THE ULTIMATE REVISION GUIDE FOR GCSE MATHS

Everything you need to pass your maths GCSE exam (foundation tier)

BY THE GCSE MATHS TUTOR

Everything You Need to Pass GCSE Maths Foundation Revision Guide

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Instructions!

Every question has a QR code that can be scanned or clicked (if using the online version) to bring up a full lesson

Try it out!

Revision Videos

Everything you need to get a Grade 5 (Higher & Foundation)

Everything you need to get a Grade 6-9 (Higher Only)

Multiplying Decimals

Work out 54.6×4.3

Full Lesson Here

..... **3 marks**

Answer: 234.78

Product of Prime Factors

Express 56 as the product of its prime factors.

Full Lesson Here

..... **2 marks**

Answer: $2 \times 2 \times 2 \times 7$ or $2^3 \times 7$

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Highest Common Factor

Find the Highest Common Factor (HCF) of 84 and 180

Full Lesson Here

Answer 12

..... **2 marks**

Lowest Common Multiple

Find the lowest common multiple (LCM) of 40 and 56

Full Lesson Here

Answer 280

..... **2 marks**

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Laws of Indices

Work out the value of $\dfrac{3^7 \times 3^{-2}}{3^3}$

Full Lesson Here

..... **2 marks**

Answer: 6

Negative and Fractional Indices

(a) Write down the value of $36^{\frac{1}{2}}$

(b) Write down the value of 23^0

Full Lesson Here

..... **2 marks**

Answer: a) 6 b) 1

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Simplifying Expressions

(a) Simplify $5f - f + 2f$

(b) Simplify $2 \times m \times n \times 8$

(c) Simplify $t^2 + t^2$

..... **3 marks**

Full Lesson Here

Answer
a) $6f$
b) $16mn$
c) $2t^2$

Expanding Single Brackets

(a) Expand $5(2m - 3)$

(b) Expand $2x(3 - x)$

..... **2 marks**

Full Lesson Here

Answer
a) $10m - 15$
b) $6x - 2x^2$

Expanding Single Brackets 2

Expand and simplify $5(p + 3) - 2(1 - 2p)$

Full Lesson Here

Answer: 9p+13

..... **2 marks**

Factorise Expressions

(a) Factorise $5 - 10m$

(b) Factorise fully $2a^2b + 6ab^2$

Full Lesson Here

Answer: a) 5(1-2m) b) 2ab(a+3b)

..... **3 marks**

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Substitution

$P = 7r + 3q$

Work out the value of P when $r = 5$ and $q = -4$

Full Lesson Here

..... **2 marks**

Answer
P = 23

Laws of Indices

(a) Simplify $m^3 \times m^4$

(b) Simplify $(5np^3)^3$

(c) Simplify $\dfrac{32q^9r^4}{4q^3r}$

Full Lesson Here

..... **5 marks**

Answer
a) m^7
b) $125n^3p^9$
c) $8q^6r^3$

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Changing the Subject 1

Make t the subject of the formula $w = 3t + 11$

Full Lesson Here

..... **2 marks**

Answer $t = \frac{w - 11}{3}$

Changing the Subject 2

Make s the subject of $v^2 = u^2 + 2as$

Full Lesson Here

..... **2 marks**

Answer $s = \frac{v^2 - u^2}{2a}$

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Two Way Tables

60 people were asked if they prefer to go on holiday in Britain or in Spain or in Italy.

38 of the people were male.
11 of the 32 people who said Britain were female.
8 males said Italy.
12 people said Spain.

One of the females is chosen at random.

What is the probability that this female said Spain?

Full Lesson Here

.....

4 marks

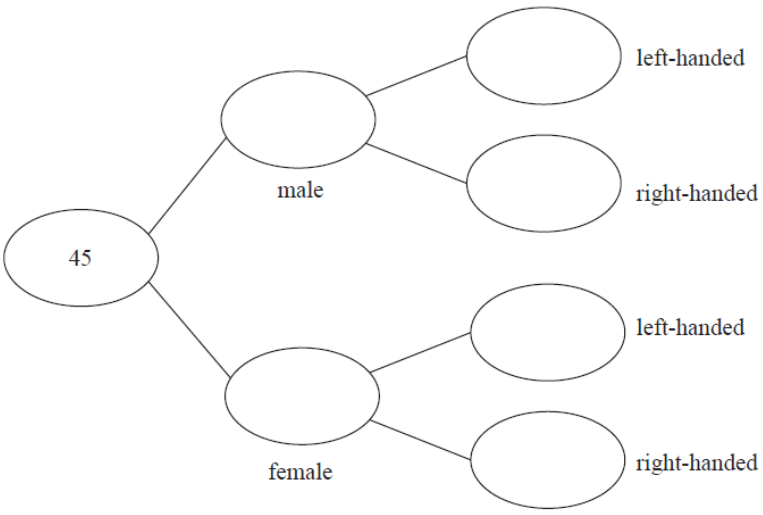
Answer: $\frac{3}{22}$

Frequency Trees

Each worker in a factory is either left-handed or right-handed.

22 of the 45 workers are male.
16 of the 34 right-handed workers are female.

Complete the frequency tree for this information.



Full Lesson Here

3 marks

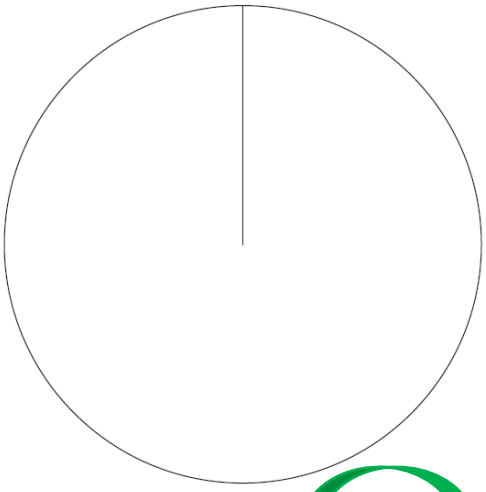
Answer: 22, 23, 4, 18, 7, 16

Pie Charts

A group of football fans were asked what their half time snack was.

The table below gives information about their answers.

Snack	Number of fans
burger	11
pie	17
hot dog	8



Draw an accurate pie chart for this information.

Full Lesson Here

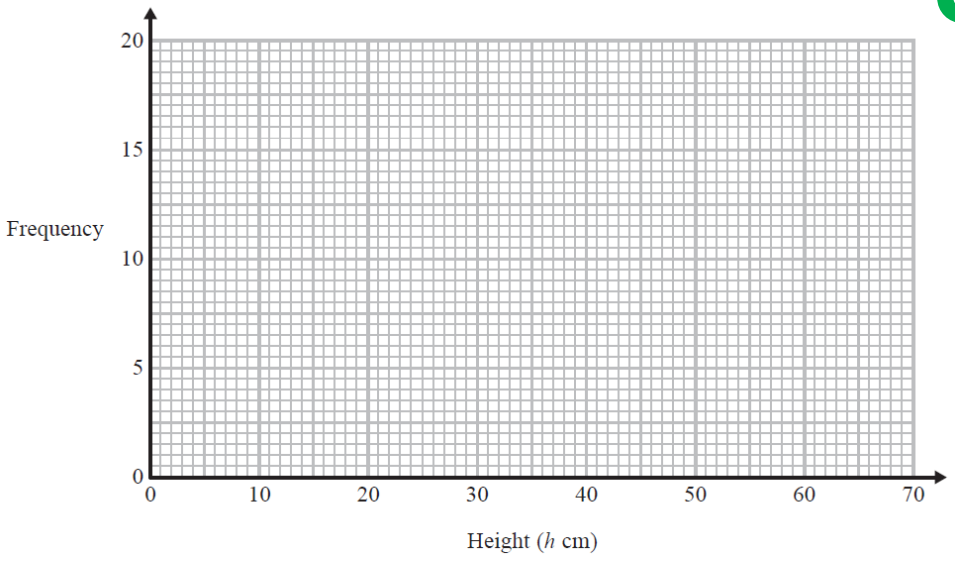
Answer: x=1.5 or $\frac{3}{2}$

..... **3 marks**

Frequency Polygons

On the grid, draw a frequency polygon for the information in the table.

Height (h cm)	Frequency
$10 < h \leqslant 20$	7
$20 < h \leqslant 30$	13
$30 < h \leqslant 40$	14
$40 < h \leqslant 50$	12
$50 < h \leqslant 60$	16
$60 < h \leqslant 70$	18



Full Lesson Here

Answer: Diagram drawn using midpoints and connected via straight lines

..... **2 marks**

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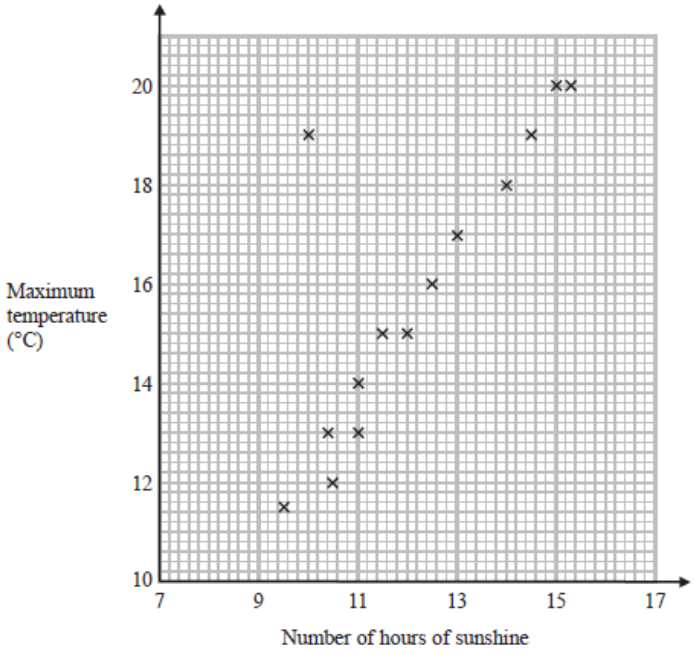
Scatter Graphs 1



One of the points is an outlier.
Write down the coordinates

For all the other points write down the type of correlation.

On the same day, in another British town, the maximum temperature was 16.4 °C.

Estimate the number of hours of sunshine in this town on this day.

Full Lesson Here

Answer a) (10,19)
b) Positive
c) 12-13

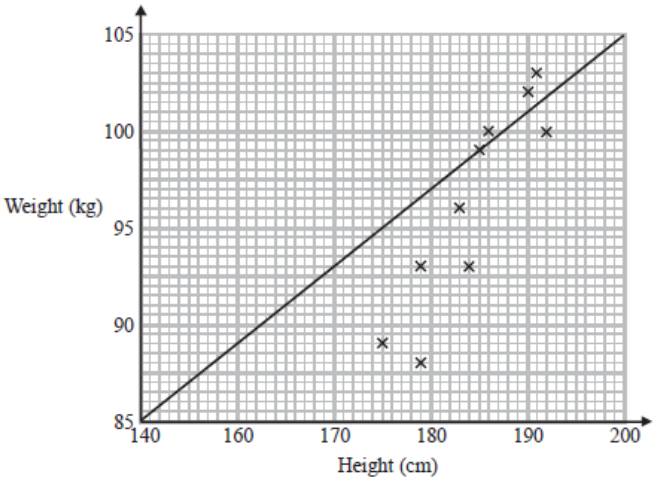
..... **4 marks**

Scatter Graphs 2

Sean has information about the height, in cm, and the weight, in kg, of each of ten rugby players.

He is asked to draw a scatter graph and a line of best fit for this information.

Here is his answer.



Sean has plotted the points accurately.

Write down two things that are wrong with his answer.

Full Lesson Here

Answer 1) Line of best fit not accurate
2) Scale on y-axis not accurate

..... **2 marks**

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Fractions of an Amount

$\frac{4}{5}$ of a number is 32

Find the number.

Full Lesson Here

..... **2 marks**

Answer: 40

Converting Fractions, Decimals and Percentages

Write these numbers in order of size.
Start with the smallest number.

35% $\frac{3}{10}$ 0.32 $\frac{2}{5}$ 0.25

Full Lesson Here

..... **2 marks**

Answer: $0.25, \frac{3}{10}, 0.32, 35\%, \frac{2}{5}$

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Percentages of an Amount

Work out 15% of 80

Full Lesson Here

.....

2 marks

Answer 12

Increase by a Percentage

Azmol is paid £1500 per month.
He is going to get a 3% increase in the amount of money he is paid.

Work out how much money Azmol will be paid per month after the increase.

Full Lesson Here

.....

2 marks

Answer £1545

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Decrease by a Percentage

A television has a normal price of £675
In a sale the price is reduced by 32%.

Work out the price of the television in the sale.

Full Lesson Here

..... **3 marks**

Answer £459

Calculating Percentage Changes

Renee buys 5 kg of sweets to sell.
She pays £10 for the sweets.

Renee puts all the sweets into bags.
She puts 250 g of sweets into each bag.
She sells each bag of sweets for 65p.

Renee sells all the bags of sweets.

Work out her percentage profit.

