probability	Unit 1/7	Types of numbers, calculating with fractions & decimals.
16	Inequalities	Unit 12/8/5/7	Solving equations, rounding, plotting graphs for regions, calculating with fractions.
17	Statistics	Unit 1/6/9/16	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

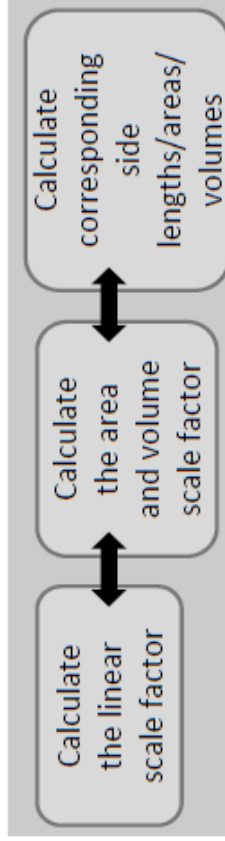
Homework 3 Due



Year 10 - Term 4: Intermediate

<u>Overview</u>	<u>Learning Objective</u>		
<p><u>Topic: Ratio and Proportion</u></p> <p><u>Big Questions</u></p> <ul style="list-style-type: none"> - Ratios related to age and how they change over time: e.g. if Josh and Beth are 1 and 4, £200 will be split in the ratio 1:4 now. What about next year etc. etc.? 	<ul style="list-style-type: none"> - Divide quantities by simple ratios. - Write ratios as a fraction. - Use ratio to convert between currencies. Use ratio to solve problems about exchange rates. - Ratio/fractions/graphs. 	<ul style="list-style-type: none"> - Similar shapes length. - Similar shapes with area & volume. 	<ul style="list-style-type: none"> - Similar shapes area & volume. - Solve ratio problems involving percentages & fractions.
<p><u>Topic: Transformations</u></p> <p><u>Big Questions</u></p> <ul style="list-style-type: none"> - True/Never/Sometimes: - Reflected shapes are the same size and shape as the original shape. - Rotated shapes are the same size and shape as the original shape. - Translated shapes are the same size and shape as the original shape. 	<ul style="list-style-type: none"> - Enlarge a shape by a positive integer scale factor from a given centre. - Enlarge a shape by a positive fractional scale factor given a centre. 	<ul style="list-style-type: none"> - Describe all four transformations. - Combined transformations. (Rotations which is the same as an enlargement.) - Introduction to vectors. (Add, subtract and multiply vectors) 	<ul style="list-style-type: none"> - Enlarge a shape by a negative scale factor given a centre - Describe the changes and invariance achieved by combinations of rotations, reflections and transformations.
<p><u>Topic: Pythagoras and Trigonometry</u></p> <p><u>Big Questions</u></p> <ul style="list-style-type: none"> - What is the same/different about three triangles with sides 3, 4, 5 and 6, 8, 10 and 5, 12, 13 - True/Never/Sometimes: - You can use trigonometry to find the missing length/angle in triangles - True/Never/Sometimes: - Pythagoras's Theorem can be used to find the lengths of sides in triangles 	<ul style="list-style-type: none"> - Use Pythagoras' Theorem to calculate the length of the hypotenuse of a right-angled triangle. - Use Pythagoras' Theorem to calculate the length of any side of a right-angled triangle. - Use Pythagoras' Theorem to calculate the height of an isosceles triangle. - Use Pythagoras' Theorem in practical problems. 	<ul style="list-style-type: none"> - Find the distance between two coordinates. - Know the exact values of sine, cosine and tangent at key angles (0, 30, 45, 60, 90 degrees). - SOHCAHTOA to calculate missing sides in right-angled triangles. - SOHCAHTOA to calculate missing angles in right-angled triangles. - Use SOHCAHTOA in practical problems. 	

