

S  
Higher GCSE Course

# Nail the Basics

## Year 11 Booklet



# SOLUTIONS

## Topic 1: Simultaneous Equations

Solve the simultaneous equations

$$4x - 4y = 24 \quad \text{--- (1)}$$

$$x - 4y = 3 \quad \text{--- (2)}$$

check with (1)  
 $7 - 4 = 3 \checkmark$

Do not use trial and improvement

$$\begin{array}{r} 4x - 4y = 24 \\ \text{sub } x - 4y = 3 \\ \hline 3x = 21 \end{array}$$

$$x = 7$$

Putting  $x=7$  into (1)  
 $28 - 4y = 24$   
 $-4y = -4$   
 $y = 1$

$$x = 7 \quad y = 1$$

(3)

Solve the simultaneous equations

$$\textcircled{1} - 2x + 4y = 26$$

$$\textcircled{2} - 3x - y = 4 \quad \times 4$$

check with (2)  
 $9 - 5 = 4 \checkmark$

Do not use trial and improvement

$$\begin{array}{r} 2x + 4y = 26 \\ \text{add } 12x - 4y = 16 \\ \hline 14x = 42 \end{array}$$

$$x = 3$$

sub into (1)  
 $6 + 4y = 26$   
 $4y = 20$   
 $y = 5$

$$x = 3 \quad y = 5$$

(3)

Solve the simultaneous equations

$$\begin{array}{l} \textcircled{1} - 3x + 2y = 16 \quad \times 3 \\ \textcircled{2} - 2x - 3y = 2 \quad \times 2 \end{array}$$

Do not use trial and improvement

$$\begin{array}{r} 9x + 6y = 48 \\ \text{add } 4x - 6y = 4 \\ \hline 13x = 52 \\ x = 4 \end{array}$$

Put  $x=4$  into  $\textcircled{1}$

$$\begin{array}{l} 12 + 2y = 16 \\ 2y = 4 \\ y = 2 \end{array}$$

check with  $\textcircled{2}$

$$8 - 6 = 2 \quad \checkmark$$

$$x = 4 \quad y = 2$$

(4)

Solve the simultaneous equations

$$\begin{array}{l} \textcircled{1} \quad 3x + 5y = 1 \quad \times 3 \\ \textcircled{2} \quad 2x - 3y = 7 \quad \times 5 \end{array}$$

Do not use trial and improvement

$$\begin{array}{r} 9x + 15y = 3 \\ \text{add } 10x - 15y = 35 \\ \hline 19x = 38 \\ x = 2 \end{array}$$

Put  $x=2$  into  $\textcircled{1}$

$$\begin{array}{l} 6 + 5y = 1 \\ 5y = -5 \\ y = -1 \end{array}$$

check with  $\textcircled{2}$

$$4 - 3 = 1 \quad \checkmark$$

$$x = 2 \quad y = -1$$

(4)

Solve the simultaneous equations

$$\begin{aligned} (1) \quad & 4x - y = 17 \\ (2) \quad & y = x - 2 \end{aligned} \quad -x + y = -2$$

Do not use trial and improvement

check in (2)  
 $3 = 5 - 2 \checkmark$

$$\begin{array}{r} 4x - y = 17 \\ -x + y = -2 \\ \hline 3x = 15 \end{array}$$

$$x = 5$$

sub into (1)

$$20 - y = 17 \\ y = 3$$

$$x = 5 \quad y = 3$$

(3)

Alan and Connor have £6.70 in total.

Alan has £1.70 more than Connor.

$$\begin{aligned} a + c &= 6.7 \quad (1) \\ a - c &= 1.7 \quad (2) \end{aligned}$$

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.

$$\begin{array}{r} a + c = 6.7 \\ a - c = 1.7 \\ \hline 2a = 8.4 \\ a = 4.2 \end{array} \quad \text{sub into (1)}$$

$$4.2 + c = 6.7 \\ c = 2.5$$

$$\text{Alan} = £4.20 \quad \text{Connor} = £2.50$$

(3)



Solve the simultaneous equations

$$\begin{array}{l} \textcircled{1} \quad 3x - y = 23 \quad \times 3 \\ \textcircled{2} \quad 2x + 3y = 8 \end{array}$$

Do not use trial and improvement

$$\begin{array}{r} \text{add} \quad 9x - 3y = 69 \\ \quad 2x + 3y = 8 \\ \hline 11x = 77 \end{array}$$

$$x = 7$$

Put  $x=7$  into  $\textcircled{1}$

$$\begin{array}{l} 21 - y = 23 \\ y = -2 \end{array}$$

$$\begin{array}{l} \text{check in } \textcircled{2} \\ 14 + -6 = 8 \checkmark \end{array}$$

$$x = \underline{\quad 7 \quad} \quad y = \underline{\quad -2 \quad} \quad (3)$$

Three bananas and two pears cost 95p.  
Five bananas and three pears cost £1.51

Find the cost of ten bananas and ten pears.

$$\textcircled{1} \quad 3x + 2y = 95 \quad \times 5$$

$$\textcircled{2} \quad 5x + 3y = 151 \quad \times 3$$

$$\begin{array}{r} \text{sub} \quad 15x + 10y = 475 \\ \quad 15x + 9y = 453 \\ \hline \end{array}$$

$$\text{sub } y=22 \text{ into } \textcircled{1}$$

$$3x + 44 = 95$$

$$3x = 51$$

$$x = 17$$

check in  $\textcircled{2}$

$$85 + 66 = 151 \checkmark$$

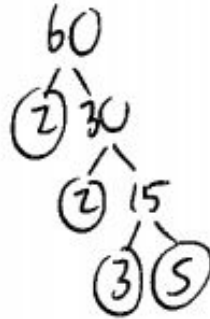
$$10 \times 17 + 10 \times 22 =$$

$$\underline{\quad \pounds 3.90 \quad}$$

(4)

## Topic 2: Prime Factors, LCM & HCF

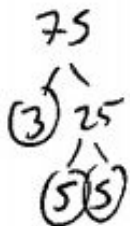
(a) Write 60 as a product of its prime factors.



