Knowledge Organisers and Practice questions

Autumn term test covers Topics 1 - 3
Spring term test covers Topics 1- 6
Summer term test covers Topics 1 - 9
Topics 10 – 11 will be assessed in year 9

Year 8 Mathematics

Topic	Title		
1	Area and Volume	Area of a triangle, parallelogram, trapezium and compound shapes	◯
		Circles – calculate circumference, area, arc length and sector area	◯
		Volume of a prism, surface area of a prism	◯
2	Expressions	Substitute into a formula, simplify using all four operations	◯
		Expand and simplify single and double brackets	◯
		Factorise into a single or double bracket	◯
		Answer "show that" questions including in context	◯
3	FDP	Work with fractions to $+ \ - \times \div$ including mixed numbers.	◯
		Find percentages of amounts, increase and decrease by a percentage	◯
		Convert between FDP and order values using conversions	◯
4	Probability	Find simple probability and represent on a scale. Compare probability.	◯
		Find the probability of an event not happening and use probability tables	◯
		Draw and interpret a sample space diagram for two events	◯
		Understand the terms relative frequency and experimental probability	◯
5	Equations and inequalities	Solve linear equations with x on one or both sides, including with brackets and fractions, where answers can be integers or fractions.	◯
		Solve inequalities (as above) and represent on a number line.	◯
		From and solve equations or inequalities from context	◯
		Rearrange formulae to make something else the subject	◯

Year 8 Mathematics

Topic	Title		
6	Shapes and angles	Properties or triangles and quadrilaterals, length and angle measurement	◯
		Identify angles around a point, on a line, on parallel lines (alternate and corresponding) and opposite angles.	◯
		Calculate angles in polygons (interior and exterior)	◯
		Draw and identify elevations – plan, front and side.	◯
7	Ratio and proportion	Find equivalent ratio, share into ratios and solve sharing problems	◯
		Work with ingredients and maps with proportions	◯
		Understand and identify direct and inverse proportion relationships	◯
8	Pythagoras and Trigonometry	Calculate sides of a RAT using Pythagoras' theorem $a^2 + b^2 = c^2$	◯
		Recall SOH CAH TOA and calculate angles and sides of a RAT	◯
9	Graphs	Identify coordinates and midpoints of line segments	◯
		Plot accurately a linear graph equation	◯
		Calculate gradients and equations of straight lines, identify parallel lines	◯
10	Sequences	Recognise and continue a sequence or pattern from a diagram	◯
		Calculate nth term of linear sequences and write out linear sequences	◯
11	Charts and Averages	Draw and interpret pie charts	◯
		Draw and interpret scatter graphs using correlation and estimation	◯
		Calculate Mean, Median, Mode and Range from a list and from a table	◯

Year 8 Topic 1 Area and Volume Student Knowledge Organiser

Key words and definitions

Area – the area of a 2D shapes is the amount of space inside it

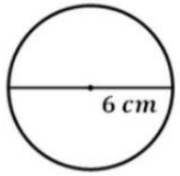
Perimeter – the perimeter is the total distance around the outside of a shape

Circumference – the distance around the outside of a circle

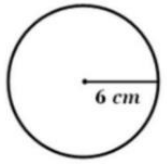
Surface area – sum of the areas of all the faces in a 3D shape

Volume – the amount of 3D space occupied by an object

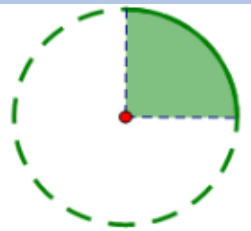
Area and Circumference



$C = \pi d$
$= 3.142 \times 6 \text{ cm}$
$= 18.85 \text{ cm}$

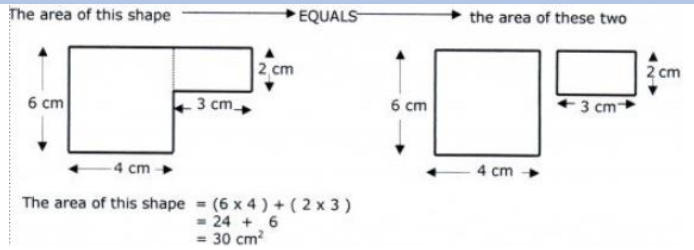


$A = \pi r^2$
$= 3.142 \times 6^2$
$= 3.142 \times 36$
$= 113.11 \text{ cm}^2$



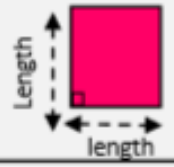
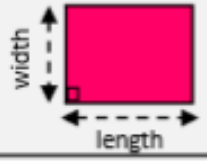
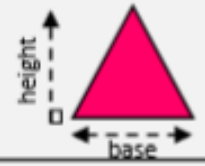
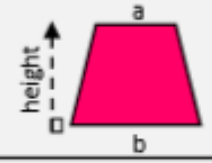
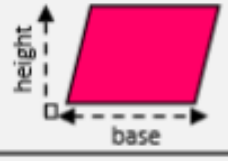
$\text{Area} = \frac{90}{360}\pi r^2 = \frac{1}{4}\pi r^2$

Compound area

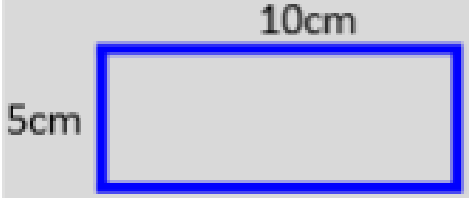


The area of this shape = (6 x 4) + (2 x 3)
= 24 + 6
= 30 cm²

Area

SQUARE A = Length²	
RECTANGLE A = Length x width	
TRIANGLE A = ½ Base x height*	
TRAPEIZUM A = ½ (a + b) x height*	
PARALLELOGRAM A = Base x height*	

Perimeter

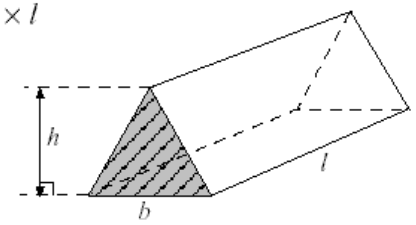


Add the sides
10 + 10 + 5 + 5
= 30cm

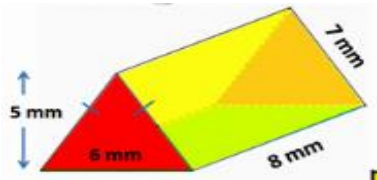
Volume of a prism

Volume of triangular prism = area of cross-section × length

$= \frac{1}{2} \times b \times h \times l$



Surface area of a triangular prism

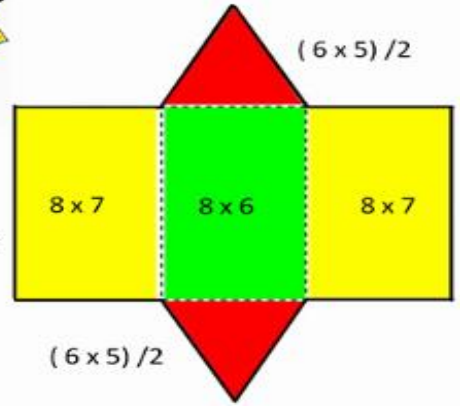


The "Total Surface Area" =

2 x (6 x 5) /2 : Two Reds
+ 2 x (8 x 7) : Two Yellows
+ 1 x (8 x 6) : One Green

= 2x15 + 2x56 + 1x48

= **190 mm²** ✓

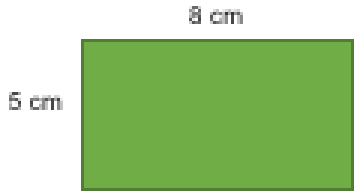


Year 8 Topic 1 Area and Volume Student Knowledge Organiser

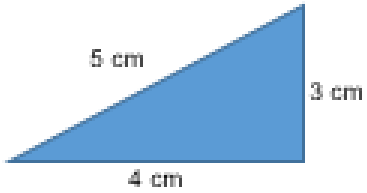
Area and perimeter

Calculate the area and perimeter of the following shapes:

1)

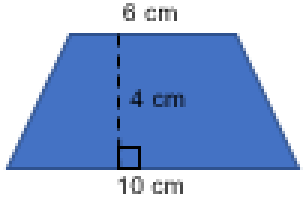


2)



Calculate the area of the following shapes:

3)



Circles

Calculate the area and circumference of the following shapes:

1)

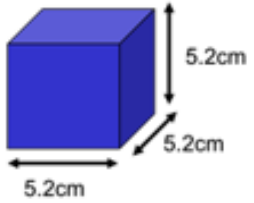
2)

Surface Area

1) How many vertices does a cube have?