Curriculum Flowchart - Similarity



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

$$£56 \times 1.7 = \$95.20$$

X 1.70

$$£1 = \$1.70$$

÷ 1.70

How to Calculate Area & Volume using SIMILARITY

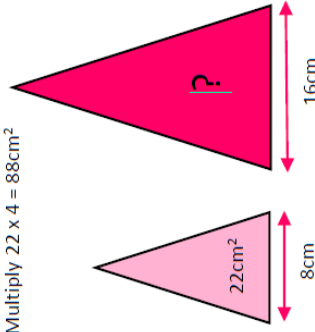
AREA (ASF)

FIND the missing **area**

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

2. **Square** linear scale factor to find the ASF:
 $2^2 = 4$

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



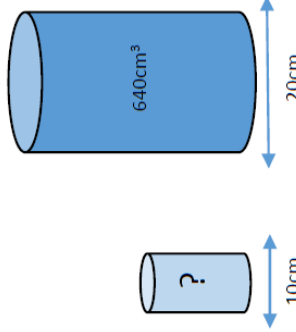
VOLUME (VSF)

FIND the missing **volume**

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

2. **Cube** the linear scale factor to find the volume SF: $2^3 = 8$

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



Key Facts – Write a Ratio as a Fraction

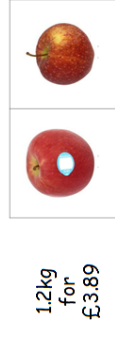
Bill and **Mary** share £50 in the ratio **2 : 3**

Write Bill's share as a fraction:

$$\frac{2}{5}$$

Bill's fraction

What is the price per gram?

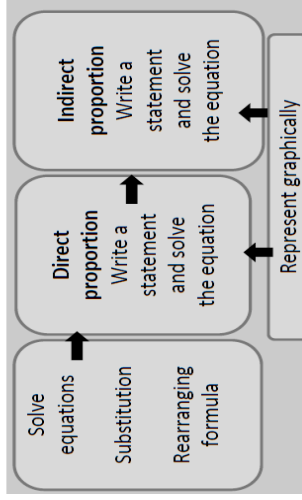


$$\begin{aligned} 1200\text{g} &= 389\text{p} \\ \div 1200 &\div 1200 \\ 1\text{g} &= 0.324\text{p} \end{aligned}$$

$$\begin{aligned} 700\text{g} &= 214\text{p} \\ \div 700 &\div 700 \\ 1\text{g} &= 0.305\text{p} \end{aligned}$$

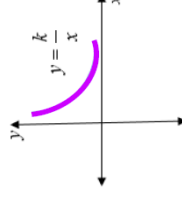
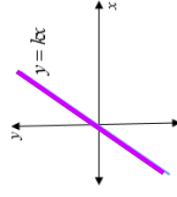
This is less money per gram, so it is the best buy

Curriculum Flowchart



What do I need to know?

Statement: y directly proportional to x	$y \propto x$
Equation	$y = kx$
Statement: y inversely proportional to square of x	$y \propto \frac{1}{x^2}$
Equation	$y = \frac{k}{x^2}$



How do I answer the question?

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

$$d \propto t^2$$

Write a formula (equation)

$$d = kt^2$$

Find k by substituting:

$$20 = k2^2$$

Divide both sides by 4

$$20 = k4$$

$$5 = k$$

$$D = 5t^2$$

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

You've worked out k

$$k = 5$$

Substitute 3 into equation

$$d = 5$$

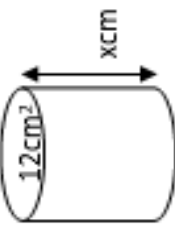
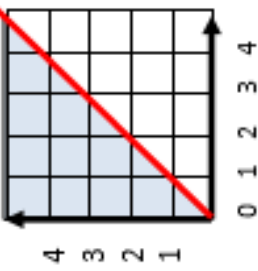
$$d = 5 \times 3^2$$

$$d = 5 \times 9$$

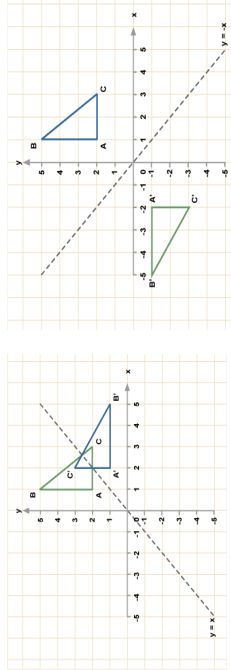
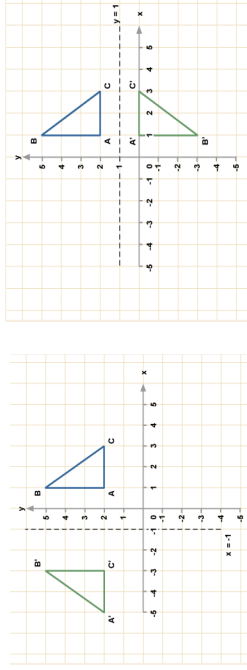
$$d = 45$$

