

## YEAR 9 SPRING 1

### 1) Angles

Angles in triangles (G17)  
Interior and Exterior Angles (123)  
Angles on Parallel lines (120)  
Bearings EXT (124)

### 2) Percentages

Equivalence with FDP  
Increase/decrease by a percentage basics (R9a)  
Percentage change (109)  
Reverse percentage (110)  
Non calculator problems  
Calculator problems  
Increase/decrease by a percentage – multiplier (R9b)

### 3). Maths and money

Bills and banks  
Simple interest (111)  
Compound interest (164)  
Problems with VAT  
Calculate wages and tax  
Problems with exchange rates (105)  
Unit pricing problems

## Key Formulae/Rules

Sum of interior angles-  $180 \times \text{the number of triangles}$   
Exterior angles- add up to 360 degrees

#### Bearings Rules

- Measure from north
- Clockwise
- 3 figures

## Percentages

on a calculator

$$39\% \text{ of } 82 \\ 0.39 \times 82$$

Change to a decimal and multiply

increasing

$$\text{Increase } \pounds 60 \text{ by } 12\%$$

$$12\% \text{ of } 60 = 0.12 \times 60 = \pounds 7.20 \\ \text{New amount} = \pounds 60 + \pounds 7.20 \\ = \pounds 67.20$$

ADD

fraction to %

$$\frac{15}{20} = \frac{75}{100} = 75\%$$

$$15 \div 20 \times 100 = 75\%$$

Percentages

%

decreasing

$$\text{decrease } \pounds 60 \text{ by } 12\%$$

$$12\% \text{ of } 60 = 0.12 \times 60 = \pounds 7.20 \\ \text{New amount} = \pounds 60 - \pounds 7.20 \\ = \pounds 52.80$$

SUBTRACT

without a calculator

50% - half      10% - divide by 10  
25% - half and half      5% - half 10%  
75% - 50% + 25%      20% - double 10%

## Reverse Percentage Formula

$$\text{Original Amount} = \text{New Amount} \div \text{Decimal Multiplier}$$

$$\text{Decimal Multiplier} = (100\% + \text{percentage change}) \div 100$$

## Maths and Money

### Compound Interest

Where  $P$  is the principal amount,  $r$  is the interest rate over a given period and  $n$  is number of times that the interest is compounded:

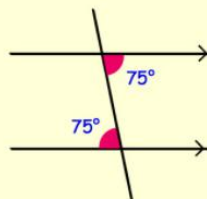
$$\text{Total accrued} = P \left( 1 + \frac{r}{100} \right)^n$$



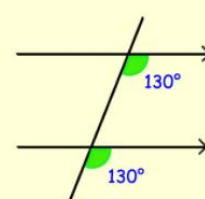
|                              | Interior                                                  | Exterior              |
|------------------------------|-----------------------------------------------------------|-----------------------|
| Sum of all Angles            | $(n - 2)180^\circ$                                        | $360^\circ$           |
| Each Angle (Regular Polygon) | $180 - \frac{360^\circ}{n}$<br>$\frac{(n-2)180^\circ}{n}$ | $\frac{360^\circ}{n}$ |

## Angles

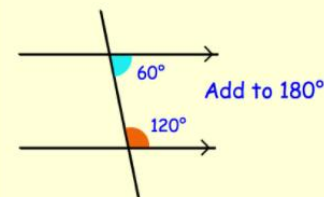
### Alternate Angles



### Corresponding Angles



### Co-interior Angles



## YEAR 9 SPRING 2

### 1) Rotation and Translation

Rotational symmetry  
Rotate about a point  
Translate by vectors

### 2) Ratio and Proportion

Introduction (R1a/R1b)  
Simplifying (R6a)  
Sharing into a given ratio (R5b)  
Introduction to proportion (42)  
Using ratio for recipes (39)  
Direct and inverse proportion (R8 and R13)

