

YEAR 10 SPRING 1 FOUNDATION

1). Transformations

Tessellation (12)
Translate and describe a translation (50)
Enlarge a shape (148)
Reflect shapes (48)
Rotate shapes and describe a rotation (49)

2). Percentages

Percentage of an Amount (86,87)
Percentage Increase/Decrease (108)
Percentage Profit and Loss (109)
Reverse Percentages (110)
Simple and Compound Interest (111,164)

3). Ratio

Simplify ratios (38/107)
Share an amount in a ratio (106)
Ratio – find one quantity (106)

4). Proportion

Using proportion (38)
Recipe Style Questions (39)
Value for Money (40,41)
Exchanging Money (105)

Ratio

Sharing a whole into a given ratio

ratio

James and Lucy share £350 in the ratio 3:4
Work out how much each person earns

Model the Question

James: Lucy
3:4

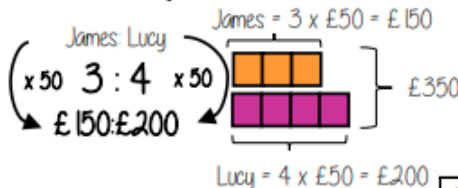


Find the value of one part

Whole: £350
7 parts to share between (3 James, 4 Lucy)

£350 ÷ 7 = £50
□ - one part
- £50

Put back into the question



Transformations

Rotation

To describe a rotation you need:

- the angle of rotation
- the direction
- the coordinates of the centre

Rotation of 90°, clockwise, about centre (2,-1)



Centre of rotation

Centre

Enlargement, scale factor 3, centre (0,7)

Enlargement

To describe an enlargement you need:

- the scale factor
- coordinates of the centre

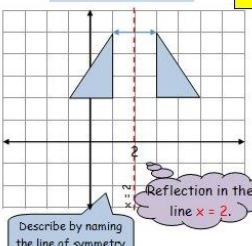
Always use **TRACING PAPER** for translation, reflection & rotation.

Translation

Describe with a vector

3 squares right
4 squares up

Reflection



Key Formulae/Rules

Compound interest -

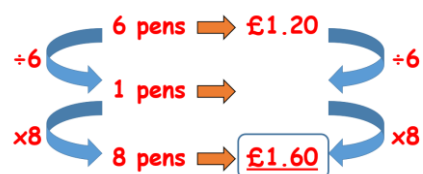
amount of money after x years = amount x multiplier^x
= £3,000 x 1.05⁴
= £3,646.51875

Simple interest – find the interest, multiply by number of years and add it on.

Increasing means to add on
Decreasing means to take away

Proportion

"Will buys 6 pens for £1.20. How much would 8 pens cost?"



Percentages

increasing

Increase £60 by 12%
12% of 60 = 0.12 x 60 = £7.20
New amount = £60 + £7.20 = £67.20

ADD

decreasing

decrease £60 by 12%
12% of 60 = 0.12 x 60 = £7.20
New amount = £60 - £7.20 = £52.80

SUBTRACT

Percentage Change

Percentage change = $\frac{\text{Change}}{\text{Original}} \times 100$

YEAR 10 SPRING 1 HIGHER

1). Simultaneous Equations

Simultaneous Equations Algebraically (162)
Solving SE graphically (140)

2). FDP

Convert fractions, decimals and percentages (85)
Compare fractions, decimals and percentages

3). Percentages

Percentage of an Amount (86,87)
Percentage Increase/Decrease (108)
Percentage Profit and Loss (109)
Reverse Percentages (110)
Simple and Compound Interest (111,164)

4). Ratio

Proportion Problems (38,39)
Share in a Ratio (106)
Ratio, Fractions and Graphs (107)

Simultaneous Equations

Simultaneous equations

Equations involving two or more unknowns that are to have the same values in each equation

$$\begin{array}{l|l|l} 4x + 3y = 5 & 2x - 3y = 4 & 3y + 10x = 7 \\ 3x + 2y = 4 & 5x + 2y = 1 & y = 2x + 1 \end{array}$$

Linear equations (Elimination method)

