

Higher GCSE Course

Nail the Basics

Year 11 Booklet



Name

Topic 1: Simultaneous Equations

Solve the simultaneous equations

$$4x - 4y = 24$$

$$x - 4y = 3$$

Do not use trial and improvement

$$x = \dots\dots\dots y = \dots\dots\dots$$

(3)

Solve the simultaneous equations

$$2x + 4y = 26$$

$$3x - y = 4$$

Do not use trial and improvement

$$x = \dots\dots\dots y = \dots\dots\dots$$

(3)

Solve the simultaneous equations

$$3x + 2y = 16$$

$$2x - 3y = 2$$

Do not use trial and improvement

$$x = \dots\dots\dots y = \dots\dots\dots$$

(4)

Solve the simultaneous equations

$$3x + 5y = 1$$

$$2x - 3y = 7$$

Do not use trial and improvement

$$x = \dots\dots\dots y = \dots\dots\dots$$

(4)

Solve the simultaneous equations

$$4x - y = 17$$

$$y = x - 2$$

Do not use trial and improvement

$$x = \dots\dots\dots y = \dots\dots\dots$$

(3)

Alan and Connor have £6.70 in total.

Alan has £1.70 more than Connor.

Let a be the amount of money Alan has.

Let c be the amount of money Connor has.

Set up a pair of simultaneous equations and solve to find out how much each person has.

$$\text{Alan} = \dots\dots\dots \text{Connor} = \dots\dots\dots$$

(3)

Solve the simultaneous equations

$$3x - y = 23$$

$$2x + 3y = 8$$

Do not use trial and improvement

$$x = \dots\dots\dots y = \dots\dots\dots$$

(3)

Three bananas and two pears cost 95p.

Five bananas and three pears cost £1.51

Find the cost of ten bananas and ten pears.

$\dots\dots\dots$
(4)

Topic 2: Prime Factors, LCM & HCF

(a) Write 60 as a product of its prime factors.

.....
(2)

(b) Find the Lowest Common Multiple (LCM) of 60 and 75.

.....
(2)

A number is written as a product of its prime factors as $2 \times 3^2 \times 5$

Work out the number.

.....
(2)

You are given that $45 = 3^2 \times 5$

(a) Write each of the following as the product of prime factors in index form.

(i) 90

.....
(1)

(ii) 135

.....
(1)

(iii) 450

.....
(1)

(b) What is the least common multiple (LCM) of 36 and 45.

.....
(2)

(c) What is the highest common factor (HCF) of 36 and 45.

.....
(2)

- (a) Express 108 as a product of its prime factors.
Give your answer in index form.

.....
(3)

- (b) Find the Highest Common Factor (HCF) of 108 and 72.

.....
(2)

Find the lowest common multiple of 19 and 34.

.....
(2)

Topic 3: Laws of Indices

Simplify the following.

$$\frac{s^3 \times s^4}{s^2}$$

.....
(2)

Simplify

$$2a^3c^3 \times 3a^2c$$

.....
(2)

Simplify

$$\frac{10m^5n^4}{2m^2n}$$

.....
(2)

Evaluate

$$4^{-2}$$

.....
(1)

Evaluate

$$36^{\frac{1}{2}}$$

.....
(1)

Write as a fraction.

$$5^{-3}$$

.....
(1)

Work out

$$25^0$$

.....
(1)

Evaluate

$$1000^{\frac{1}{3}}$$

.....
(1)

Evaluate

(a)

$$27^{2/3}$$

.....
(2)

(b)

$$10000^{3/4}$$

.....
(2)

(c)

$$32^{-4/5}$$

.....
(2)

Work out

$$16^{0.5}$$

.....
(1)

Evaluate

$$81^{-3/4}$$

.....
(2)

Work out

$$16^{\frac{3}{2}}$$

.....
(2)

Evaluate

$$\left(\frac{16}{25}\right)^{\frac{1}{2}}$$

.....
(2)

Evaluate

$$32^{-0.4}$$

.....
(2)

Work out

$$25^{\frac{1}{2}} \div 2^{-2}$$

.....
(3)

Topic 4: Pythagoras' Theorem

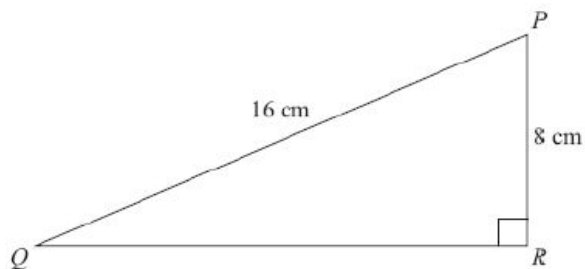


Diagram NOT
accurately drawn

PQR is a right-angled triangle.

$PQ = 16\text{ cm}$.

$PR = 8\text{ cm}$.

Calculate the length of QR .

Give your answer correct to 2 decimal places.

..... cm

(3 marks)

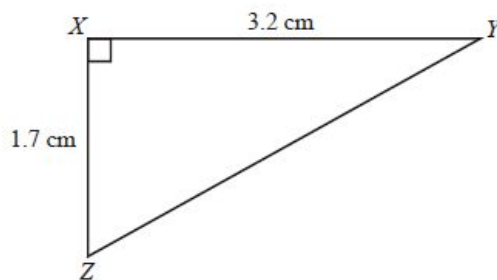


Diagram NOT
accurately drawn

XYZ is a right-angled triangle.

$XY = 3.2\text{ cm}$.

$XZ = 1.7\text{ cm}$.

Calculate the length of YZ .