### 3). Enlargement and Similarity

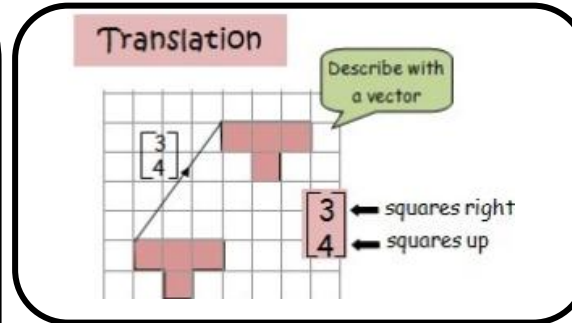
Similarity and congruence  
Find missing sides of similar shapes  
Lengths, areas and volumes of similar shapes  
Recognise enlargement and similarity  
Enlarge a shape by a positive scale factor  
Enlarge a shape by a negative scale factor

## Key Formulae/Rules

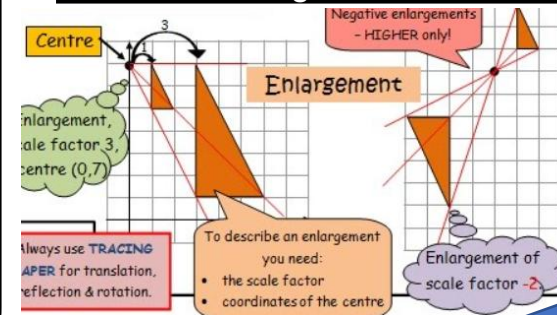
**Direct Proportion**-two (or more) quantities increase or decrease in the same ratio

**Inverse Proportion**  
two quantities are inversely proportional then as one quantity increases, the other decreases.

## Translation



## Enlargement



Simplify the following ratios

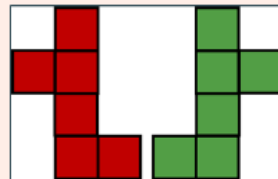
$$\begin{array}{lll} 15:20 & 18:30 & 12:40 \\ \div 5 & \div 6 & \div 4 \\ \hline 3:4 & 3:5 & 3:10 \end{array}$$

## Congruence

Congruent shapes are just exact replicas of the original

The angles and side lengths remain the same

The shapes may well be orientated differently

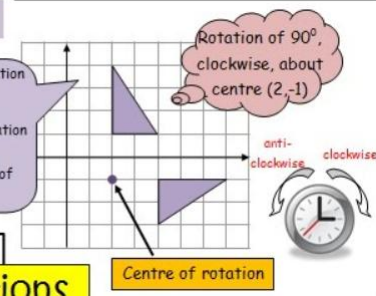


## Rotation

### Rotation

To describe a rotation you need:

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



## Ratio and Proportion

Fred has a recipe for 30 biscuits.

Here is a list of ingredients for 30 biscuits.

Self-raising flour : 230g  
Butter : 150g  
Caster sugar : 100g  
Eggs : 2

Fred wants to make 45 biscuits.

(a) Complete his new list of ingredients for 45 biscuits.

$$\begin{array}{l} 230g \div 2 = 115g \\ 115 \times 3 = 345g \end{array}$$

$$HCF = 15$$

Self-raising flour : 345  
Butter : .....  
Caster sugar : .....  
Eggs : .....  
(3)

## Similarity in 1D

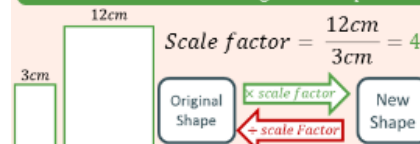
Similar shapes are just enlargements of the original

The angles remain the same but the lengths have been scaled up or down

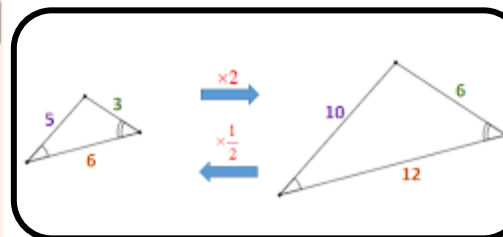
This scale factor needs to be calculated in order to solve problems involving similar shapes.