Date Due

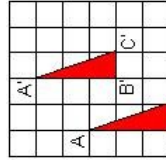
Score to beat

Section A: Number		Section B: Algebra Geometry & measures		Section C: Using and applying	
1. To increase an amount by 24%, what single multiplier would you use?		11. Expand & simplify: $2(2x + 3) + 2(x - 2)$		21. Volume is 144cm^3 , Find x ?	
2. Divide 72 in the ratio of 7 : 2		12. Solve: $x + 8 \geq 5$		22.	
3. Work out: $1\frac{2}{3} \div \frac{3}{4}$		13. Make a the subject of the formula: $T = a - 2$		5.7 is rounded to one decimal place. Write down the maximum possible it could have been.	
4. Estimate the answer to: 7.9×0.67		14. Write down the nth term of this sequence: -1 3 7 11 15 ...		23.	
5. Work out the LCM of 6 and 9		15. If $y = x^2 + 2x$, find the value of y when $x = -1$		The mass of a bar of chocolate is 1800g. The density of the chocolate is 9g/cm^3 . What is its volume?	
6. Write $0.\dot{3}\dot{6}$ as a fraction		16. Factorise: $y^2 - 169$		24. What inequality is represented here?	
7. Work out the balance for £720 invested for 4 years at 5% per annum		17. Multiply & simplify: $(3x - 1)(3x + 1)$		25. On a spinner: $P(3) = \frac{1}{4}$ and the $P(4) = \frac{3}{4}$ What is the probability of getting 3 or 4	
8. The cost of a fridge has increased by 15% to £828. Work out the original price.		18. Make s the subject of the formula: $v^2 = u^2 + 2as$			
9. Write 41500 in standard form:		19. <u>Give your answer correct to 3sf</u> $A = \pi r^2 - \pi rs$. Find A when, $r = 6.5$ $s = 2.5$			
10. Work out $(7 \times 10^3) \times (8 \times 10^2)$ Give your answer in standard form		20. If $\tan 63^\circ = \frac{x}{4}$, find x (3sf)			
Total (A)		Total (B)		Total (C)	
Test Total (A+B+C)		R (0-9)	Y (10-19)	G (20-25)	

REFLECTION

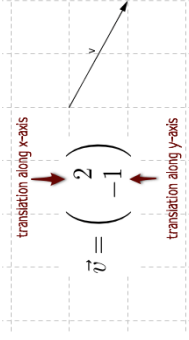


TRANSLATION



Each point moved 2 to the right and 2 up.

The vector describing this translation is: $\begin{pmatrix} 2 \\ 2 \end{pmatrix}$



Equal vectors

If two vectors have the **same magnitude and direction**, then they are **equal**.



Adding vectors

Look at the graph below to see the movements between **PQ**, **QR** and **PR**.

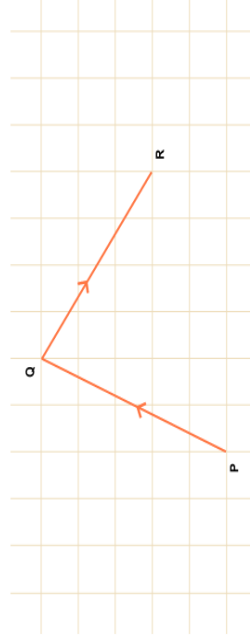
$$\begin{pmatrix} 6 \\ 5 \end{pmatrix} + \begin{pmatrix} 4 \\ 3 \end{pmatrix} = \begin{pmatrix} 10 \\ 8 \end{pmatrix}$$

Vector \overrightarrow{PQ} followed by vector \overrightarrow{QR} represents a movement from **P** to **R**.