Full Lesson Here

..... **4 marks**

Answer 30%

Solving Equations with Unknowns on One Side

Solve $3(m-4)=21$

Full Lesson Here

Answer m=11

..... **2 marks**

Solving Equations with an Unknown Both Sides

Solve $5x-6=3(x-1)$

Full Lesson Here

Answer x=1.5 or $\frac{3}{2}$

..... **3 marks**

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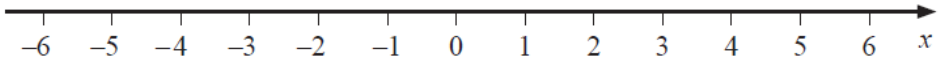
Solving Inequalities and Number Lines

(a) Solve $14n > 11n + 6$

(b) On the number line below, show the set of values of x for which $-2 < x + 3 \leqslant 4$



Full Lesson Here

4 marks

Answer
a) n > 2
b) Open circle above -5, closed circle above 1 and a line connecting them.

Error Intervals

A number, y, is rounded to 2 significant figures.

The result is 0.46

Write down the error interval for y.

Full Lesson Here

2 marks

Answer
0.455 ≤ x < 0.465

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Error Intervals with Truncation

Kiera used her calculator to work out the value of a number x.
She wrote down the first two digits of the answer on her calculator.

She wrote down 7.3

Write down the error interval for x.

Full Lesson Here

Answer: $6.3 \leq x < 7.4$

..... **2 marks**

Finding the nth Term of Sequences

Here are the first four terms of an arithmetic sequence.

5 11 17 23

Write down an expression, in terms of n, for the nth term of the sequence.

Full Lesson Here

Answer: $6n - 1$

..... **2 marks**

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Using the nth Term

Here are the first four terms of an arithmetic sequence.

6 10 14 18

(a) Write an expression, in terms of n, for the nth term of this sequence.

The nth term of a different arithmetic sequence is $3n + 5$

(b) Is 108 a term of this sequence?
Show how you get your answer.

Full Lesson Here

.....

4 marks

Answer
a) $4n + 2$
b) No, $(108 - 5) \div 3$ is not an integer

Fibonacci Sequences

Here are the first six terms of a Fibonacci sequence.

1 1 2 3 5 8

The rule to continue a Fibonacci sequence is,

the next term in the sequence is the sum of the two previous terms.

(a) Find the 9th term of this sequence.

The first three terms of a different Fibonacci sequence are

a b $a + b$

(b) Show that the 6th term of this sequence is $3a + 5b$

Full Lesson Here

.....

3 marks

Answer
a) 21
b) $a+2b$, $2a+3b$, $3a+5b$

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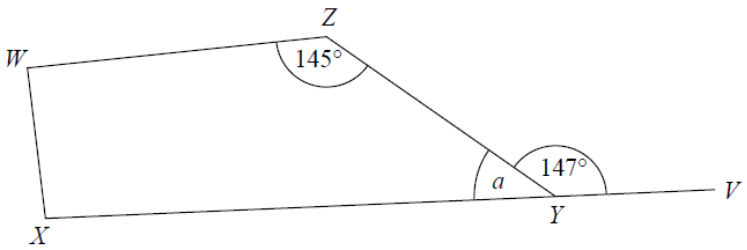
Missing Angles in Quadrilaterals



WXYZ is a quadrilateral.
XYV is a straight line.

(a) (i) Find the size of the angle marked *a*.

(ii) Give a reason for your answer.

Angle *ZWX* = angle *WXY*

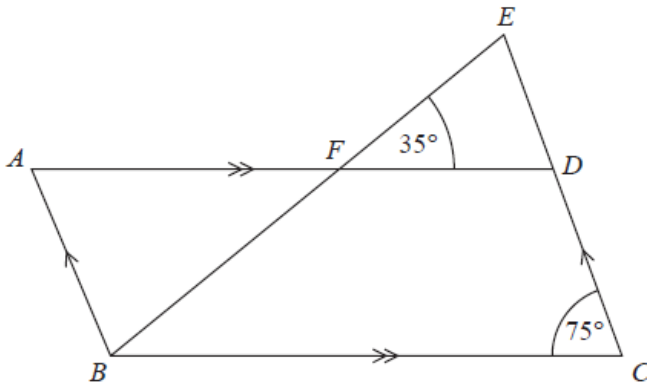
(b) Work out the size of angle *ZWX*.

..... **4 marks**

Full Lesson Here

Answer
a) i) 33°
ii) Angles on a straight line sum to 180° c) 91°

Missing Angles in Triangles and Quadrilaterals



ABCD is a parallelogram.
EDC is a straight line.
F is the point on *AD* so that *BFE* is a straight line.

Angle *EFD* = 35°
Angle *DCB* = 75°

Show that angle *ABF* = 70°
Give a reason for each stage of your working.

..... **4 marks**

Full Lesson Here

Answer
Reasoning shown.
Option: AFB=35 (vertically opposite angles are equal), BAF=75 (opposite angles in a parallelogram are equal) ABF = 180 – (35+75) = 70 (angles in a triangle – 180.

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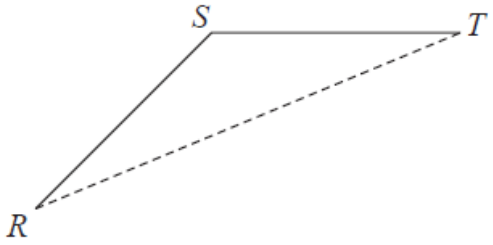
Angles in Polygons



RS and *ST* are 2 sides of a regular 12-sided polygon.
RT is a diagonal of the polygon.

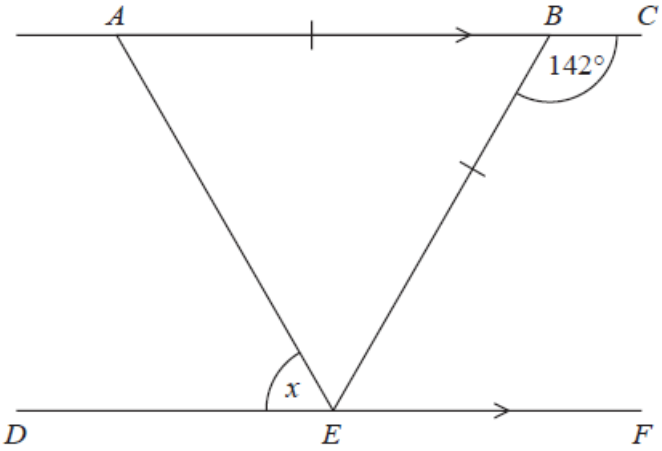
Work out the size of angle *STR*.
You must show your working.

Full Lesson Here

..... **3 marks**

Answer: 15°

Angles in Parallel Lines



ABC and *DEF* are parallel straight lines.
ABE is an isosceles triangle with *AB* = *BE*.
Angle *CBE* = 142°

Work out the size of angle *x*.
Give a reason for each stage in your working.

Full Lesson Here

..... **5 marks**

Answer: 71° Reasons including: Base angles in an isosceles are equal, angles ion straight line = 180 and alternate angles are equal.

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Reverse Means

There are 10 boys and 20 girls in a class.
The class has a test.

The mean mark for all the class is 60
The mean mark for the girls is 54

Work out the mean mark for the boys.

Full Lesson Here

..... **3 marks**

Answer 72

Averages from a Table

Work out an estimate for the mean of the weekly earnings.

Weekly earnings (£x)	Frequency
$150 < x \leqslant 250$	1
$250 < x \leqslant 350$	11
$350 < x \leqslant 450$	5
$450 < x \leqslant 550$	0
$550 < x \leqslant 650$	3

Full Lesson Here

..... **3 marks**

Answer £365

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Averages from a Stem and Leaf

The table shows the heights of a group of students in year 9.

least height	150 cm
median	165 cm
greatest height	170 cm

The stem and leaf shows the heights of some students in year 12.

15	8 9 9
16	4 5 7 7 8
17	0 3 4 4 7
18	0 2

Key: 15 \| 8 represents 158 cm

Compare the distribution of heights for the year 9 students with the year 12 students.

..... **3 marks**

Full Lesson Here

Answer
Median: Yr9 (165) < Yr12 (168)
Range: Yr9 (20) < Yr12 (24)

Sampling and Bias

Hannah is planning a day trip for 195 students.

She asks a sample of 30 students where they want to go.
Each student chooses one place.

The table shows information about her results.

Place	Number of students
Theme Park	10
Theatre	5
Sports Centre	8
Seaside	7

(i) Work out how many of the 195 students you think will want to go to the Theme Park.

(ii) State any assumption you made **and** explain how this may affect your answer.

..... **3 marks**

Full Lesson Here

Answer
a) 65
b) The sample is representative
it could be more or less.

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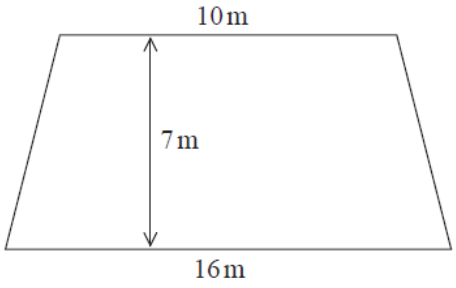
Area of Triangles, Parallelograms and Trapezia

The diagram shows a floor in the shape of a trapezium.



John is going to paint the floor.

Each 5 litre tin of paint costs £16.99
1 litre of paint covers an area of 2 m^2

John has £160 to spend on paint.

Has John got enough money to buy all the paint he needs?
You must show how you get your answer.

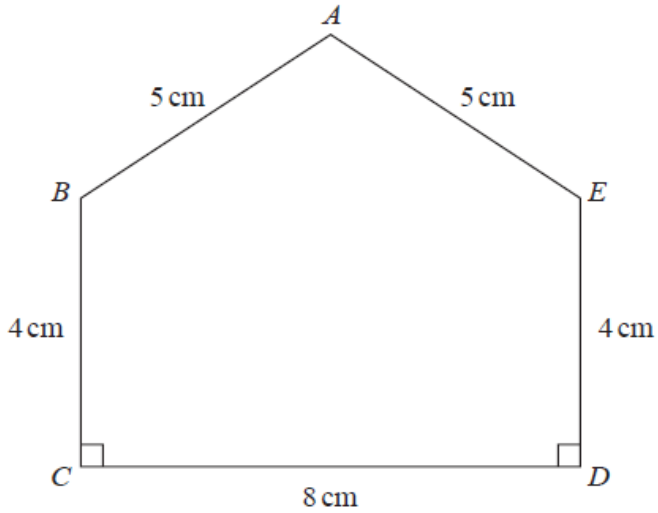
..... **5 marks**

Full Lesson Here

Answer
No, £169.90 or 90m^2

Area of Compound Shapes

ABCDE is a pentagon.



Work out the area of *ABCDE*.

..... **5 marks**

Full Lesson Here

Answer
44cm^2

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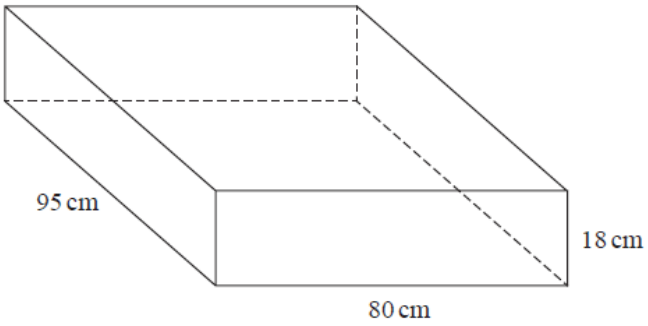
Surface Area of Prisms

A sofa has 6 identical cushions.
Each cushion is a cuboid 18 cm by 80 cm by 95 cm.



The cushions are covered with a protective spray.
The protective spray is in cans.

The label on each can has this information.

Spray in this can covers 4 m^2

Work out how many cans are needed to cover the 6 cushions with protective spray.

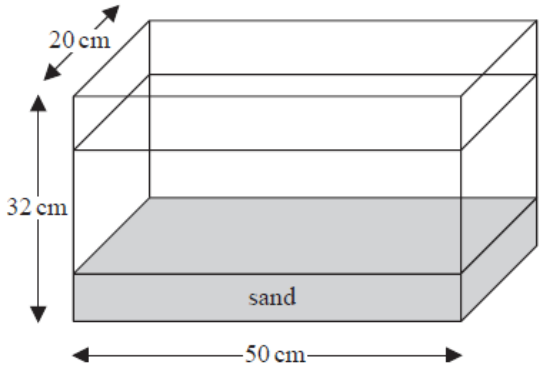
..... **5 marks**

Full Lesson Here

Answer: 4

Volume of Prisms

The diagram shows a fish tank in the shape of a cuboid.



The dimensions of the tank are 50 cm by 32 cm by 20 cm.

The tank is $\frac{3}{4}$ full of water and sand.

The ratio of the volume of water to the volume of sand is 5 : 1

Work out the number of litres of water in the tank.
You must show all your working.