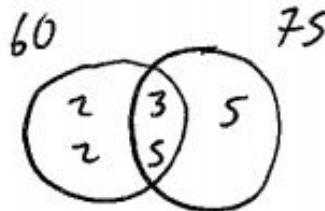
$$2 \times 2 \times 3 \times 5$$

$$2^2 \times 3 \times 5$$

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



$$75 = 3 \times 5 \times 5$$



$$LCM = 2 \times 2 \times 3 \times 5 \times 5$$

$$300$$

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

Work out the number.

$$2 \times 9 \times 5$$

$$90$$

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

$$45 \times 2 = 90$$
$$(3^2 \times 5) \times 2$$

$$\underline{2 \times 3^2 \times 5}$$

(1)

(ii) 135

$$45 \times 3 = 135$$
$$(3^2 \times 5) \times 3$$

$$\underline{3^3 \times 5}$$

(1)

(iii) 450

$$45 \times 10 = 450$$
$$(3^2 \times 5) \times (2 \times 5)$$

$$\underline{2 \times 3^2 \times 5^2}$$

(1)

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

$$\begin{array}{c} 36 \\ \swarrow \searrow \\ (2) \quad 18 \\ \swarrow \searrow \\ (2) \quad 9 \\ \swarrow \searrow \\ (3) \quad (3) \end{array}$$
$$2 \times 2 \times 3 \times 3$$

$$45 = 3 \times 3 \times 5$$
$$\begin{array}{c} 36 \qquad 45 \\ \bigcirc \quad \bigcirc \\ \begin{array}{c} 2 \\ 2 \end{array} \quad \begin{array}{c} 3 \\ 3 \end{array} \quad 5 \end{array}$$

$$LCM =$$
$$2 \times 2 \times 3 \times 3 \times 5$$

$$\underline{180}$$

(2)

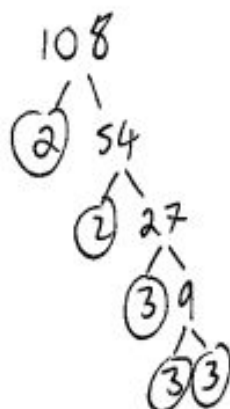
(c) What is the highest common factor (HCF) of 36 and 45.

$$HCF = 3 \times 3$$

$$\underline{9}$$

(2)

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



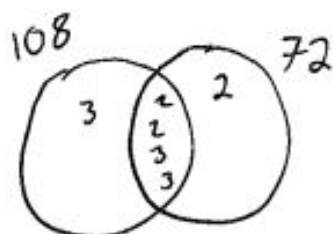
$$2 \times 2 \times 3 \times 3 \times 3$$

$$\underline{2^2 \times 3^3} \quad (3)$$

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



$$2 \times 2 \times 2 \times 3 \times 3$$

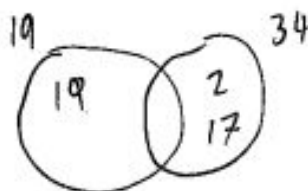


$$HCF = 2 \times 2 \times 3 \times 3$$

$$\underline{36} \quad (2)$$

- Find the lowest common multiple of 19 and 34.

19 (prime)



$$LCM = 2 \times 17 \times 19$$

$$\underline{646} \quad (2)$$



### Topic 3: Laws of Indices

Simplify the following.

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

$$\frac{s^7}{s^2}$$

$$s^5$$

(2)

Simplify

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

$$6a^5c^4$$

(2)

Simplify

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

$$5m^3n^3$$

(2)

Evaluate

$$4^{-2}$$

$$\frac{1}{16}$$

(1)

Evaluate

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

$$6$$

(1)

Write as a fraction.

$$5^{-3}$$

$$\frac{1}{125}$$

(1)

Work out

$$25^0$$

$$1$$

(1)

Evaluate

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

$$10$$

(1)

Evaluate

(a)

$$27^{2/3}$$

$$\begin{aligned}\sqrt[3]{27} &= 3 \\ 3^2 &= 9\end{aligned}$$

$$9$$

(2)

(b)

$$10000^{3/4}$$

$$\begin{aligned}\sqrt[4]{10000} &= 10 \\ 10^3 &= 1000\end{aligned}$$

$$1000$$

(2)

(c)

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

$$\begin{aligned}\sqrt[5]{32} &= 2 \\ 2^4 &= 16\end{aligned}$$

$$\frac{1}{16}$$

(2)

Work out

$$16^{0.5}$$

$$\sqrt{16}$$

$$4$$

(1)

Evaluate

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

$$\begin{aligned}\sqrt[4]{81} &= 3 \\ 3^3 &= 27\end{aligned}$$

$$\frac{1}{27}$$

(2)

Work out

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

$$\sqrt{16} = 4$$
$$4^3 = 64$$

$$64$$

(2)

Evaluate

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

$$\sqrt{\frac{16}{25}} = \frac{4}{5}$$

$$\frac{4}{5}$$

(2)

Evaluate

$$32^{-0.4}$$

$$32^{-\frac{2}{5}}$$
$$\sqrt[5]{32} = 2$$
$$2^2 = 4$$

$$\frac{1}{4}$$

(2)

Work out

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

$$5 \div \frac{1}{4}$$

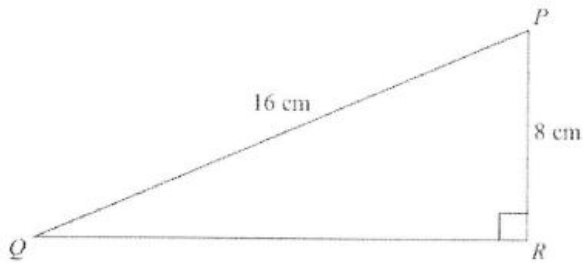
$$5 \times 4$$

$$20$$

(3)

## Topic 4: Pythagoras' Theorem

Diagram NOT  
accurately drawn



$PQR$  is a right-angled triangle.

$PQ = 16$  cm.

$PR = 8$  cm.

Calculate the length of  $QR$ .

Give your answer correct to 2 decimal places.

$$16^2 - 8^2 = 192$$

..... cm

(3 marks)

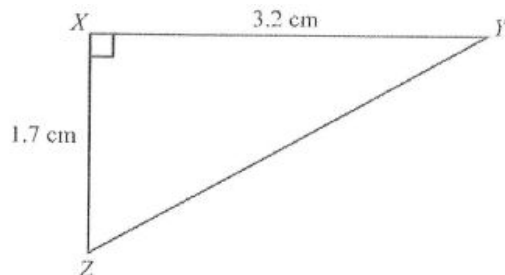


Diagram NOT  
accurately drawn

$XYZ$  is a right-angled triangle.

$XY = 3.2$  cm.

$XZ = 1.7$  cm.

Calculate the length of  $YZ$ .