$$\overrightarrow{PQ} + \overrightarrow{QR} = \overrightarrow{PR}$$

Written out the vector addition looks like this

$$\begin{pmatrix} 2 \\ 5 \end{pmatrix} + \begin{pmatrix} 4 \\ 3 \end{pmatrix} = \begin{pmatrix} 6 \\ 8 \end{pmatrix}$$



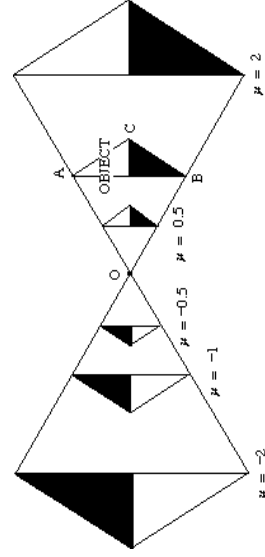
Enlarge this triangle by a scale factor of 3 using A as the centre of enlargement.

The new lines must be the length of the original distance from the centre of enlargement times the scale factor

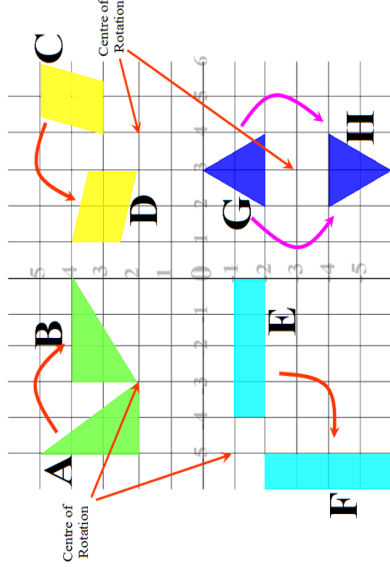
Use the lines to find the corners of the enlarged shape

Draw lines from the centre of enlargement through the vertices (corners) of the shape.

ENLARGEMENT



ROTATION



Subtracting vectors

Subtracting a vector is the same as adding a negative version of the vector (remember that making a vector negative means reversing its direction).

$$\begin{pmatrix} a \\ b \end{pmatrix} - \begin{pmatrix} c \\ d \end{pmatrix} = \begin{pmatrix} a - c \\ b - d \end{pmatrix}$$

Look at the diagram and imagine going from X to Z. How would you write the path in vectors using only the vectors \overrightarrow{XY} and \overrightarrow{YZ} ?

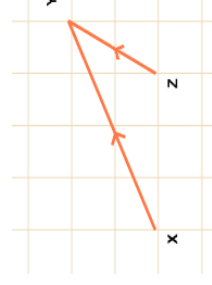
You could say it is vector \overrightarrow{XY} followed by a backwards movement along \overrightarrow{YZ} .

So we can write the path from X to Z as

$$\overrightarrow{XY} - \overrightarrow{YZ} = \overrightarrow{XZ}$$

Written out in numbers it looks like this:

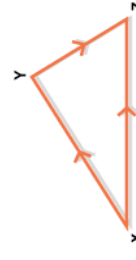
$$\begin{pmatrix} 4 \\ 2 \end{pmatrix} - \begin{pmatrix} 1 \\ 2 \end{pmatrix} = \begin{pmatrix} 3 \\ 0 \end{pmatrix}$$



Resultant vectors

To travel from X to Z, it is possible to move along vector \overrightarrow{XY} followed by \overrightarrow{YZ} . It is also possible to go directly along \overrightarrow{XZ} .

\overrightarrow{XZ} is therefore known as the **resultant** of \overrightarrow{XY} and \overrightarrow{YZ} .



