

**Edexcel Style**

**GCSE Mathematics  
Past Paper Questions  
Model Answers**

**Arranged by Topic**

**1MA0**

**by Peter Bland**

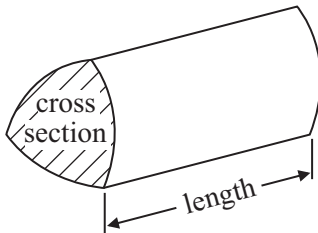


## GCSE Mathematics 1MA0

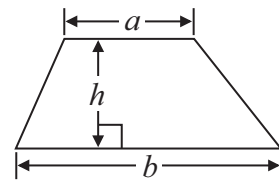
Formulae: Higher Tier

**You must not write on this formulae page.  
Anything you write on this formulae page will gain NO credit.**

**Volume of prism** = area of cross section  $\times$  length

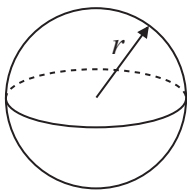


**Area of trapezium** =  $\frac{1}{2} (a + b)h$



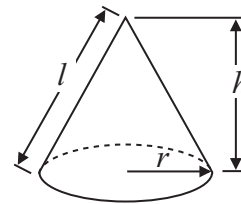
**Volume of sphere** =  $\frac{4}{3} \pi r^3$

**Surface area of sphere** =  $4\pi r^2$

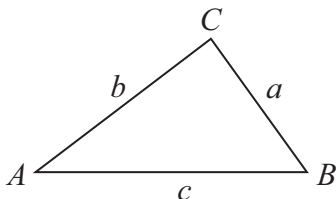


**Volume of cone** =  $\frac{1}{3} \pi r^2 h$

**Curved surface area of cone** =  $\pi r l$



**In any triangle ABC**



**The Quadratic Equation**

The solutions of  $ax^2 + bx + c = 0$   
where  $a \neq 0$ , are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

**Sine Rule**  $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

**Cosine Rule**  $a^2 = b^2 + c^2 - 2bc \cos A$

**Area of triangle** =  $\frac{1}{2} ab \sin C$

Write your name here

Surname

Other names

In the style of:

**Edexcel GCSE**

Centre Number

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Candidate Number

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# Mathematics A

## A\* Type Questions 1H

### Model Answers

**Higher Tier**

Extra topics that occur less frequently,  
to help students working towards an A\*

Paper Reference

**1MA0/1H**

**You must have:** Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

### Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided  
– *there may be more space than you need.*
- **Calculators must not be used.**



### Information

- The total mark for this paper is 100
- The marks for **each** question are shown in brackets  
– *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (\*) are ones where the quality of your written communication will be assessed.

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1. Solve the equation  $\frac{x}{2} - \frac{2}{x+1} = 1$

$$\frac{x}{2} - \frac{2}{x+1} - 1 = 0$$

Both Sides  $\times 2$

$$x - \frac{4}{x+1} - 2 = 0$$

Both Sides  $\times (x+1)$

$$x(x+1) - 4 - 2(x+1) = 0$$

$$x^2 + x - 4 - 2x - 2 = 0$$

$$x^2 - x - 6 = 0$$

$$(x+2)(x-3) = 0$$

$$x = -2 \text{ or } 3$$

.....-2 or 3..... Q1

(Total 4 marks)





2. The diagram shows a solid wax cylinder.

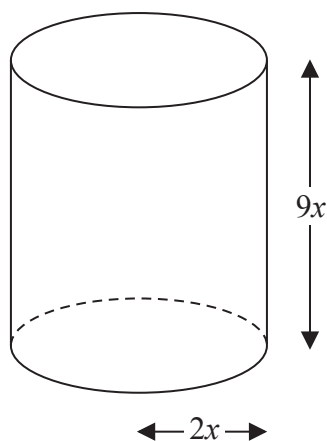


Diagram **NOT**  
accurately drawn

The cylinder has base radius  $2x$  and height  $9x$ .

The cylinder is melted down and made into a sphere of radius  $r$ .

Find an expression for  $r$  in terms of  $x$ .

$$\begin{aligned}\text{Volume of a cylinder} &= \pi r^2 h \\ &= \pi (2x)^2 9x \\ &= \pi 4x^2 9x \\ &= \pi 36x^3\end{aligned}$$

$$\begin{aligned}\text{Volume of a sphere} &= \frac{4}{3} \pi r^3 \\ \frac{4}{3} \pi r^3 &= \pi 36x^3 \\ r^3 &= \frac{3\pi 36x^3}{4\pi} \\ r^3 &= 27x^3 \\ r &= 3x\end{aligned}$$

$$r = 3x$$

(Total for Question 2 is 3 marks)



3.

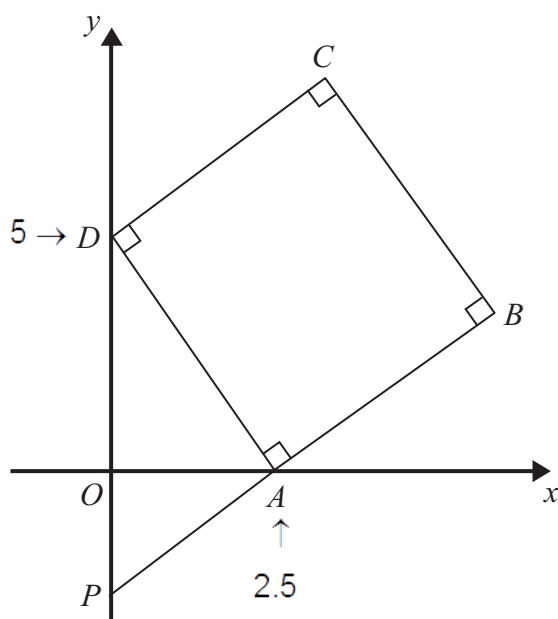


Diagram **NOT**  
accurately drawn

$ABCD$  is a square.

$P$  and  $D$  are points on the  $y$ -axis.

$A$  is a point on the  $x$ -axis.

$PAB$  is a straight line.

The equation of the line that passes through the points  $A$  and  $D$  is  $y = -2x + 5$

Find the length of  $PD$ .

The line  $AB$  is perpendicular to the line for the equation  $y = -2x + 5$

This means its equation will be  $y = \frac{1}{2}x + c$

As it passes through the point  $(2.5, 0)$  this can be substituted into the equation to find  $c$

$$0 = 1.25 + c$$

$c = -1.25$  and this is the  $y$  intercept

The equation for the line  $AB$  is  $y = \frac{1}{2}x - 1.25$

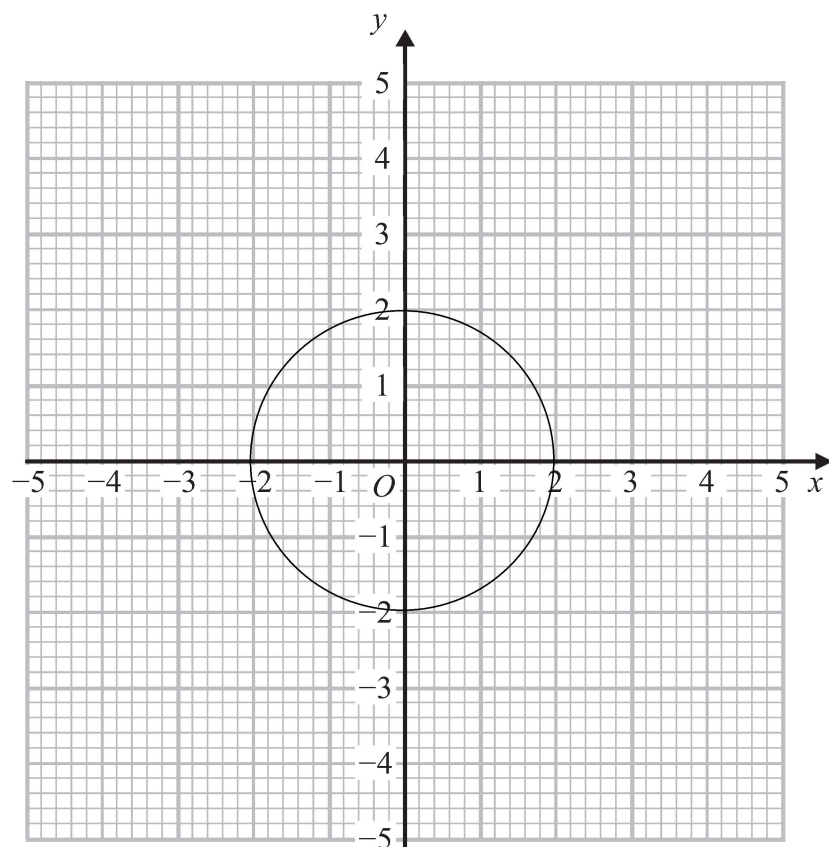
The distance between  $P$  and  $D$  is  $5 + 1.25$

.....6.25.....