Give your answer correct to 3 significant figures.

$$3.2^2 + 1.7^2 = 13.13$$

..... cm

(3 marks)



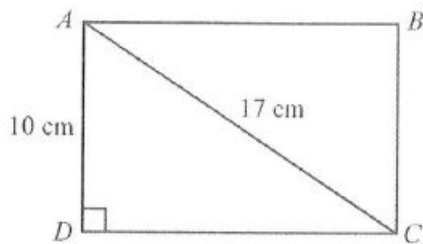


Diagram NOT  
accurately drawn

$ABCD$  is a rectangle.

$AC = 17$  cm.

$AD = 10$  cm.

Calculate the length of the side  $CD$ .

Give your answer correct to one decimal place.

$$17^2 - 10^2 = 189$$

$$\dots\dots\dots 13.7 \dots\dots\dots \text{ cm}$$

(3 marks)

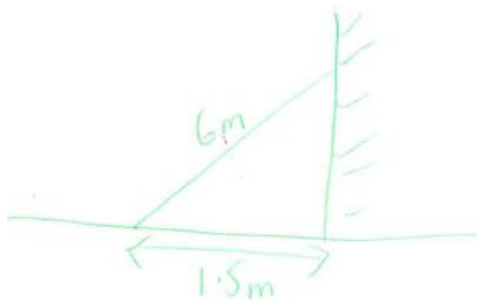
A ladder is 6 m long.

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.



$$6^2 - 1.5^2 = 33.75$$

$$\sqrt{33.75} = 5.8$$

$$\dots\dots\dots 5.8 \dots\dots\dots \text{ m}$$

(4 marks)

## Topic 5: Right Angled Trigonometry

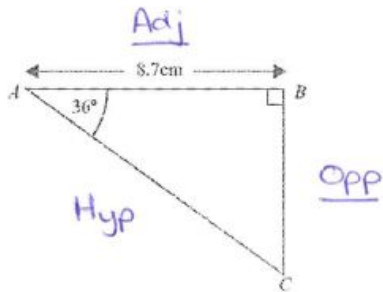


Diagram NOT  
accurately drawn

$ABC$  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.

SOH CAH TOA

$$\tan \theta = \frac{\text{Opp}}{\text{Adj}}$$

$$\tan 36 = \frac{BC}{8.7}$$

$$\begin{aligned} BC &= 8.7 \times \tan 36 \\ &= 6.32091... \\ &= 6.32 \text{ cm (3sf)} \end{aligned}$$

..... 6.32 ..... cm  
(3 marks)

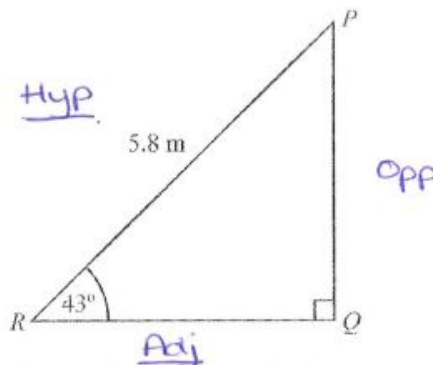


Diagram NOT accurately drawn

$PQR$  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.

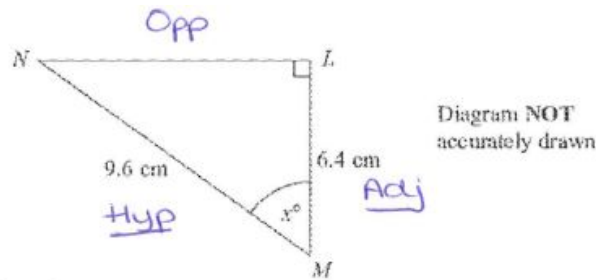
SOH CAH TOA

$$\cos \theta = \frac{\text{Adj}}{\text{Hyp}}$$

$$\cos 43 = \frac{QR}{5.8}$$

$$\begin{aligned} QR &= 5.8 \times \cos 43 \\ &= 4.24185... = 4.24 \text{ m (3sf)} \end{aligned}$$

..... 4.24 ..... m  
(3 marks)



$LMN$  is a right-angled triangle.

$MN = 9.6$  cm.

$LM = 6.4$  cm.

Calculate the size of the angle marked  $x^\circ$ .  
Give your answer correct to 1 decimal place.

SOH CAH TOA

$$\cos \theta = \frac{\text{Adj}}{\text{Hyp}}$$

$$\cos x = \frac{6.4}{9.6}$$

$$x = \cos^{-1}\left(\frac{6.4}{9.6}\right)$$

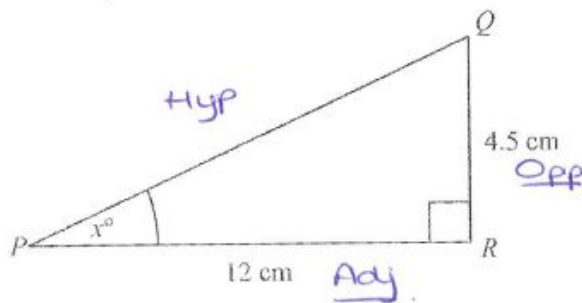
$$= 48.1896 \dots$$

$$= 48.2^\circ \text{ (1 dp)}$$

48.2

(3 marks)

Diagram NOT  
accurately drawn



$PQR$  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.

SOH CAH TOA

$$\tan \theta = \frac{\text{Opp}}{\text{Adj}}$$

$$\tan x = \frac{4.5}{12}$$

$$x = \tan^{-1}\left(\frac{4.5}{12}\right)$$

$$x = 20.55604 \dots$$

$$= 20.6^\circ \text{ (1 dp)}$$

$$x = 20.6^\circ \text{ (1 dp)}$$

(3 marks)

## Topic 6: Standard Form

Write the following numbers in standard form.

(a) 40000

$$4 \times 10^4$$

(1)

(b) 5600

$$5.6 \times 10^3$$

(1)

(c) 41200000

$$4.12 \times 10^7$$

(1)

(d) 0.00000008

$$8 \times 10^{-8}$$

(1)

(e) 0.000345

$$3.45 \times 10^{-4}$$

(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  $b - a$

$$\begin{array}{r} 490000 \\ - 54000 \\ \hline 436000 \end{array}$$

$$4.36 \times 10^5$$

(2)

(b) Calculate  $c^2$

$$\begin{array}{l} 4 \times 10^6 \times 4 \times 10^6 \\ 16 \times 10^{12} \end{array}$$

$$1.6 \times 10^{13}$$

(2)

(c) Calculate  $ac$

$$\begin{array}{l} 5.4 \times 10^4 \times 4 \times 10^6 \\ 21.6 \times 10^{10} \end{array}$$

$$2.16 \times 10^{11}$$

(2)

Work out  $(1.52 \times 10^5) + (5.4 \times 10^4)$

Give your answer in standard form.

$$\begin{array}{r} 152000 \\ + 54000 \\ \hline 206000 \end{array}$$

$$2.06 \times 10^5$$

(3)



Work out, giving each answer in standard form.