Multiply equations to get matching coefficients

Add/subtract equations

Substitute to find second variable

$$\begin{array}{rcl} 4x + 3y = 5 & \times 3 & \rightarrow 12x + 9y = 15 \\ 3x + 2y = 4 & \times 4 & \rightarrow -12x + 8y = 16 \\ \hline & & y = -1 \end{array}$$

Substitute $y = -1$ into equation 2

$$3x + 2(-1) = 4 \rightarrow 3x - 2 = 4 \rightarrow x = 2$$



Ratio

Ratios in 1:n and n:1

This is asking you to cancel down until the part indicated represents 1

Show the ratio 4:20 in the ratio of 1:n

The question states that this part has to be 1 unit. Therefore Divide by 4

$$\begin{array}{c} 4 : 20 \\ \downarrow \quad \downarrow \\ 1 : 5 \end{array}$$

This side has to be divided by 4 too - to keep in proportion

the n part does not have to be an integer for this type of question

Trees: Flowers

$$3 : 7 \rightarrow \frac{3}{10}$$

Number of parts of in group
Total number of parts

Key Formulae/Rules

Remember - to compare fractions, decimals and percentages, we would convert them into the same format.

Compound interest -

$$\begin{aligned} \text{amount of money after } x \text{ years} &= \text{amount} \times \text{multiplier}^x \\ &= £3,000 \times 1.05^4 \\ &= £3,646.51875 \end{aligned}$$

Simple interest - find the interest, multiply by number of years and add it on.

Increasing means to add on
Decreasing means to take away

percentage fraction decimal

$$30\% \quad \frac{3}{10} \quad 0.3$$

to go from a fraction to a percentage we can convert to a decimal first

$$3/5 \rightarrow 0.6 \rightarrow 60\%$$

Percentages

increasing

Increase £60 by 12%

$$12\% \text{ of } 60 = 0.12 \times 60 = £7.20$$

$$\text{New amount} = £60 + £7.20 = £67.20$$

ADD

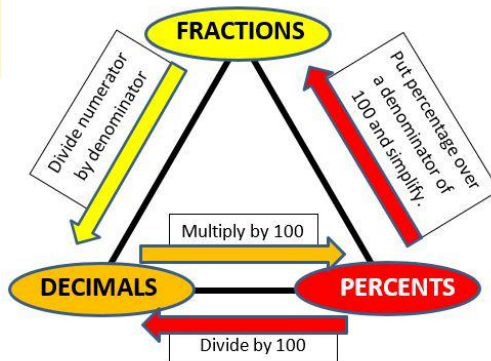
decreasing

decrease £60 by 12%

$$12\% \text{ of } 60 = 0.12 \times 60 = £7.20$$

$$\text{New amount} = £60 - £7.20 = £52.80$$

SUBTRACT



FDP

Percentage Change

$$\text{Percentage change} = \frac{\text{Change}}{\text{Original}} \times 100$$

YEAR 10 SPRING 2 Foundation

1). 2D and 3D Shapes

Properties of 2D/3D shapes -faces, edges, vertices (43)

Nets of 3D shapes - cuboid, prism, pyramid (44)

Plans and elevations (51)

2) Linear Graphs

Horizontal and vertical line graphs

Draw a straight line graph (96)

Find the gradient and y intercept (97,159a)

Find the equation of a line through two given points (159b)

3). Area and Perimeter

Triangles, rectangles, parallelograms (53,54,55)

Compound area

Area of a Trapezium (56)

4). Standard Form

Write numbers in standard form (83)

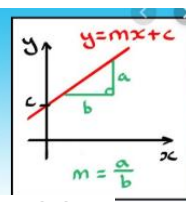
Multiply and divide numbers in standard form

Add and subtract numbers in standard form

The Equation of a Line

$$y = mx + c$$

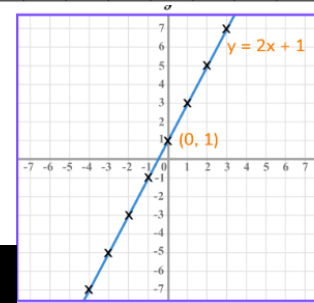
$$\text{Gradient (M)} = \frac{Y_2 - Y_1}{X_2 - X_1}$$