(Total for Question 3 is 4 marks)

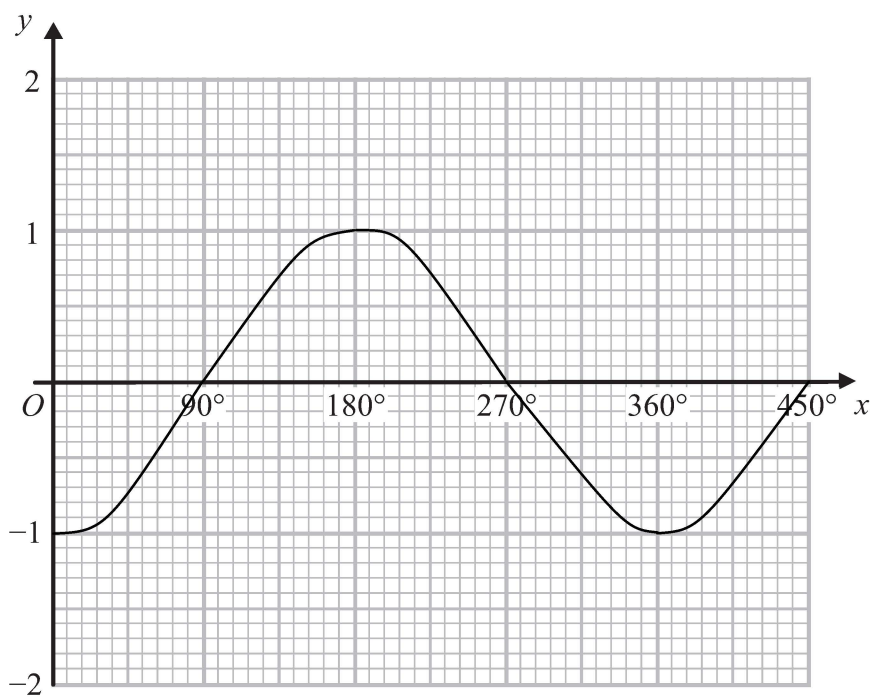


4.



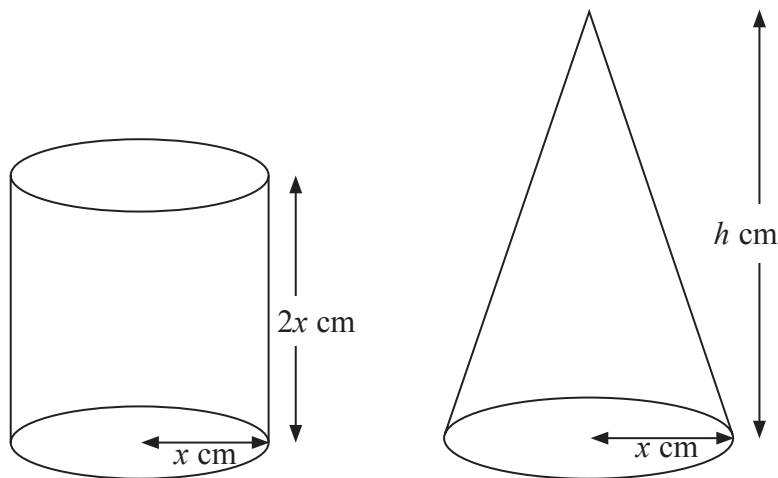
(a) On the grid, draw the graph of  $x^2 + y^2 = 4$

(2)



(b) On the grid, sketch the graph of  $y = \cos x$  for  $0^\circ \leq x \leq 360^\circ$

5.



Diagrams **NOT**  
accurately drawn

A cylinder has base radius  $x$  cm and height  $2x$  cm.

A cone has base radius  $x$  cm and height  $h$  cm.

The volume of the cylinder and the volume of the cone are equal.

Find  $h$  in terms of  $x$ .

Give your answer in its simplest form.

$$\begin{aligned}\text{Volume of cylinder} &= \pi r^2 h \\ &= \pi x^2 2x \\ &= \pi 2x^3\end{aligned}$$

$$\begin{aligned}\text{Volume of cone} &= \frac{1}{3} \pi r^2 h \\ &= \frac{1}{3} \pi x^2 h\end{aligned}$$

Volume of cone = Volume of cylinder

$$\frac{1}{3} \pi x^2 h = \pi 2x^3$$

$$\pi x^2 h = 3\pi 2x^3$$

$$\pi x^2 h = 6\pi x^3$$

$$\begin{aligned}\text{Both sides } \div \pi, \div x^2 \\ h = 6x\end{aligned}$$

$$h = 6x \dots\dots\dots$$

**Q5**

**(Total 3 marks)**



6.

$$\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$$

$$u = 2\frac{1}{2}, v = 3\frac{1}{3}$$

(a) Find the value of  $f$ .

$$\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$$

$$\frac{1}{2\frac{1}{2}} + \frac{1}{3\frac{1}{3}} = \frac{1}{f}$$

$$\left(1 \div 2\frac{1}{2}\right) + \left(1 \div 3\frac{1}{3}\right) = \frac{1}{f}$$

$$\left(1 \div \frac{5}{2}\right) + \left(1 \div \frac{10}{3}\right) = \frac{1}{f}$$

$$\left(1 \times \frac{2}{5}\right) + \left(1 \times \frac{3}{10}\right) = \frac{1}{f}$$

$$\frac{2}{5} + \frac{3}{10} = \frac{1}{f}$$

$$\frac{7}{10} = \frac{1}{f}$$

$$\frac{10}{7} = \frac{f}{1}$$

$$1\frac{3}{7} = f$$

$$\dots\dots\dots 1\frac{3}{7} \dots\dots\dots \quad (3)$$

(b) Rearrange  $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$ to make  $u$  the subject of the formula.

Give your answer in its simplest form.

**Both sides  $\times u$** 

$$1 + \frac{u}{v} = \frac{u}{f}$$

$$\frac{u}{v} - \frac{u}{f} = -1$$

$$\frac{uf - uv}{vf} = -1$$

**Both sides  $\times vf$** 

$$uf - uv = -vf$$

$$u(f - v) = -vf$$

$$u = \frac{-vf}{f - v}$$

$$\text{or } u = \frac{vf}{v - f}$$

$$u = \frac{vf}{v - f}$$

(2)

Q6

(Total 5 marks)



7.

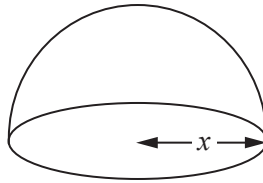
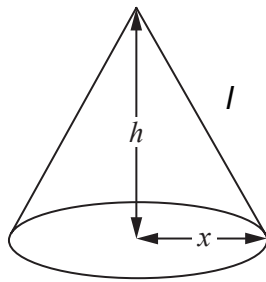


Diagram **NOT**  
accurately drawn

The diagram shows a solid cone and a solid hemisphere.

The cone has a base of radius  $x$  cm and a height of  $h$  cm.

The hemisphere has a base of radius  $x$  cm.

The surface area of the cone is equal to the surface area of the hemisphere.