(a)

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

$$0.5 \times 10^7$$
$$5 \times 10^6$$

$$5 \times 10^6$$

(2)

(b)

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

$$0.3 \times 10^{-1}$$
$$3 \times 10^{-2}$$

$$3 \times 10^{-2}$$

(2)

(c)

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

$$5 \times 10^4 \times 5 \times 10^4$$
$$25 \times 10^8$$

$$2.5 \times 10^9$$

(2)

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

The speed of light is  $2.998 \times 10^8$  m/s.

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

Include suitable units.

$$t = \frac{d}{s}$$

$$t = \frac{384400000}{2.998 \times 10^8} = 1.28 \text{ seconds}$$

(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.

	male	female	total
packed lunch	33	56	89
cooked lunch	39	<u>22</u>	61
total	72	78	150

22

(3)

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.

	male	female	total
French	25	15	40
Spanish	9	20	29
German	<u>20</u>	11	31
total	54	46	100

.....20.....  
(4)

## 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?

$$104\% = £291.20$$

$$1\% = 2.8$$

$$100\% = £280$$

$$\begin{array}{r} \text{£ } 280 \\ \hline \end{array} \quad (3)$$

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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?

$$2.5\% = 890,000$$

$$1\% = 356000$$

$$100\% = 35,600,000$$

$$\begin{array}{r} 35,600,000 \\ \hline \end{array} \quad (3)$$

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?

$$125\% = 650$$

$$1\% = 5.2$$

$$100\% = 520$$

520  
.....g  
(3)

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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?

$$55\% = 363$$

$$1\% = 6.6$$

$$100\% = 660$$

660  
.....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.

$$10\% = £26$$

$$20\% = £52$$

$$£ \underline{208} \quad (3)$$

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

Work out the percentage increase.

$$\frac{28}{70} \times 100 \quad \frac{4}{10} \times 100$$

$$\underline{40} \% \quad (2)$$

---

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

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

$$\frac{72000}{120000} \times 100$$

$$\underline{60} \% \quad (3)$$

---

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

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

$$\frac{1.5}{2} \times 100$$

$$\underline{75} \% \quad (3)$$

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

Work out her percentage profit

$$\div 12 \left( \begin{array}{l} \frac{96}{120} \times 100 \\ \frac{8}{10} \times 100 \end{array} \right)$$

$$\frac{80}{\dots\dots\dots} \% \\ (3)$$

Holly bought a table for £80

She sold the table for £108

Find the percentage profit

$$\div 8 \left( \begin{array}{l} \frac{28}{80} \times 100 \\ \frac{3.5}{10} \times 100 \end{array} \right)$$

$$\frac{35}{\dots\dots\dots} \% \\ (3)$$

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

In 2011 the population was 1,810,863.

Calculate the percentage increase.

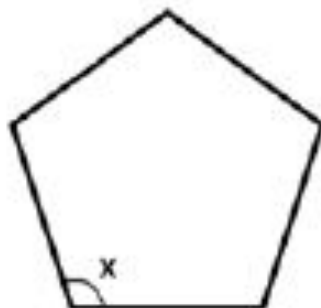
Give your answer correct to one decimal place.

$$\frac{554302}{1256561} \times 100$$

$$\frac{44.1}{\dots\dots\dots} \% \\ (4)$$

## Topic 10: Angles in Polygons

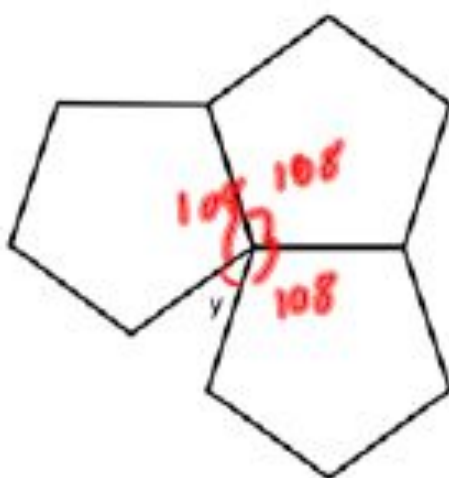
Shown below is a regular pentagon.



(a) Find the size of each interior angle.

$$540 \div 5 = 108$$

$$x = \frac{108}{(2)}$$



Three identical regular pentagons are joined as shown above.

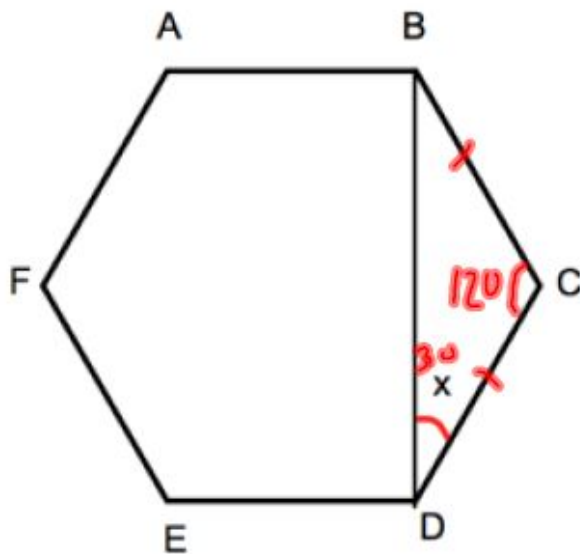
$$\begin{array}{r} 108 \\ 108 \\ + 108 \\ \hline 324 \end{array}$$

(b) Work out the size of angle y.

$$\begin{array}{r} 360 \\ - 324 \\ \hline 36 \end{array}$$

$$y = \frac{36}{(2)}$$

Shown below is a regular hexagon ABCDEF.



Calculate angle x.

$$\begin{aligned}720 \div 6 &= 120 \\180 - 120 &= 60 \\60 \div 2 &= 30\end{aligned}$$

$$x = \overset{30}{\dots\dots\dots}^\circ$$

(3)

A regular polygon has 12 sides.