Find two comparative lengths.

$$\text{Scale factor} = \frac{\text{New shape}}{\text{Original shape}}$$



## Similar shapes



## YEAR 9 SUMMER 1

### 1) Pythagoras

Pythagoras (G30)

Pythagoras' Theorem (150a, 150b)

3D Pythagoras (217)

### 2) Trigonometry

Trigonometry (G35a/G35b)

Trigonometry (168)

Exact Values of Trigonometry (173)

### 3) Rates (Compound Measure)

Metric conversions (112)

Speed/distance/time (R11a/142a)

Density (R11b, 142b)

Units – Length, mass and capacity (N7a)

Interpreting real life graphs (A21a /A21b)

## Key Formulae/Rules

### Trigonometry

**only applies to Right Angles Triangles**

**SOHCAHTOA** – used to find a missing side or an angle When finding the missing angle you must use **SHIFT** on our calculators to get the inverse

(-1) function

**Density** is the amount of mass per unit of volume. If an object is heavy and compact, it has a high **density**

Watch out for mixed Units – use conversion

$$10 \text{ mm} = 1 \text{ cm}$$

$$100\text{cm} = 1\text{m}$$

$$1000\text{g} = 1 \text{ kg}$$

$$1000\text{ml} = 1\text{litres}$$

## Pythagoras

### Pythagoras' Theorem

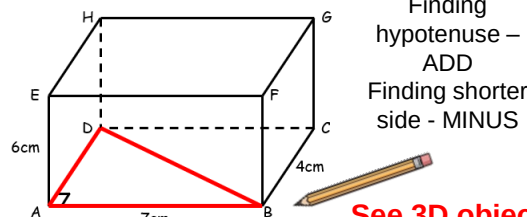
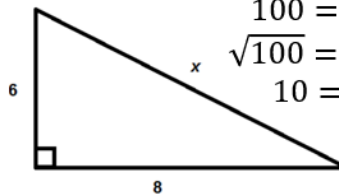
$$a^2 + b^2 = c^2$$

$$6^2 + 8^2 = x^2$$

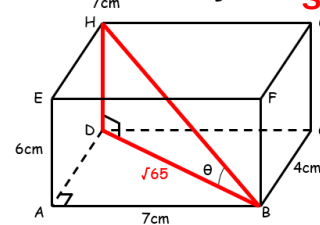
$$100 = x^2$$

$$\sqrt{100} = x$$

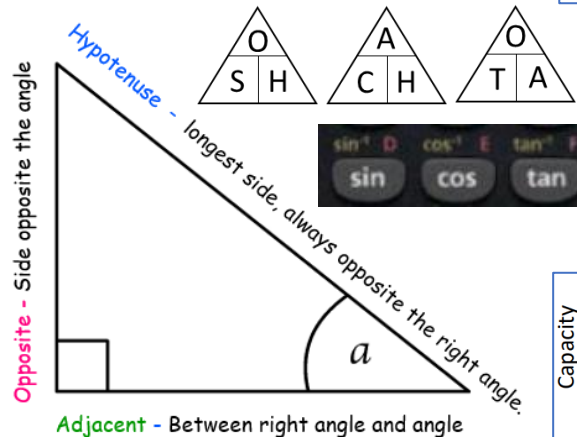
$$10 = x$$



Finding hypotenuse –  
ADD  
Finding shorter  
side - MINUS



## Trigonometry



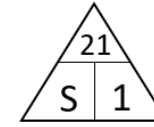
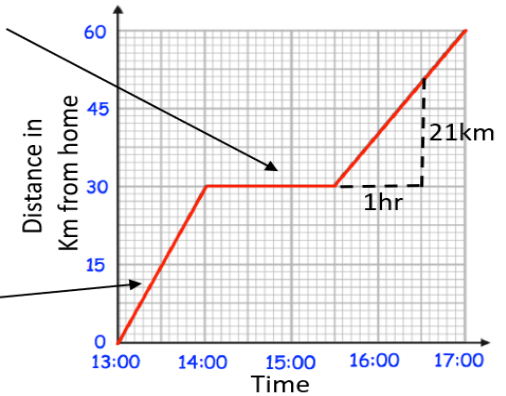
Opposite - Side opposite the angle