Find an expression for  $h$  in terms of  $x$ .

$$\text{Surface area of sphere} = 4\pi r^2$$

$$\begin{aligned}\text{Surface area of hemisphere} &= 2\pi r^2 + \pi r^2 \\ &= 3\pi r^2\end{aligned}$$

$$\text{Surface area of cone} = \pi r l + \pi r^2$$

$$\pi x l + \pi x^2 = 3\pi x^2$$

$$x l = 2x^2$$

$$l = 2x$$

Pythagoras

$$h^2 = 4x^2 - x^2$$

$$h^2 = 3x^2$$

$$h = \sqrt{3}x$$

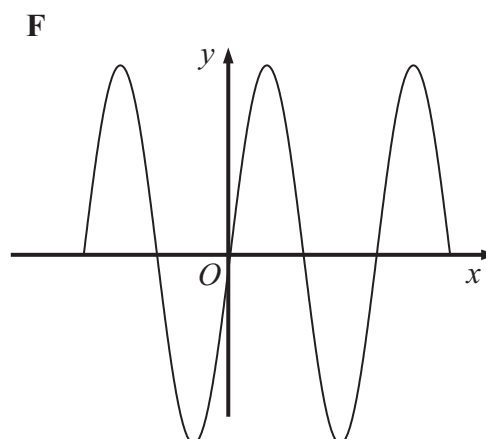
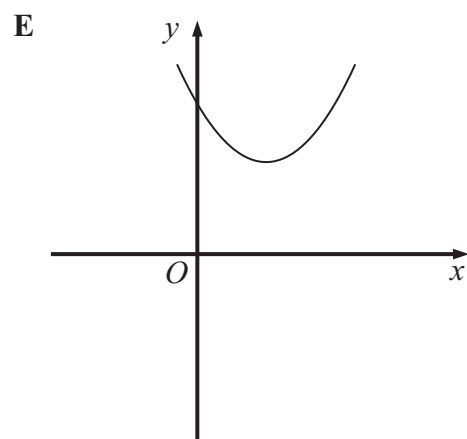
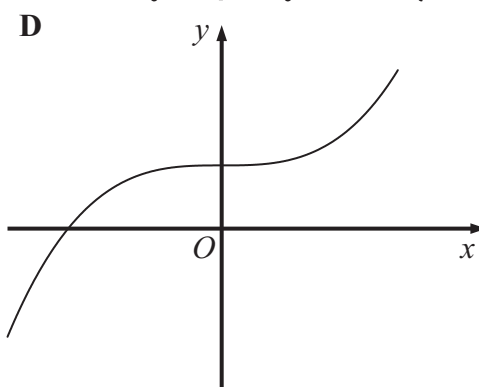
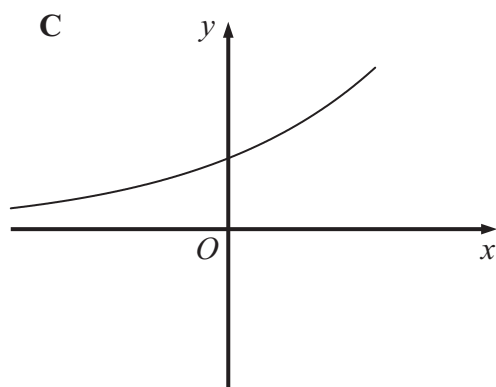
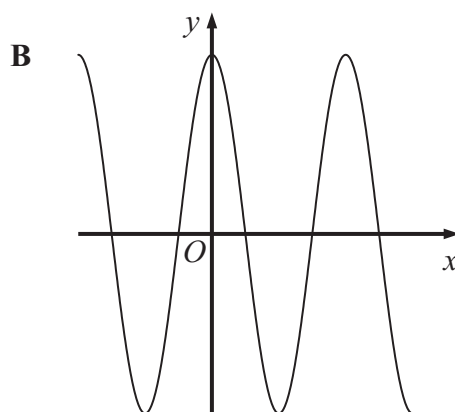
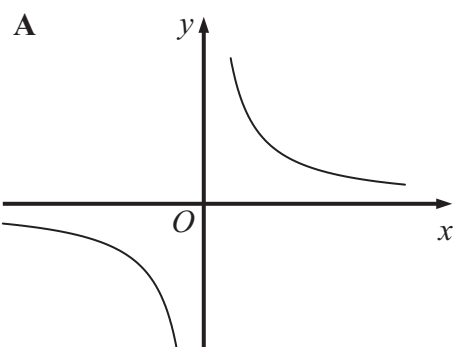
$$h = \sqrt{3}x$$

Q7

(Total 4 marks)



8.



Each equation in the table represents one of the graphs **A** to **F**.

Write the letter of each graph in the correct place in the table.

Equation	Graph
$y = 4 \sin x^\circ$	F
$y = 4 \cos x^\circ$	B
$y = x^2 - 4x + 5$	E
$y = 4 \times 2^x$	C
$y = x^3 + 4$	D
$y = \frac{4}{x}$	A

(Total 3 marks)

Q8



9. Here is a shape  $ABCDE$ .

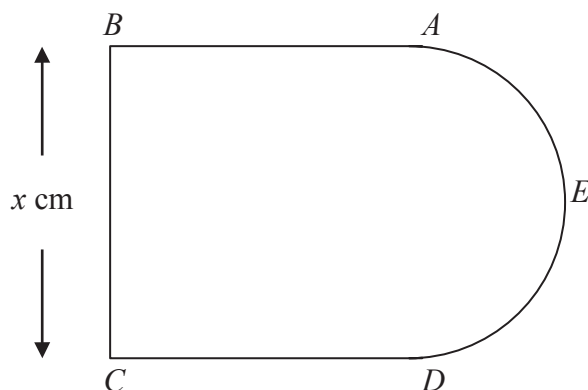


Diagram **NOT**  
accurately drawn

$AB$ ,  $BC$  and  $CD$  are three sides of a square.

$BC = x$  cm.

$AED$  is a semicircle with diameter  $AD$ .

The perimeter,  $P$  cm, of the shape  $ABCDE$  is given by the formula

$$P = 3x + \frac{\pi x}{2}$$

- (a) Rearrange this formula to make  $x$  the subject.

$$3x + \frac{\pi x}{2} = P$$

Both sides  $\times 2$

$$6x + \pi x = 2P$$

$$x(6 + \pi) = 2P$$

$$x = \frac{2P}{6 + \pi}$$

$$x = \frac{2P}{6 + \pi}$$

(2)





The area,  $A \text{ cm}^2$ , of this shape is given by  $A = kx^2$  where  $k$  is a constant.

- (b) Find the exact value of  $k$ .  
Give your answer in its simplest form.

$$\begin{aligned}\text{Area} &= x^2 + \frac{1}{2}\pi\left(\frac{x}{2}\right)^2 \\ &= x^2 + \frac{1}{2}\pi\frac{x^2}{4} \\ &= x^2\left(1 + \frac{1}{2}\pi\frac{1}{4}\right) \\ &= x^2\left(1 + \frac{\pi}{8}\right) \\ \therefore k &= 1 + \frac{\pi}{8}\end{aligned}$$

$$1 + \frac{\pi}{8}$$

(3) Q9

(Total 5 marks)



10. Express the recurring decimal  $0.2\dot{1}\dot{3}$  as a fraction.

$$r = 0.2\dot{1}\dot{3}$$

Multiply by 1000

$$1000r = 213.131313$$

$$10r = 2.131313$$

$$1000r - 10r = 990r$$

$$990r = 213.1313 - 2.1313$$

$$990r = 211$$

$$r = \frac{211}{990}$$

$$\frac{211}{990}$$

Q10

(Total 3 marks)



11.

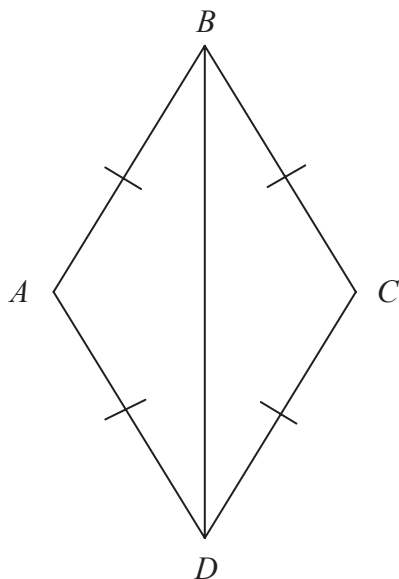


Diagram **NOT**  
accurately drawn

In the diagram,  $AB = BC = CD = DA$ .