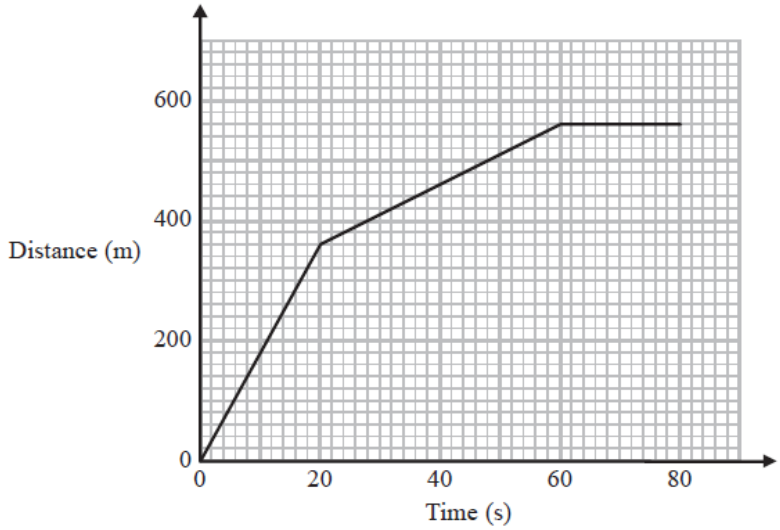
..... **5 marks**

Full Lesson Here

Answer: 20

Distance-Time Graphs

Here is part of a distance-time graph for a car's journey.



(a) Between which two times does the car travel at its greatest speed?
Give a reason for your answer.

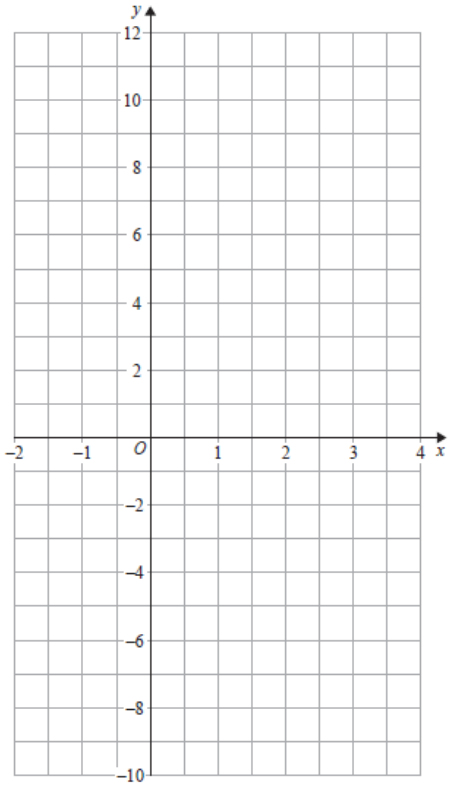
(b) Work out this greatest speed.

..... **3 marks**

Full Lesson Here

Answer a) 0-20 has the highest gradient

Drawing Linear Graphs



On the grid, draw the graph of $y = 3x - 2$ for values of x from -2 to 4

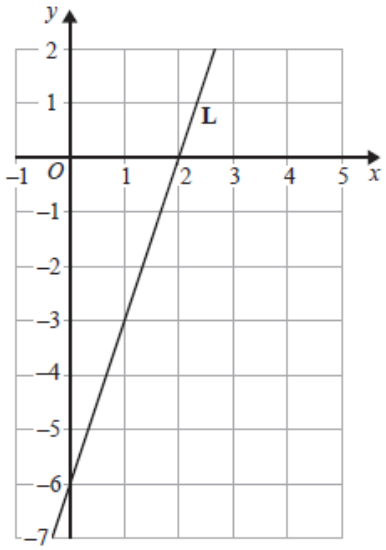
3 marks

Full Lesson Here

Answer $x = -2\ -1\ 0\ 1\ 2\ 3\ 4$ $y = -8\ -5\ -2\ 1\ 4\ 7\ 10$

Find the Equation of a Line

The line **L** is shown on the grid.



Find an equation for **L**.

..... **3 marks**

Full Lesson Here

Answer: $y = 3x - 6$

Gradient of a Line

A is the point with coordinates $(5, 9)$
B is the point with coordinates $(d, 15)$

The gradient of the line AB is 3

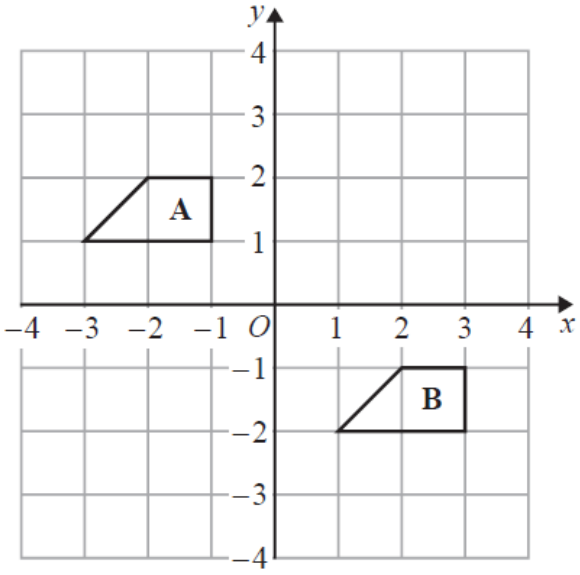
Work out the value of d.

..... **3 marks**

Full Lesson Here

Answer: 7

Translations



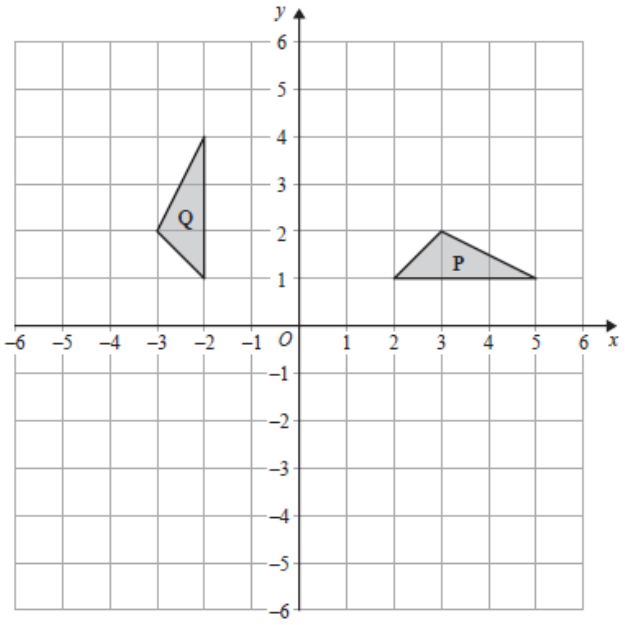
Describe the single transformation that maps shape **A** onto shape **B**.

2 marks

Full Lesson Here

Answer: Translation by the vector $\begin{pmatrix} 4 \\ -3 \end{pmatrix}$

Rotations



Describe fully the single transformation that maps triangle **P** onto triangle **Q**.

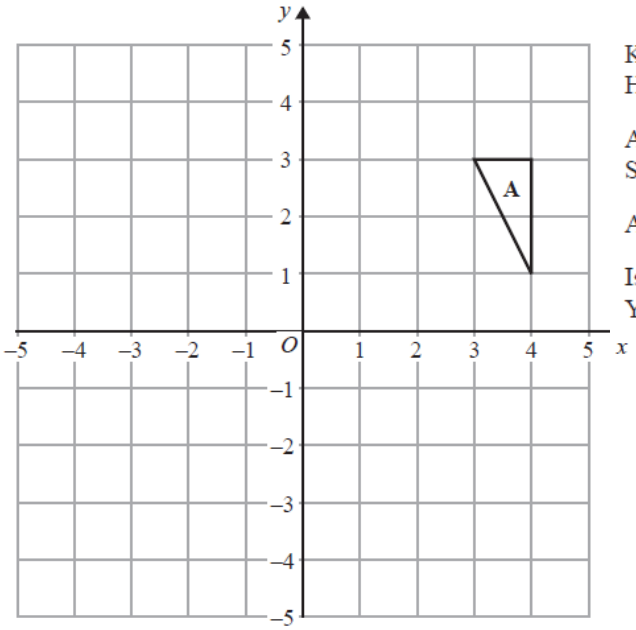
.....

2 marks

Full Lesson Here

Answer: Rotation, 90°, Anti-Clockwise, Centre (0,-1)

Reflections



Kyle reflects triangle **A** in the x-axis to get triangle **B**.
He then reflects triangle **B** in the line $y = x$ to get triangle **C**.

Amy reflects triangle **A** in the line $y = x$ to get triangle **D**.
She is then going to reflect triangle **D** in the x-axis to get triangle **E**.

Amy says that triangle **E** should be in the same position as triangle **C**.

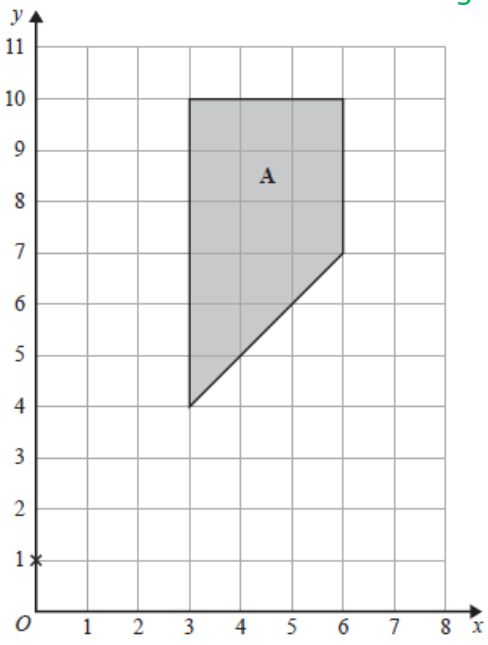
Is Amy correct?
You must show how you get your answer.

3 marks

Full Lesson Here

Answer
No, C is a rotation of 90° anti-clockwise about O

Enlargements



Enlarge shape **A** by scale factor $\frac{1}{3}$ centre (0, 1)

2 marks

Full Lesson Here

Answer
Correct enlargement at (1,2), (2,3), (2,4), (1,4)

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Sharing in a Ratio

The perimeter of a right-angled triangle is 72 cm.
The lengths of its sides are in the ratio 3 : 4 : 5

Work out the area of the triangle.

Full Lesson Here

..... **4 marks**

Answer: 216cm²

Ratio, Fractions and Percentage Problems

Daniel bakes 420 cakes.
He bakes only vanilla cakes, banana cakes, lemon cakes and chocolate cakes.

$\frac{2}{7}$ of the cakes are vanilla cakes.

35% of the cakes are banana cakes.

The ratio of the number of lemon cakes to the number of chocolate cakes is 4 : 5

Work out the number of lemon cakes Daniel bakes.

Full Lesson Here

..... **5 marks**

Answer: 89

GCSE MATHS TUTOR
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Combining Ratios

In a village

the number of houses and the number of flats are in the ratio 7 : 4
the number of flats and the number of bungalows are in the ratio 8 : 5

There are 50 bungalows in the village.

How many houses are there in the village?

Full Lesson Here

Answer 140

..... **3 marks**

Direct Proportion in Context

Jack is building a wall.

He uses 300 bricks to build part of the wall.
This part of the wall is 5 metres long and 1.5 metres high.

The complete wall will be 8 metres long and 1.5 metres high.

How many more bricks does Jack need to complete the wall?

Full Lesson Here

Answer 180

..... **3 marks**

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Inverse Proportion in Context

It would take 120 minutes to fill a swimming pool using water from 5 taps.

(a) How many minutes will it take to fill the pool if only 3 of the taps are used?

(b) State one assumption you made in working out your answer to part (a).

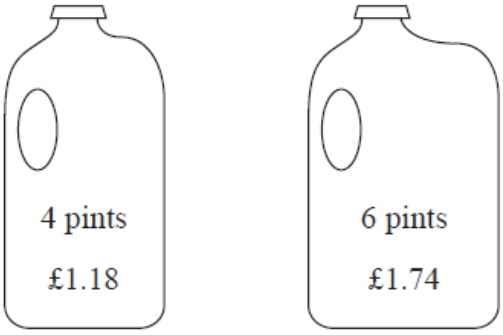
Full Lesson Here

Answer a) 200
b) The taps are running at the same rate/speed

..... **3 marks**

Best Buys

Milk is sold in two sizes of bottle.



A 4 pint bottle of milk costs £1.18
A 6 pint bottle of milk costs £1.74

Which bottle of milk is the best value for money?
You must show all your working.

Full Lesson Here

Answer 6 pints

..... **3 marks**

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Exchange Rates

Gina finds out the price of a CD box set in three different countries.

The price is

£98 in the UK
$134.99 in the USA
€139.99 in Germany

The exchange rates are

£1 = $1.43
€1 = £0.73

Gina wants to pay the cheapest price for the box set.

(a) From which country should Gina buy the box set?
You must show how you get your answer.

Gina lives in the UK.

(b) Why might your answer to (a) **not** be the best country for Gina to buy the box set from?

..... **4 marks**

Full Lesson Here

Answer
a) USA
b) Postage costs

Recipes

Deon needs 50 g of sugar to make 15 biscuits.

She also needs

three times as much flour as sugar
two times as much butter as sugar

Deon is going to make 60 biscuits.

(a) Work out the amount of flour she needs.

Deon has to buy all the butter she needs to make 60 biscuits.
She buys the butter in 250 g packs.

(b) How many packs of butter does Deon need to buy?

..... **5 marks**

Full Lesson Here

Answer
a) 600
b) 2

Pythagoras Theorem

Triangle ABC has perimeter 20 cm.

$AB = 7$ cm.
$BC = 4$ cm.

By calculation, deduce whether triangle ABC is a right-angled triangle.