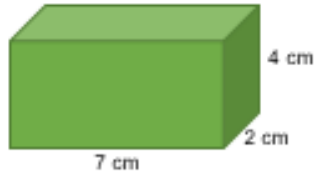
2) Draw the net of a cube

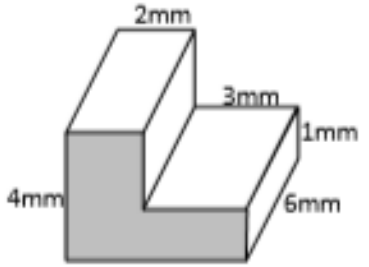
3) Calculate the surface area of the following:



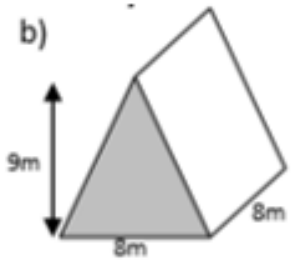
Volume

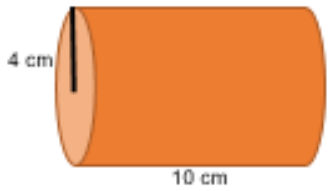
Calculate the volume of the following





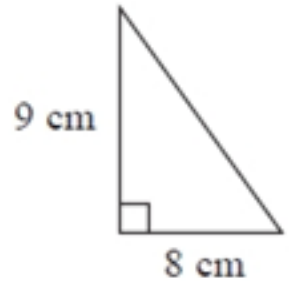
b)

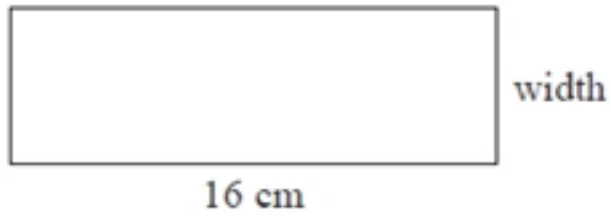




Problem Solving

Here are a triangle and a rectangle.





The area of the rectangle is 6 times the area of the triangle.

Work out the width of the rectangle.

Year 8 Topic 2 Expressions Student Knowledge Organiser

Key words and definitions

Expression – numbers, symbols and operators grouped together

Term – number or variable or numbers and variables multiplied together

Equation – a mathematical statement that shows two things are equal

Expand – multiply to remove brackets

Factorise – the reverse of expanding, taking out a common factors

Substitution – putting numbers in place of letters

Simplify – collect like terms

Simplifying expressions

$t + t + t = 3t$

$t \times t \times t = t^3$

add powers

$a^1 \times a^1 = a^2$

subtract powers

$a^{10} \div a^3 = a^7$

Simplifying

$3e + 6r - e + 5t$

$2e + 11t$

If there is **no sign** in front of the term, it is *POSITIVE*

Substitution

Evaluate 3a - 2b, for a = 10 and b = 4

$3a - 2b \quad (a = 10 \quad b = 4)$

$= 3(10) - 2(4)$

$= 30 - 8$

$= 22$ ✓

Expand a single bracket

Expanding single brackets

$3(x + 2)$

$3x + 6$

Expand a double bracket

Expanding double brackets

$(x + 3)(x + 4)$

$x^2 + 4x + 3x + 12$

$x^2 + 7x + 12$

Factorising

$4x + 16$

4 is a factor of both 4 and 16.

$4(x + 4)$

Factorising a quadratic

$x^2 + 5x + 4$

1. Find factors of 4 which sum (add) to 5
2. They are $4 \times 1 = 4$ and $4 + 1 = 5$
3. Result is: $(x + 4)(x + 1)$

Writing expressions

5 less than a number k $k - 5$

a number x divided by 11 $\frac{x}{11}$

4 times the sum of n and 5 $4(n + 5)$

Year 8 Topic 2 Expressions Student Knowledge Organiser

Simplifying

a) $3x + 6y - 4y + 2x$

b) $y + y$

c) $3p \times 5q$

d) $p \times p \times p \times p$

Substituting

1) Find $3x + 5y$ when $x = 4$ and $y = 2$

2) Find abc when $a = 2$, $b = 3$ and $c = 5$

3) Find $7s - 2t$ when $s = 4$ and $t = -3$

4) Find $4(2n - 3)$ when $n = 5$

Expanding

1) $3(a + 4)$

2) $5(c + 6b)$

3) $4(x - 3y)$

4) $a(a + 5)$

5) $x(4y - 2x)$

Expanding and simplifying

1. $4(2x + 3y) + 2(x + 2y)$
2. $5(a + 3b) + 3(a - b)$
3. $2(3a - 4b) - 3(2a + 1)$
4. $(x + 2)(x + 3)$
5. $(x + 5)(x + 2)$
6. $(x - 6)(x - 6)$
7. $(x + 10)(x - 4)$
8. $(x + 3)(x - 5)$

Factorising into a single set of bracket

1. $3x + 33$
2. $5y + 25$
3. $4a - 18$
4. $x^2 + 4x$
5. $y^3 - 2y$
6. $4a^2 + 20a$

Factorising into double brackets

1. $x^2 + 5x + 6$
2. $x^2 + 8x + 12$
3. $x^2 + 13x + 30$
4. $x^2 - 7x + 12$
5. $x^2 - 2x + 1$
6. $x^2 + 2x - 8$
7. $x^2 + 7x - 30$

Writing expressions

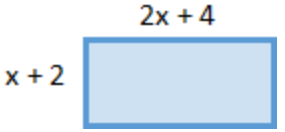
My age is C, write expressions for the ages of the members of my family if:

a) My brother is 3 years older than me

b) My sister is 2 years younger than me

c) My mum is double my age

Write an **expression** for the **area** of the rectangle.



Year 8 Topic 3 Fractions, decimals and percentages Student Knowledge Organiser

Key words and definitions

Fraction – represents part(s) of a whole

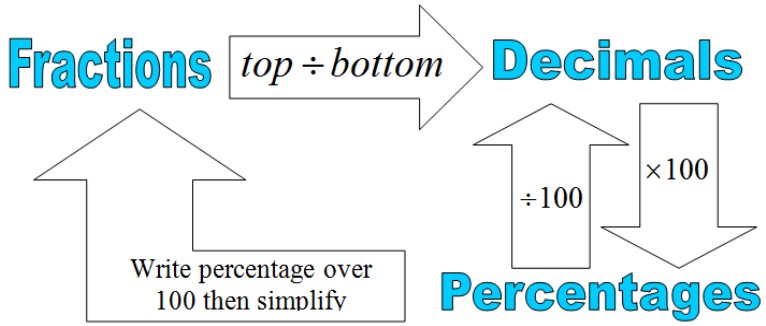
Percentage – how many parts per hundred

Equivalent – equal in value

Improper – a fraction where the numerator (top number) is larger than the denominator (bottom number)

Fraction, decimal and percentage equivalence

Fractions	Decimals	Percentages
$\frac{1}{5}$	0.2	20%
$\frac{3}{4}$	0.75	75%
$\frac{1}{8}$	0.125	12.5%
$\frac{1}{2}$	0.5	50%



Addition and subtraction of fractions

Add

$$\frac{1}{2}+\frac{1}{3}=\frac{1\times3}{2\times3}+\frac{1\times2}{3\times2}=\frac{3}{6}+\frac{2}{6}=\frac{5}{6}$$

Subtract

$$\frac{7}{8}-\frac{1}{3}=\frac{7\times3}{8\times3}-\frac{1\times8}{3\times8}=\frac{21}{24}-\frac{8}{24}=\frac{13}{24}$$

Multiplying and dividing fractions

Multiply

$$\frac{3}{4}\times\frac{1}{3}=\frac{3}{12}=\frac{1}{4}$$

Divide (KFC)

$$\frac{1}{2}\div\frac{1}{3}=\frac{1}{2}\times\frac{3}{1}=\frac{3}{2}=1\frac{1}{2}$$

Finding a fraction of an amount

When we work out a fraction of an amount we

multiply by the numerator
and
divide by the denominator

For example,

$\frac{2}{3}$ of 18 litres = 18 litres ÷ 3 × 2

= 6 litres × 2

= 12 litres

Finding a percentages

% of an amount	**15% of £200** 10% = 20 5% = 10 **Answer: £30**
Increase by a %	**Increase £200 by 15%** 15% of 200 = 30 Add it on or use the multiplier(1.2) (200 x 1.2) **Answer: £230**
Decrease by a %	**Decrease £200 by 15%** 15% of 200 = 30 Subtract it or use the multiplier(0.85) (200 x 0.85) **Answer: £170**

Improper fractions and mixed numbers

$\frac{14}{3}$ How many 'whole' 3's fit into 14? $4\frac{2}{3}$

$7\frac{2}{5}$ (5 x 7) + 2 = $\frac{37}{5}$

Year 8 Topic 3 Fractions, decimals and percentages Student Knowledge Organiser

Simplifying Fractions

1) Simplify $\frac{9}{18}$

2) Simplify $\frac{12}{20}$

3) Simplify $\frac{16}{24}$

4) Write as an improper fraction $2\frac{3}{4}$

5) Write as a mixed number $\frac{27}{6}$

Calculating with fractions

Give your answers in their simplest form.