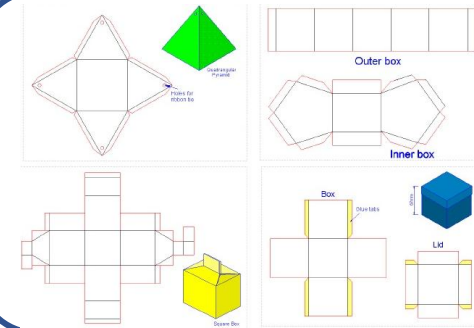
Linear Graphs

Substitute into the table of values to produce the coordinates

x	-3	-2	-1	0	1	2	3



Nets of 3D shapes



Key Formulae/Rules

Standard Form

A number between 1 and 10 multiplied by a power of 10.

Area and Perimeter

Area – space inside a shape

Perimeter is the distance around a shape

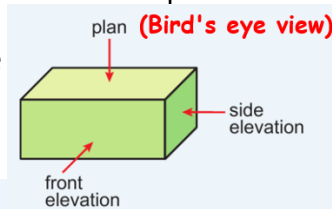
$$\pi = 3.14159...$$

Area and Perimeter

The **plan** is the view from above an object.

The **front elevation** is the view of the front of an object.

The **side elevation** is the view of the side of an object.



Standard Form

$$4.2 \times 10^9$$

Must be 1 to 10
(but not 10!)

Must be $\times 10$

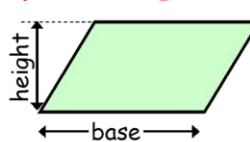
Must be an Integer

rectangle



$$\text{Area} = \text{base} \times \text{height}$$

parallelogram

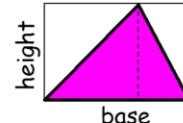
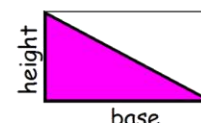


$$\text{Area} = \text{base} \times \text{height}$$

trapezium

$$\text{Area} = \frac{(a + b) \times h}{2}$$

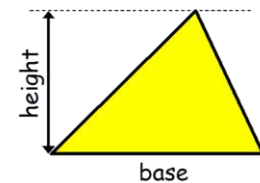
a **triangle** is half the area of a rectangle



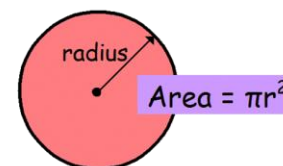
$$\text{Area} = \frac{\text{base} \times \text{height}}{2}$$

AREA

Always use the
**perpendicular
height**



circle



YEAR 10 SPRING 2 HIGHER

1). Standard Form

Write numbers in standard form (83)

Multiply and divide numbers in standard form

Add and subtract numbers in standard form

2) Pythagoras

Missing Sides (150)

3D Pythagoras (217)

3) Trigonometry

Missing Sides (168)

Missing Angles (168)

3D Trig (218)

4) Perimeter, Area and Volume

Basic Area and Circles (52,53,53,55,56,117,118)

Surface Area (114)

Volume of a Prism (115,119)

Spheres, Cones, Pyramids and Frustums
(169,170,171,172)

Standard Form

Must be an Integer

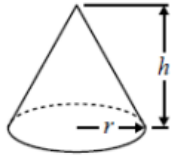
$$4.2 \times 10^9$$

Must be 1 to 10 (but not 10!)

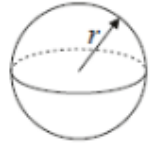
Must be $\times 10$

Perimeter, Area and Volume

Volume of cone = $\frac{1}{3}\pi r^2 h$



Volume of sphere = $\frac{4}{3}\pi r^3$



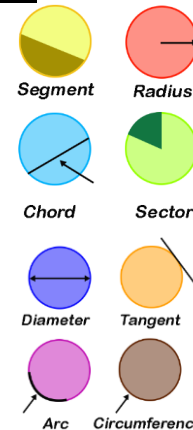
Circles

Circles $\pi = 3.14159...$

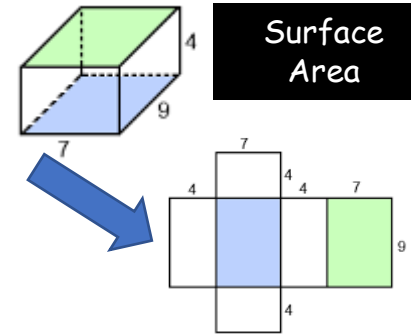
Circumference = $\pi \times \text{diameter}, C = \pi d$