Prove that triangle  $ADB$  is congruent to triangle  $CDB$ .

$AB = CB$  equal sides

$AD = CD$  equal sides

$BD$  is common

$ADB$  is congruent to  $CDB$  (SSS)

Q11

(Total 3 marks)



12. Prove, using algebra, that the sum of two consecutive whole numbers is always an odd number.

Let  $n$  be any integer

A pair of consecutive numbers would be  $n$  and  $n + 1$

$$n + n + 1 = 2n + 1$$

$2n$  is a multiple of 2 so is even

An even number  $+ 1$  is odd.

(Total 3 marks)



13. The table shows information about the ages, in years, of 1000 teenagers.

Age (years)	13	14	15	16	17	18	19
Number of teenagers	158	180	165	141	131	115	110

Sophie takes a sample of 50 of these teenagers, stratified by age.

Calculate the number of 14 year olds she should have in her sample.

The proportion of 14 year olds is  $\frac{180}{1000}$

The sample size would be this fraction of 50

$$\frac{180}{1000} \times 50 = \frac{90}{10} = 9$$

Q13

(Total 2 marks)

14.  $P$  is inversely proportional to  $V$ .

When  $V = 8$ ,  $P = 5$

- (a) Find a formula for  $P$  in terms of  $V$ .

$$P \propto \frac{1}{V}$$

$$P = \frac{k}{V}$$

Substitute  $V = 8$ ,  $P = 5$

$$5 = \frac{k}{8}$$

$$k = 40$$

Substitute this into the formula

$$P = \frac{40}{V}$$

$$P = \frac{40}{V} \quad (3)$$

- (b) Calculate the value of  $P$  when  $V = 2$

$$P = 20$$

(1)

Q14

(Total 4 marks)



15.

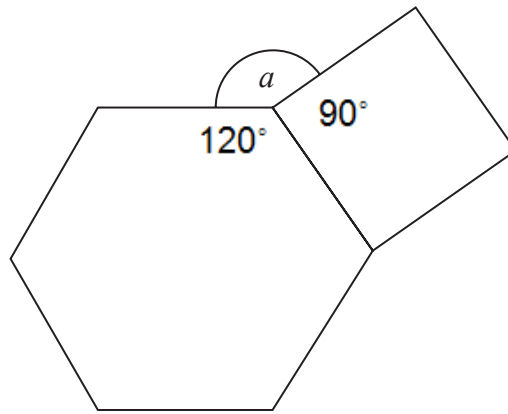


Diagram **NOT**  
accurately drawn

The diagram shows a regular hexagon and a square.

Calculate the size of the angle  $a$ .

Sum of interior angles of a regular polygon  
 $= 2n - 4$  right angles, where  $n$  is the number  
of sides.

Substitute  $n = 6$

$12 - 4 = 8$  right angles

$= 720^\circ$

$720 \div 6 = 120^\circ$

$\angle a = 360 - 120 - 90$

$= 150^\circ$

150 °

Q15

(Total 4 marks)



Write your name here

Surname

Other names

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Candidate Number

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# Mathematics A

## A\* Type Questions 2H

### Model Answers

**Higher Tier**

Extra topics that occur less frequently,  
to help students working towards an A\*

Paper Reference

**1MA0/2H**

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Total Marks

### Instructions

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Turn over ►



1. 258 Year 9 students were choosing the subjects they would be taking in Year 10. The table shows information about these students.

	Subject to be studied		
	Geography	History	Spanish
Male	45	52	26
Female	25	48	62

A sample, stratified by the subject studied and by gender, of 50 of the 258 students is taken.

- (a) Work out the number of male students studying Spanish in the sample.

$\frac{26}{258}$  is the fraction of males studying Spanish

Number in sample:

$$\frac{26}{258} \times 50 = 5.04 \quad \text{.....5.....} \quad (2)$$

- (b) Work out the number of female students in the sample.

Number of females:

$$25 + 48 + 62 = 135$$

Number of females in sample:

$$\frac{135}{258} \times 50 = 26.2 \quad \text{.....26.....} \quad (2) \quad \text{Q1}$$

(Total 4 marks)

2. Prove that  $(3x + 1)^2 - (3x - 1)^2$  is a multiple of 4, for all positive integer values of  $x$ .

This is the difference of 2 squares:

$$a^2 - b^2 = (a + b)(a - b)$$

$$(3x + 1 + 3x - 1)(3x + 1 - 3x + 1)$$

$$= 6x \times 2$$

$$= 12x$$

12 is a multiple of 4. Any positive integer multiplied by

12 is a multiple of 4.

Q2

(Total 3 marks)





3.

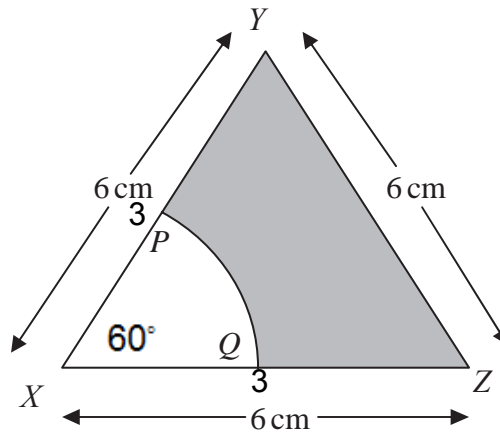


Diagram **NOT**  
accurately drawn

The diagram shows an equilateral triangle  $XYZ$  with sides of length 6 cm.

$P$  is the midpoint of  $XY$ .

$Q$  is the midpoint of  $XZ$ .

$XPQ$  is a sector of a circle, centre  $X$ .

Calculate the area of the shaded region.

Give your answer correct to 3 significant figures.

$$\begin{aligned}\text{Area of triangle} &= \frac{1}{2} \times XY \times YZ \times \sin 60^\circ \\ &= \frac{1}{2} \times 6 \times 6 \times \sin 60^\circ \\ &= 15.588\end{aligned}$$

$$\begin{aligned}\text{Area of sector } XPQ &= \frac{60}{360} \times \pi \times 3^2 \\ &= 4.712\end{aligned}$$

$$\begin{aligned}\text{Area of shaded region} &= 15.588 - 4.712 \\ &= 10.876\end{aligned}$$

.....10.9.....  $\text{cm}^2$   
(Total 4 marks)

Q3



4. Make  $A$  the subject of the formula  $x = \sqrt{\frac{A}{3}}$

$$x^2 = \frac{A}{3}$$

$$3x^2 = A$$

$$A = 3x^2 \quad \text{Q4}$$

(Total 2 marks)

5. (a) Write 12 500 in standard form.

$$\dots\dots\dots 1.25 \times 10^4 \dots\dots\dots$$

(1)

- (b) Write  $2.48 \times 10^{-3}$  as an ordinary number.

$$\dots\dots\dots 0.00248 \dots\dots\dots$$

(1)

- (c) Work out the value of

$$23\,500 \div (1.25 \times 10^{-4})$$

Give your answer in standard form.

$$188\,000\,000$$

$$= 1.88 \times 10^8$$

$$\dots\dots\dots 1.88 \times 10^8 \dots\dots\dots$$

(2) Q5

(Total 4 marks)



6. **X** and **Y** are two solid shapes which are mathematically similar.  
The shapes are made from the same material.

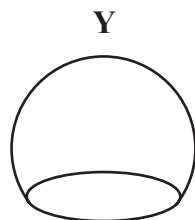
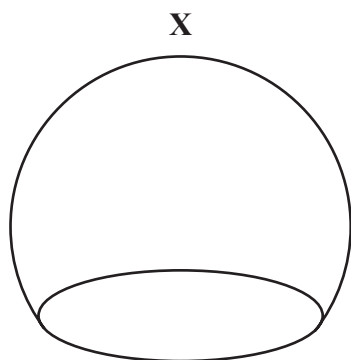


Diagram **NOT**  
accurately drawn

The surface area of **X** is  $50 \text{ cm}^2$ .