Give your answer correct to 3 significant figures.

..... cm

(3 marks)

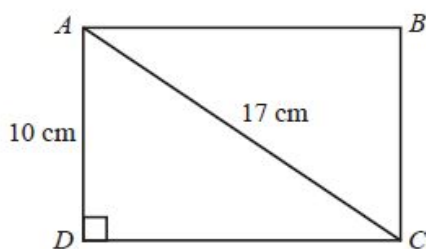


Diagram NOT
accurately drawn

$ABCD$ is a rectangle.

$AC = 17$ cm.

$AD = 10$ cm.

Calculate the length of the side CD .

Give your answer correct to one decimal place.

..... cm

(3 marks)

A ladder is 6 m long.

The ladder is placed on horizontal ground, resting against a vertical wall.

The instructions for using the ladder say that the bottom of the ladder must **not** be closer than 1.5 m from the bottom of the wall.

How far up the wall can the ladder reach?

Give your answer correct to 1 decimal place.

..... m

(4 marks)

Topic 5: Right Angled Trigonometry

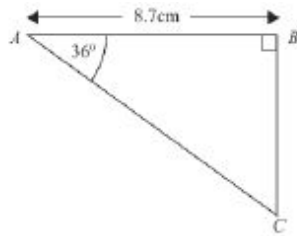


Diagram **NOT**
accurately drawn

ABC is a right-angled triangle.

Angle $B = 90^\circ$.

Angle $A = 36^\circ$.

$AB = 8.7$ cm.

Work out the length of BC .

Give your answer correct to 3 significant figures.

..... cm
(3 marks)

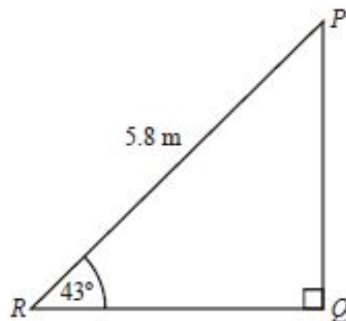


Diagram **NOT** accurately drawn

PQR is a triangle.

Angle $Q = 90^\circ$.

Angle $R = 43^\circ$.

$PR = 5.8$ m.

Calculate the length of QR .

Give your answer correct to 3 significant figures.

..... m
(3 marks)

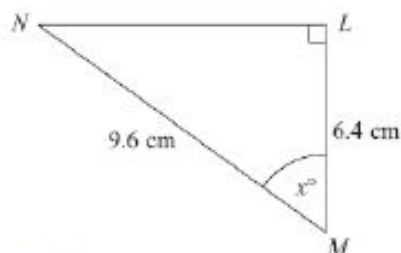


Diagram NOT
accurately drawn

LMN is a right-angled triangle.

$MN = 9.6$ cm.

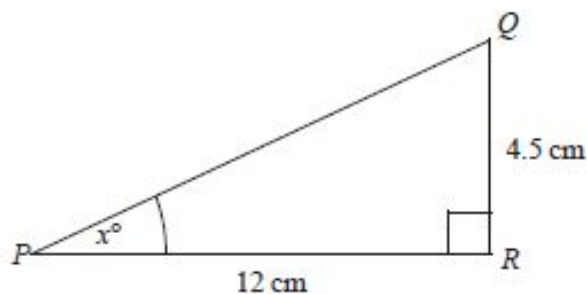
$LM = 6.4$ cm.

Calculate the size of the angle marked x° .

Give your answer correct to 1 decimal place.

.....°

(3 marks)



PQR is a right-angled triangle.

$PR = 12$ cm.

$QR = 4.5$ cm.

Angle $PRQ = 90^\circ$.

Work out the value of x .

Give your answer correct to one decimal place.

$x =$

(3 marks)

Topic 6: Standard Form



Write the following numbers in standard form.

(a) 40000

.....
(1)

(b) 5600

.....
(1)

(c) 41200000

.....
(1)

(d) 0.00000008

.....
(1)

(e) 0.000345

.....
(1)

a, b and c are standard form numbers. 

$$a = 5.4 \times 10^4$$

$$b = 4.9 \times 10^5$$

$$c = 4 \times 10^6$$

(a) Calculate $b - a$

.....
(2)

(b) Calculate c^2

.....
(2)

(c) Calculate ac

.....
(2)

Work out $(1.52 \times 10^5) + (5.4 \times 10^4)$
Give your answer in standard form.



.....
(3)



Work out, giving each answer in standard form.

(a)

$$(3 \times 10^4) \div (6 \times 10^{-3})$$

.....
(2)

(b)

$$(2.1 \times 10^{-5}) \div (7 \times 10^{-4})$$

.....
(2)

(c)

$$(5 \times 10^4)^2$$

.....
(2)

The distance of the moon to the Earth is 384,400 km.

The speed of light is 2.998×10^8 m/s.



Work out how long it will take light to travel from the moon to the Earth.

Include suitable units.

.....
(3)

Topic 7: Two Way Tables

150 students visit a school canteen.

Some students have packed lunches.

Some students have a cooked lunch.

56 out of the 89 students who have packed lunch are female.

There are 72 boys.

Work out how many females have a cooked lunch.

100 people study one language at a college.

Some people study French.

Some people study Spanish.

The rest of the people study German.

54 of the people are male.

20 of the 29 people who study Spanish are female.

31 people study German.

15 females study French.

Work out the number of males who study German.

Topic 8: Reverse Percentages

Patrick invested money into a special savers bank account.
Each year money in the account earns 4% interest.

After one year, the total amount of money in the account was £291.20

How much did Patrick invest?