Circumference = $2 \times \pi \times \text{radius}, C = 2\pi r$

Area of a circle = $\pi \times \text{radius squared } A = \pi r^2$



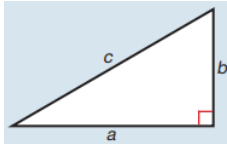
Surface Area



Key Formulae/Rules

Pythagoras

For a right-angled triangle,
 $a^2 + b^2 = c^2$



Trigonometry

SOH

$$\sin(\theta) = \frac{O}{H}$$

CAH

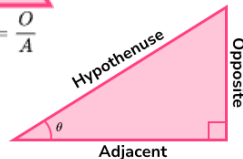
$$\cos(\theta) = \frac{A}{H}$$

TOA

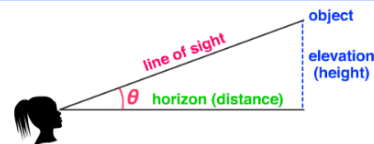
$$\tan(\theta) = \frac{O}{A}$$

Use **SHIFT** to find the

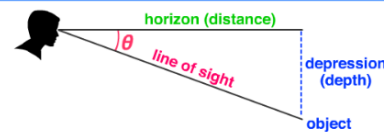
angle
 $\sin^{-1}$
 $\cos^{-1}$
 $\tan^{-1}$



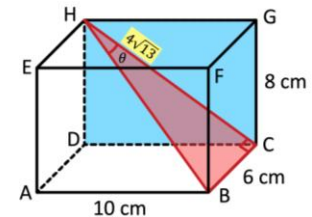
angle of elevation



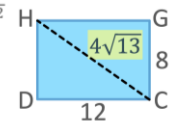
angle of depression



3D Trigonometry



Solve
 $HC = \sqrt{12^2 + 8^2}$
 $HC = 4\sqrt{13} \text{ cm}$



$\tan(\theta) = \frac{6}{4\sqrt{13}}$
 $\theta = \tan^{-1}\left(\frac{6}{4\sqrt{13}}\right)$
 $\theta = 22.6^\circ$

YEAR 10 Summer 1 Foundation

1). Circles

Name parts of circles (116/149)

Calculate area and circumference of circles (117/118)

Calculate the area of sectors (167)

Calculate the lengths of Arcs (167)

2) Pythagoras

Finding longer sides(150)

Finding shorter sides(150)

Problem Solving

Pythagoras on coordinate grids

3). Trigonometry

Missing Sides (168)

Missing Angles (168)

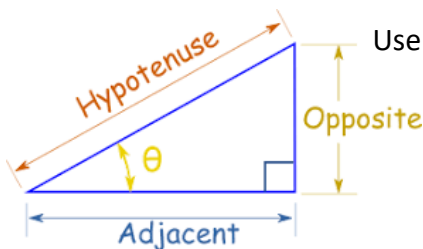
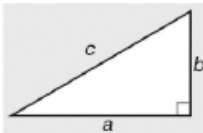
3D Trig (218)

Key Formulae/Rules

Pythagoras

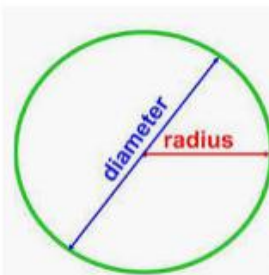
Pythagoras' Theorem

For a right-angled triangle,
 $a^2 + b^2 = c^2$



Use **SHIFT** to find the
angle
 $\sin^{-1}$
 $\cos^{-1}$
 $\tan^{-1}$

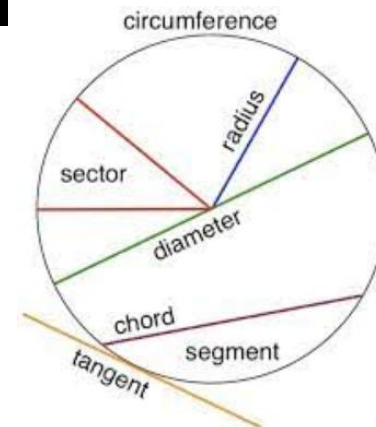
Circles



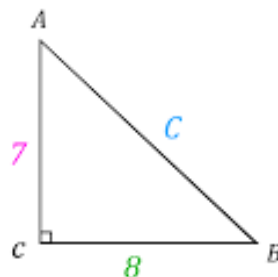
Area of a circle
 $= \pi \times \text{radius}^2$