Fractional scale factors

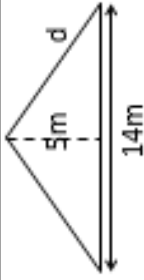


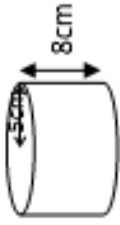
If we 'enlarge' a shape by a scale factor that is between -1 and 1, the image will be **smaller** than the object

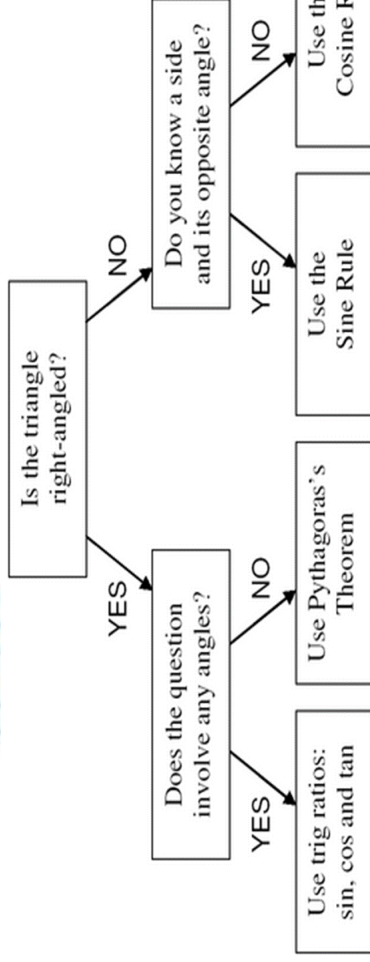
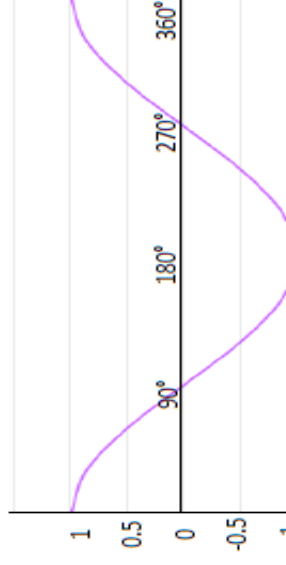
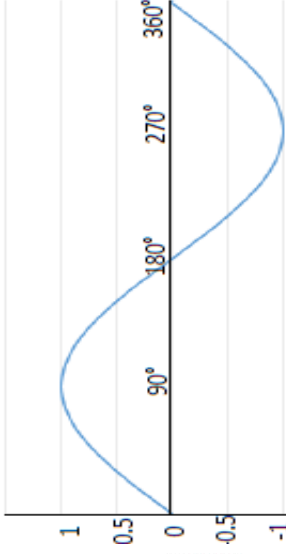
Negative scale factors

An enlargement using a negative scale factor is similar to an enlargement using a positive scale factor, but this time the image is on the other side of the centre of enlargement, and it is upside down.

Date Due

Score to beat

Section A: Number		Section B: Algebra		Section C: Using and applying	
1. To increase an amount by 3.2%, what single multiplier would you use?		11. Expand & simplify: $x(x + 2) + x(x + 3)$		21.	
2. Decrease £750 by 18% 		12. Factorise: $6m - 14$		Find 'd' to 1DP:	
3. Divide 360 in the ratio of 5 : 7		13. Simplify: $2g^3 \times 3g^2$		22.	40 is rounded to the nearest whole. Write down the maximum possible length it could have been.
4. Galina and Hiran shared 36 sweets. Galina had 12 more sweets than Hiran. What was the ratio of sweets shared in its simplest form.		14. Solve: $4x \leq 10$			
5. Work out: $1\frac{4}{5} - \frac{3}{4}$		15. Make d the subject of the formula: $A = cd$		23.	A block of copper weighs 2160g and has a volume of 240cm^3 . What is the density of the copper?
6. Work out: $2\frac{2}{5} \div \frac{3}{4}$		16. Work out the value of: $xy + 5$ When $x = 2$ and $y = 3$			
7. Round off 0.482 to one significant figure		17. Write down the nth term of this sequence: 1 7 13 19 25 ...		24.	In an experiment the colours of 50 cars passing was recorded. 17 silver cars were recorded. What is the relative frequency of a silver car passing?
8. Estimate the answer to: $253 \div 0.46$		18. Write down the 7th term in the sequence given by: $T(n) = n^2 + 2n$			
9. Write down all the factors of 24		19. If $y = x^2 - x$, find the value of y when $x = -3$		25.	Use π on the calculator  Work out the volume of this cylinder? (correct to 1 decimal place) 
10. Write down the HCF of 24 and 32		20. Write down the equation of a line parallel to the graph $y = 2x - 4$			
Total (A)		Total (B)		Total (C)	
Test Total (A+B+C)		R (0-9)	Y (10-19)	G (20-25)	