1) $\frac{1}{2} + \frac{1}{4}$

2) $\frac{5}{12} \times \frac{6}{15}$

3) $\frac{16}{27} \div \frac{8}{9}$

4) $2\frac{1}{3} - 1\frac{2}{3}$

Equivalent fractions

1) Complete the table below.

Fraction	Decimal	Percentage
½		
	0.6	
		15%
¼		

2) Would you rather have ¾, 70% or 0.72 of a pizza? Why?

Percentage increase/decrease

1) Claire improves her further distance for running by 19%. She used to be able to run 4km. How far can she run now?

2) Michael gets 42% better at kick ups. He used to be able to do 32. How many can he do now?

3) Ben loses 36% of his Instagram followers. He used to have 380. How many does he have now?

4) Red bull has 94% more sugar than Coke Life. Coke Life has 1.2g of sugar. How much does Red Bull have?

Percentage of an amount

1) Calculate 40% of 600 ml.

2) Calculate 67% of £120.

3) Bobby went to the shop and there was a 20% sale. He was going to buy a top for £24. How much does he save?

4) Sarah went to the shop and there was a 15% sale. She was going to buy a CD for £8. How much does she save?

Year 8 Topic 4 Probability Student Knowledge Organiser

Key words and definitions

Probability – the likelihood of an event happening

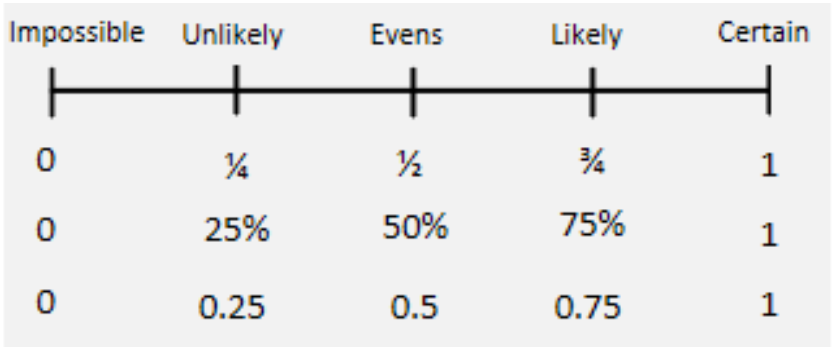
Mutually exclusive events – events which may not occur at the same time.

Exhaustive - Events are exhaustive if they include all possible outcomes

Sample space diagram - shows all the possible outcomes. It is used to find theoretical probability.

Outcome – A possible result of an experiment or trial.

Probability Scale



$$\textbf{Probability} = \frac{number\ of\ successful\ outcomes}{total\ number\ of\ possible\ outcomes}$$

Probability of an event not happening

$$P(\text{not A}) = 1 - P(A)$$

Ex: The probability of NOT tossing a ⚄ of a die.

$P(A) = \frac{1}{6}$ (Probability of Event A)

therefore $P(\text{not A}) = 1 - P(A) = 1 - \frac{1}{6} = \frac{5}{6}$

Sample space diagrams

Represent the results from **adding** two 6-sided dice in a sample space diagram.

a) The probability of getting a total of 7? $\frac{6}{36}$

b) The probability of getting a total of a 1? $\frac{0}{36}$

c) The probability of getting a total of a 10? $\frac{30}{36}$

		First die					
		1	2	3	4	5	6
Second die	1	2	3	4	5	6	7
	2	3	4	5	6	7	8
	3	4	5	6	7	8	9
	4	5	6	7	8	9	10
	5	6	7	8	9	10	11
	6	7	8	9	10	11	12

Relative Frequency

$$\textbf{Relative Frequency} = \frac{number\ of\ 'successful'\ trials}{total\ number\ of\ trials}$$

Item	Frequency	Relative frequency
1	4	4/20 (or 20%)
2	5	5/20 (or 25%)
3	5	5/20 (or 25%)
4	2	2/20 (or 10%)
5	4	4/20 (or 20%)
Total	20	

Experimental Probability

$$\textbf{Estimated/Experimental Probability} = \frac{frequency\ of\ event}{total\ frequency}$$

Predicted number of outcomes = probability x number of trials

Year 8 Topic 4 Probability Student Knowledge Organiser

Probability

1) I roll a normal, 6 sided dice. What is the probability that I get:
a) a 6?
b) an even number?
c) a number less than 2?

2) The spinner shown in spun. What is the probability that the spinner lands on:
a) red?
b) red or yellow?
c) not blue?

3) I put the letters from the word EXERCISE on cards, place them face down and then mix them up. I pick one card at random. What is the probability that the card is:
a) an X?
b) a vowel?
c) not an E?

4) The probability that I win a 100m race is 3/10. What is the probability that I don't win the race?

5) The probability that is rains tomorrow is 0.14. What is the probability that it doesn't rain tomorrow?

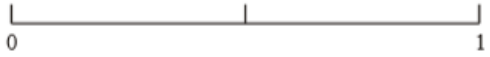
Probability scale

On the probability scale below, mark

(i) with the letter S, the probability that it will snow in London in June,

(ii) with the letter H, the probability that when a fair coin is thrown once it comes down heads,

(iii) with the letter M, the probability that it will rain in Manchester next year.



Sample space diagrams

Two fair dice are thrown together and the scores are added together.

1) Complete the sample space diagram showing all the possible outcomes

	1	2	3	4	5	6
1						
2						
3						
4						
5						
6						

2) How many outcomes are there altogether?
3) What is the most likely score?
4) What are the least likely scores?
5) What is probability of scoring 10 or more?

6) What is the probability of scoring less than 5?

Listing

1) Three friends Andrew, Billy and Chris are sitting in the same row at a concert. Show the different seating arrangements that are possible.

2) A restaurant menu allows a choice of one each of starter, main course and sweet. The choices are:

Starter	Main Course	Sweet
Melon	Pasta	Gateaux
Soup	Fish	Ice-cream
	Chicken	

Relative Frequency

1) The probability that a biased dice will land on a five is 0.3. Megan is going to roll the dice 400 times. Work out an estimate for the number of times the dice will land on a five.

2) Jack sows 300 wildflower seeds. The probability of a seed flowering is 0.7. Work out an estimate for the number of these seeds that will flower.

Year 8 Topic 5 Equations and Inequalities Student Knowledge Organiser

Key words and definitions

Equation – a statement linking two expressions as equal

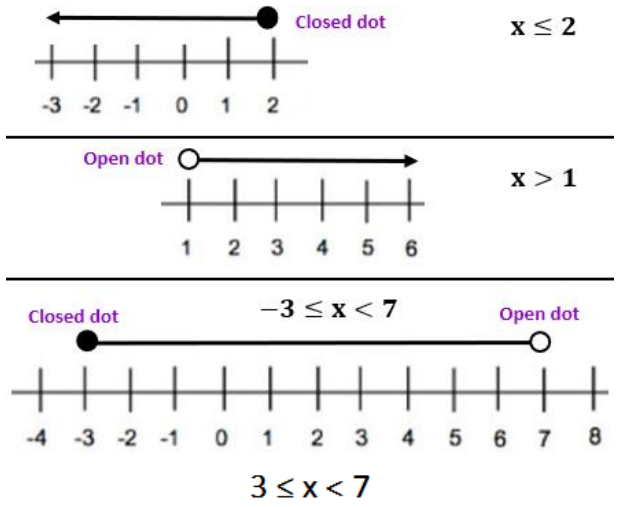
Variable – a symbol that may take any value

Constant – a value that does not change

Coefficient – a constant attached to the front of a variable

Formula – a statemnt, often written as an equation, that shows the exact relationship beyween different variables e.g. y=mx+c.

Inequalities on number lines



$3 \leq x < 7$

This is asking what values would represent x. They are 3, 4, 5, and 6. This is because ≤ includes the 3 but < does not include the 7

Simple equations

$y + 7 = 10$

$y = 3$

10-7 = 3

$2y - 3 = 9$

$2y = 12$

$y = 6$

To solve the question, we use the inverse operation to get the variable (letter) on its own

Unknown on both sides

$$5y - 8 = 2y + 7$$
$$3y - 8 = 7$$
$$3x = 15$$
$$y = 5$$

Equations with brackets

$2(4p + 1) = 18$ {Use Distributive Law}

$8p + 2 = 18$ {Subtract 2 from both sides}

$8p + 2 - 2 = 18 - 2$

$8p = 16$ {Divide both sides by 8}

$\frac{8p}{8} = \frac{16}{8}$

$p = 2$

Rearranging formulae

Rearrange the formula to make a the subject

This means we want to rearrange the formula so it says a =

$b = 5a + 21$

$-21 \quad -21$

$b - 21 = 5a$

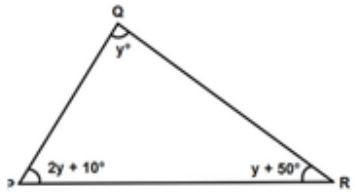
$\div 5 \quad \div 5$

$\frac{b - 21}{5} = a$

Our answer should say ... $a = \frac{b - 21}{5}$

Forming and solving equations

PQR is a triangle. Form and solve an equation to find the value of y.