The surface area of **Y** is  $18 \text{ cm}^2$ .

The mass of **X** is 500 grams.

Calculate the mass of **Y**.

$$\begin{aligned}\text{Ratio of areas is } 50 : 18 \\ = 25 : 9\end{aligned}$$

$$\begin{aligned}\text{Ratio of lengths is } \sqrt{25} : \sqrt{9} \\ = 5 : 3\end{aligned}$$

$$\begin{aligned}\text{Ratio of volumes is } 5^3 : 3^3 \\ = 125 : 27\end{aligned}$$

$$\begin{aligned}\text{Mass of Y} &= 500 \times \frac{27}{125} \\ &= 108\end{aligned}$$

.....108..... grams      **Q6**  
(Total 4 marks)



7. The diagram shows a sector of a circle with centre  $O$ .  
The radius of the circle is 8 cm.

$XYZ$  is an arc of the circle.

$XZ$  is a chord of the circle.

Angle  $XOZ = 40^\circ$

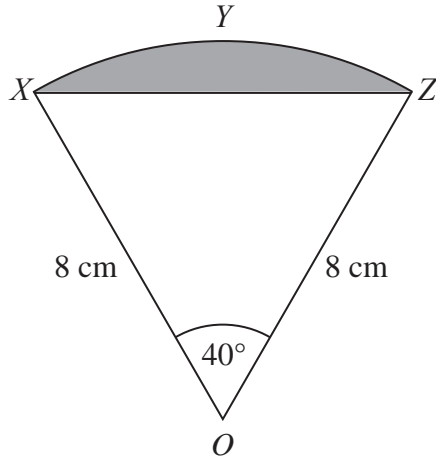


Diagram **NOT**  
accurately drawn

Calculate the area of the shaded segment.  
Give your answer correct to 3 significant figures.

$$\begin{aligned}\text{Area of sector} &= \frac{\theta}{360} \pi r^2 \\ &= \frac{40}{360} \pi 8 \times 8 \\ &= 22.34\end{aligned}$$

$$\begin{aligned}\text{Area of triangle} &= \frac{1}{2} OX \times OZ \sin \theta \\ &= \frac{1}{2} \times 8 \times 8 \sin 40^\circ \\ &= 20.57\end{aligned}$$

$$\begin{aligned}\text{Area of shaded segment} &= 22.34 - 20.57 \\ &= 1.77\end{aligned}$$

.....1.77.....  $\text{cm}^2$     Q7  
(Total 5 marks)



8. The table shows six expressions.  
 $x$  is a positive integer.

$2x - 3$	$3x - 2$	$3(x + 4)$	$4x + 1$	$4(3x + 1)$	$2x + 1$
----------	----------	------------	----------	-------------	----------

- (a) From the table, write the expression whose value is

- (i) always even

.....  $4(3x + 1)$  .....

- (ii) always a multiple of 3

.....  $3(x + 4)$  .....  
 (2)

- (b) From the table, write the expression which is a factor of  $4x^2 - 1$

The factors of  $4x^2 - 1$  are  $(2x + 1)(2x - 1)$

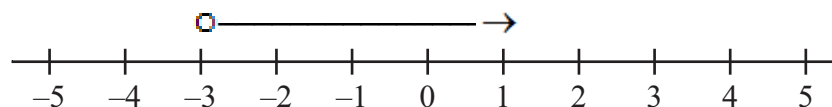
.....  $2x + 1$  .....  
 (1)

Q8

(Total 3 marks)

9. (a)  $n > -3$

Show this inequality on the number line.



(2)

- (b) Solve the inequality  $7x + 36 \leq 8$

$$7x \leq 8 - 36$$

$$7x \leq -28$$

$$x \leq -4$$

.....  $x \leq -4$  .....  
 (2)

Q9

(Total 4 marks)



**10.** In a sale the normal price of a pen is reduced by 10%.

The sale price of the pen is £4.86

Calculate the normal price of the pen.

90% of full price is £4.86

10% of full price is £0.54

100% of full price is £5.40

£5.40 .....

**Q10**

**(Total 3 marks)**



11. The diagram shows two similar triangles.

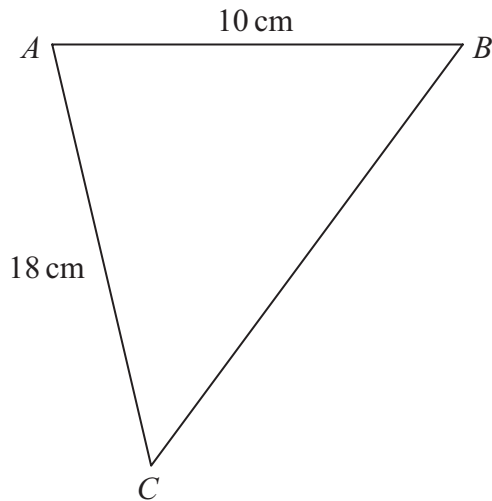
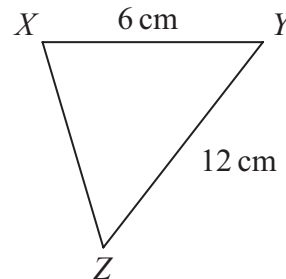


Diagram **NOT**  
accurately drawn



In triangle  $ABC$ ,  $AB = 10$  cm and  $AC = 18$  cm.  
In triangle  $XYZ$ ,  $XY = 6$  cm and  $YZ = 12$  cm.

Angle  $ABC = \text{angle } XYZ$ .  
Angle  $CAB = \text{angle } ZXY$ .

(a) Calculate the length of  $BC$ .

$$\begin{aligned} AB &: XY \\ &= 10 : 6 \\ &= 5 : 3 \\ CB &= 12 \times \frac{5}{3} \\ &= 20 \end{aligned}$$

.....20..... cm  
(2)

(b) Calculate the length of  $XZ$ .

$$\begin{aligned} XZ &= 18 \times \frac{3}{5} \\ &= 10.8 \end{aligned}$$

.....10.8..... cm  
(2) Q11

(Total 4 marks)



12. The surface area of Venus is 510 072 000 km<sup>2</sup>.  
The surface area of Jupiter is  $6.21795 \times 10^{10}$  km<sup>2</sup>.

The surface area of Jupiter is greater than the surface area of Venus.  
How many times greater?  
Give your answer in standard form.

$$6.21795 \times 10^{10} \div 510072000 = 121.90$$

In standard form:  $1.219 \times 10^2$

$$1.22 \times 10^2$$





13. The table shows some expressions.

$w$ ,  $x$ ,  $y$  and  $z$  represent lengths.

$\pi$  and 2 are numbers that have no dimensions.

$y^2(x + z)$	$\pi w^2 y^2$	$\frac{w^3 x}{y^3}$	$\pi w^2 x$	$\frac{2w^3 z}{y}$	$z^2$	$2w + x^2$
✓			✓	✓		

Tick (✓) the boxes underneath the **three** expressions which could represent volumes.

**Q13**

**(Total 3 marks)**



14. There are three big employment sites in Knutsford.  
The table shows the number of employees in each of these sites.

Barclays	Longridge	Parkgate
750	700	900

Georgina takes a sample of 50 employees stratified by site. Work

out the number of employees from Longridge in the sample.

**Total number of employees:**

$$750 + 700 + 900 = 2350$$

**Fraction working at Longridge:**

$$\frac{700}{2350}$$

**Number in sample:**

$$\frac{700}{2350} \times 50 = 14.89$$

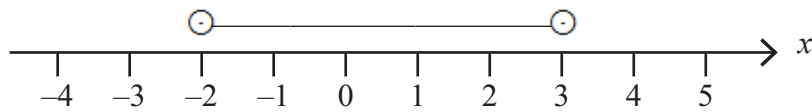
**Number in sample should be 15**

.....15..... **Q14**

**(Total 2 marks)**

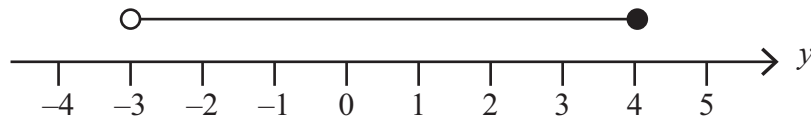


15. (a) On the number line below, show the inequality  $-2 < x < 3$



(1)

- (b) Here is an inequality, in  $y$ , shown on a number line.