Circumference of a
circle $= \pi \times \text{diameter}$

remember that the
diameter $= 2 \times \text{radius}$

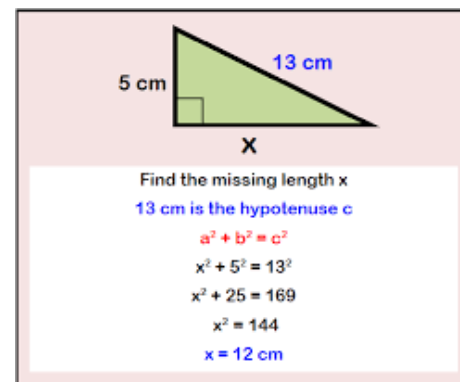


Pythagoras

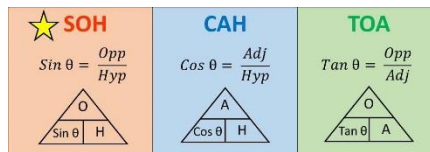


$$\begin{aligned} a^2 + b^2 &= c^2 \\ 8^2 + 7^2 &= c^2 \\ 64 + 49 &= c^2 \\ 113 &= c^2 \end{aligned}$$

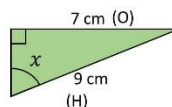
$$c = \sqrt{113}$$



Trigonometry



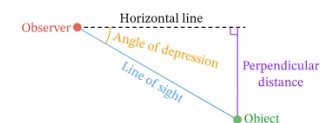
Find the value of x to 2dp.



Right Triangle for an Angle of Elevation



Right Triangle for an Angle of Depression



YEAR 10 SUMMER 1 HIGHER

1) Averages

Averages from frequency tables (130a,b)

Averages from graphs

Draw Box plots (187)

Cumulative frequency graphs (186)

Comparing averages

2) Sequences

Recognise types of sequences (104, 141)

n th Term of an Arithmetic Sequence (102, 103)

N th Term of a Geometric Sequence (163)

N th Term of a Quadratic Sequence (213)

3) Compound Measures and Kinematics

Substitute into formulas for
SDT, DMV, PFA (95, 137, 142)

Convert between units (112)

Compare lengths, area and volume
using ratio notation (142)

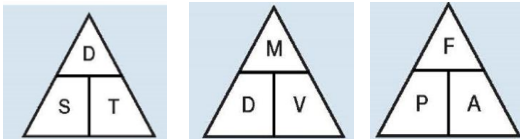
Use the Kinematic Formula

4) Algebraic Fractions

Simplifying (210a)

Solve Equations involving Algebraic Fractions
(210b)

Key Formulae/Rules



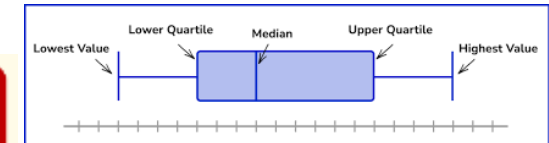
Averages

Weight	Frequency	Mid-point	fx
$0kg \leq x \leq 2kg$	12	1	12
$2kg < x \leq 4kg$	3	3	9
$4kg < x \leq 6kg$	9	5	45
$6kg < x \leq 8kg$	10	7	70
Sum of Freq	34	Sum of fx	136

Two extra columns are created, the midpoint of each group and the fx column

This enables us to find out an estimate for the mean

Box Plot

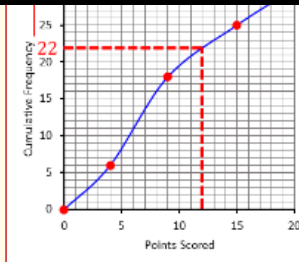


The **median** tells us an **average**

The **range** tells us the **spread** of the data

The **interquartile range** tells us the **spread** of the middle 50% of the data