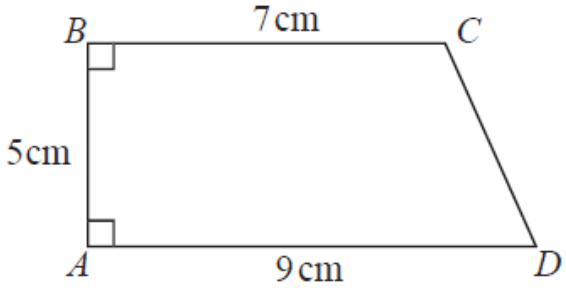
..... **4 marks**

Full Lesson Here

Answer No, AC=9cm
$4^2+7^2=65$
$\sqrt{65} \neq 9$cm

Pythagoras Theorem Problems

$ABCD$ is a trapezium.



A square has the same perimeter as this trapezium.

Work out the area of the square.
Give your answer correct to 3 significant figures.

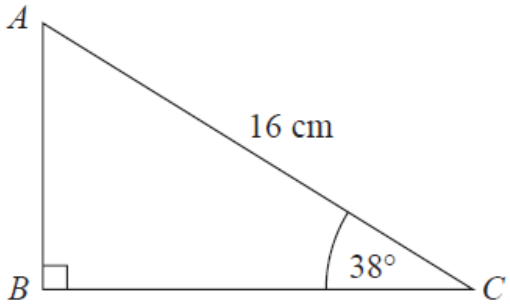
..... **5 marks**

Full Lesson Here

Answer 43.5cm

Trigonometry (Side Lengths)

ABC is a right-angled triangle.



Calculate the length of *AB*.
Give your answer correct to 2 decimal places.

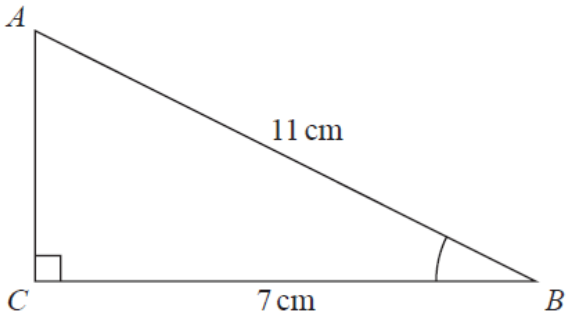
Full Lesson Here

Answer 9.85cm

..... **2 marks**

Trigonometry (Angles)

ABC is a right-angled triangle.



Work out the size of angle *ABC*.
Give your answer correct to 1 decimal place.

Full Lesson Here

Answer 50.5°

..... **2 marks**

GCSE MATHS TUTOR
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Probability from a Table

There are only blue cubes, red cubes and yellow cubes in a box.

The table shows the probability of taking at random a blue cube from the box.

Colour	blue	red	yellow
Probability	0.2		

The number of red cubes in the box is the same as the number of yellow cubes in the box.

(a) Complete the table.

There are 12 blue cubes in the box.

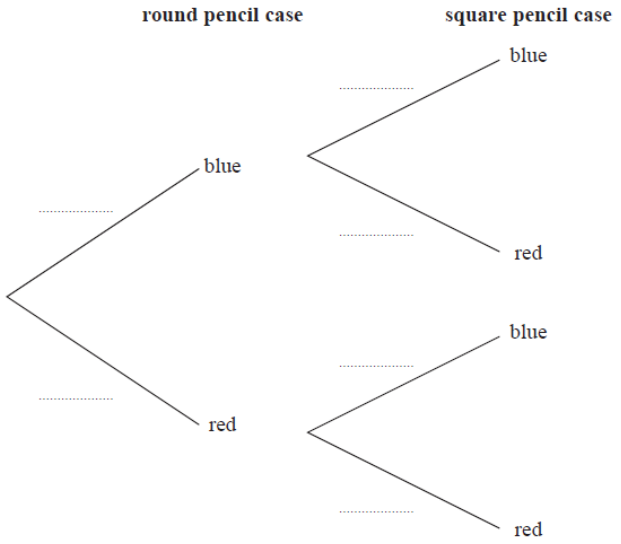
(b) Work out the total number of cubes in the box.

..... **4 marks**

Full Lesson Here

Answer
a) 0.4, 0.4
b) 60

Probability Trees (Independent) 1



Sameena has a round pencil case and a square pencil case.

There are 4 blue pens and 3 red pens in the round pencil case.
There are 3 blue pens and 5 red pens in the square pencil case.

Sameena takes at random one pen out of each pencil case.

(a) Complete the probability tree diagram.

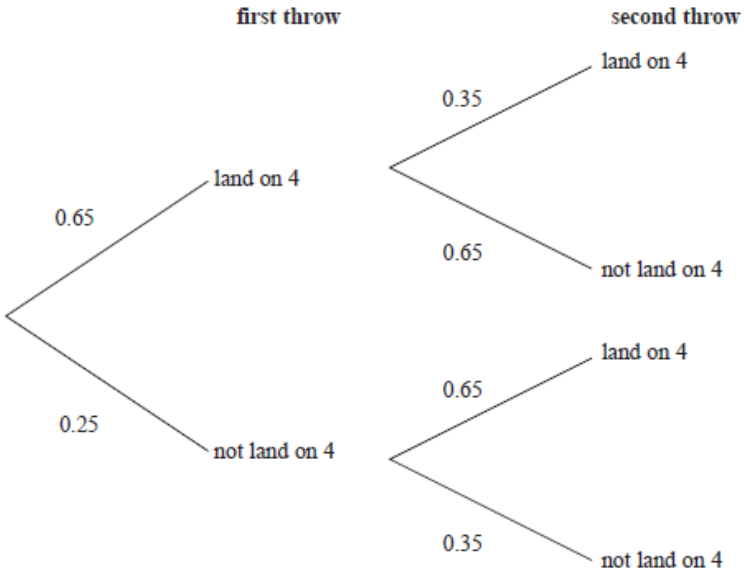
(b) Work out the probability that the pens Sameena takes are both red.

..... **4 marks**

Full Lesson Here

Answer
a) Round: $\frac{4}{7}, \frac{3}{7}$
Square: $\frac{3}{8}, \frac{5}{8}, \frac{3}{8}, \frac{5}{8}$ b) $\frac{15}{56}$

Probability Trees (Independent) 2



When a biased 6-sided dice is thrown once, the probability that it will land on 4 is 0.65
The biased dice is thrown twice.

Amir draws this probability tree diagram.
The diagram is **not** correct.

Write down **two** things that are wrong with the probability tree diagram.

..... **2 marks**

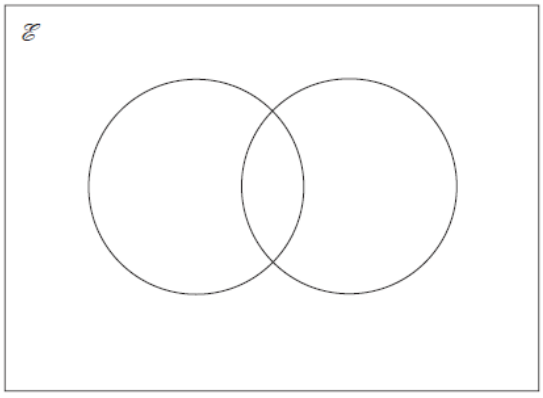
Full Lesson Here

Answer
1) probabilities should sum to 1
2) 0.35 and 0.65 swapped over

Venn Diagrams and Set Theory

$\mathscr{E}$ = {odd numbers less than 30}
A = {3, 9, 15, 21, 27}
B = {5, 15, 25}

(a) Complete the Venn diagram to represent this information.

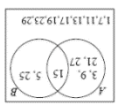


A number is chosen at random from the universal set, $\mathscr{E}$.

(b) What is the probability that the number is in the set $A \cup B$?

..... **6 marks**

Full Lesson Here

Answer a)


b) $\frac{7}{15}$

Compound Interest

Katy invests £200 000 in a savings account for 4 years.
The account pays compound interest at a rate of 1.5% per annum.

Calculate the total amount of interest Katy will get at the end of 4 years.

Full Lesson Here

Answer
£12,272.70
£12,272.72

..... **3 marks**

Compound Interest (Non-Calculator)

Toby invested £7500 for 2 years in a savings account.
He was paid 4% per annum compound interest.

How much money did Toby have in his savings account at the end of 2 years?

Full Lesson Here

Answer
£8112

..... **2 marks**

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Depreciation

Natalia pays £13 995 for a car.
Lauren pays £14 495 for a car.

Assume that
the rate of depreciation for Natalia's car is 12% per annum
and the rate of depreciation for Lauren's car is 13% per annum.

(a) Work out whose car will have the greater value at the end of 3 years.
You must show all your working.

The rate of depreciation assumed for Natalia's car was too low.

(b) How does this affect the value of her car at the end of 3 years?

Full Lesson Here

.....

5 marks

Answer
a) Lauren
b) Her car will be worth less

Reverse Percentages

Jules buys a washing machine.

20% VAT is added to the price of the washing machine.
Jules then has to pay a total of £600

What is the price of the washing machine with **no** VAT added?

Full Lesson Here

.....

2 marks

Answer
£500

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Density, Mass and Volume

A gold bar has a mass of 12.5 kg.

The density of gold is 19.3 g/cm³

Work out the volume of the gold bar.
Give your answer correct to 3 significant figures.

Full Lesson Here

Answer 648cm³

..... **3 marks**

Density Mixtures

The density of apple juice is 1.05 grams per cm³.

The density of fruit syrup is 1.4 grams per cm³.

The density of carbonated water is 0.99 grams per cm³.

25 cm³ of apple juice are mixed with 15 cm³ of fruit syrup and
280 cm³ of carbonated water to make a drink with a volume of 320 cm³.

Work out the density of the drink.
Give your answer correct to 2 decimal places.

Full Lesson Here

Answer 1.01g/cm³

..... **4 marks**

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Speed, Distance and Time

Olly drove 56 km from Liverpool to Manchester.
He then drove 61 km from Manchester to Sheffield.

Olly's average speed from Liverpool to Manchester was 70 km/h.
Olly took 75 minutes to drive from Manchester to Sheffield.

Work out Olly's average speed for his total drive from Liverpool to Sheffield.

Full Lesson Here

.....

4 marks

Answer 57.1km/h

Speed, Distance and Time (Non-Calculator)

Gary drove from London to Sheffield.
It took him 3 hours at an average speed of 80km/h.

Lyn drove from London to Sheffield.
She took 5 hours.

Assuming that Lyn
drove along the same roads as Gary
and did not take a break,

(a) work out Lyn's average speed from London to Sheffield.

(b) If Lyn did **not** drive along the same roads as Gary, explain how this could affect your answer to part (a).

Full Lesson Here

.....

4 marks

Answer a) 48km/h
b) She may drive a different distance / have a different average speed

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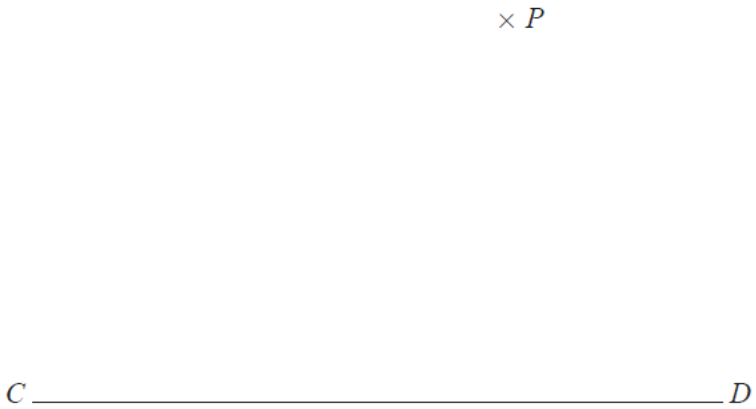
Perpendicular Bisector

Use a ruler and compasses to construct the line from the point P perpendicular to the line CD.
You must show **all** construction lines.



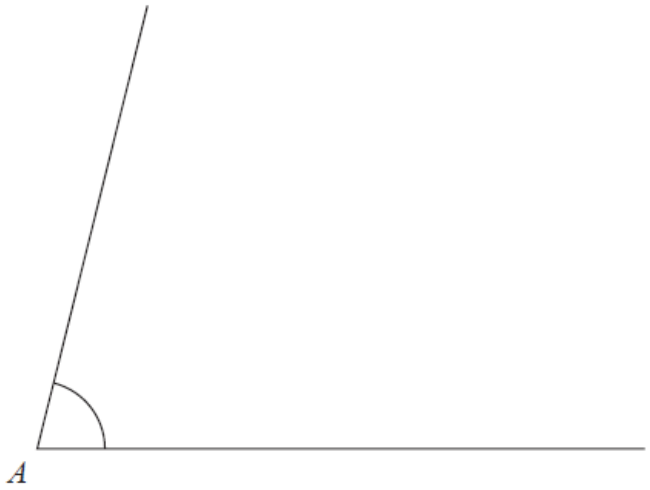
..... **2 marks**

Full Lesson Here

Answer
Perpendicular line constructed through P

Angle Bisector

Use ruler and compasses to bisect the angle at A.
You must show all your construction lines.



..... **2 marks**

Full Lesson Here

Answer
2.5cm circle around A and a perpendicular bisector of BC

Constructing Triangles

Draw accurately an isosceles triangle with side lengths, 8cm, 7cm and 7cm.
One side of the triangle has been drawn for you.