Write down the inequality.

.....  $3 < y \leq 4$  .....

(2)

- (c) Solve the inequality  $4t - 5 > 9$

$$4t > 9 + 5$$

$$4t > 14$$

$$t > \frac{14}{4}$$

$$t > 3.5$$

.....  $t > 3.5$  .....

(2)

Q15

(Total 5 marks)



16.

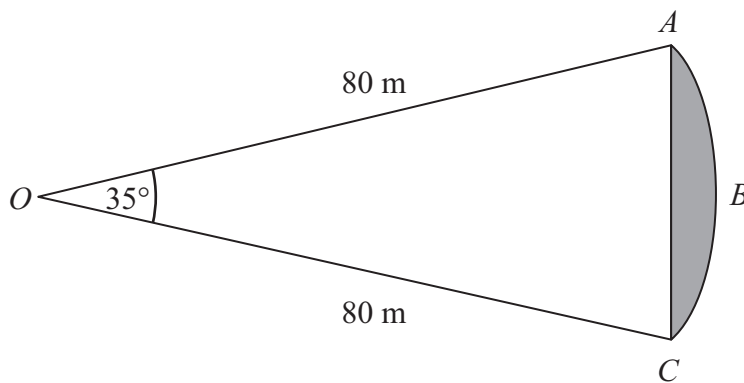


Diagram **NOT**  
accurately drawn

$ABC$  is an arc of a circle centre  $O$  with radius 80 m.  
 $AC$  is a chord of the circle.  
 Angle  $AOC = 35^\circ$ .

Calculate the area of the shaded region.  
 Give your answer correct to 3 significant figures.

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

$$= \frac{35}{360} \pi 80^2$$

$$= 1954.77$$

$$\text{Area of triangle} = \frac{1}{2} AO \times CO \sin 35^\circ$$

$$= \frac{1}{2} \times 80 \times 80 \sin 35^\circ$$

$$= 1835.44$$

Area of shaded segment

$$1954.77 - 1835.44 = 119.33$$

.....119..... m<sup>2</sup>

(Total 5 marks)



17. The table below gives some information about some students in a college.

Year group	Boys	Girls	Total
Year 1	126	94	220
Year 2	77	85	162
<b>Total</b>	203	179	382

Peter is going to carry out a survey of these students.

He uses a sample of 50 students, stratified by year group and gender. Work out the number of Year 2 girls that should be in his sample.

Total number of students = 382

Proportion of Year 2 girls is  $\frac{85}{382}$

Sample size is  $\frac{85}{382} \times 50$   
 $= 11.125$

Thus the sample would be 11

.....11..... **Q17**  
**(Total 2 marks)**

18.  $y$  is directly proportional to  $x$ .

When  $x = 500$ ,  $y = 10$

(a) Find a formula for  $y$  in terms of  $x$ .

$$y \propto x$$

$$y = kx$$

Find  $k$

$$10 = k500$$

$$\frac{10}{500} = k$$

$$k = \frac{1}{50}$$

$$y = \frac{1}{50} \times x$$

$$y = \frac{x}{50}$$

$$y = \frac{x}{50} \quad (3)$$

(b) Calculate the value of  $y$  when  $x = 350$

$$y = \frac{350}{50}$$

$$= 7$$

$y = 7$ ..... **Q18**  
**(1)**

**(Total 4 marks)**



19.  $A$  and  $B$  are vertices of a cuboid.

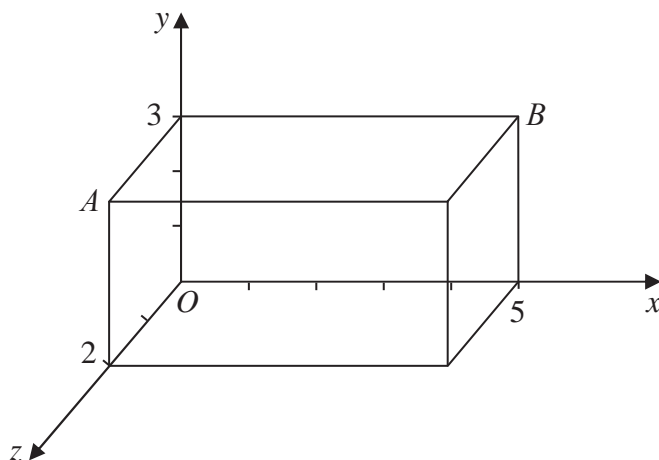


Diagram **NOT**  
accurately drawn

(a) Write down the coordinates of point  $A$ .

( .....0..... , .....3..... , .....2.... )  
(1)

(b) Write down the coordinates of point  $B$ .

( .....5..... , .....3..... , .....0.... )  
(1)

**Q19**

**(Total 2 marks)**

20. (a) Write 83 500 000 in standard form.

..... $8.35 \times 10^7$ .....  
(1)

(b) Work out  $(5.2 \times 10^{-7}) \times (2.8 \times 10^{-9})$

Give your answer in standard form.

..... $1.456 \times 10^{-15}$ .....  
(2)

**Q20**

**(Total 3 marks)**



Write your name here

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# Mathematics A

## Algebra

## Model Answers

**Foundation Tier**

Past Paper Style Questions  
Arranged by Topic

Paper Reference

**1MA0/1F**

**You must have:** Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

### Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
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- Answer the questions in the spaces provided  
– *there may be more space than you need.*
- **Calculators must not be used.**



### Information

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- Check your answers if you have time at the end.

Turn over ►



1. Peter thinks of a number.

He multiplies the number by 3

He then adds 2

His answer is 20

(a) What number did Peter think of?

Work backwards from the answer

reversing each operation.

$$20 - 2 = 18$$

$$18 \div 3 = 6$$

$$\dots\dots\dots 6 \dots\dots\dots$$

(2)

Sophie uses the formula  $P = 2a + b$

to find the perimeter  $P$  of this triangle.

(b) Find the value of  $P$  when

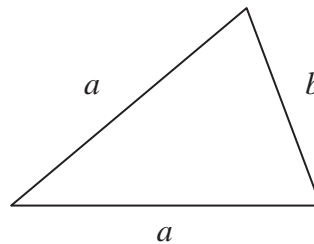
$$a = 6 \text{ and } b = 4$$

$$P = 2a + b$$

$$P = (2 \times 6) + 4$$

$$P = 12 + 4$$

$$P = 16$$



$$P = \dots\dots\dots 16 \dots\dots\dots$$

(2)

(Total 4 marks)

2. (a) Work out the value of

(i)  $4^2$

$$4 \times 4 = 16$$

$$\dots\dots\dots 16 \dots\dots\dots$$

(ii)  $\sqrt{64}$

$$8 \times 8 = 64$$

$$\dots\dots\dots 8 \dots\dots\dots$$

(iii)  $3 \times 2^3$

$$3 \times 2 \times 2 \times 2 = 24$$

$$\dots\dots\dots 24 \dots\dots\dots$$

(3)

(b) Work out

(i)  $-3 + 5$

Think of this as  $5 - 3 = 2$

$$\dots\dots\dots 2 \dots\dots\dots$$

(ii)  $-2 - 3$

Add the numbers and call the answer minus

$$\dots\dots\dots -5 \dots\dots\dots$$

(2)

(Total 5 marks)



3. The cost of hiring a car can be worked out using this rule.

$$\text{Cost} = \text{£}80 + 50\text{p per mile}$$

Bill hires a car and drives 90 miles.