£.....
(3)

Ottawa is the capital city of Canada.
The population of Ottawa is 890,000.
This population is 2.5% of the total population of Canada.

What is the total population of Canada?

.....
(3)

A limited edition bag of flour contains 25% more than the standard bag.
The limited edition bag contains 650g of flour.

How much flour is in the standard bag?

.....g
(3)

A fish tank sprung a leak and loses 45% of its water.
There is now 363 litres of water in the fish tank.

How much water was in the fish tank before the leak?

.....l
(3)

Topic 9: Percentage Change

- (a) The price of a TV is £260
In a sale the price is decreased by 20%

Work out the price of the TV in the sale.

£.....
(3)

- (b) The number of TVs sold increased from 70 to 98

Work out the percentage increase.

.....%
(2)

The value of a painting rises from £120,000 to £192,000.

Work out the percentage increase in the value of the painting.

.....%
(3)

A puppy weighed 2kg.
Eight weeks later the puppy weighed 3.5kg

What was the percentage increase in the puppy's weight?

.....%
(3)

Susan buys an antique for £120 and sells it for £216.

Work out her percentage profit

.....%
(3)

Holly bought a table for £80

She sold the table for £108

Find the percentage profit

.....%
(3)

The population of Northern Ireland in 1911 was 1,256,561

In 2011 the population was 1,810,863.

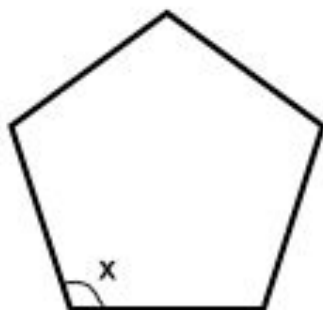
Calculate the percentage increase.

Give your answer correct to one decimal place.

.....%
(4)

Topic 10: Angles in Polygons

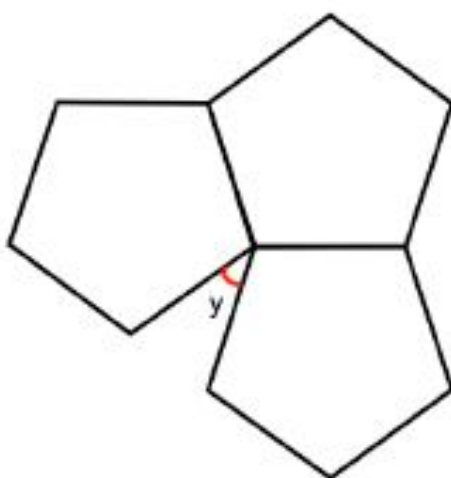
Shown below is a regular pentagon.



(a) Find the size of each interior angle.

$$x = \dots\dots\dots^\circ$$

(2)



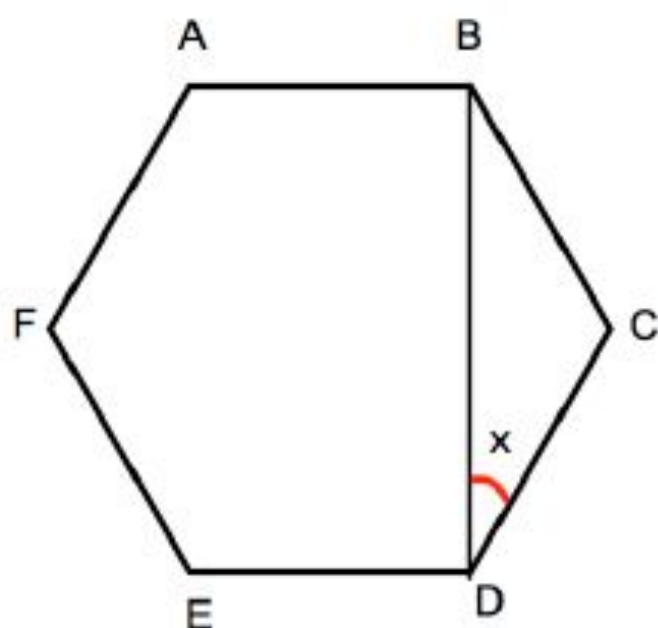
Three identical regular pentagons are joined as shown above.

(b) Work out the size of angle y .

$$y = \dots\dots\dots^\circ$$

(2)

Shown below is a regular hexagon ABCDEF.



Calculate angle x .

$$x = \dots\dots\dots^\circ$$

(3)

A regular polygon has 12 sides.

Work out the size of each interior angle.

$$\dots\dots\dots^\circ$$

(2)

Martin has drawn a regular nonagon (9 sided polygon).

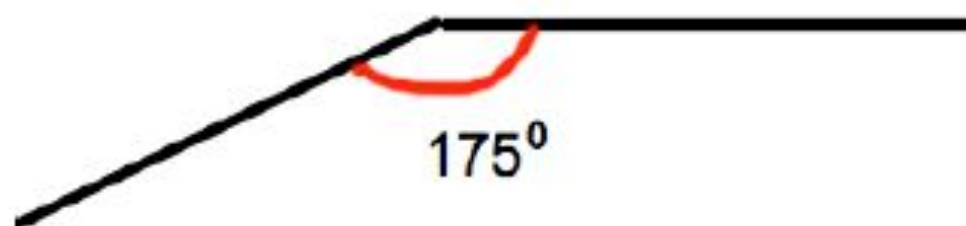
(a) What size is each exterior angle?

.....
(2)

(b) What size is each interior angle?