What do the angles in a triangle add up to?

180

How can we write an equation for this?

2y + 10 + y + y + 50 = 180

Can we collect like terms?

4y + 60 = 180

4y = 120

y = 30

Year 8 Topic 5 Equations and inequalities Student Knowledge Organiser

Solving

1) $x + 4 = 11$

2) $w - 6 = 23$

3) $5d = 70$

4) $\frac{k}{4} = 7$

5) $2x + 6 = 12$

1) $6(x - 2) = 24$

2) $5(4y + 2) = 70$

3) $2x + 4 = 5x - 8$

4) $4x - 3 = 2x + 2$

5) $3(x + 6) = 4(x + 5)$

Inequalities

List the integers which satisfy these inequalities and display on a number line

$2 < x < 7$

$1 < x < 3$

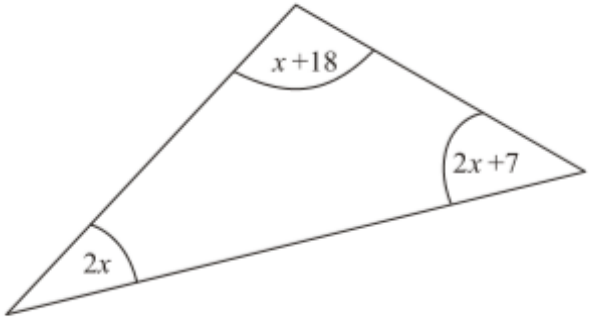
$-3 \leq x < 3$

$-1 \leq x \leq 1$

$27 \leq x \leq 33$

$55 < x \leq 59$

Forming and solving



The sizes of the angles, in degrees, of the triangle are

$2x + 7$
$2x$
$x + 18$

(a) Use this information to write down an equation in terms of x.

.....

(b) Use your answer to part (a) to work out the value of x.

Year 8 Topic 6 Shapes and angles Student Knowledge Organiser

Key words and definitions

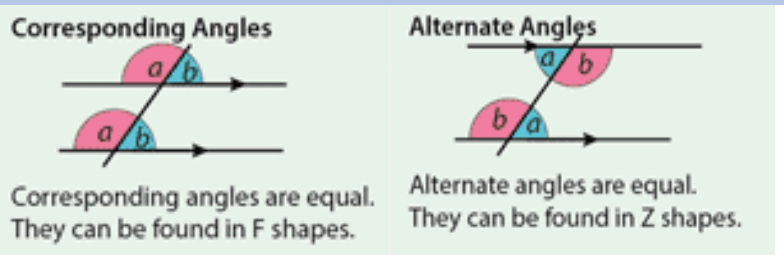
Polygon - A **polygon** is any 2-dimensional shape formed with straight lines. The name tells you how many sides the shape has. For example, a triangle has three sides, and a quadrilateral has four sides.

Parallel lines – lines which never meet, they stay the same distance apart

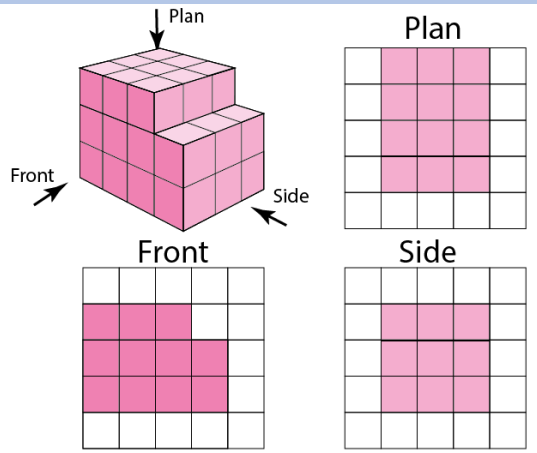
Plan view – looking down on an object from above

Elevation – view from the front or side of an object

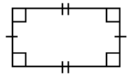
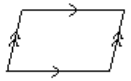
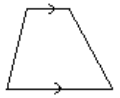
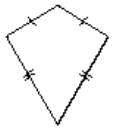
Angles in parallel lines



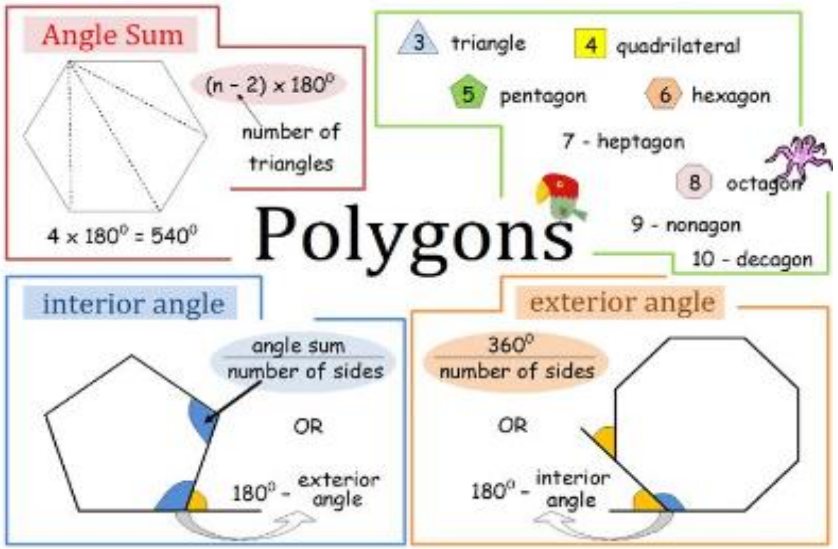
Plans and elevations



Types of special quadrilaterals

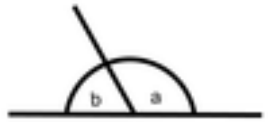
Quadrilateral	*Properties*	
Rectangle	4 right angles and opposite sides equal	
Square	4 right angles and 4 equal sides	
Parallelogram	Two pairs of parallel sides and opposite sides equal	
Rhombus	Parallelogram with 4 equal sides	
Trapezium	Two sides are parallel	
Kite	Two pairs of adjacent sides of the same length	

Angles in polgons



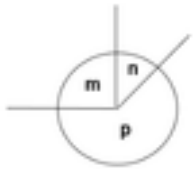
Angle facts

The angles on a straight line add up to 180°.
a + b = 180°



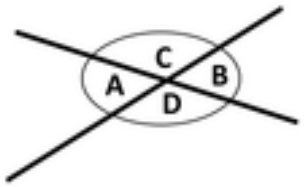
The angles in a triangle add up to 180°.
a + b + c = 180°

The angles at a point add up to 360°.
m + n + p = 360°



The angles in a quadrilateral up to 360°.
w + x + y + z = 360°

Vertically opposite angles are equal.
A = B
D = C

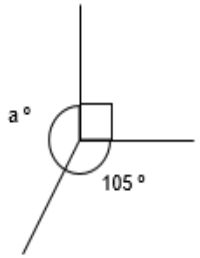


Year 8 Topic 6 Shapes and angles Knowledge Organiser

Angles

Calculate the missing angles in each of these diagrams and give reasons for your answers.

1)



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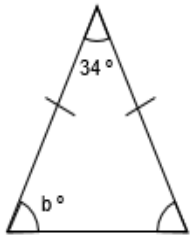
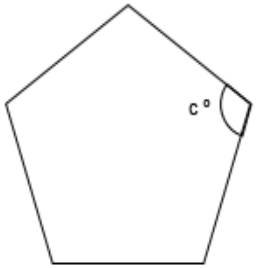
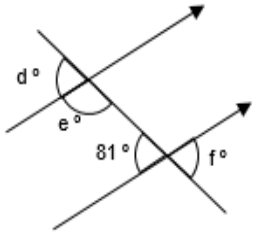


3) Diagram shows a regular pentagon



4)



Plans and elevations

Draw the front, side and plan view.