Work out the size of each interior angle.

$$\begin{aligned}\text{exterior angle} &: 360 \div 12 = 30^\circ \\ \text{interior angle} &: 180 - 30 = 150\end{aligned}$$

$$\begin{aligned}\text{or} \\ (12 - 2) \times 180 &= 1800 \\ 1800 \div 12 &= 150\end{aligned}$$

$$\overset{150}{\dots\dots\dots}^\circ$$

(2)

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

(a) What size is each exterior angle?

$$360 \div 9 = 40^\circ$$

40<sup>0</sup>  
(2)

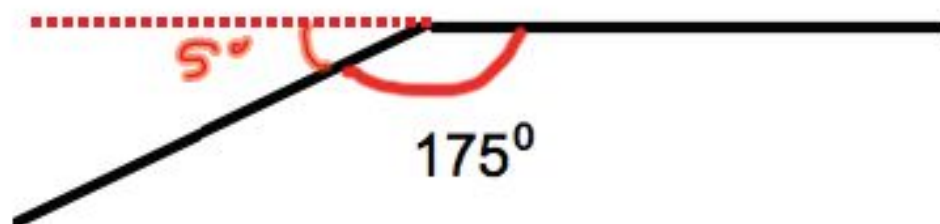
(b) What size is each interior angle?

$$180 - 40 = 140^\circ$$

140<sup>0</sup>  
(2)

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Shown below is an interior angle from a regular polygon.



Calculate the number of sides the polygon has.

$$360 \div 5 = 72$$

72 sides  
(2)



Work out the sum of the interior angles for a 40 sided polygon.

$$(40-2) \times 180 \\ = 38 \times 180 =$$

$$\underline{6840}$$

(2)

The sum of the interior angles in a polygon is  $7380^\circ$ .

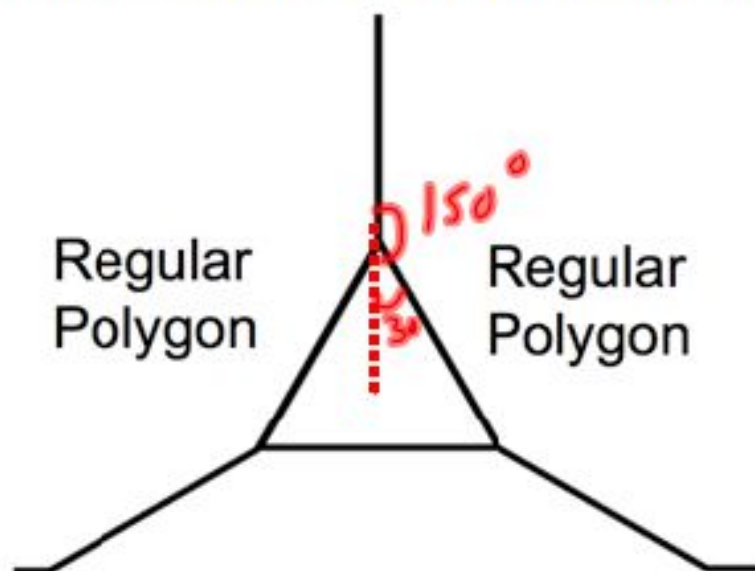
Calculate the number of sides the polygon has.

$$7380 \div 180 = 41 \\ 41 + 2 = 43$$

$$\underline{43 \text{ sides}}$$

(2)

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



Calculate the number of sides each regular polygon has.

$$\text{Interior angle} = 150^\circ \\ \text{exterior angle} = 30^\circ$$

$$360 \div 30$$

$$\underline{12 \text{ sides}}$$

(3)

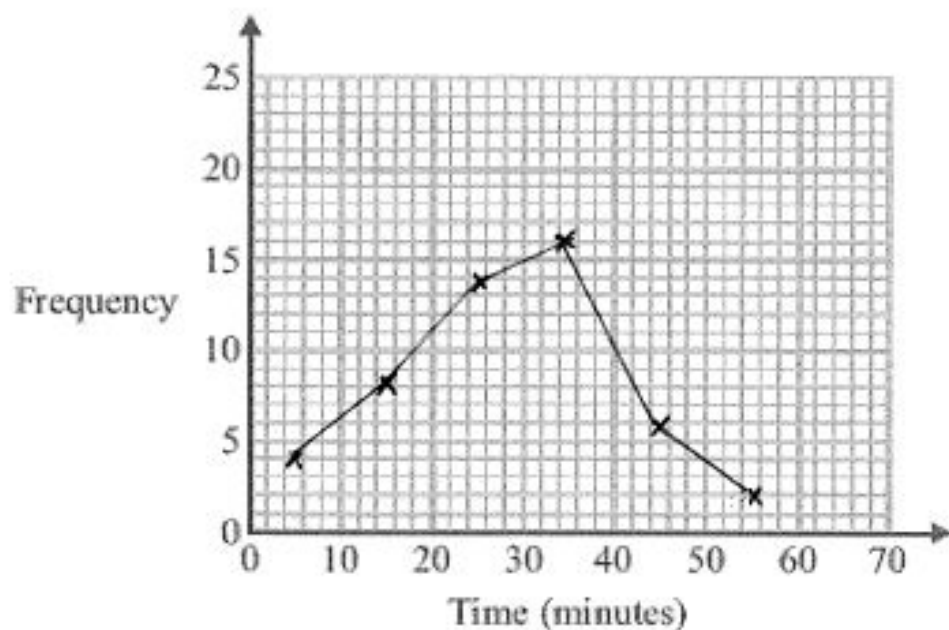
## Topic 11: Frequency Polygons

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

I more than 40 minutes.

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



(3)

- (b) Write down the modal class interval.