.....
(2)

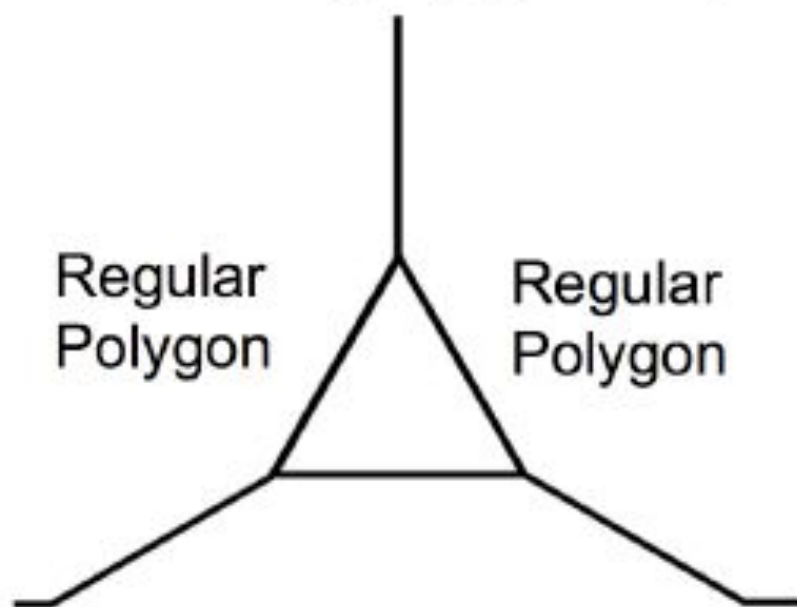
Shown below is an interior angle from a regular polygon.



Calculate the number of sides the polygon has.

.....
(2)

Shown below are two identical regular polygons and an equilateral triangle.



Calculate the number of sides each regular polygon has.

.....
(3)

A regular polygon has interior angles that are 5 times larger than each of its exterior angles.

Calculate how many sides it has.

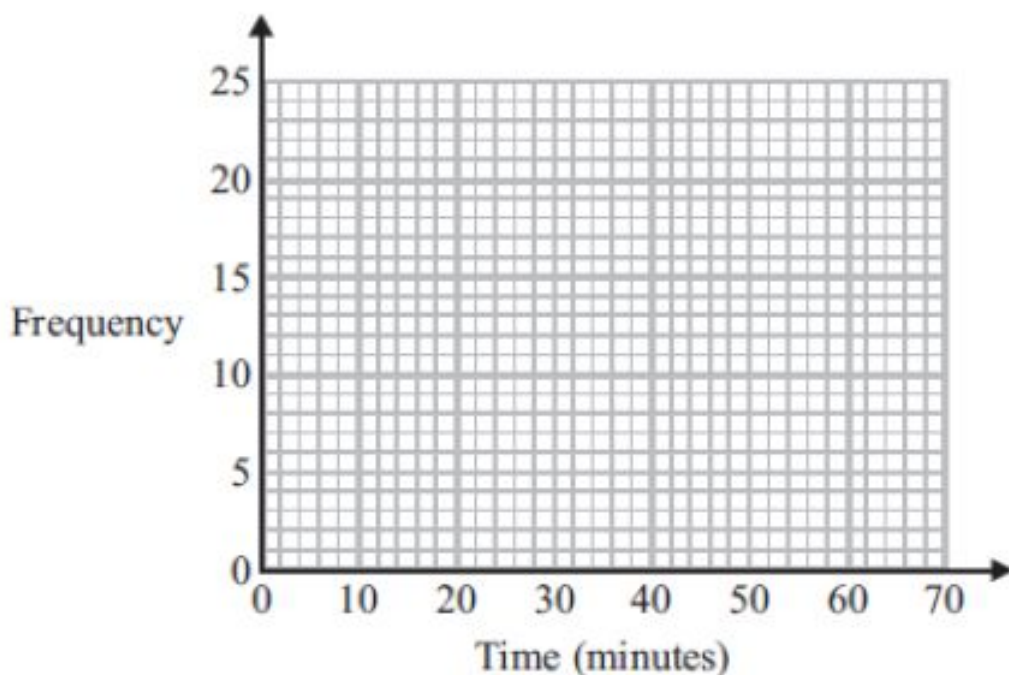
.....
(3)

Topic 11: Frequency Polygons

The frequency table gives information about the times it took some office workers to get to the office one day.

Time (t minutes)	Frequency
$0 < t \leq 10$	4
$10 < t \leq 20$	8
$20 < t \leq 30$	14
$30 < t \leq 40$	16
$40 < t \leq 50$	6
$50 < t \leq 60$	2

- (a) Draw a frequency polygon for this information.



- (b) Write down the modal class interval.

(3)

.....
(1)

One of the office workers is chosen at random.

- (c) Work out the probability that this office worker took more than 40 minutes to get to the office.