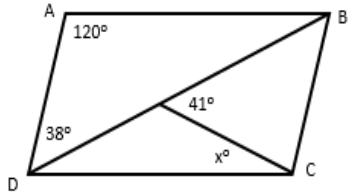
Front

Side

Plan

Apply your knowledge

1)



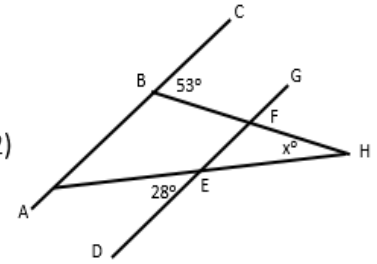
ABCD is a parallelogram

Angle ADB = 38°
Angle BEC = 41°
Angle DAB =120°

Calculate the size of angle x
You must give reasons for your answer.

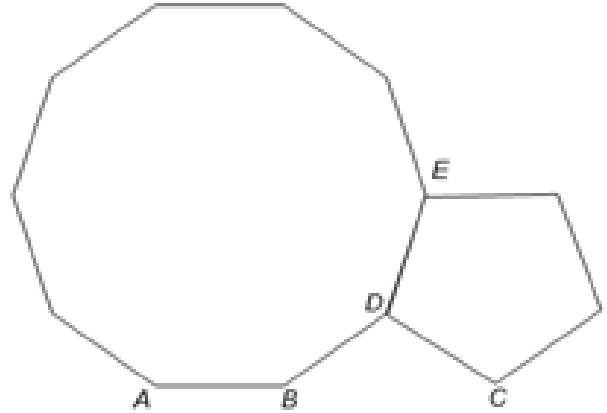
Diagrams NOT accurately drawn

2)



ABC and DEFG are parallel.
AEH and BFH are straight lines.
Work out the size of the angle marked x°

A regular decagon and a regular pentagon have sides the same length. They are joined as shown.



Prove that *ABC* is a straight line.

Year 8 Topic 7 Ratio Student Knowledge Organiser

Key words and definitions

Ratio – A **ratio** shows the relative sizes of two or more values.

Direct proportion – There is a **direct proportion** between two values when one is a multiple of the other.

Inverse Proportion – a relation between two quantities such that one increases in proportion as the other decreases.

Simplify – To **simplify** a **ratio** means to reduce it to its simplest form. In order to do this you need to find the highest common factor for both terms in the **ratio.**

Highest common factor – the highest number that can be divided exactly into each of two or more numbers.
"6 is the highest common factor of 12 and 18"

Simplify ratio

Ratios can be fully **simplified** just like fractions.

To simplify a ratio, divide all of the numbers in the ratio by the same number (**highest common factor**) until they cannot be divided any more.

Simplify: 6 : 12

Divide both by 6

1 : 2

Write in the form 1:n

When asked to write a ratio in the format 1 : n, you need to **divide BOTH sides** by **the ratio where the 1 is.**

Write 7 : 21 in the ratio 1: n

7 : 21 divide both sides by 7

1 : 3

Share in a given ratio

Monty and Mosaurus get A TOTAL of £72 pocket money.

They share it in the **ratio 5 : 3**

How much do they each get?

- **Add the ratios: 3 + 5 = 8**
- **Divide 72 by 8 (72 ÷ 8 = 9)**

Each ONE portion is worth £9

Monty has 5 portions

5 x 9 = £45

Mosaurus has 3 portions

3 x 9 = £27

In a school the ratio of boys to girls is 9 : 4.

There are 270 boys in the school.

How many students are there in the school altogether?

Divide the total number of boys by the boy's ratio

270 ÷ 9 = 30

This gives the number for 1 'portion'

Girls

4 x 30 = 120

Total = 270 + 120 = 390

Recipes

A recipe for 6 people uses 900g of mince. How much mince is needed for

a 12 people

P : M

6 : 900g (×2) → 12 : 1800g

b 3 people

P : M

6 : 900g (÷2) → 3 : 450g

c 9 people?

6 people + 3 people = 9 people

900 + 450 = 1350g

Exchange rates

The exchange rate is:

£1 buys $2.12

Find how many dollars ($) can be bought for £1500

£1 = $2.12 (×1500)

£1500 = $.....

(1)

Maps and scales

6. Each diagram is part of a map. Find the actual distance between the two places for each map. Give your answers in metres.

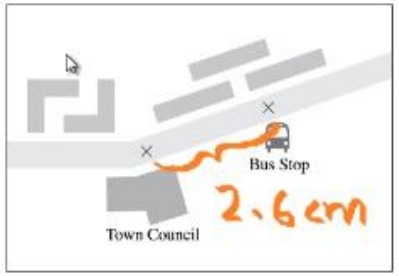
(a) Scale 1 : 12 500

1 cm : 12 500cm

2.6 cm : 32 500 cm (×2.6)

if 100 cm is 1m

32 500cm is 325 m



Inverse proportion

Best seen with an example .... usually builders!

If it takes 2 builders 10 days to dig a hole, how long will it take 1 builder?

B	D
2	10
1	20

(÷2 on B, ×2 on D)

Year 8 Topic 7 Ratio and proportion Student Knowledge Organiser

Simplify ratio

1) Simplify 16 : 8

2) Simplify 11 : 22

3) Simplify 24 : 12

4) Simplify 50p : £2.50

5) Simplify 4 : 8 : 12

6) There are 32 pupils in a class. 20 of them are girls. What is the ratio of boys to girls in its simplest form?

Write in the for 1:n

The ratio 20 minutes to 1 hour can be written in the form 1 : *n*.

Find the value of *n*.

The scale 1 cm represents 25 m can be written in the form 1 : *k*.

Find the value of *k*.

Ratio – sharing

1) Paul is making grey paint. He mixes black and white paint in the ratio 1: 3. He makes 35 litres of grey paint. How much white paint does he use?

2) The ratio of adults to children in the sports club is 5 : 2. There are 120 adults in the club. How many children are there?

3) Tim, Shula and Carol share the running costs of the car in the ratio 1 : 2 : 3. Last year it cost £1860 to run the car. How much did Carol pay?

Proportion - recipes

Here is a list of ingredients for making **10** Flapjacks.

Ingredients for 10 Flapjacks
80 g rolled oats
60 g butter
30 m*l* golden syrup
36 g light brown sugar

Work out the amount of each ingredient needed to make **15** Flapjacks.

Proportion - inverse

A farmer has enough food for 200 chickens for 20 days. He buys 50 more chickens. How long will the food now last?

Apply your knowledge

400 g of raspberries and 300 g of strawberries cost a total of £7.46
500 g of strawberries cost £4.10

Work out the total cost of 200 g of raspberries and 200 g of strawberries.

Colin, Dave and Emma share some money.

Colin gets $^{3}/_{10}$ of the money.

Emma and Dave share the rest of the money in the ratio 3 : 2

What is Dave's share of the money?

Year 8 Topic 8 Pythagoras and trigonometry Student Knowledge Organiser

Key words and definitions

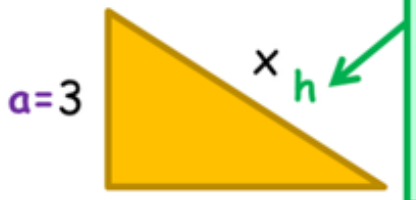
Basic trigonometry is used to calculate **angles** and **side lengths** in **right-angled triangles**.

Trigonometry involves **three ratios**: **sine**, **cosine** and **tangent** which are abbreviated to: ***sin***, ***cos*** and ***tan***.

Hypotenuse- The longest side of a right-angled triangle. It is opposite the right angle.

Pythagoras – short side

Finding a hypotenuse



Always begin by identifying the hypotenuse. This is the longest side, and is always opposite the right angle.

b= 5

You might also want to label the other two sides with a and b (either way round).

$a^2 + b^2 = h^2$

$3^2 + 5^2 = x^2$

$9 + 25 = x^2$

$34 = x^2$

$\sqrt{34} = x$

Substitute the values then work out the left hand side.

Square root to "undo" the squaring operation.

Pythagoras – long side

Finding a short side

Make sure you can rearrange formulae confidently!

b= 4

$a^2 + b^2 = h^2$ — Label the sides, write down the formula and substitute as before.

$x^2 + 4^2 = 7^2$

$x^2 + 16 = 49$ — Subtract 16 so the left hand side reads $x^2 = \ldots$

$x^2 = 49 - 16$

$x^2 = 33$ — Square root to "undo" the squaring operation as before.