8 cm

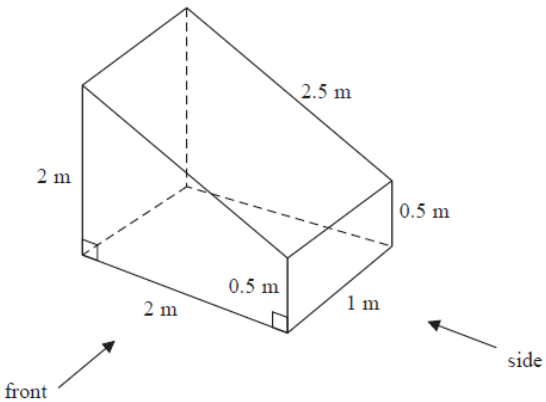
..... **2 marks**

Full Lesson Here

Answer
Accurate triangle drawn

Plans and Elevations

The diagram shows a prism with a cross section in the shape of a trapezium.



On the centimetre grid below, draw the front elevation and the side elevation of the prism.
Use a scale of 2 cm to 1 m.

..... **4 marks**

Full Lesson Here

Answer
Side: 4x2 rectangle
with a line drawn 1cm from the 2cm edge. Front: Trapezium base 4cm, parallel sides 1cm and 4cm

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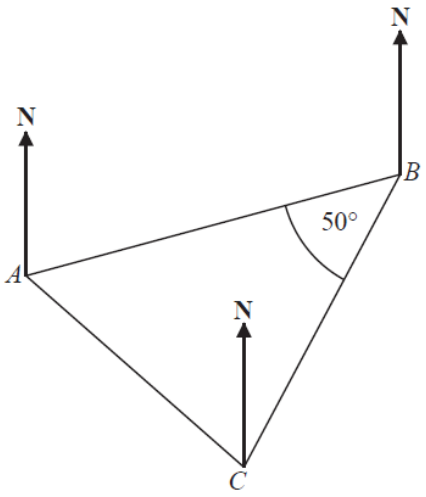
Bearings



The bearing of B from A is 070°

Angle ABC is 50°
$AB = CB$

Work out the bearing of C from A.

..... **3 marks**

Full Lesson Here

Answer
135°

Loci Problems

Point T is 250 metres from point A.
Point T is equidistant from point B and point C.

On the map, show one of the possible positions for point T.

B ×

A ×

× C

1 cm represents 100 metres.

Note: The image is scaled down so it will be different but you can still do it!

..... **3 marks**

Full Lesson Here

Answer
2.5cm circle around A and a perpendicular bisector of BC

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Expanding Double Brackets

Expand and simplify $(5x + 2)(2x - 3)$

Full Lesson Here

Answer: $10x^2 - 11x - 6$

..... **2 marks**

Factorising Quadratics

Factorise $x^2 + 4x + 3$

Full Lesson Here

Answer: $(x+1)(x+3)$

..... **2 marks**

GCSE MATHS TUTOR
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Solving Quadratic Equations by Factorising

Solve $x^2 + 5x - 24 = 0$

.....

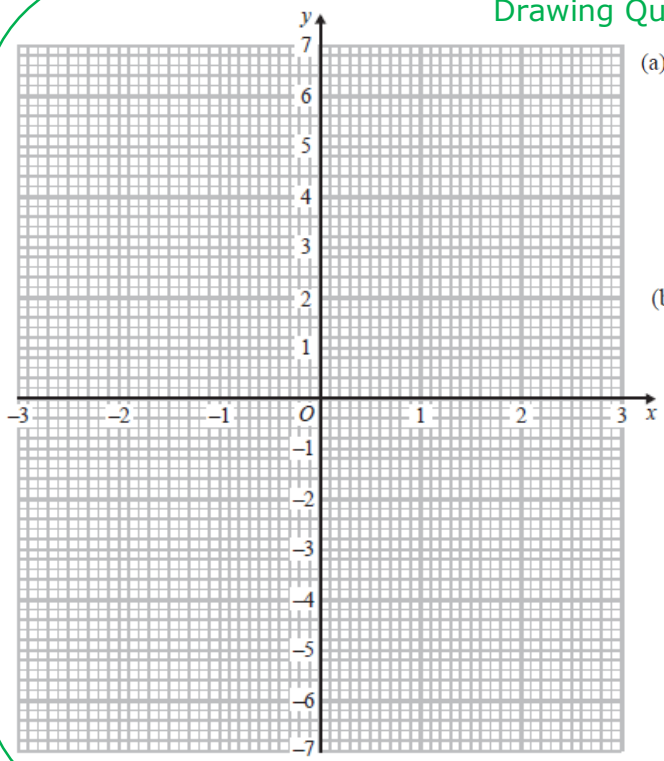
3 marks

Full Lesson Here

Answer

x = -8 and x = 3

Drawing Quadratic Graphs



(a) Complete the table of values for $y = x^2 - x - 6$

x	–3	–2	–1	0	1	2	3
y	6			– 6			

(b) On the grid, draw the graph of $y = x^2 - x - 6$ for values of x from –3 to 3

.....

4 marks

Full Lesson Here

Answer

a) 0, -4, -6, -4, 0

b) Graph drawn

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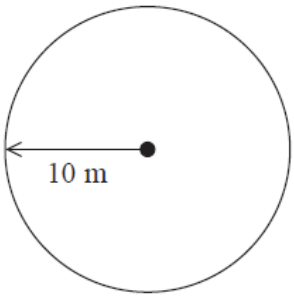
Area and Circumference of a Circle (Non-Calculator)

Balena has a garden in the shape of a circle of radius 10 m.
He is going to cover the garden with grass seed to make a lawn.



Grass seed is sold in boxes.
Each box of grass seed will cover 46 m^2 of garden.

Balena wants to cover all the garden with grass seed.

(a) Work out an estimate for the number of boxes of grass seed Balena needs.
You must show your working.

(b) Is your estimate for part (a) an underestimate or an overestimate?
Give a reason for your answer.

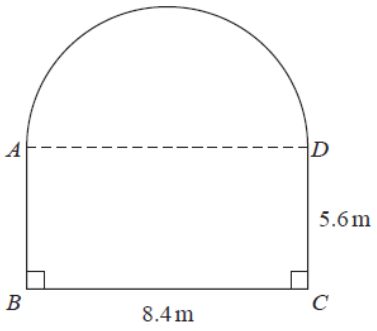
..... **5 marks**

Full Lesson Here

Answer
a) 6-8
b) Underestimate as true area is greater so could need more boxes

Area and Circumference of a Circle

A garden is in the shape of a rectangle, *ABCD*, and a semicircle.
AD is the diameter of the semicircle.



Carol is going to cover the garden with fertiliser.

A box of fertiliser costs £4.99
Carol has been told that one box of fertiliser will cover 12 m^2 of garden.

(a) Work out the cost of buying enough fertiliser to cover the garden completely.

Carol finds out that one box of fertiliser will cover more than 12 m^2 of garden.

(b) Explain how this might affect the number of boxes she needs to buy.

..... **6 marks**

Full Lesson Here

Answer
a) $n > 2$
b) Open circle above -5, closed circle above 1 and a line connecting them.

Cones

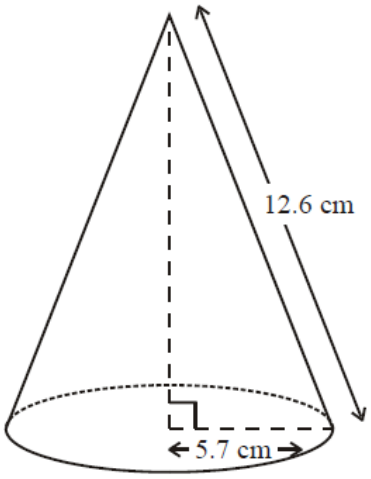
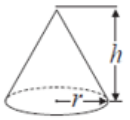


Diagram **NOT** accurately drawn

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



The radius of the base of a cone is 5.7 cm.
Its slant height is 12.6 cm.

Calculate the volume of the cone.
Give your answer correct to 3 significant figures.

..... **4 marks**

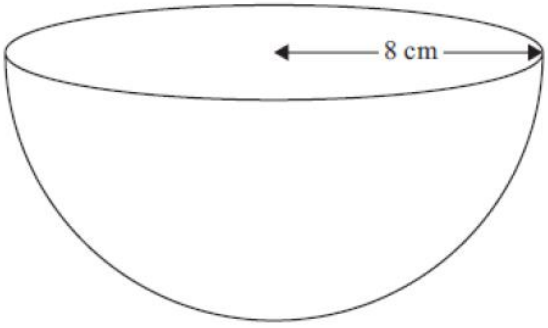
Full Lesson Here

Answer $382cm^3$

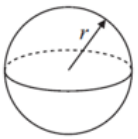
Probability from a Table

The diagram shows a solid hemisphere of radius 8 cm.

Diagram **NOT** accurately drawn



Volume of sphere = $\frac{4}{3}\pi r^3$
Surface area of sphere = $4\pi r^2$



Work out the total surface area of the hemisphere.
Give your answer correct to 3 significant figures.

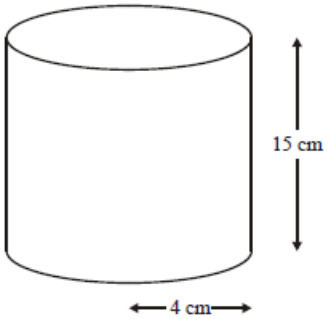
..... **3 marks**

Full Lesson Here

Answer $603cm^2$

Volume of a Cylinder

A can of drink is in the shape of a cylinder.
The can has a radius of 4 cm and a height of 15 cm.



Calculate the volume of the cylinder.
Give your answer correct to 3 significant figures.

Full Lesson Here

Answer 754cm^3

..... **3 marks**

Surface Area of a Cylinder

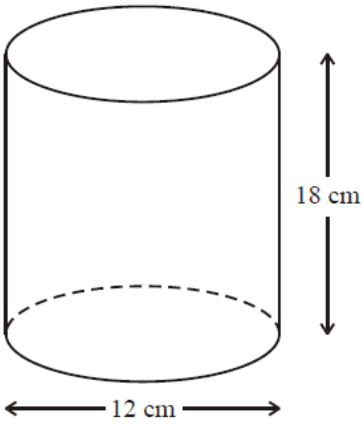


Diagram **NOT** accurately drawn

The diagram shows a solid cylinder.
The cylinder has a diameter of 12 cm and a height of 18 cm.

Calculate the **total** surface area of the cylinder.
Give your answer correct to 3 significant figures.

Full Lesson Here

Answer 905cm^2

..... **4 marks**

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Fraction Calculations 1

(a) Work out $\frac{2}{7} + \frac{1}{5}$

(b) Work out $1\frac{2}{3} \div \frac{3}{4}$

Full Lesson Here

..... **4 marks**

Answer
a) $\frac{17}{35}$ b) $\frac{20}{9}$

Fraction Calculations 2

(a) Work out $2\frac{1}{7} + 1\frac{1}{4}$

(b) Work out $1\frac{1}{5} \div \frac{3}{4}$

Give your answer as a mixed number in its simplest form.

Full Lesson Here

..... **4 marks**

Answer
a) $\frac{95}{28}$ or $3\frac{11}{28}$
b) $1\frac{3}{5}$

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Standard Form Conversions

(a) Write 0.00562 in standard form.

(b) Write 1.452×10^3 as an ordinary number.

Full Lesson Here

..... **2 marks**

Answer
a) 5.62×10^{-3}
b) 1452

Standard Form Calculations

Work out $(13.8 \times 10^7) \times (5.4 \times 10^{-12})$
Give your answer as an ordinary number.

Full Lesson Here

..... **2 marks**

Answer
0.0007452

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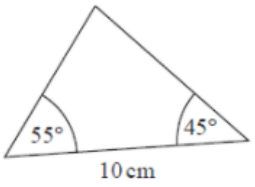
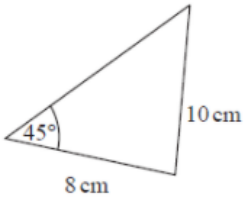
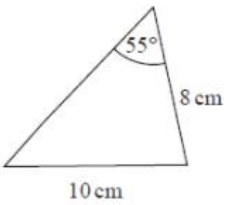
Congruent Triangles



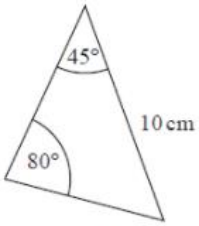
Triangle **A**



Triangle **B**



Triangle **C**



Triangle **D**

Two of these triangles are congruent.

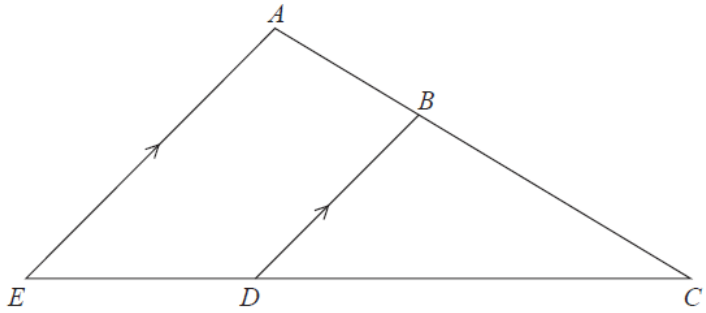
Write down the letters of these two triangles.