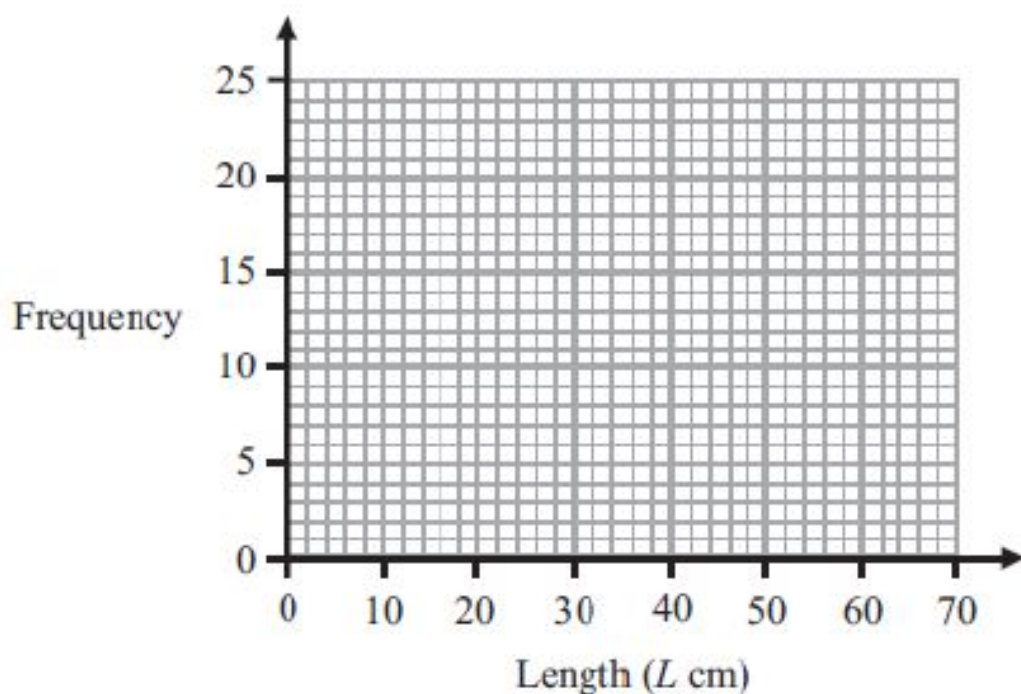
.....
(2)

(6 marks)

The table gives information about the lengths of the branches on a bush.

Length(L cm)	Frequency
$0 \leq L < 10$	20
$10 \leq L < 20$	12
$20 \leq L < 30$	10
$30 \leq L < 40$	8
$40 \leq L < 50$	6
$50 \leq L < 60$	0

(a) Draw a frequency polygon to show this information.



(b) Write down the modal class interval.

(3)

.....
(1)

One of the branches is chosen at random.

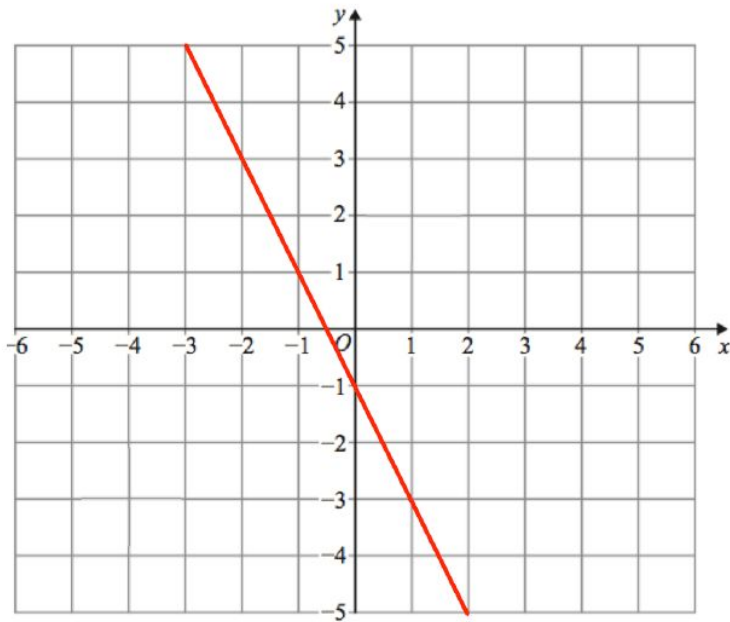
(c) Work out the probability that this branch less than 20 cm long.

.....
(2)

(6 marks)

Topic 12: $y=mx + c$ Basics

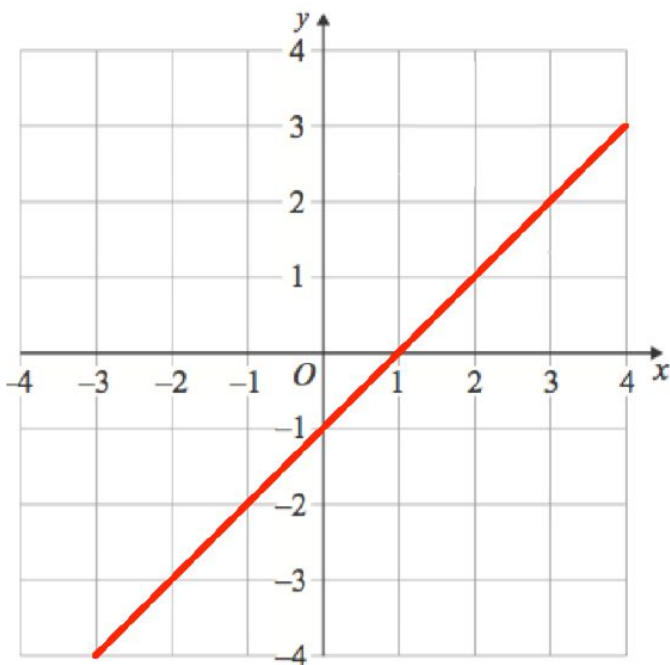
A straight line L is shown on the grid.



Work out the equation of line L.

.....
(3)

A straight line L is shown on the grid.



Work out the equation of line L.

.....
(3)

The point A $(-3, 5)$ and the point B $(1, -15)$ lie on the line L.

Find the equation of the line L.

.....
(4)

The point A $(1, 1)$ and the point B $(5, -1)$ lie on the line L.