(a) Work out the cost.

$$90 \times 50\text{p} = \text{£}45$$

$$80 + 45 = 125$$

$$\text{£ } 125 \dots\dots\dots (2)$$

The cost of hiring a car and driving  $m$  miles is  $C$  pounds.

(b) Complete the formula for  $C$  in terms of  $m$ .

$$C = \text{£}80 + \text{£}0.50m$$

$$C = 80 + 0.5m$$

$$C = 80 + 0.5m \dots\dots\dots (2)$$

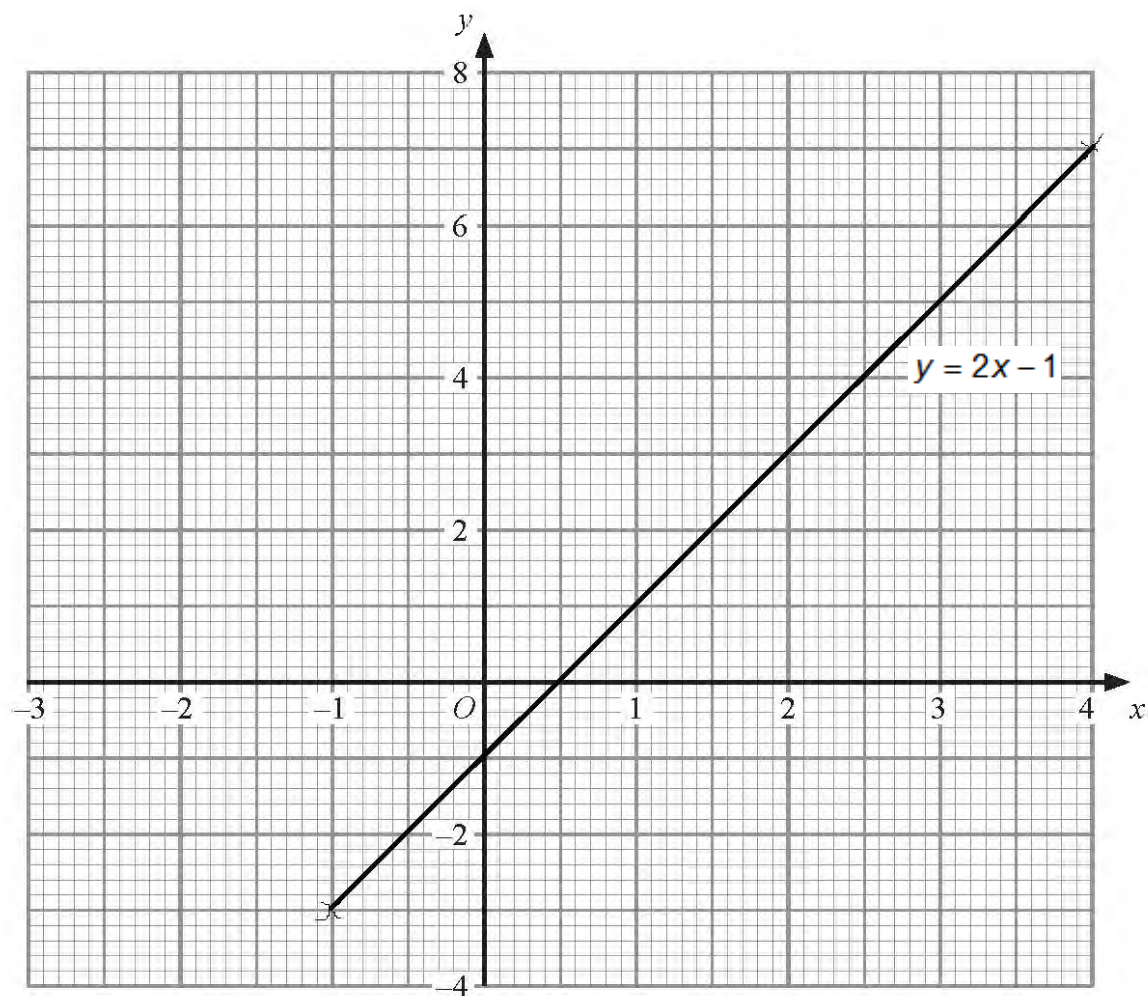
**(Total 4 marks)**



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

$x$	-1	0	1	2	3	4
$y$	-3	-1	1	3	5	7

(2)



(2)

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

(Total 4 marks)



5. Work out an estimate for the value of  $\frac{31 \times 4.92}{0.21}$

$$\approx \frac{30 \times 5}{0.2}$$

$$= \frac{150}{0.2}$$

$$= \frac{1500}{2}$$

$$= 750$$

Multiply top and bottom by 10

750

(Total 3 marks)

6. (a) Expand  $y(2y - 3)$

$$2y^2 - 3y$$

$$2y^2 - 3y$$

(1)

(b) Factorise  $x^2 - 4x$

$$x(x - 4)$$

$$x(x - 4)$$

(2)

$k$  is an integer such that  $-1 \leq k < 3$

(c) List all the possible values of  $k$ .

-1, 0, 1, 2

Remember 0 is an integer

-1, 0, 1, 2

(2)

(Total 5 marks)



7. (a) Factorise  $x^2 - 5x$

$$x(x - 5)$$

$$\dots\dots\dots x(x - 5) \dots\dots\dots$$

(2)

(b) Expand  $3(5x - 2)$

$$15x - 6$$

$$\dots\dots\dots 15x - 6 \dots\dots\dots$$

(1)

(Total 3 marks)

8. A hotel has 64 guests.  
40 of the guests are male.

(a) Work out 40 out of 64 as a percentage.

$$\frac{40}{64} \times \frac{100}{1} = 62.5$$

$$\dots\dots\dots 62.5 \dots\dots\dots \%$$

(2)

40% of the 40 male guests wear glasses.

(b) Write the number of male guests who wear glasses as a fraction of the 64 guests.  
Give your answer in its simplest form.

10% of 40 is 4  
So 40% of 40 is 16

$$\frac{16}{64} = \frac{1}{4}$$

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

(4)

(Total 6 marks)



9. (a) Simplify  $8x - 4x$

$$4x$$

$$\dots\dots\dots 4x$$

(1)

(b) Simplify  $y \times y \times y$

$$y^3$$

$$\dots\dots\dots y^3$$

(1)

(c) Simplify  $5y + 4x - 2x + 5x$

$$5y + 7x$$

$$\dots\dots\dots 5y + 7x..$$

(2)

**(Total 4 marks)**



10. The two-way table gives some information about how 100 children travelled to school one day.

	Walk	Car	Bike	Total
Boy	15	25	14	54
Girl	22	8	16	46
Total	37	33	30	100

- (a) Complete the two-way table.

(3)

One of the children is picked at random.

- (b) Write down the probability that this child walked to school that day.

$$P(\text{walked}) = \frac{37}{100}$$

.....  $\frac{37}{100}$  .....  
(1)

One of the girls is picked at random.

- (c) Work out the probability that this girl did **not** walk to school that day.

$$P(\text{girl not walked}) = 1 - \frac{22}{100}$$

$$= \frac{78}{100}$$

.....  $\frac{78}{100}$  .....  
(2)

(Total 6 marks)

11. Apples cost  $a$  pence each

Bananas cost  $b$  pence each.

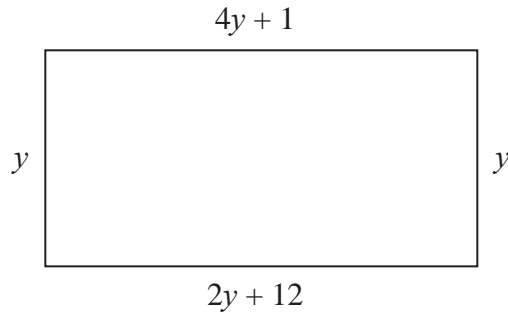
Write down an expression for the total cost, in pence, of 2 apples and 4 bananas.

.....  $2a + 4b$  ..... pence  
(Total 2 marks)



14.

Diagram **NOT**  
accurately drawn



The diagram shows a rectangle.

All the measurements are in centimetres.