$x = \sqrt{33}$

Trigonometry – Finding a side

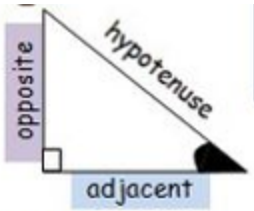
Steps:

1. Label the sides of the triangle (opp, adj, hyp)
2. Identify which trig identity? (sin, cos, tan)

SOHCAHTOA

3. Form an expression

e.g. $\sin\theta = \frac{opp}{hyp}$



4. Solve to find the unknown side

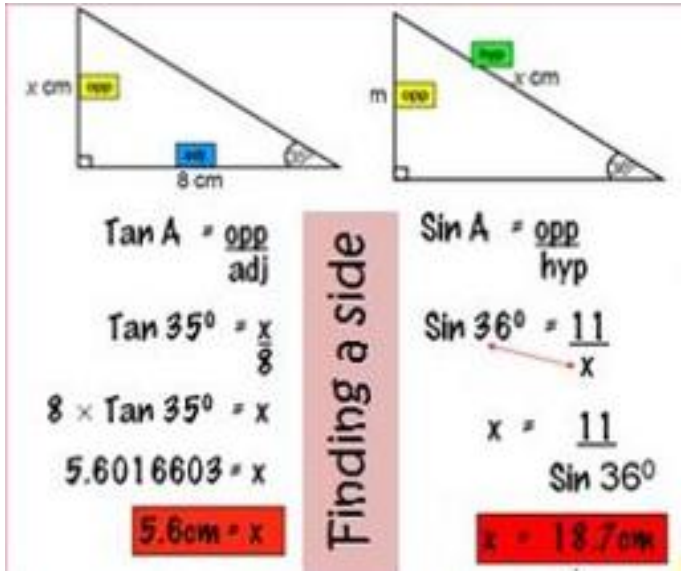
Trigonometry – Finding an angle

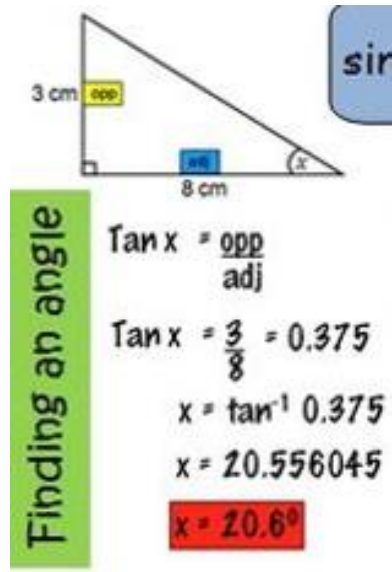
SOH	CAH	TOA
$\sin\theta = \frac{O}{H}$	$\cos\theta = \frac{A}{H}$	$\tan\theta = \frac{O}{A}$
O / $S^\theta \times H$	A / $C^\theta \times H$	O / $T^\theta \times A$

Cover the term you are looking for.

Example:
Using Cos ratio:

To work out 'A', cover A and my calculation is
Cos Θ x Hypotenuse



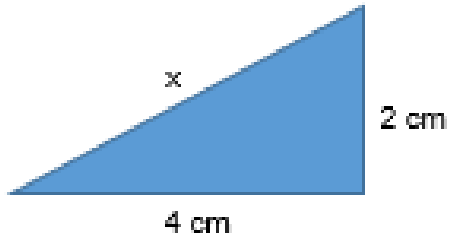


Year 8 Topic 8 Pythagoras and trigonometry Student Knowledge Organiser

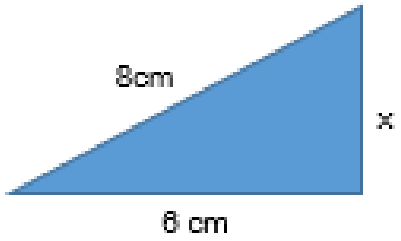
Pythagoras

Calculate the missing side

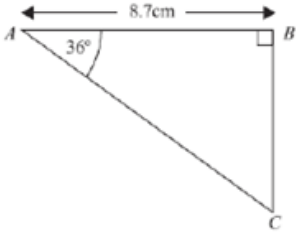
1)



2)



Trigonometry

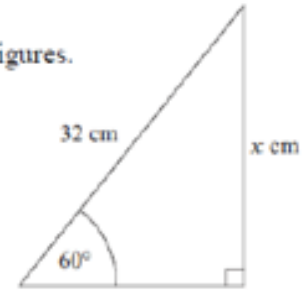


ABC is a right-angled triangle.

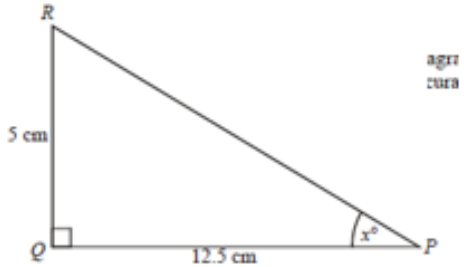
Angle $B = 90°$.
Angle $A = 36°$.
$AB = 8.7$ cm.

Work out the length of BC.
Give your answer correct to 3 significant figures.

Calculate the value of x.
Give your answer correct to 3 significant figures.



Calculate the value of x.
Give your answer correct to 1 decimal place.

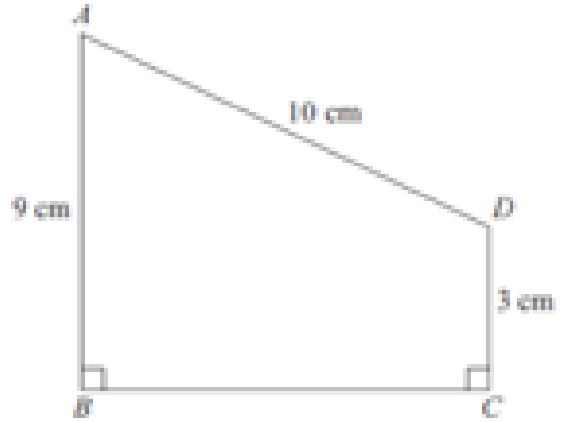


Apply your knowledge

$ABCD$ is a trapezium.

$AD = 10$ cm
$AB = 9$ cm
$DC = 3$ cm
Angle ABC = angle $BCD = 90°$

Calculate the length of AC.
Give your answer correct to 3 significant figures.



Year 8 Topic 9 Graphs Student Knowledge Organiser

Key words and definitions

Coordinate – used to indicate the position of a point

Gradient – how steep the graph is

Y-intercept- where the graph crosses the y axis

Midpoint- the middle coordinate of the line segment

Axis – a fixed reference line for the measurement of coordinates

Horizontal – parallel to the plane of the horizon at right angles to the vertical.

Parallel- Lines which have the same distance continuously between them.

Coordinates

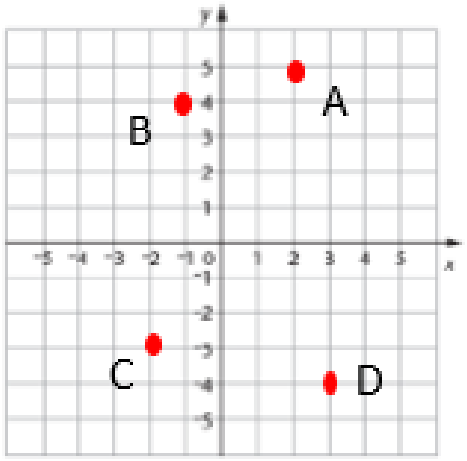
Always **write the X first** (across), then Y (up)

A (2 ; 5)

B (-1 ; 4)

C (-2 ; -3)

D (3 ; - 4)



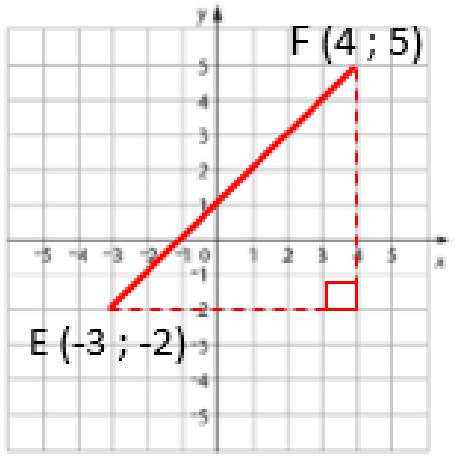
Midpoint

Add the two x values and ÷ **2**

Add the two y values and ÷ **2**

$\frac{(-3+4)}{2}$ $\frac{(-2+5)}{2}$

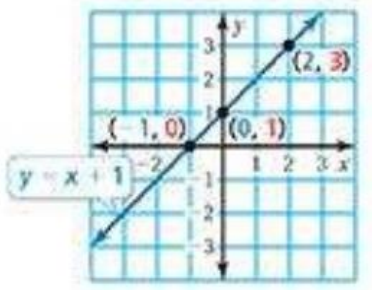
= $(\frac{1}{2}\ ;\ 1\frac{1}{2})$



Linear graphs

- A **linear equation** is an equation whose graph is a line.
- The points on the line are **solutions** of the equation.

x	y	(x, y)
−1	0	(−1, 0)
0	1	(0, 1)
2	3	(2, 3)