Find the equation of the line L.

.....
(4)

A line has a gradient of 8 and passes through the point (2, 3).
Find the equation of the line.

.....
(3)

A line has a gradient of $-\frac{1}{2}$ and passes through the point (-6, -8).
Find the equation of the line.

.....
(3)

A line has a gradient of $-\frac{4}{5}$ and passes through the point (30, 24).
Find the equation of the line.

.....
(3)

Topic 13: Probability Trees

1. James goes to an arcade.

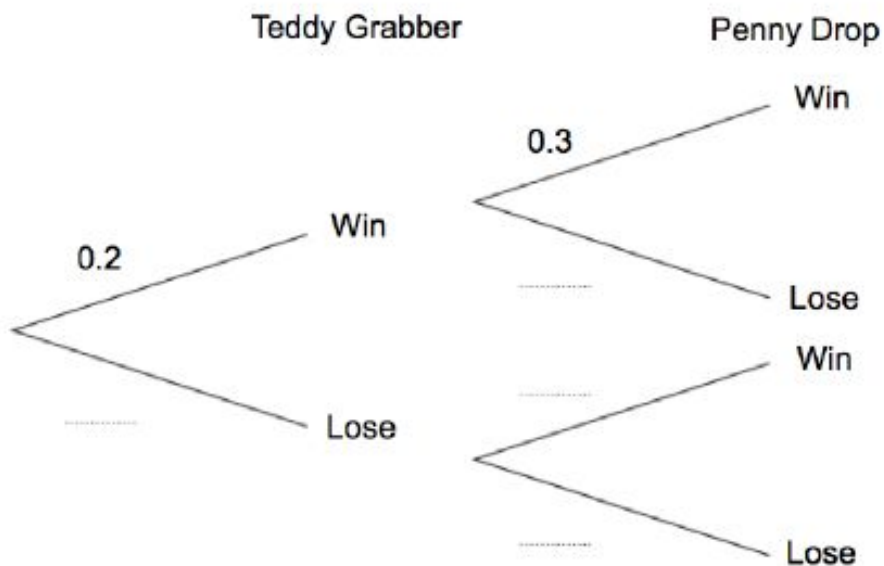
He has one go on the Teddy Grabber.

He has one go on the Penny Drop.

The probability that he wins on the Teddy Grabber is 0.2.

The probability that he wins on the Penny Drop is 0.3.

- (a) Complete the tree diagram.



(2)

- (b) Work out the probability that James wins on the Teddy Grabber and he also wins on the Penny Drop.

(2)

2. Natalie has 8 socks in a drawer.

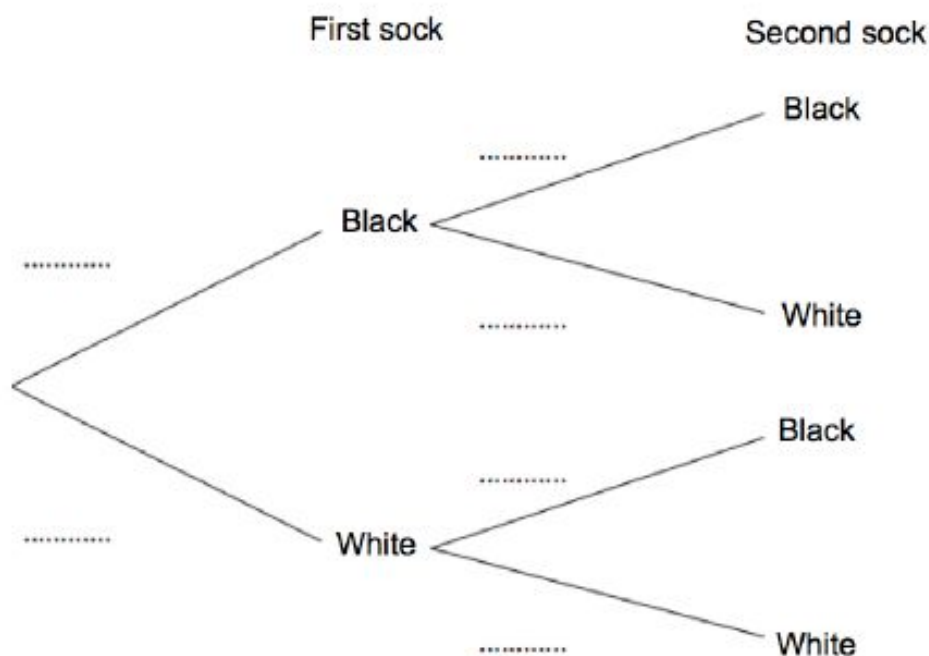
5 of the socks are black.

3 of the socks are white.

Natalie takes out a sock at random, writes down its colour and puts it back into the drawer.

Then Natalie takes out a second sock, at random, and writes down its colour.

(a) Complete the probability tree diagram.