Adjacent - Between right angle and angle

## Rates (Compound Measure)

Horizontal sections are where the object is stationary

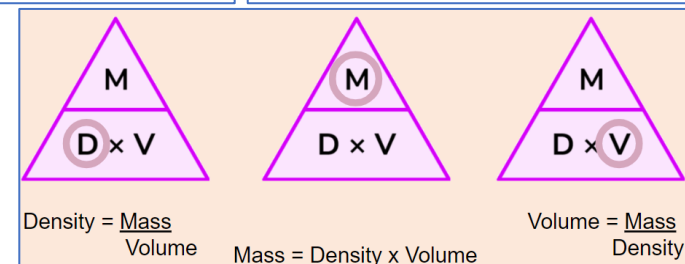
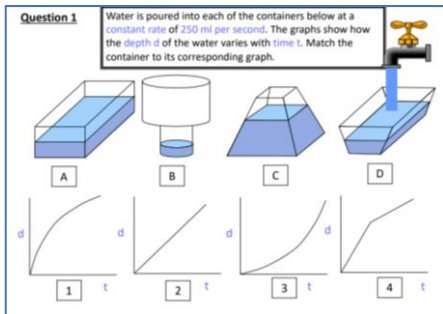
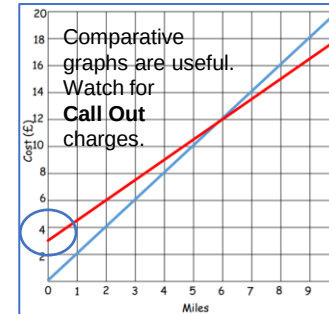
Diagonal lines show the object moving away from home or moving closer to home



$$\text{Speed} = \frac{\text{distance}}{\text{time}}$$

$$\text{Speed} = \frac{21}{1}$$

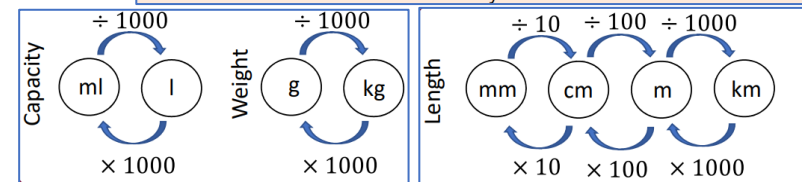
$$\text{Speed} = 21\text{km/h}$$



$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

$$\text{Mass} = \text{Density} \times \text{Volume}$$

$$\text{Volume} = \frac{\text{Mass}}{\text{Density}}$$





## YEAR 9 SUMMER 2

### 1) Probability

Calculating probabilities (P2a, P2b, 59)

Sample space diagrams (126)

Two-way tables (P5)

Frequency trees (57, 151, 175)

Relative Frequency (P7)

### 2) Algebraic Representations

Drawing linear graphs (A14)

Equation of the line (A14)

Draw and recognise quadratic, cubic and reciprocal graph. (A28)

Inequalities on a line (A20a)

### 3) Simultaneous Equations

Simultaneous equations graphically (A24a)

Simultaneous equation algebraically (A24b)

### 4) Constructions and Congruence

Construct a triangle (G26a)

Construct a line/angle bisector (G26b, G26c)

Loci (G27)

Similarity and congruence (R10, G31)

## Key Formulae/Rules

> Greater than

≥ Greater than or equal to

< Less than

≤ Less than or equal to

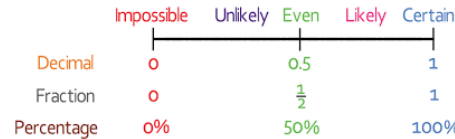
Equation of a line-  $y = mx + c$

Where m is the gradient and c is the y-intercept

Parallel lines - same gradient

Perpendicular lines- one line has a gradient that is the negative reciprocal of the other.

## Probability



$$P(\text{outcome}) = \frac{\text{number of ways the outcome can happen}}{\text{total number of possible outcomes}}$$

Sample Space

|                             |        | 2 <sup>nd</sup> Sock colour |       |     |        |       |
|-----------------------------|--------|-----------------------------|-------|-----|--------|-------|
|                             |        | Purple                      | Black | Red | Yellow | Green |
| 1 <sup>st</sup> sock colour | Purple | P,P                         | P,B   | P,R | P,Y    | P,G   |
|                             | Black  | B,P                         | B,B   | B,R | B,Y    | B,G   |
|                             | Red    | R,P                         | R,B   | R,R | R,Y    | R,G   |
|                             | Yellow | Y,P                         | Y,B   | Y,R | Y,Y    | Y,G   |
|                             | Green  | G,P                         | G,B   | G,R | G,Y    | G,G   |