Cumulative Frequency



Always plot each point at the end of the group

Draw a smooth line through the points

Compound Measures

$$v = u + at$$

$$v^2 = u^2 + 2as$$

$$s = ut + \frac{1}{2}at^2$$

$$s = vt - \frac{1}{2}at^2$$

$$s = \frac{1}{2}(u + v)t$$

s – displacement
 u – initial velocity
 v – final velocity
 a – acceleration
 t – time

Algebraic Fractions

Add or Subtract “+ or -” with different denominators

$$\frac{1}{3} + \frac{1}{4} = \frac{4}{12} + \frac{3}{12} = \frac{7}{12}$$

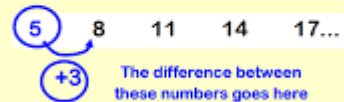
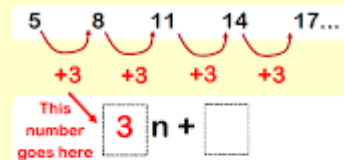
Change to equivalent fractions with common denominators, then add (or subtract).

Multiplying fractions

$$\frac{2}{3} \times \frac{5}{6} = \frac{10}{18} = \frac{5}{9}$$

Multiply the numerators, multiply the denominators, then simplify

Sequences



Dividing fractions

$$\frac{2}{5} \div \frac{1}{2} = \frac{2}{5} \times \frac{2}{1} = \frac{4}{5}$$

Change the problem to multiplication by inverting the second fraction, then multiply

YEAR 10 Summer 2 Foundation

1). Sequences

Continue and find missing terms in a number sequence (37)

Find the nth term (103)

Use the nth term to find a given term (102)

Continue a diagram sequence

Explain whether a number is or is not in a sequence

Recognise different types of sequences (104, 141)

Understand the difference between arithmetic and geometric sequences

2) Averages and Range

Calculate mean, mode, median and range (62)

Calculate averages from frequency tables (130a and 130b)

Calculate averages from bar charts, stem and leaf diagrams and pictograms

3) Displaying Data

Construct and interpret frequency tables (65a)

Construct and use two way tables (61)

Pie charts (128a)

Draw and interpret Scattergraphs and interpret outliers (129)

Frequency Polygons (65b)

Stem and leaf diagrams (128b)

Draw histograms (205)

Special Sequences

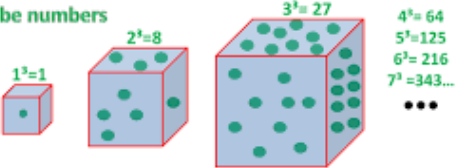
Triangular numbers



Square numbers

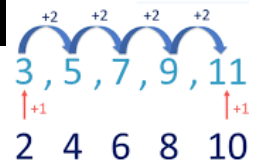


Cube numbers



Finding the Nth term

2n:



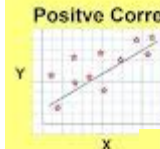
$$2n + 1$$

Fibonacci Sequences

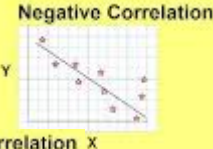


Displaying Data

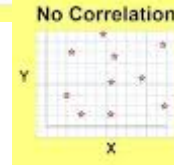
Positive Correlation



Negative Correlation



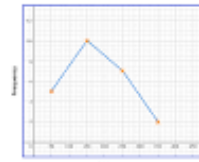
No Correlation



To construct a **frequency polygon** we use grouped data. We use the midpoints of the class intervals to plot points with the frequencies and then join up the points with straight lines.

E.g.

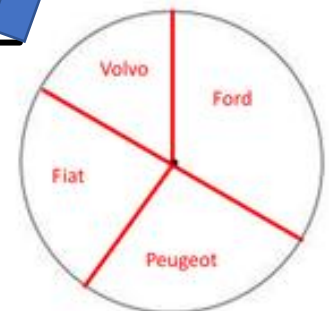
Values, x	Frequency
$0 \leq x < 100$	5
$100 \leq x < 200$	10
$200 \leq x < 300$	7
$300 \leq x < 400$	2



Frequency Polygons

Plot the midpoints

Drawing Pie Charts,



A car dealer sold these cars in the first month of his job. Show this information in a pie chart.