(2)

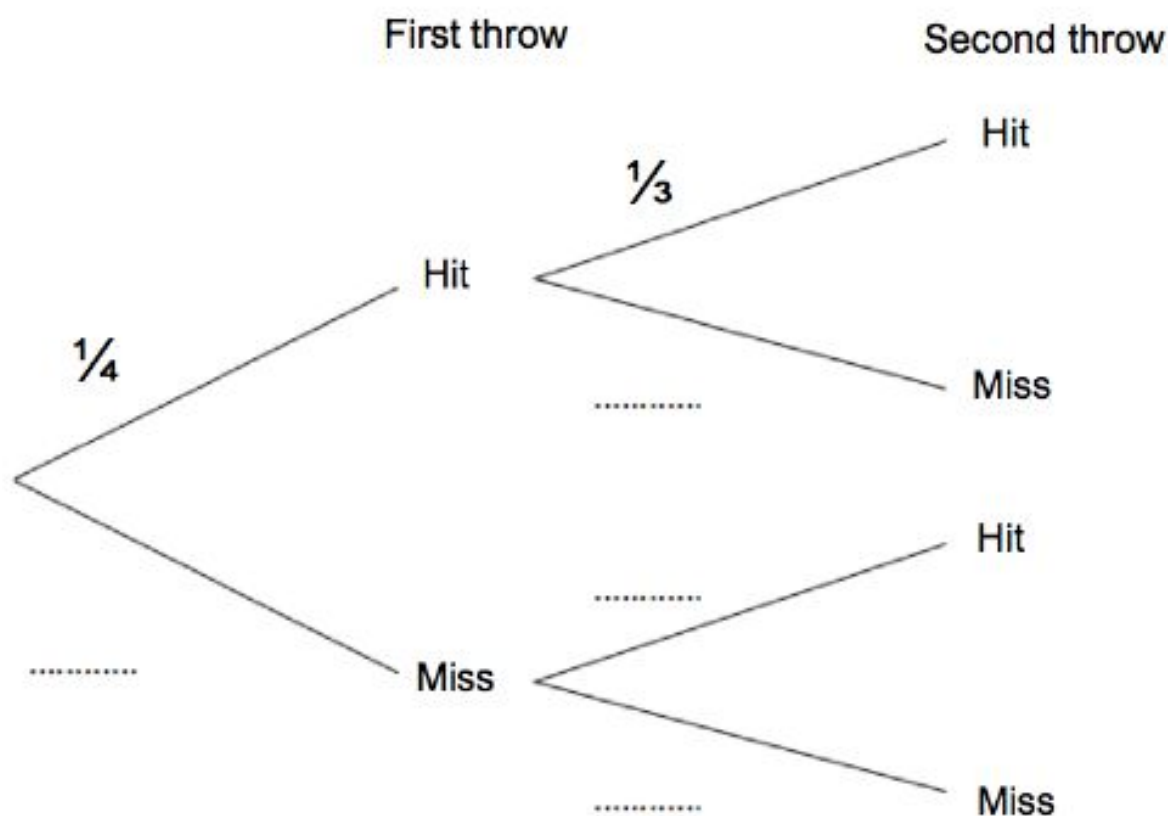
(b) Work out the probability that the two socks are the same colour.

(2)

5. Jennifer is playing darts.
She throws two darts aiming for a Bullseye.

The probability Jennifer hits the Bullseye on her first throw is $\frac{1}{4}$.
The probability she hits the Bullseye on her second throw $\frac{1}{3}$.

- (a) Complete the tree diagram.



- (b) Work out the probability Jennifer hits the Bullseye at least once.