$30 < t \leq 40$

(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.

$$4 + 8 + 14 + 16 + 6 + 2 = 50$$

$$\frac{8}{50}$$

(2)

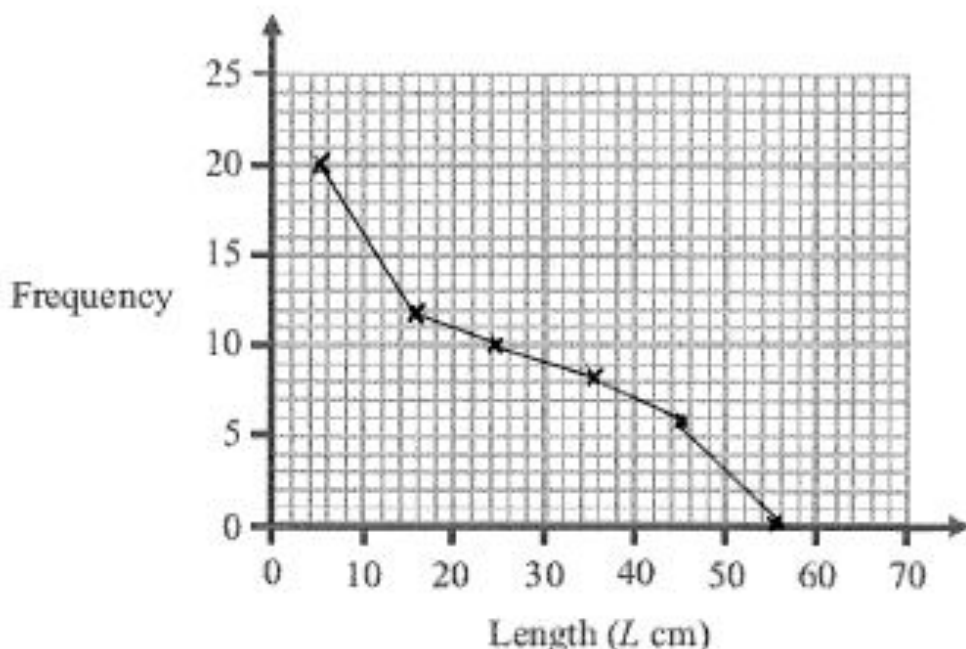
(6 marks)

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

Length(Lcm)	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

Less than 20cm

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



(b) Write down the modal class interval.

(3)

$$\underline{0 \leq L < 10}$$

(1)

One of the branches is chosen at random.

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

$$20 + 12 + 10 + 8 + 6 =$$

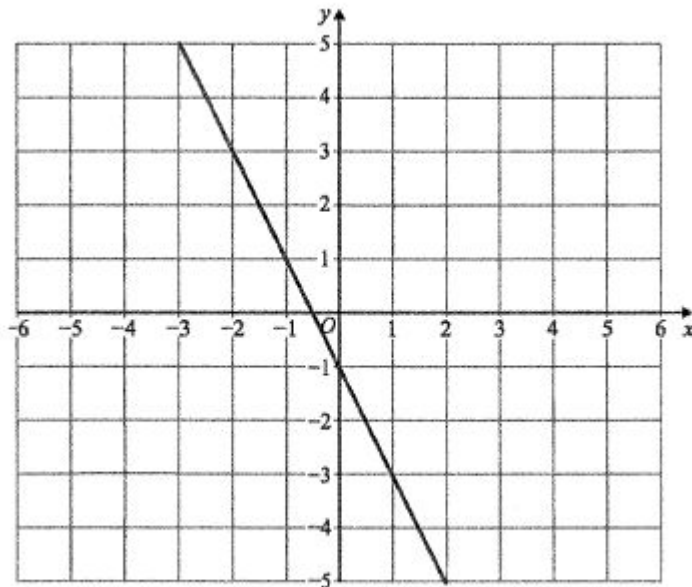
$$\underline{\frac{32}{56} = \frac{16}{28} = \frac{4}{7}}$$

(2)

(6 marks)

## Topic 12: $y=mx + c$ Basics

A straight line L is shown on the grid.

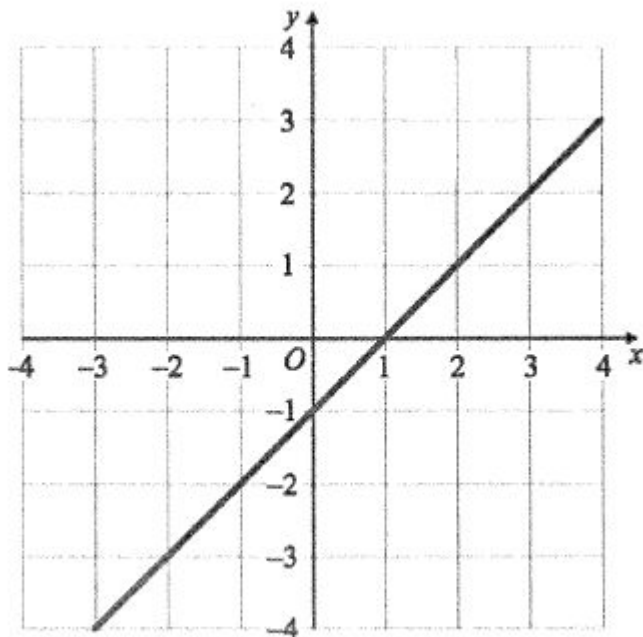


Work out the equation of line L

$$\underline{y = -2x - 1}$$

(3)

A straight line L is shown on the grid.



Work out the equation of line L

$$\underline{y = x - 1}$$

(3)

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

Find the equation of the line L.

$$m = \frac{-15 - 5}{1 - -3} = \frac{-20}{4} = -5$$

$$(1, -15) \rightarrow y = -5x + c$$

$$-15 = -5 \times 1 + c$$

$$-15 = -5 + c$$

$$c = -10$$

$$y = -5x - 10$$

.....  
(4)

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

Find the equation of the line L.

$$m = \frac{-1 - 1}{5 - 1} = \frac{-2}{4} = -\frac{1}{2}$$

$$(1, 1) \rightarrow y = -\frac{1}{2}x + c$$

$$1 = -\frac{1}{2} \times 1 + c$$

$$1 = -\frac{1}{2} + c$$

$$c = 1.5$$

$$y = -\frac{1}{2}x + 1.5$$

.....  
(4)

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

$$y = 8x + c$$

$$3 = 8 \times 2 + c$$

$$3 = 16 + c$$

$$c = -13$$

$$y = 8x - 13$$

(3)

---

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

$$y = -\frac{1}{2}x + c$$

$$-8 = -\frac{1}{2} \times -6 + c$$

$$-8 = 3 + c$$

$$c = -11$$

$$y = -\frac{1}{2}x - 11$$

(3)

---

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

$$y = -\frac{4}{5}x + c$$

$$24 = -\frac{4}{5} \times 30 + c$$

$$24 = -24 + c$$

$$c = 48$$

$$y = -\frac{4}{5}x + 48$$

(3)