Car	Frequency	Angle
Ford	10	$10 \times 12 = 120^\circ$
Peugeot	8	$8 \times 12 = 96^\circ$
Fiat	7	$7 \times 12 = 84^\circ$
Volvo	5	$5 \times 12 = 60^\circ$
Total	30	

$$360 \div 30 = 12$$

Key Formulae/Rules

Sequences

ARITHMETIC SEQUENCE

-6, 1, 8, 15, 22

+7 +7 +7 +7

GEOMETRIC SEQUENCE

2, 4, 8, 16, 32

x2 x2 x2 x2

Pie charts

To draw a pie chart;

1. Add up the frequency
2. Divide 360 by the total frequency
3. Multiply each frequency by the answer to part 2.

This gives you the angles

Mode

The mode is the value that appears most often in a set of data.

The range is the difference between the lowest value and the highest value.

Range

Median

The median is the middle number in a list of numbers ordered from lowest to highest.

The mean is the total of all the values, divided by the number of values.

Mean

YEAR 10 SUMMER 2 HIGHER

1) Further Trig

Revise 3D Pythag and Trig (217, 218)
Area of a triangle using $\frac{1}{2} ab \sin C$ (203)
Sine Rule (202a)
Cosine Rule (202b)
Solve problems with 3D shapes

2) Transformations

Tessellation (12a)
Translation (50)
Enlargement (148)
Reflection (48)
Rotation Describe the changes and invariance by a combination of transformations (49)
Introduce addition of column vectors with translation (174)

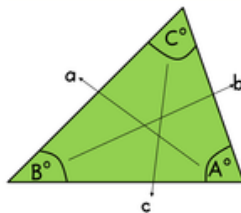
3) Maps and Bearings

Scale Drawings (38)
3 Figure Bearings (120, 124)

Key Formulae/Rules

Invariant points are points that DO NOT move when a shape is transformed.

Labelling your triangle



Area of a triangle

$$\frac{1}{2} \times a \times b \times \sin C^\circ$$

Further Trig

Cosine rule

Finding Sides

$$a^2 = b^2 + c^2 - 2bc \cos A$$

To find sides you need:
2 sides and 1 angle

Finding Angles

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

To find angles you need:
3 sides

Sine rule

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

To find sides you need:
1 side and 2 angle

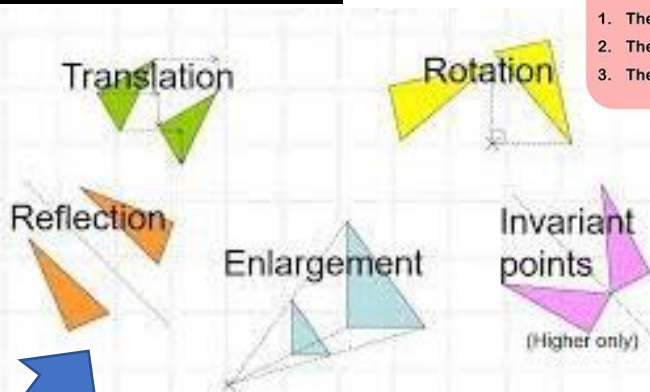
$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

To find angles you need:
2 sides and 1 angle

You only need to use 2 of the 3 fractions given here!

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Transformations



Describing Rotations

State...

1. The centre of rotation
2. The angle of rotation
3. The direction of rotation

Describing Translations

State...

1. Movement left or right
 2. Movement up or down
- Or write the column vector

Describing Reflections

State...

1. The line of symmetry

Describing Enlargements

State...

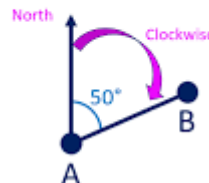
1. Centre of enlargement
2. Scale Factor

Maps and Bearings

A bearing is an angle measured clockwise from north

Write bearings with 3 figures

The bearing of B from A is 050°



A ship leaves point A on a bearing of 45° and travels for 13 km.
Another ship leaves point A on a bearing of 155° and travels for 20 km.
How far apart are the two ships?