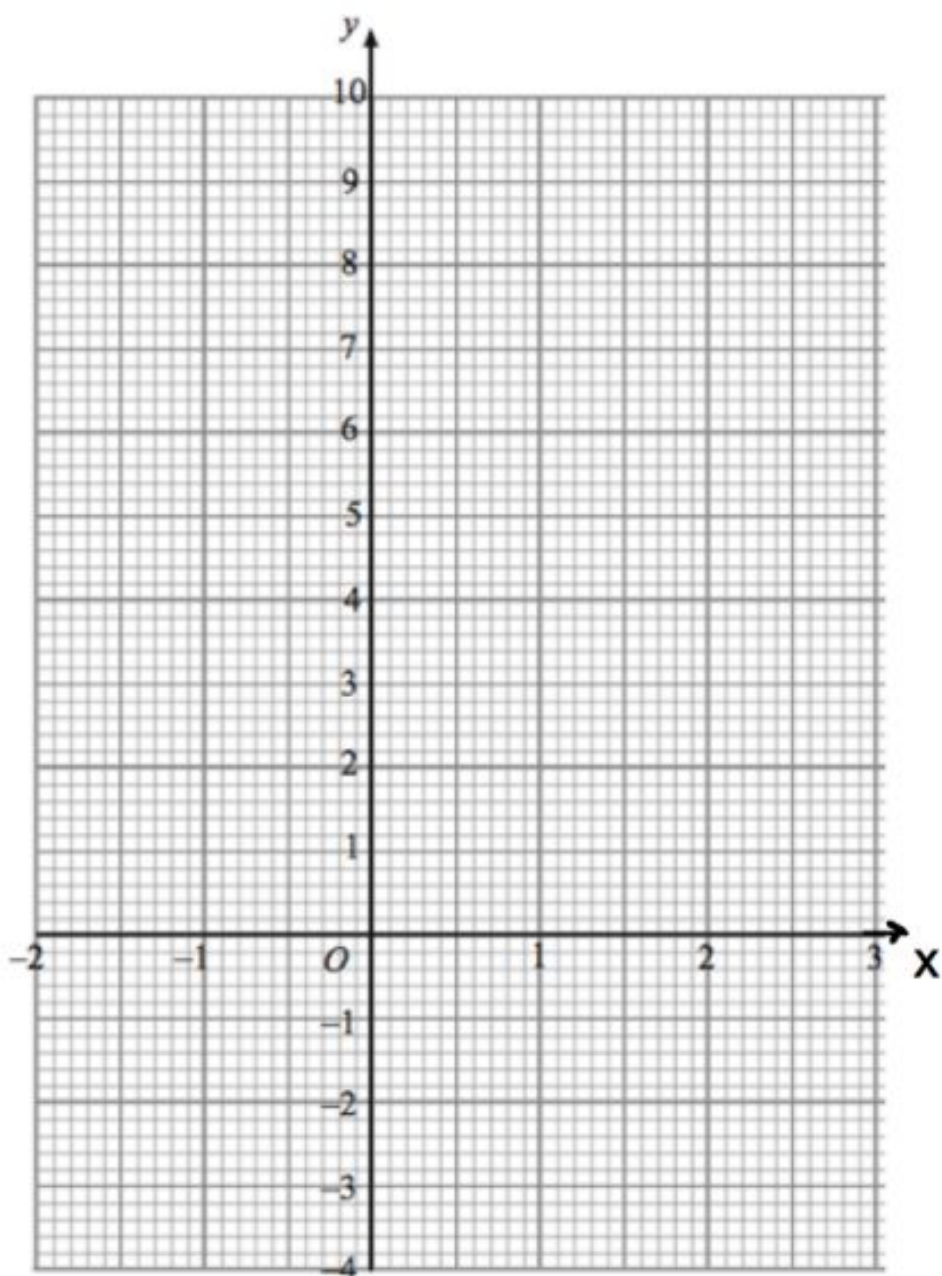
Topic 14: Plotting Non-Linear Graphs

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

x	-2	-1	0	1	2	3
y	3		-1		3	

(2)

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



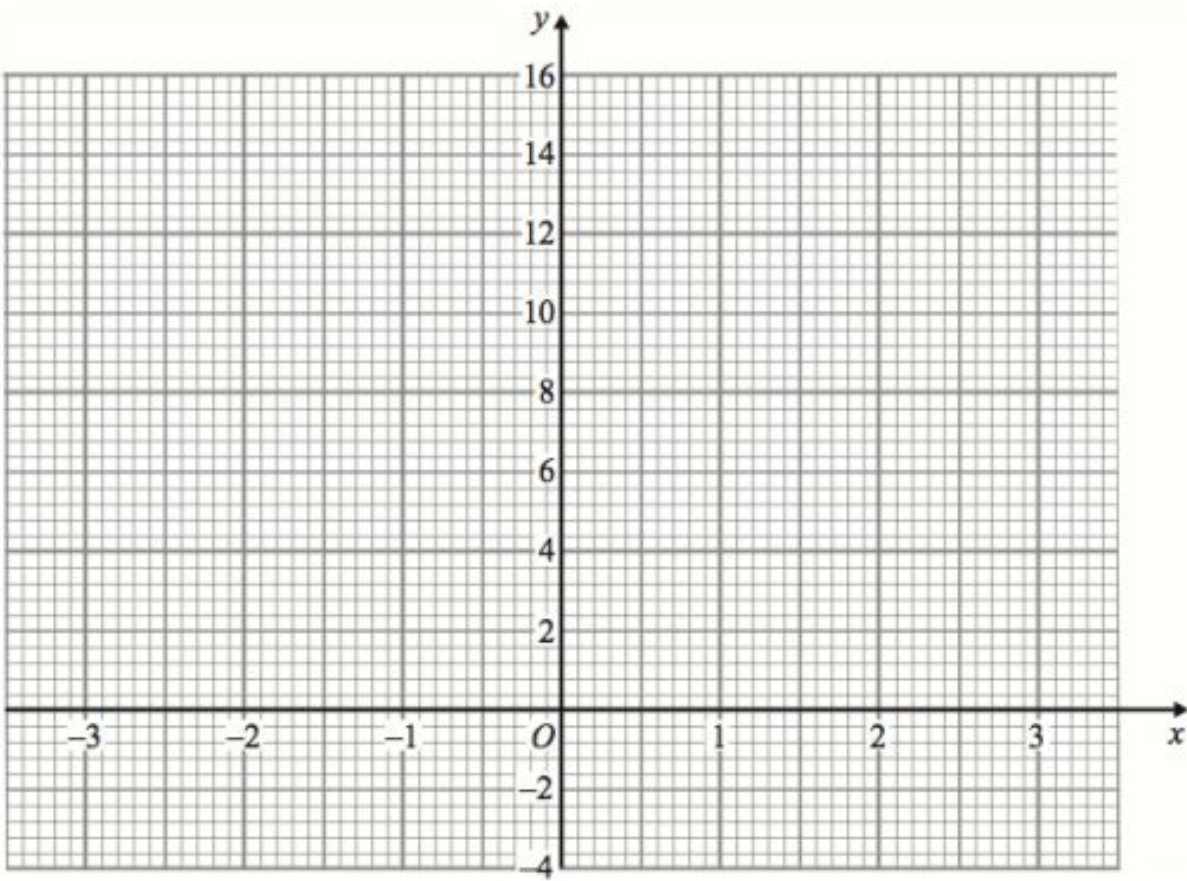
(2)

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

x	-3	-2	-1	0	1	2	3
y	6		0		2	6	

(2)

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



(2)

Topic 15: Operations with Fractions

Work out

$$1\frac{2}{5} + 2\frac{1}{2}$$

Give your answer as a mixed number.

.....
(3)

Work out

$$5\frac{1}{2} \times 1\frac{2}{3}$$

Give your answer as a mixed number.

.....
(3)

Work out

$$4\frac{1}{3} - 3\frac{4}{9}$$

Give your answer as a fraction.

.....
(3)

Work out

$$1\frac{4}{7} \div 1\frac{1}{4}$$

Give your answer as a mixed number.

.....
(3)