Full Lesson Here

Answer
A and D

..... **1 mark**

Similar Shapes



ABC and *EDC* are straight lines.
EA is parallel to *DB*.

EC = 8.1 cm.
DC = 5.4 cm.
DB = 2.6 cm.

(a) Work out the length of *AE*.

AC = 6.15 cm.

(b) Work out the length of *AB*.

Full Lesson Here

Answer
a) 3.9cm
b) 2.05cm

..... **4 marks**

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Column Vectors 1

Shape **A** is translated by the vector $\begin{pmatrix} 4 \\ -7 \end{pmatrix}$ to make Shape **B**.

Shape **B** is then translated by the vector $\begin{pmatrix} -3 \\ -2 \end{pmatrix}$ to make Shape **C**.

Describe the single transformation that maps Shape **A** onto Shape **C**.

..... **2 marks**

Answer: Translation by the vector $\begin{pmatrix} 1 \\ -9 \end{pmatrix}$

Column Vectors 2

$\mathbf{a} = \begin{pmatrix} 1 \\ 4 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$

(a) Write down as a column vector

(i) $\mathbf{a} + \mathbf{b}$

(ii) $2\mathbf{a} + 3\mathbf{b}$

..... **3 marks**

Answer: a) $\begin{pmatrix} 4 \\ 6 \end{pmatrix}$ b) $\begin{pmatrix} 11 \\ 14 \end{pmatrix}$

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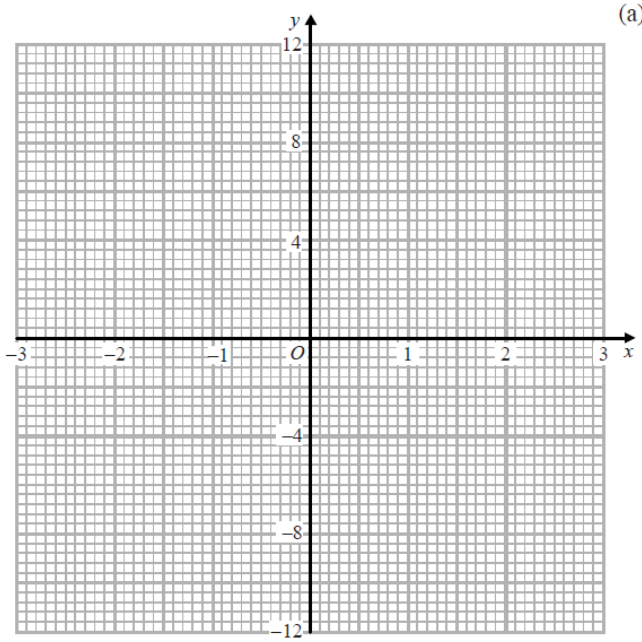
Cubic Graphs



(a) Complete the table of values for $y = x^3 + x^2 - 2x + 1$

x	−3	−2	−1	0	1	2
y		1	3		1	

(b) On the grid, draw the graph of $y = x^3 + x^2 - 2x + 1$ for values of x from −3 to 2

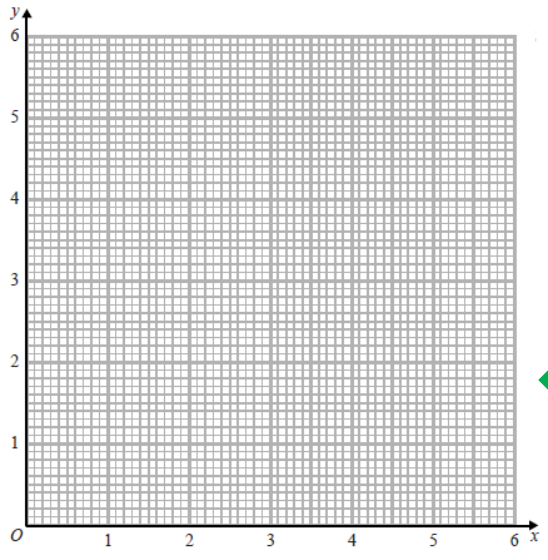
Full Lesson Here

.....

4 marks

Answer
a) -11, 1, 9
b) Graph drawn

Reciprocal Graphs



(a) Complete the table of values for $y = \frac{3}{x}$

x	0.5	1	2	3	4	5	6
y		3	1.5		0.75		

(b) On the grid, draw the graph of $y = \frac{3}{x}$ for values of x from 0.5 to 6

Full Lesson Here

.....

4 marks

Answer
a) 6, 1, 0.6, 0.5
b) graph drawn

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Simultaneous Equations 1

Solve the simultaneous equations

$$2x - 4y = 19$$
$$3x + 5y = 1$$

Full Lesson Here

..... **4 marks**

Answer
x = 4.5
y = -2.5

Simultaneous Equations 2

Solve the simultaneous equations

$$3x + y = -4$$
$$3x - 4y = 6$$

Full Lesson Here

..... **3 marks**

Answer
$x = -\frac{2}{3}$, y = -2

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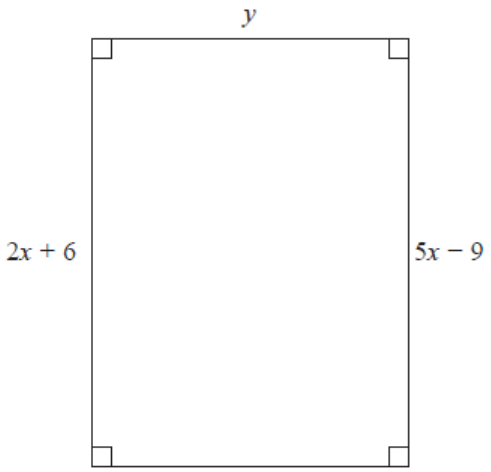
Forming and Solving Equations 1

Here is a rectangle.



All measurements are in centimetres.

The area of the rectangle is 48 cm².

Show that $y = 3$

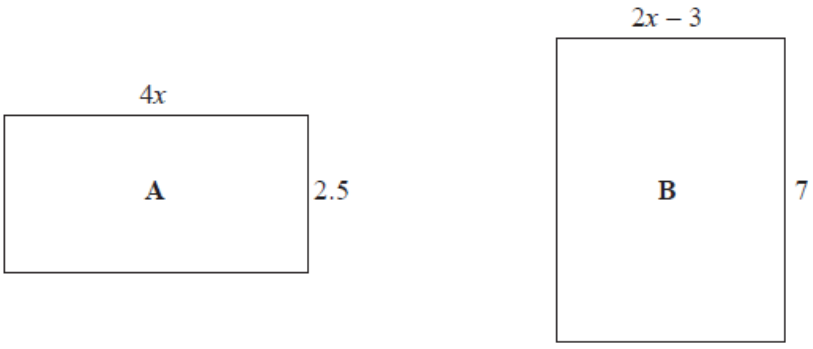
..... **4 marks**

Full Lesson Here

Answer $2x+6=5x-9$, $x=5$, $2(5)+6=16$

Forming and Solving Equations 2

Here are two rectangles.



All measurements are in centimetres.

The area of rectangle **A** is equal to the area of rectangle **B**.

Work out the perimeter of rectangle **B**.

..... **5 marks**

Full Lesson Here

Answer 29cm

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GCSE Mathematics Foundation Tier

Number · Algebra · Ratio, proportion and rates of change · Geometry & measures · Probability · Statistics

Here is pretty much all the Foundation Tier content we could fit onto an A3 sheet of paper, including all the formulae you are required to know for GCSE. An ➔ points to an illustrative example. The codes refer to the DfE subject content. Pin this to a wall, keep it on your desk, carry it in your bag, make notes on it (sorry, don't take it into the examination)…

BIDMAS N3

…or BODMAS. Use the correct order of operations; take care when using a calculator.

- **B**rackets
- **I**ndices (or p**O**wers)
- **D**ivision and **M**ultiplication
- **A**ddition and **S**ubtraction

Types of number N4

Integer: a "whole" number
Factors; the divisors of an integer
➔ **Factors of 12 are 1, 2, 3 ,4, 6, 12**
Multiples; a "times table" for an integer (will continue indefinitely)
➔ **Multiples of 12 are 12, 24, 36 …**
Prime number: an integer which has exactly two factors (1 and the number itself). Note: 1 is not a prime number.

HCF, LCM N4

Highest **C**ommon **F**actor (HCF)
➔ **Factors of 6 are 1, 2, 3, 6**
Factors of 9 are 1, 3, 9
HCF of 6 and 9 is 3
Lowest **C**ommon **M**ultiple (LCM)
➔ **Multiples of 6 are 6, 12, 18, 24, …**
Multiples of 9 are 9, 18, 27, 36, …
LCM of 6 and 9 is 18

Prime factors N4

Write a number as a product of its prime factors; use indices for repeated factors:
➔ $720 = 5 \times 3^2 \times 2^4$

Powers and roots N6, N7

Special indices: for any value a:

$$a^0 = 1$$

$$a^{-n} = \frac{1}{a^n}$$

➔ $3^{-4} = \frac{1}{3^4} = \frac{1}{81}$

Calculating with fractions N8

Adding or subtracting fractions; use a common denominator…
➔ $\frac{4}{5} - \frac{1}{3} = \frac{12}{15} - \frac{5}{15} = \frac{7}{15}$
Multiplying fractions; multiply numerators and denominators…
➔ $\frac{4}{7} \times \frac{2}{3} = \frac{8}{21}$
Dividing fractions; "flip" the second fraction, then multiply…
➔ $\frac{2}{7} \div \frac{5}{6} = \frac{2}{7} \times \frac{6}{5} = \frac{12}{35}$

Fractions, decimals N10

Fraction is numerator ÷ denominator
➔ $\frac{5}{8} = 5 \div 8 = 0.625$
Use place values to change decimals to fractions. Simplify where possible.
➔ $0.45 = \frac{45}{100} = \frac{9}{20}$
Learn the most frequently used ones:

$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{3}{4}$
0.5	0.25	0.1	0.2	0.75

Surds N8

Look for the biggest square number factor of the number:
➔ $\sqrt{80} = \sqrt{16 \times 5} = 4\sqrt{5}$

Standard form N9

Standard form numbers are of the form $a \times 10^n$ where $1 \le a < 10$ and n is an integer.

Standard units N13

1 tonne = 1000 kilograms
1 kilogram = 1000 grams

1 kilometre = 1000 metres
1 metre = 100 centimetres
= 1000 millimetres
1 centimetre = 10 millimetres

1 day = 24 hours
1 hour = 60 minutes = 3600 seconds
1 minute = 60 seconds

Rounding N15

Truncate the number, then use a "decider digit" to round up or down.
Decimal places: use the decimal point
➔ **162.3681 to 2dp;**
162.36 | 81 = **162.37 to 2dp**
Significant figures: use the first non-zero digit.
➔ **162.3681 to 2sf;**
16 | 2.3681 = **160 to 2sf**
➔ **0.007 039 to 3sf;**
0.007 03 | 9 = **0.007 04 to 3sf**

Error intervals N15

Find the range of numbers that will round to a given value:
➔ $x = 5.83$ **(2 decimal places)**
$5.825 \le x < 5.835$
➔ $y = 46$ **(2 significant figures)**
$45.5 \le y < 46.5$
Note use of ≤ and <, and that the last significant figure of each is 5

Algebraic notation A1

$$ab = a \times b$$
$$3y = y + y + y$$
$$a^2 = a \times a$$
$$a^3 = a \times a \times a$$
$$a^2b = a \times a \times b$$
$$\frac{a}{b} = a \div b$$

Equations and identities A3

An equation is true for some particular value of x
➔ **$2x + 1 = 7$ is true if $x = 3$**
…but an identity is true for every value of x
➔ **$(x + a)^2 \equiv x^2 + 2ax + a^2$**
(note the use of the symbol ≡)

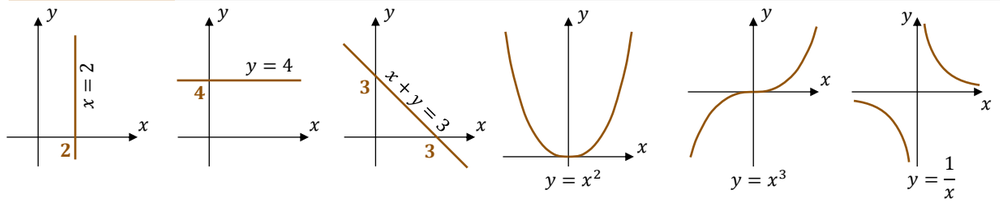
Laws of indices A4

For any value a:

$$a^x \times a^y = a^{x+y}$$
$$\frac{a^x}{a^y} = a^{x-y}$$
$$(a^x)^y = a^{xy}$$

➔ $\left(\frac{2pq^4}{p^3q}\right)^3 = \frac{8p^3q^{12}}{p^9q^3} = \frac{8q^9}{p^6}$ or $8q^9p^{-6}$

Standard graphs A12



$y = mx + c$ A9

Equation of straight line $y = mx + c$
m is the gradient; c is the y intercept:
➔ **Find the equation of the line that joins (0 , 3) to (2 , 11)**
Find its gradient…

$$\frac{11 - 3}{2 - 0} = \frac{8}{2} = 4$$

…and its y intercept…
Passes through (0 , 3), so c = 3
Equation is $y = 4x + 3$

Parallel lines: gradients are equal;
➔ **$y = 2x + 3$ and $y = 2x - 5$ both have gradient 2 so are parallel.**

Expanding brackets A4

$$p(q + r) = pq + pr$$
➔ $5(x - 2y) = 5x - 10y$
$$(x + a)(x + b) = x^2 + ax + bx + ab$$
➔ $(2x - 3)(x + 5)$
$= 2x^2 - 3x + 10x - 15$
$= 2x^2 + 7x - 15$
Reverse of expanding is factorising - putting an expression into brackets.