## Topic 13: Probability Trees

1. James goes to an arcade.

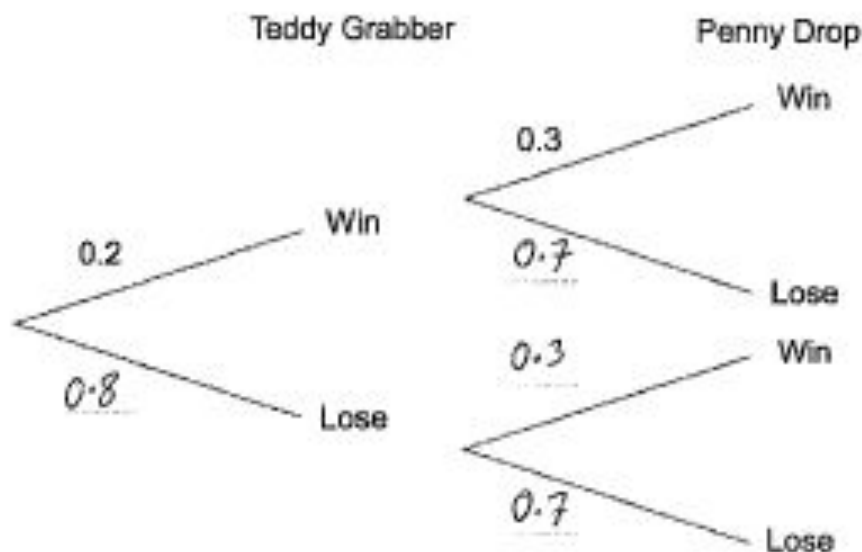
He has one go on the Teddy Grabber.

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.

$$P(WW) = 0.2 \times 0.3 = 0.06$$

0.06

(2)

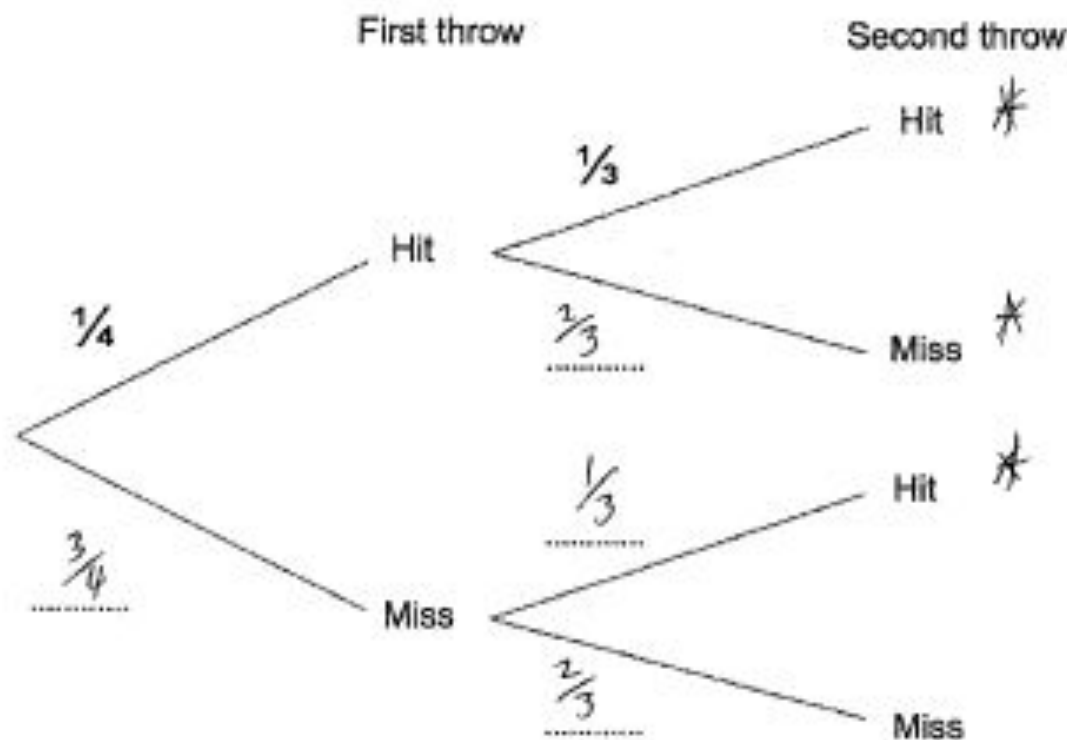


(2)

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.

$$P(HH) = \frac{1}{4} \times \frac{1}{3} = \frac{1}{12}$$

$$P(HM) = \frac{1}{4} \times \frac{2}{3} = \frac{2}{12}$$

$$P(MH) = \frac{3}{4} \times \frac{1}{3} = \frac{3}{12}$$

$$P(\text{at least one}) = \frac{1}{12} + \frac{2}{12} + \frac{3}{12} = \frac{6}{12}$$