Cosine Rule

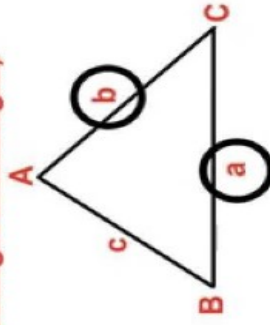
The Cosine Rule can be used in any triangle

$$a^2 = b^2 + c^2 - 2bc \cos A \quad \text{Used to calculate an unknown SIDE}$$

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc} \quad \text{Used to calculate an unknown ANGLE}$$

Area of a Triangle (Non Right-Angled Triangle)

$$\text{Area} = \frac{1}{2} ab \sin C$$



This formula finds the **area** of a non right-angled triangle from **2 sides**

Key Facts - Exact Trigonometric Values

	0°	30°	45°	60°	90°
$\sin \theta$	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
$\cos \theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0
$\tan \theta$	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	$\pm \infty$

Key Facts - Pythagoras' Theorem

$$a^2 + b^2 = c^2$$

Where C is the hypotenuse

$$c^2 - a^2 = b^2$$

Where the unknown side is the shorter side (aka 'leg')

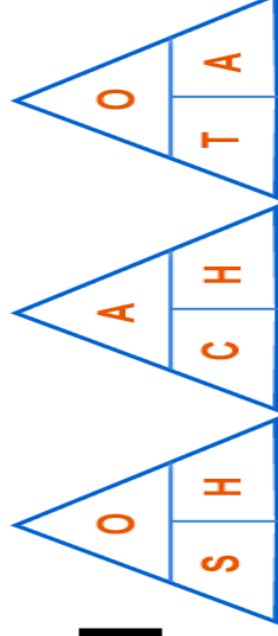
Sine Rule

The Sine Rule can be used in any triangle
Used to calculate an unknown SIDE

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Used to calculate an unknown ANGLE

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$



Date Due

Score to beat

Section A: Number		Section B: Algebra Geometry & measures		Section C: Using and applying	
1. To decrease an amount by 4%, what single multiplier would you use?		11. Expand & simplify: $5(x - 3) - 2(2x + 1)$		21. Use π on the calculator. Work out the volume of this cylinder? (Correct to 1 significant figure)	
2. Share £1000 in the ratio of 3 : 2		12. Give the inequality 			
3. Work out: $\frac{5}{8} \div \frac{2}{3}$		13. Work out the value of: $5x - 2y$ When $x = -2$ and $y = -3$		22. Sam ran at 6km/h for 2h 20min. What distance did he run?	
4. Round off 0.521 to one significant figure		14. Write down the nth term of this sequence: 5 11 21 35 ...		23. 500 tickets are sold for a prize draw. The probability that Bill wins first prize is $\frac{1}{20}$. How many tickets did he buy?	
5. Write down the LCM of 20 and 15		15. If $y = x^2 + 2x$, find the value of y when $x = -2$		24. What inequality is represented here? 	
6. Write 0.5 as a fraction		16. Factorise: $p^2 - 1$		25. On a spinner: 	
7. The value of a bike depreciates by 55% per year. Work out the current value of a bike bought 2 years ago for £1300.		17. Multiply & simplify: $(2a - 3)(2a + 1)$			
8. The cost of a phone has increased by 10% to £352. Work out the original price.		18. Make w the subject of the formula: $P = \frac{7w - 10}{60}$			
9. Write 5×10^{-3} as an ordinary number		19. Give your answer correct to 3sf. $A = \pi r^2 - \pi r s$. Find A when $r = 2.7$ $s = 1.6$			
10. Work out $(8 \times 10^5) \times (9 \times 10^{-2})$ Give your answer in standard form		20. If $\cos 35^\circ = \frac{8}{x}$, find x (3sf)			
Total (A)		Total (B)		Total (C)	
Test Total (A+B+C)		R (0-9)	Y (10-19)	G (20-25)	