Quadratics A18

Solve a quadratic by factorising.
➔ **Solve $x^2 - 8x + 15 = 0$**
Put into brackets (taking care with any negative numbers)…
$(x - 3)(x - 5) = 0$
…then either $x - 3 = 0$ or $x - 5 = 0$ so that **$x = 3$ or $x = 5$.**

Difference of two squares A4

$$a^2 - b^2 = (a + b)(a - b)$$
➔ **$x^2 - 25 = (x + 5)(x - 5)$**

Simultaneous equations A19

➔ **Solve** $\begin{cases} 2x + 3y = 11 \\ 3x - 5y = 7 \end{cases}$
Multiply to match a term in x or y
$\begin{cases} 10x + 15y = 55 \\ 9x - 15y = 21 \end{cases}$
Add or subtract to cancel…
$19x = 76$, so $x = 4$
Finally, substitute and solve…
$2 \times 4 + 3y = 11$, so $y = 1$

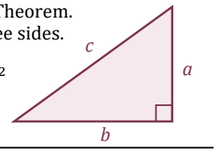
Rearrange a formula A5

The subject of a formula is the term on its own. Use rules that "balance" the formula to change its subject
➔ **Make x the subject of**
$2x + 3y = z$
Here, subtract $3y$ from both sides…
$2x = z - 3y$
…then divide both sides by 2

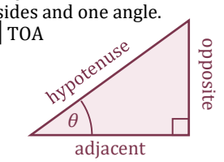
$$x = \frac{z - 3y}{2}$$

Right angled triangles G20, G22

Pythagoras Theorem.
Links all three sides.
No angles.
$a^2 + b^2 = c^2$



Trigonometry.
Links two sides and one angle.
SOH | CAH | TOA



$\sin\theta = \frac{\text{opp}}{\text{hyp}}$ $\cos\theta = \frac{\text{adj}}{\text{hyp}}$ $\tan\theta = \frac{\text{opp}}{\text{adj}}$

Use "2ndF" or "SHIFT" key to find a missing angle

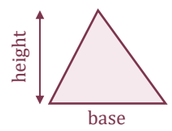
The longest side of any right angled triangle is the hypotenuse; check that your answer is consistent with this.

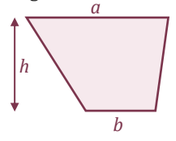
Special values of sin, cos, tan
Learn (or be able to find without a calculator)…

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

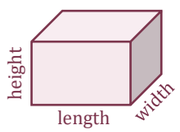
Areas and volumes G16, G17, G18, G23

Area of triangle = $\frac{1}{2} \times$ base $\times$ height



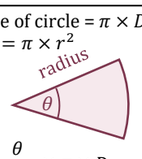


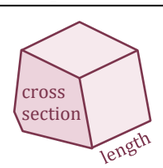
Volume of cuboid = length × width × height

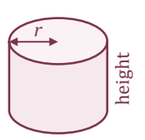


Area of trapezium = $\frac{1}{2}(a + b) \times h$

Circumference of circle = $\pi \times D$
Area of circle = $\pi \times r^2$







Arc length = $\frac{\theta}{360°} \times \pi \times D$

Area of sector = $\frac{\theta}{360°} \times \pi \times r^2$

Volume of cylinder = $\pi r^2 \times$ height

Volume of prism = area of cross section × length

Transformations G7, G8

Reflection
- Line of reflection

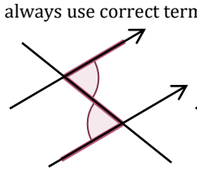
Translation
- Vector

Rotation
- Centre of rotation
- Angle of rotation
- Clockwise or anticlockwise

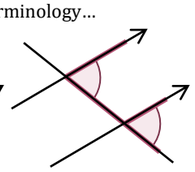
Enlargement
- Centre of enlargement
- Scale factor (if SF < 1 the shape will get smaller).

Angle facts G3

Equal angles in parallel lines: always use correct terminology…

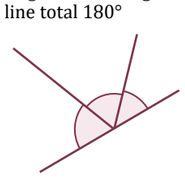


Alternate angles

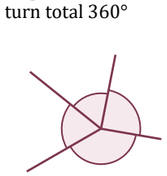


Corresponding angles

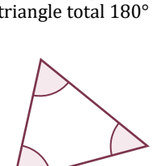
Angles on a straight line total 180°



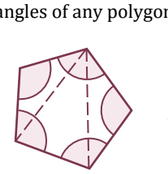
Angles in a full turn total 360°



Interior angles in a triangle total 180°

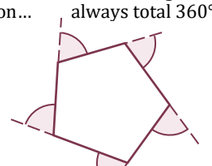


Use this for the interior angles of any polygon…



…or $180° \times (n - 2)$

Exterior angles always total 360°



Sequences A24, A25

Triangular numbers:

1st	2nd	3rd	4th	5th
1	3	6	10	15

Square numbers ($n^2 = n \times n$):

1^2	2^2	3^2	4^2	5^2
1	4	9	16	25

Cube numbers ($n^3 = n \times n \times n$):

1^3	2^3	3^3	4^3	5^3
1	8	27	64	125

nth term of an arithmetic (linear) sequence is $an + d$
➔ **nth term of 5, 8, 11, 14, … is $3n+2$ (always increases by 3 first term is $3 \times 1 + 2 = 5$)**
Geometric sequence; multiply each term by a constant ratio
➔ **3, 6, 12, 24, … (ratio is 2)**
Fibonacci sequence; make the next term by adding the previous two …
➔ **2, 4, 6, 10, 16, 26, 42, …**

Probability P8, P9

$$p = \frac{n(\text{equally likely favourable outcomes})}{n(\text{equally likely possible outcomes})}$$

$p = 0$	impossible
$0 < p < 0.5$	unlikely
$p = 0.5$	evens
$0.5 < p < 1$	likely
$p = 1$	certain

Probability rules P8, P9

Multiply for independent events
➔ **P(6 on dice and H on coin)**

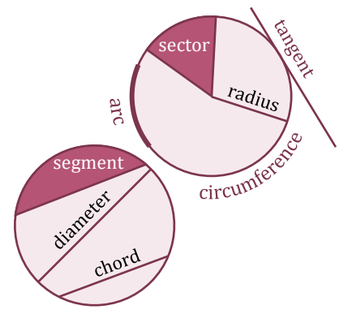
$$\frac{1}{6} \times \frac{1}{2} = \frac{1}{12}$$

Add for mutually exclusive events
➔ **P(5 or 6 on dice)**

$$\frac{1}{6} + \frac{1}{6} = \frac{2}{6}$$

Apply these rules to tree diagrams.

Parts of a circle G9



Division using ratio R5

Use a ratio for unequal sharing
➔ **Divide £480 in the ratio 7 : 5**
7 + 5 = 12, then £480 ÷ 12 = £40
7 × £40 = £280, 5 × £40 = £200
(check: £280 + £200 = £480 ✓)

Ratio and fractions R8

Link between ratios and fractions
➔ **Boys to girls in ratio 2 : 3**
$\frac{2}{5}$ are boys, $\frac{3}{5}$ are girls.

Percentages R9

$$y \text{ percent of } x = \frac{y}{100} \times x$$

➔ **Increase £58 by 26%.**

$$\frac{26}{100} \times £58 = £15.08$$

£58 + £15.08 = £73.08

$$y \text{ as a percentage of } x = \frac{y}{x} \times 100\%$$

➔ **The population of a town increases from 3500 to 4620**
Find the percentage increase.

$$\frac{1120}{3500} \times 100\% = 32\%$$

Note: fraction = $\frac{\text{increase}}{\text{original}}$

Learn the most frequently used ones:

$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{1}{100}$
50%	25%	10%	20%	1%

Speed, distance, time R11

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

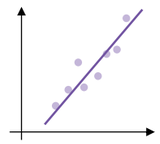
➔ **A car travels 90 miles in 1 hour, 30 minutes. Find its average speed.**
90 miles ÷ 1.5 hours = 60 mph

Averages S4

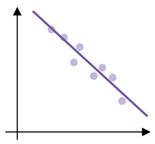
Mode: most frequently occurring
Median: put the data in numerical order, then choose the middle one
Mean = $\frac{\text{total of items of data}}{\text{number of items of data}}$

Correlation S6

Positive correlation



Negative correlation



GCSE Foundation Maths Formula Sheet

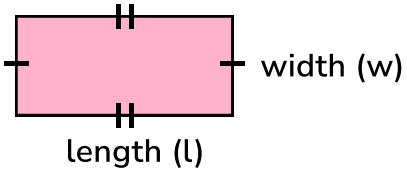
Foundation

THIRD SPACE LEARNING

Area

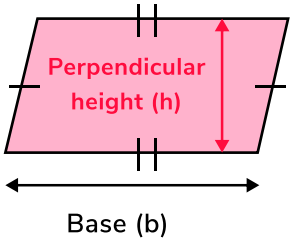
Rectangle

Area = length x width

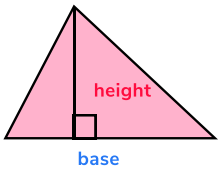


Parallelogram

Area = base x perpendicular height

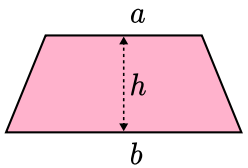


Triangle



Area = $\frac{1}{2}$ x base x height

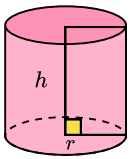
Trapezium



Area = $\frac{1}{2}(a+b)h$

Surface Area

Cylinder



r = radius, h = height

Surface area = $2\pi rh + 2\pi r^2$

Pie Charts

The angle to draw for each sector is

$$\text{Angle} = \frac{\text{Frequency}}{\text{Total}} \times 360°$$

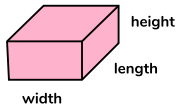
Probability

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

Volume

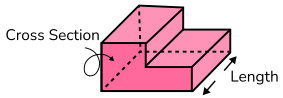
Cuboid

Volume = length x width x height

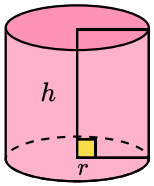


Prism

Volume = area of cross section x length



Cylinder



r = radius, h = height

Volume = $\pi r^2 h$

Direct and Inverse Proportion

If x is directly proportional to y^n then

$x \propto y^n$ so $x = ky^n$

If x is inversely proportional to y^n then

$x \propto \frac{1}{y^n}$ so $x = \frac{k}{y^n}$

Straight Lines

Gradient

$m = \frac{y_2 - y_1}{x_2 - x_1}$

Equation of a Line

$y = mx + c$

m = Gradient, $c = y$ intercept

Midpoint 2 points (x_1, y_1) **and** (x_2, y_2)

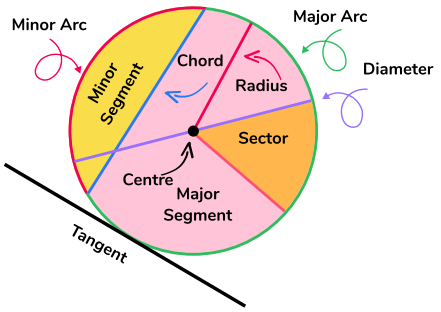
$(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2})$

Circles

r = radius, d = diameter

Area = πr^2

Circumference = πd or $2\pi r$



Percentage Change

$$\text{Percentage change} = (\frac{\text{Difference}}{\text{Original}}) \times 100$$

THIRD SPACE LEARNING

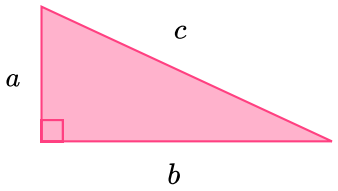
Pythagoras

Note: Right angled triangles only

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

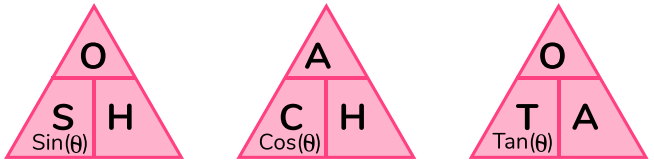
c is the **hypotenuse**
(The longest side)

a and b are the shorter sides.