or  
 $\frac{1}{2}$

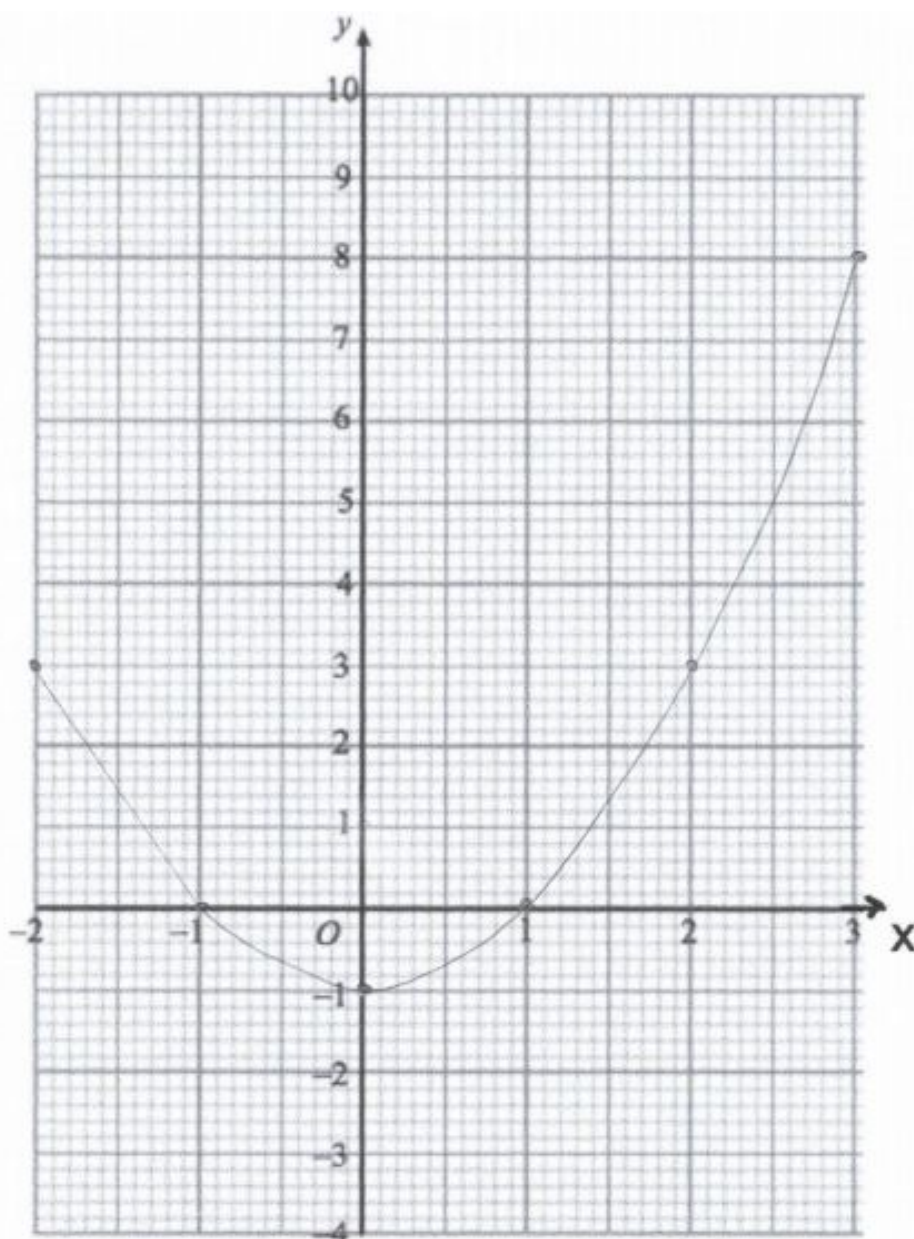
## Topic 14: Plotting Non-Linear Graphs

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

$x$	-2	-1	0	1	2	3
$y$	3	0	-1	0	3	8

(2)

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



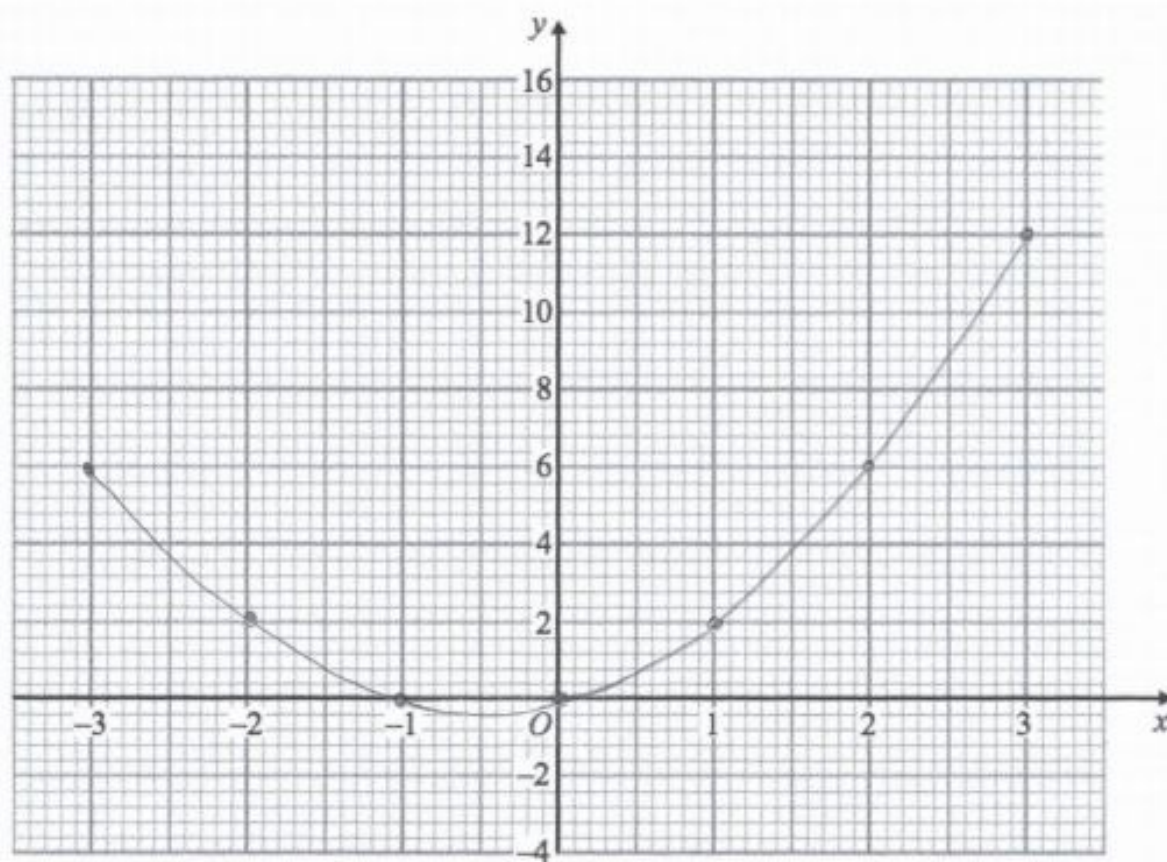
(2)

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

$x$	-3	-2	-1	0	1	2	3
$y$	6	2	0	0	2	6	12

(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.

$$\frac{7}{5} + \frac{5}{2}$$

$$\frac{14}{10} + \frac{25}{10} = \frac{39}{10}$$

$$3\frac{9}{10}$$

.....  
(3)

Work out

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

$$\frac{11}{2} \times \frac{5}{3} = \frac{55}{6}$$

Give your answer as a mixed number.

$$9\frac{1}{6}$$

.....  
(3)

Work out

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

Give your answer as a fraction.

$$\frac{13}{3} - \frac{31}{9}$$

$$\frac{39}{9} - \frac{31}{9} = \frac{8}{9}$$

$$\frac{8}{9}$$

Work out

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

$$\frac{11}{7} \div \frac{5}{4}$$

Give your answer as a mixed number.

$$\frac{11}{7} \times \frac{4}{5} = \frac{44}{35}$$

$$1\frac{9}{35}$$

(3)