## Two-Way Table

|        | France | Spain | Portugal | TOTAL |
|--------|--------|-------|----------|-------|
| July   | 12     | 27    | 14       | 53    |
| August | 23     | 13    | 11       | 47    |
| TOTAL  | 35     | 40    | 25       | 100   |

## Simultaneous Equations

**Scale up** multiply to match coefficients for x or y

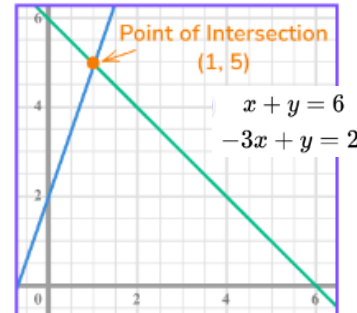
**Eliminate**

Add or subtract to remove term

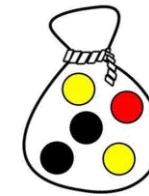
Same Take Opposite Plus

**Solve (to find x)**

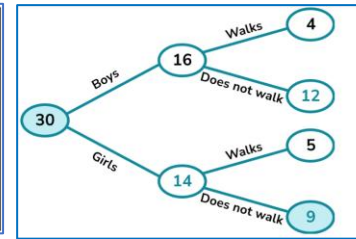
**Substitute in (to find y)**



At random a counter is picked from the bag.

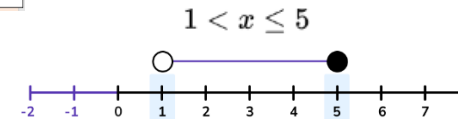


What is P(yellow counter)?

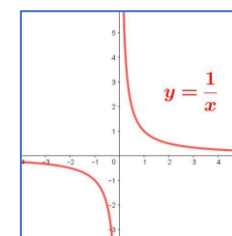
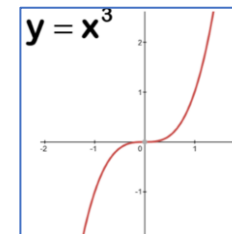
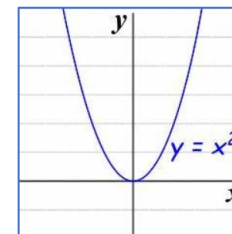


The probability of picking a girl who does not walk to school is  $9 / 30$ . This simplifies to  $3 / 10$ .

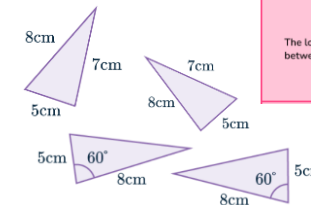
## Algebraic Representations



## Non-Linear Graphs



## Congruence



## Construction and Loci

|                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Perpendicular from a point on a line                                         | <p>Step 1: With the point of the compasses on the point P, draw two arcs</p> <p>Step 2: With the point of the compasses on each intersection, draw two further arcs</p> <p>Step 3: Draw a line from point through the intersection of the arcs</p>                                                                                                                                                                                                                                                                    |
| Triangle given all three sides                                               | <p>Step 1: Draw a line using one of the given lengths</p> <p>Step 2: Set the compasses so that the distance between the point and the pencil is the second given length and draw an arc with the point of the compasses on one end of the original line</p> <p>Step 3: Set the compasses so that the distance between the point and the pencil is the first given length and draw an arc with the point of the compasses on the other end of the original line</p> <p>Step 4: Draw the lines to make the triangle</p> |
| Angle bisector                                                               | <p>Step 1: With the point of the compasses on the vertex, draw a curve</p> <p>Step 2: With the point of the compasses on each intersection, draw two further curves</p> <p>Step 3: Draw a line from the vertex to the intersection of the arcs</p>                                                                                                                                                                                                                                                                    |
| Perpendicular bisector                                                       | <p>Step 1: With the point of the compasses on one end of the line, draw an arc</p> <p>Step 2: With the point of the compasses on the other end of the line, draw a second arc</p> <p>Step 3: Draw a line through the two intersections</p>                                                                                                                                                                                                                                                                            |
| The locus of points that are a given distance, d, from a point.              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| The locus of points within a given distance, d, of a line.                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| The locus of points equidistant between two points (perpendicular bisector). |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| The locus of points equidistant between two lines (angle bisector).          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

**SSS:** Side, Side, Side  
**ASA:** Angle, Side, Angle  
**SAS:** Side, Angle, Side