Trigonometry

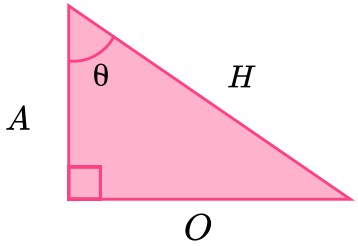
Note: Right angled triangles only



$\text{Sin}\,\theta = \dfrac{\text{Opposite}}{\text{Hypotenuse}}$

$\text{Cos}\,\theta = \dfrac{\text{Adjacent}}{\text{Hypotenuse}}$

$\text{Tan}\,\theta = \dfrac{\text{Opposite}}{\text{Adjacent}}$



Compound Growth & Decay

The amount after n years (or days, etc), where percentage rate of change is r is

$$\text{Starting Amount} \times (1 \pm \frac{r}{100})^n$$

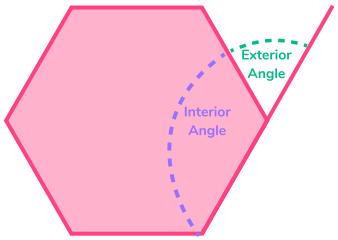
Angles in a Polygon

Exterior angle = $\dfrac{360}{n}$

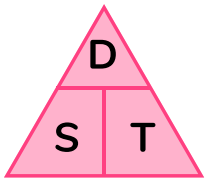
n = number of sides

Interior angle + Exterior angle = 180°

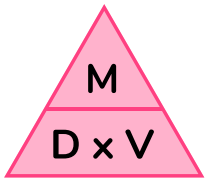
Sum of interior angles = $(n-2) \times 180$



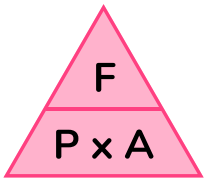
Compound Measures



Distance = Speed x Time
Speed = Distance ÷ Time
Time = Distance ÷ Speed



Mass = Density x Volume
Density = Mass ÷ Volume
Volume = Mass ÷ Density



Force = Pressure x Area
Pressure = Force ÷ Area
Area = Force ÷ Area

Pearson Edexcel GCSE (9–1) Mathematics

May–June 2023 Assessment Window

Syllabus reference **1MA1**

Mathematics
Foundation tier
Exam Aid

You are not permitted to take this notice into the examination.
A version of this equation list will be included with the May–June 2023 question papers. This document is valid if downloaded from the Pearson Qualifications website.

Instructions

- Please ensure that you have read this aid before the examination.

Information

- A formula sheet will be provided for foundation tier and for higher tier students.
- The format/structure of the assessments remains unchanged.
- This exam aid provides students with additional exam formulae which they may refer to in their examinations.
- Please note, a copy of this exam aid will be made available to all students on the day of the examination as an insert in the question paper.
- There are no restrictions on who can use this aid.
- Students and teachers can discuss this exam aid.
- This document has 2 pages.

Continue ▶

Foundation Tier Formulae Sheet

Perimeter, area and volume

Where a and b are the lengths of the parallel sides and h is their perpendicular separation:

Area of a trapezium = $\frac{1}{2}(a + b)\,h$

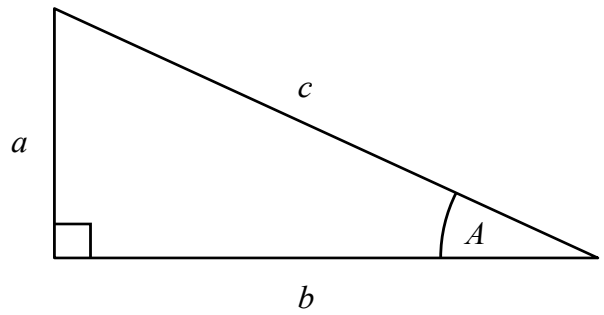
Volume of a prism = area of cross section × length

Where r is the radius and d is the diameter:

Circumference of a circle = $2\pi r = \pi d$

Area of a circle = πr^2

Pythagoras' Theorem and Trigonometry



In any right-angled triangle where a, b and c are the length of the sides and c is the hypotenuse:

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

In any right-angled triangle ABC where a, b and c are the length of the sides and c is the hypotenuse:

$\sin A = \frac{a}{c}$ $\cos A = \frac{b}{c}$ $\tan A = \frac{a}{b}$

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:

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

Probability

Where P (A) is the probability of outcome A and P (B) is the probability of outcome B:

P (A or B) = P (A) + P (B) – P (A and B)

END OF EXAM AID

Sparx Maths

Foundation Skills List

Number

Topic	Topic code	R	A	G
Ordering positive integers	U600			
Ordering decimals	U435			
Ordering negative numbers	U947			
Adding and subtracting positive integers	U417			
Multiplying and dividing positive integers	U127, U453			
Adding and subtracting negative numbers	U742			
Multiplying and dividing negative numbers	U548			
Adding and subtracting decimals	U478			
Multiplying and dividing with place value	U735			
Multiplying and dividing with decimals	U293, U868			
Order of operations	U976			
Prime numbers, prime factorisation	U236, U739			
Factors, multiples, HCF and LCM	U211, U751, U529			
Powers and roots	U851			
Using standard form	U330, U534			
Calculating with standard form	U264, U290, U161			
Equivalent fractions and simplifying fractions	U704, U646			
Mixed numbers and improper fractions	U692			
Ordering fractions	U746			
Addition and subtraction of fractions	U736, U793			
Multiplication and division of fractions	U475, U544			
Converting and ordering fractions, decimals and percentages	U888, U594			
Fractions of amounts	U881, U916			
Percentages of amounts	U554, U349			
Percentage change	U773, U671			
Reverse percentages	U286, U278			
Simple interest	U533			
Rounding	U480, U298			
Rounding to significant figures	U731, U965			
Estimating answers	U225			
Value for money	M681			

Sparx Maths

Foundation Skills List

Algebra

Topic	Topic code	R	A	G
Algebraic expressions	U613			
Collecting like terms	U105			
Substitution	U201, U585, U144			
Expanding brackets	U179, U768			
Factorising expressions	U365			
Index laws	U235, U694, U662, U103			
Changing the subject	U556			
Coordinates	U789, U889			
Midpoints	U933			
Plotting straight line graphs	U741			
Equations of straight line graphs	U315, U669			
Parallel lines	U377			
Distance-time graphs	U403, U914, U462, U966			
Quadratic graphs	U989, U667			
Linear equations	U755, U325, U870, U505, U599			
Quadratic expressions and equations	U178, U228			
Linear sequences	U213, U530, U498, U978			
Other sequences	U958, U680			

Ratio and proportion

Topic	Topic code	R	A	G
Simplifying ratios	U687			
Sharing amounts in a ratio	U753, U577			
Converting between ratios, fractions and percentages	U176			
Direct proportion	U721, U640			
Inverse proportion	U357, U364			
Proportion graphs	U238			
Units of measure: Length, Mass and Capacity	U102, U388			
Units of measure: Time	U902			
Units of measure: Area	U248			
Currency conversion	U610			
Conversion graphs	U652, U638, U862			
Compound units: Speed	U151			

Geometry

Topic	Topic code	R	A	G
Properties of 2D shapes	U121, U849			
Properties of 3D shapes	U719			
Nets of 3D shapes	U761			
Angles: Measuring, Drawing and Estimating	U447			
Angle on a line and about a point	U390			
Vertically opposite angles	U730			
Angles on parallel lines	U826			
Angles in a triangle	U628			
Combining angle facts	U655			
Angles in a quadrilateral	U732, U329			
Angles in polygons	U427			
Bearings	U525, U107			
Translations	U196			
Reflections	U799			
Enlargements	U519			
Rotations	U696			
Congruence	U790, U866			
Area and perimeter of simple shapes	U993, U970, U351, U226			
Area of triangles, parallelograms and trapeziums	U945, U575, U424, U265, U343			
Circles	U767			
Circumference	U604, U221			
Circle area	U950, U373			
Surface area	U929, U259, U871			
Volume of cuboids	U786			
Volume of prisms and cylinders	U174, U915			
Similar shapes	U551, U578			
Scale diagrams	U257			

Sparx Maths Foundation Skills List

Probability

Topic	Topic code	R	A	G
Probability scale	U803			
Probability of single events	U408, U510, U683			
Experimental probability	U580			
Expected outcomes	U166			
Listing elements in a set	U748, U296			
Probability from Venn diagrams	U476			
Frequency trees	U280			
Sample space diagrams	U104			
Tree diagrams	U558, U729			

Statistics

Topic	Topic code	R	A	G
Collecting data, frequency tables	U322, U120			
Two-way tables	U981			
Bar charts	U363, U557			
Pictograms	U506			
Pie charts	U508, U172			
Stem and leaf diagrams	U200, U909			
Mode	U260			
Mean	U291			
Median	U456			
Range	U526			
Choosing averages	U717			
Scatter graphs	U199, U277, U128			

Sparx Maths

Crossover Skills List

Number

Topic	Topic code	R	A	G
Fractions	U224, U538, U793			
Factors, multiples and primes	U739, U250			
Percentage change	U671, U332, U988			
Standard form	U330, U534, U264, U290			
Error intervals	U657			

Algebra

Topic	Topic code	R	A	G
Linear equations	U325, U870, U599			
Linear inequalities	U759, U738, U145, U337			
Index laws	U662			
Linear simultaneous equations	U760, U757, U836, U137			
Linear graphs and coordinates	U315, U669, U477, U848, U377			
Quadratic graphs and equations	U989, U667, U228, U601			

Ratio and proportion

Topic	Topic code	R	A	G
Ratio	U687, U753, U176, U577, U921, U865			
Speed	U151			
Density and pressure	U910, U527			
Proportion	U721, U357, U610			

Geometry

Topic	Topic code	R	A	G
Area	U226, U343, U950			
Volume	U786, U174, U915			
Angles	U655, U826, U329, U427			
Pythagoras' theorem	U385			
Trigonometry	U605, U283, U545			
Transformations	U196, U799, U696, U519, U766			

Probability

Topic	Topic code	R	A	G
Calculating probabilities	U408, U510, U683, U580			
Expected outcomes	U166			
Tree diagrams	U558, U729			
Set notation	U748, U296			

Statistics

Topic	Topic code	R	A	G
Averages	U717, U569			
Averages with grouped data	U877			
Sampling	U162			
Scatter graphs	U199, U277, U128			
Frequency polygons	U840			

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- [ ] Reverse Mean
- [ ] Averages from a Table
- [ ] Grouped Frequency Tables
- [ ] Bar Charts
- [ ] Pictograms
- [ ] Dual/Composite Bar Charts
- [ ] Scatter Graphs
- [ ] Frequency Polygons
- [ ] Pie Charts
- [ ] Averages from a Stem and Leaf
- [ ] Sampling and Bias

RATIO & PROPORTION

- [ ] Simplifying a Ratio
- [ ] Sharing in a Ratio
- [ ] Three Part Ratios
- [ ] Writing Ratios as Fractions
- [ ] Recipes
- [ ] Exchange Rates
- [ ] Best Value Purchases
- [ ] Conversion Graphs
- [ ] Unit Conversions
- [ ] Reverse Percentages
- [ ] Simple/Compound Interest
- [ ] Depreciation
- [ ] Direct Proportion in context
- [ ] Inverse Proportion in context
- [ ] Distance-Time Graphs
- [ ] Speed, Distance & Time
- [ ] Mass, Density & Volume
- [ ] Pressure, Force & Area

GEOMETRY

- [ ] Triangles & Quadrilaterals
- [ ] Area of 2D Shapes
- [ ] Angles in Parallel Lines
- [ ] Angles in Polygons
- [ ] Plans & Elevations
- [ ] Constructions
- [ ] Perpendicular/Angle Bisectors
- [ ] Solving Loci Problems
- [ ] Area & Circumference of Circles
- [ ] Circle Sectors
- [ ] Surface Area of 3D Shapes
- [ ] Volume of 3D Shapes
- [ ] Cylinders, Cones & Spheres
- [ ] Transformations
- [ ] Bearings
- [ ] Similar Shapes
- [ ] Congruent Triangles
- [ ] Column Vectors

PROBABILITY

- [ ] Writing Probabilities
- [ ] Probability from a Table
- [ ] Venn Diagrams
- [ ] Set Theory
- [ ] Frequency Trees
- [ ] Two Way Tables
- [ ] Probability Trees (Fractions)
- [ ] Probability Trees (Decimals)

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- [ ] Multiply & Divide Decimals
- [ ] Estimations
- [ ] Rounding
- [ ] Powers and Roots
- [ ] Use of a Calculator
- [ ] Combinations
- [ ] FDP Conversions
- [ ] Order of Operations
- [ ] Negative and Fractional Indices
- [ ] Highest Common Factor
- [ ] Lowest Common Multiple
- [ ] Product of Prime Factors
- [ ] Standard Form Conversions
- [ ] Standard Form Calculations
- [ ] Fraction Calculations
- [ ] Percentages of an Amount
- [ ] Percentage Changes
- [ ] Error Intervals

ALGEBRA

- [ ] Collecting Like Terms
- [ ] Substitution
- [ ] Using Formulae
- [ ] Laws of Indices
- [ ] Expanding and Simplifying
- [ ] Factorising Expressions
- [ ] Expanding Double Brackets
- [ ] Factorising Quadratics
- [ ] Rearranging Formulae
- [ ] Solving Equations
- [ ] Solving Quadratic Equations
- [ ] Forming and Solving Equations
- [ ] Linear Simultaneous Equations
- [ ] Solving Linear Inequalities
- [ ] Drawing Inequalities
- [ ] Linear Sequences
- [ ] Picture Sequences
- [ ] Special Sequences
- [ ] Coordinates
- [ ] Drawing Linear Graphs
- [ ] Interpreting the Gradient
- [ ] Writing the Equation of a Line
- [ ] Drawing Quadratic Graphs
- [ ] Roots and Turning Points
- [ ] Drawing Cubic Graphs
- [ ] Drawing Reciprocal Graphs

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TRIGONOMETRY

- [ ] Pythagoras Theorem
- [ ] SOHCAHTOA Sides Lengths
- [ ] SOHCAHTOA Angles
- [ ] Exact Trigonometry

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