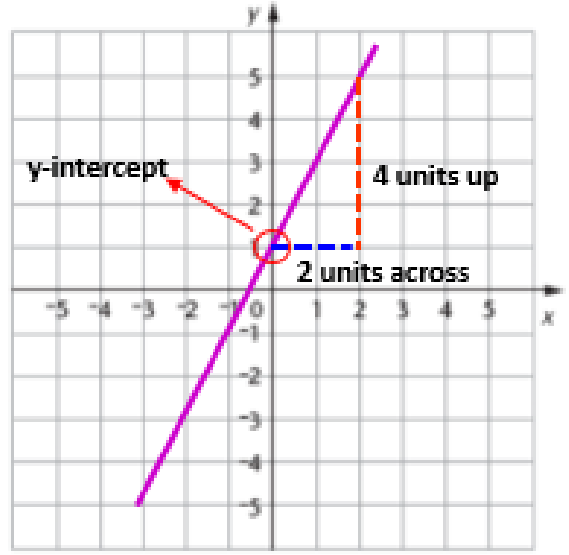


Gradient

y = mx + c is the **equation** of a straight-line graph

Gradient y-intercept

Gradient = $\frac{\text{change in y}}{\text{change in x}} = \frac{4}{2} = 2$



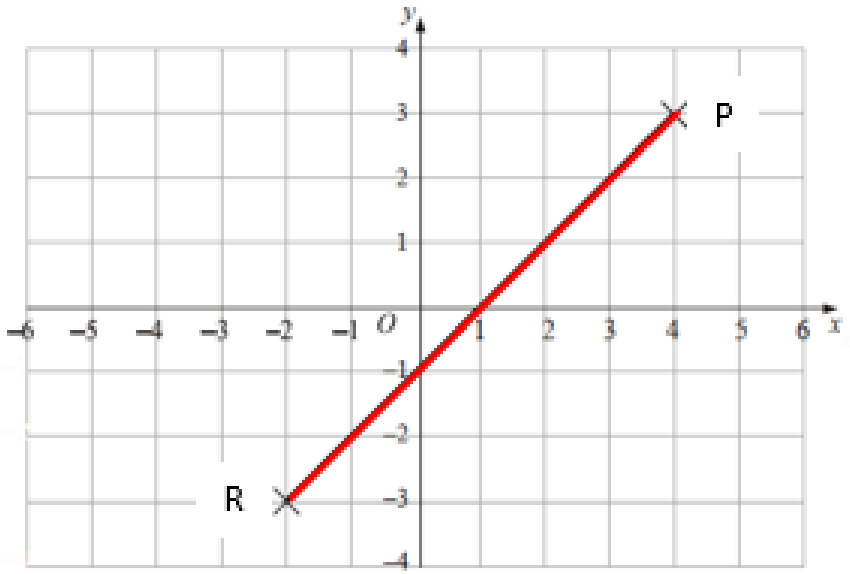
Equation is therefore y = 2x + 1

Year 8 Topic 9 Graphs Student Knowledge Organiser

Coordinates and midpoint

1a) Write down the coordinate of R and P

b) Calculate the midpoint of the line segment RP

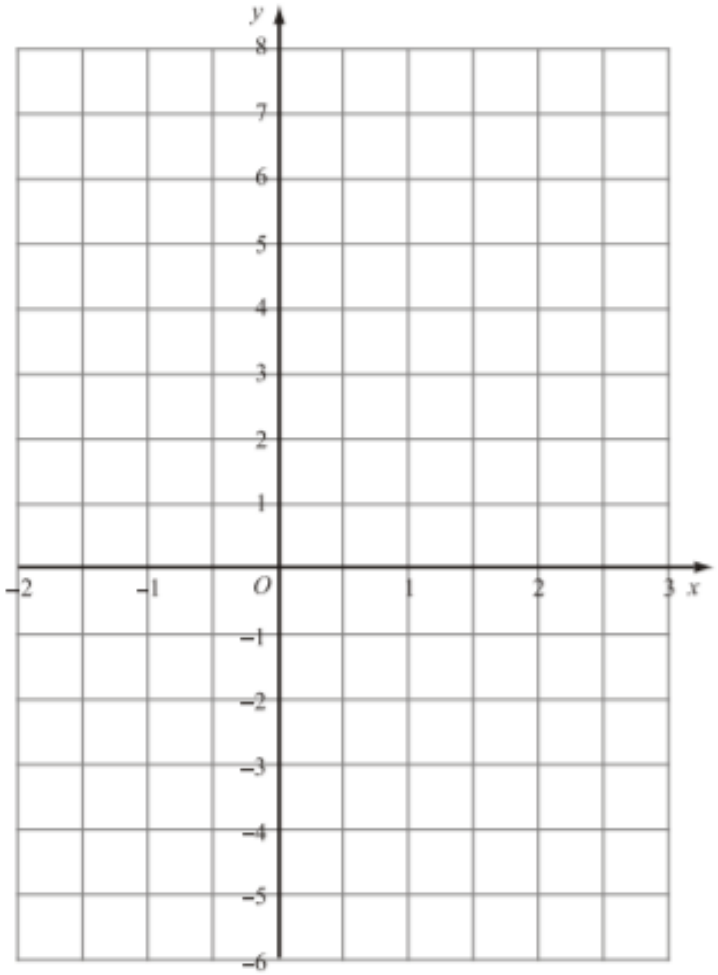


Linear Graphs

(a) Complete the table of values for $y = 2x + 1$

x	−2	−1	0	1	2	3
y		−1	1			

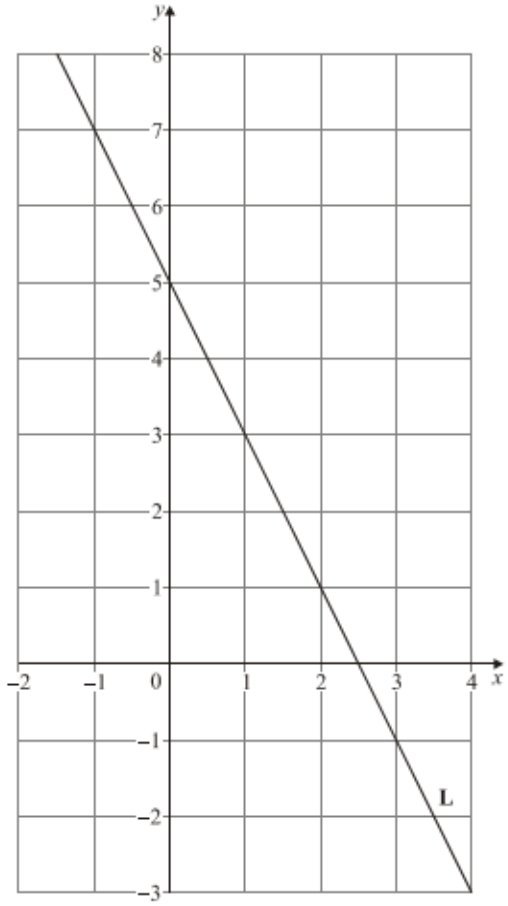
(b) On the grid, draw the graph of $y = 2x + 1$



Equation of a line

The equation of a straight line is $y = 3x - 2$.

Write down the coordinates of the point where this line crosses the y-axis.



Find the equation of line **L**

Year 8 Topic 10 Sequences Student Knowledge Organiser

Key words and definitions

Sequence – A set of quantities ordered in the same manner as the positive integers.

Pattern – a set of numbers or objects in which all the members are related with each other by a specific rule.

nth term – a formula that enables you to find any number in a sequence of numbers.

Position-to-term – a rule that defines the value of each term in a sequence.

Term-to-term – is the difference between the numbers in the sequence

Linear – A number pattern which increases (or decreases) by the same amount each time

Using a term-to-term rule

Find the next term in the sequence 28, 37, 46, 55, 64, __.

① ② ③ ④ ⑤ ⑥

28, 37, 46, 55, 64, 73, ...

+9 +9 +9 +9 +9

ARITHMETIC SEQUENCE

Answer 73

nth term of a linear sequence

3 8 13 18 23

+5 +5 +5

1. Find the *difference* between each term:
   5
2. Always put 'n' next to it (n = term number)
   5n
3. Add or subtract to get the first term in the sequence?
   5-2 = 3

The nth term is **5n -2**

Geometric sequence

A geometric sequence is one where to get from one term to the next you multiply by the same number each time. This number is called the *common ratio, r*.

Eg 1 2 3 4

2, 10, 50, 250 ...

x5 x5 x5

r=5

Sequences from patterns

Shape number	1	2	3	4	5	6	7	8	9	10	50
Number of matchsticks	3	5	7	9	11	13	15	17	19	21	101
Function rule	Number of matchsticks = Shape number × 2 + 1										

Finding missing terms

Find the missing terms and rule for: 48, ___, 70 , ___, 92

48 → 70 (2 jumps!) gives us: Add 22

So our rule for one jump is half this → Add 11 (common diff = +11)

Number after 48 → 48 + 11= 59

[CHECK: 59 → 59 + 11 = 70!]

Number after 70 → 70 + 11 = 81

Year 8 Topic 10 Sequences Student Knowledge Organiser

Sequences

1) Find the next three terms and the rule of the sequence 6, 10, 14, 18, ……

2) Find the next three terms and the rule of the sequence 5, 10, 20, 40,…….

3) Find the first three terms of the sequence with nth term **3n - 2**

4) Find the first three terms of the sequence with nth term **2n + 4**

Nth term

Find the n^{th} term of the following sequences

1) 5, 8, 11, 14, 17, …..

2) 9, 14, 19, 24, 29,…..

3) 3, 9, 15, 21, 27,…..

4) 2, 4, 6, 8, 10,…..

Patterns

Here are some patterns made up of dots.

Pattern number 1 Pattern number 2 Pattern number 3

(a) In the space below, draw Pattern number 4.

(b) Complete the table.

Pattern number	1	2	3	4	5
Number of dots	10	14	18		

(c) How many dots are used in Pattern number 10?

Year 8 Topic 11 Charts and Averages Student Knowledge Organiser

Key words and definitions

Primary data – data collected first hand, in a survey or experiment

Secondary data – data collected by someone else

Discrete – can only take certain values, usually something you can count

Continuous – data that can be measured, can take any value

Average – a typical value for some data, see mean, mode and median

Distribution – how data is spread out, takes account of average & range

Averages

Mode
Most common

Mean
Sum of values / Number of values

Median
Middle value in ascending order

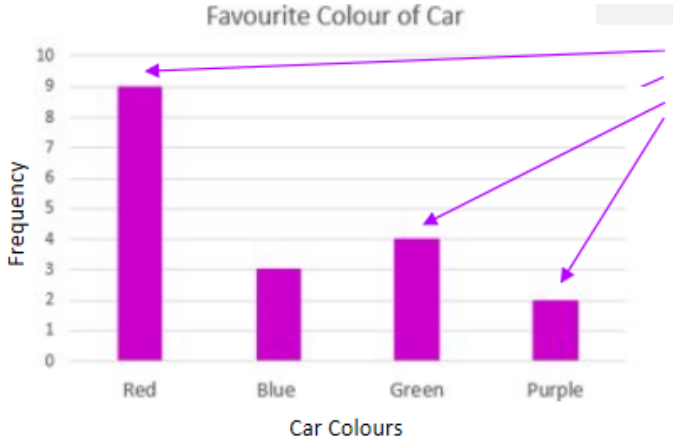
Average	Advantages	Disadvantages
Mean	Every value makes a difference	Affected by extreme values
Median	Not affected by extreme values	May not change if a data value changes
Mode	Easy to find. Not affected by extreme values. Can be non-numerical	There may not be one. There may be more than one.

Tally Charts and bar charts

Complete a tally chart for the most popular colour of car

Red, blue, red, green, red, purple, red, green, red, purple, green, blue, red, green, blue, red, red, red

Colour	Tally	Frequency
Red	𝍸 IIII	9
Blue	III	3
Green	IIII	4
Purple	II	2



The number of red, blue, green and purple cars is the **frequency (height of the bars).**

IMPORTANT

The **bars** are the **SAME width**

The **gaps** between the bars are the **SAME width**

Both axes are **labelled**

The graph has a **title**

Frequency starts at 0

Range

Range

Largest value – smallest value

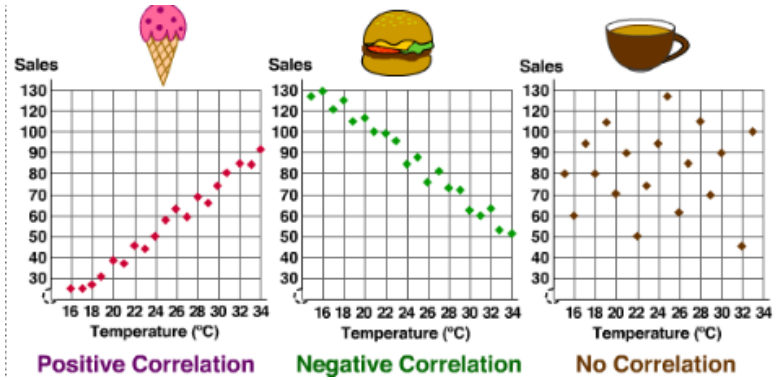
Pie chart

1	Sum (add up) the frequency
2	360° ÷ frequency 360° ÷ 72 = 5
3	Multiply each category x5 to find sector size

Fish	Frequency	
Perch	10	x 5 = 50°
Bream	23	x 5 = 115°
Carp	39	x 5 = 195°
TOTAL	72	360°
360° ÷ 72 = 5		

Draw an accurate pie chart to show this information.
This table give information about then number of fish in a lake.

Scatter graphs



Year 8 Topic 11 Charts and averages Student Knowledge Organiser

Averages

1) Here are fifteen numbers.
10 12 13 15 15 17 19 20 20 20 21 25 25 25 25

a) Find the mode.

b) Find the median.

c) Work out the range.

2) A rugby team played 7 games.
Here is the number of points they scored in each game.
3 5 8 9 12 12 16

a) Find the median.

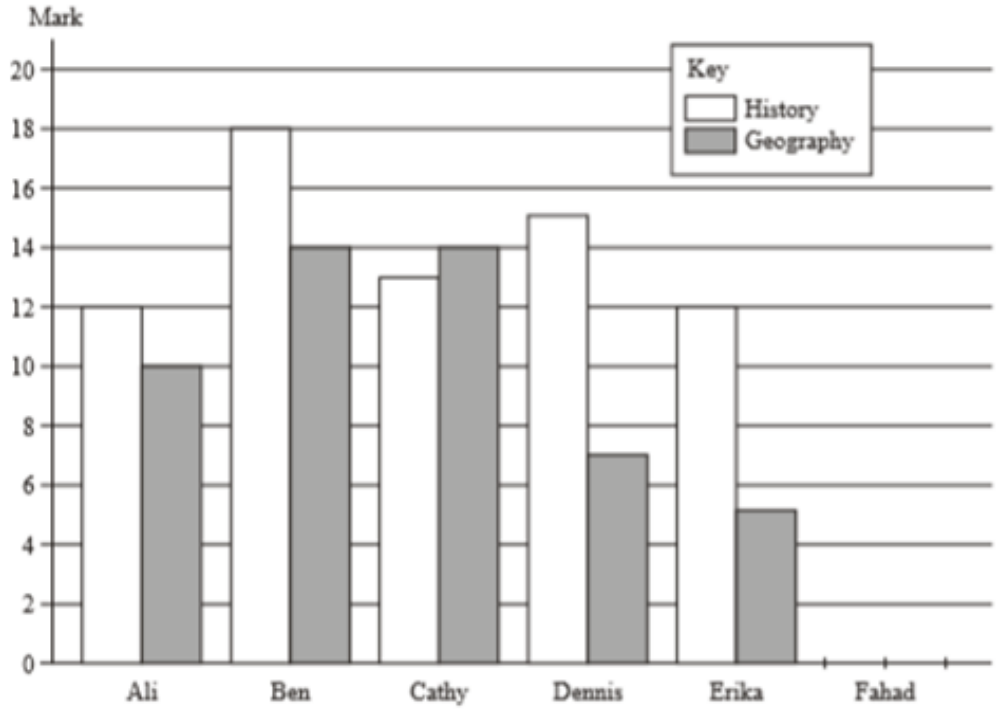
The rugby team played another game.
They scored 11 points.

b) Find the median number of points scored in these 8 games.

3) The mean of eight numbers is 41
The mean of two of the numbers is 29
What is the mean of the other six numbers?

Bar Carts

Six students each sat a history test and a geography test.
The marks of five of the students, in each of the tests, were used to draw the bar chart.



(a) How many marks did Ali get in his history test?

.....

(b) How many marks did Dennis get in his geography test?

.....

(c) One student got a lower mark in the history test than in the geography test.
Write down the name of this student.

Pie charts

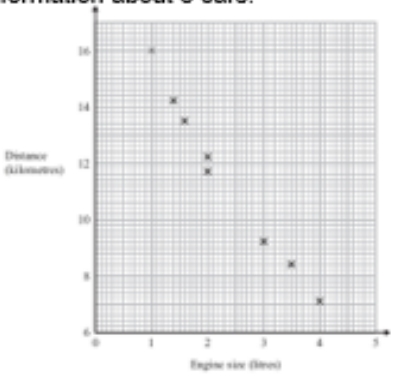
Harry asked each student in his class how they travelled to school that day.
He used the results to draw this pie chart.

How did most of the students travel to school?

Harry asked a total of 24 students.
Work out the number of students who cycled to school.

Scatter Graphs

The scatter graph shows some information about 8 cars.



What type of correlation does the scatter graph show?

A car has an engine size of 2.5 litres.
Estimate the distance travelled on one litre.