(a) Explain why  $4y + 1 = 2y + 12$

..... Opposite sides of a rectangle are equal.....  
(1)

(b) Solve  $4y + 1 = 2y + 12$

$$4y - 2y = 12 - 1$$

$$2y = 11$$

$$y = 5\frac{1}{2}$$

$$y = 5\frac{1}{2}$$

.....  
(2)

(c) Use your answer to part (b) to work out the perimeter of the rectangle.

Perimeter is the sum of the sides.

$$4y + 1 + y + 2y + 12 + y$$

$$= 8y + 13$$

$$8y + 13 \text{ cm}$$

.....  
(2)

(Total 5 marks)



15. (a) Simplify  $5ab + 2ab - 4ab$   
 $= 3ab$

..... $3ab$ .....  
 (1)

(b) Simplify  $4a + 3b - 2a + 2b$   
 $= 2a + 5b$

..... $2a + 5b$ .....  
 (2)

(c) Simplify  $n \times n \times n$   
 $= n^3$

..... $n^3$ .....  
 (1)

(d) Simplify  $3m \times 2q$   
 $= 6mq$

..... $6mq$ .....  
 (1)

(e) Factorise  $5n + 10$   
 $= 5(n + 2)$

..... $5(n + 2)$ .....  
 (1)

(Total 6 marks)





Write your name here

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# Mathematics A

## Bearings

### Model Answers

**Foundation Tier**

Past Paper Style Questions  
Arranged by Topic

Paper Reference

**1MA0/1F**

**You must have:** Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

### Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
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- Answer the questions in the spaces provided  
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- **Calculators must not be used.**



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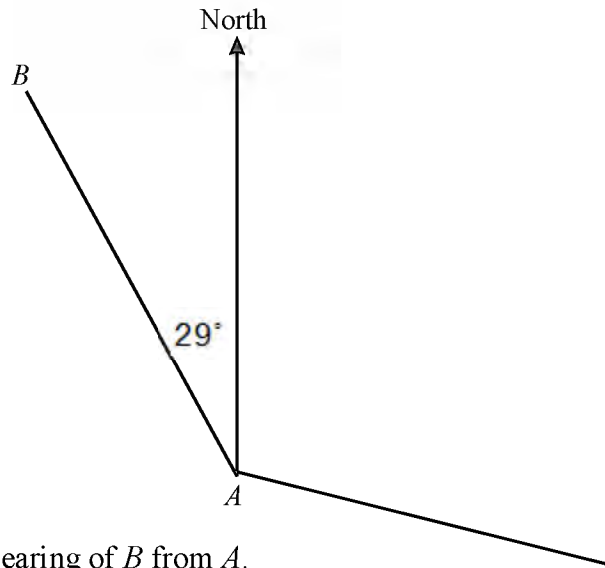
### Advice

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- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►



1.



- (a) Measure and write down the bearing of B from A.

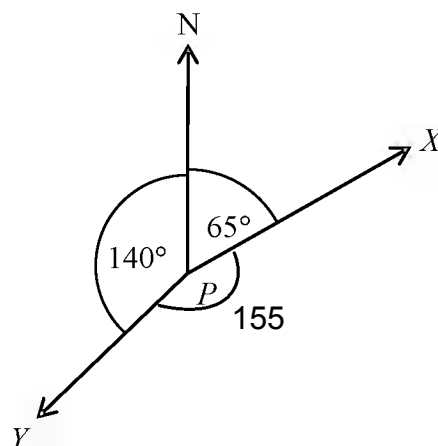
$$360 - 29 = 331$$

..... 331 .....<sup>°</sup>  
(1)

- (b) On the diagram, draw a line on a bearing of  $103^\circ$  from A.

(1)  
(Total 2 marks)

2.



- (a) Write down the bearing of X from P.

..... 065 .....<sup>°</sup>  
(1)

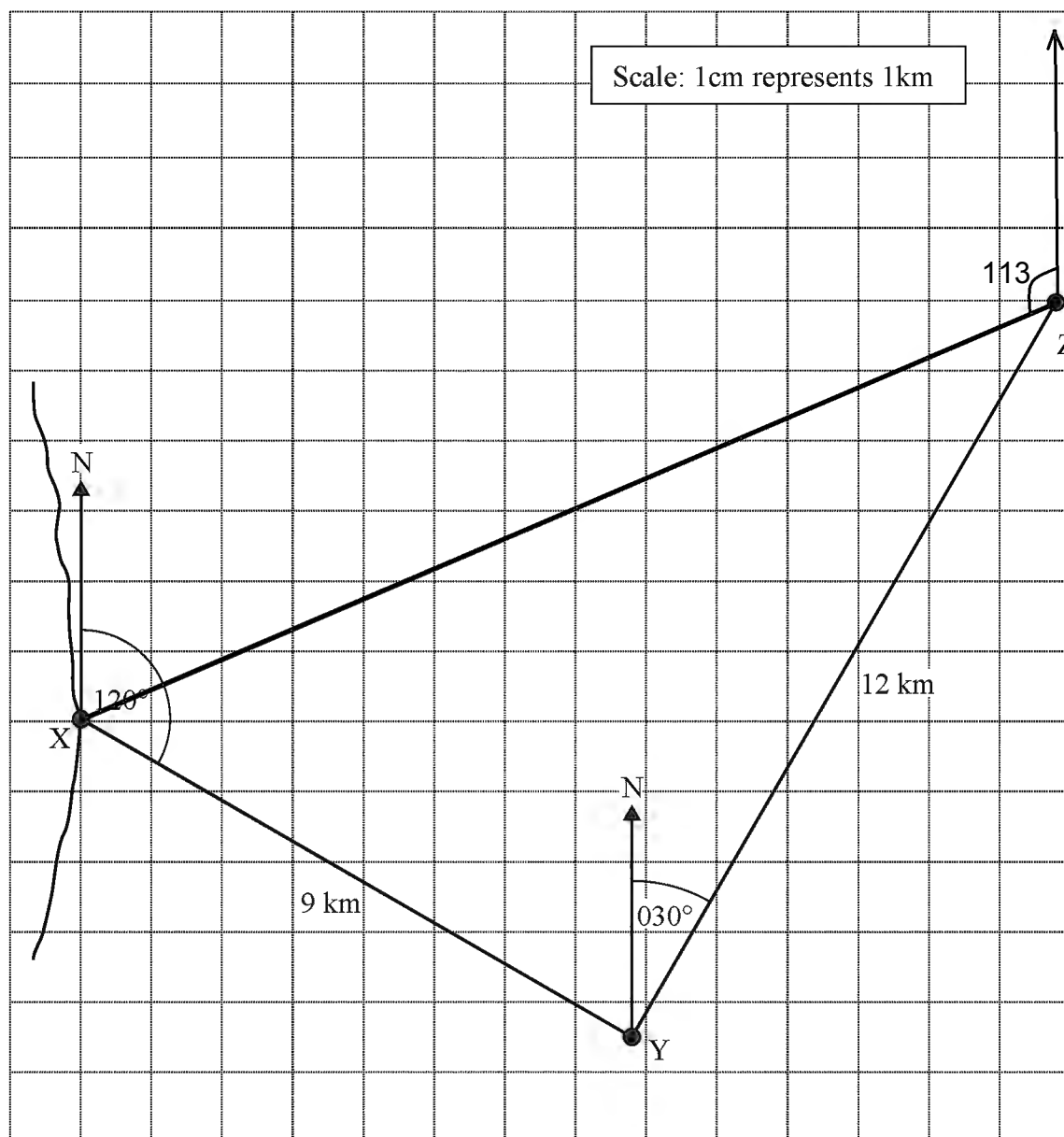
- (b) Work out the bearing of Y from P.

$$155 + 65 = 220$$

..... 220 .....<sup>°</sup>  
(2)



3. A ship leaves port X and travels 9 km on a bearing of  $120^\circ$  to point Y. The ship then turns and travels 12 km on a bearing of  $030^\circ$  to point Z. This journey is shown on the scale drawing below.



The ship then turns and travels directly back from Z to X.

Use a ruler and protractor to work out the distance and bearing of the journey from Z to X

Distance .....15.1..... km

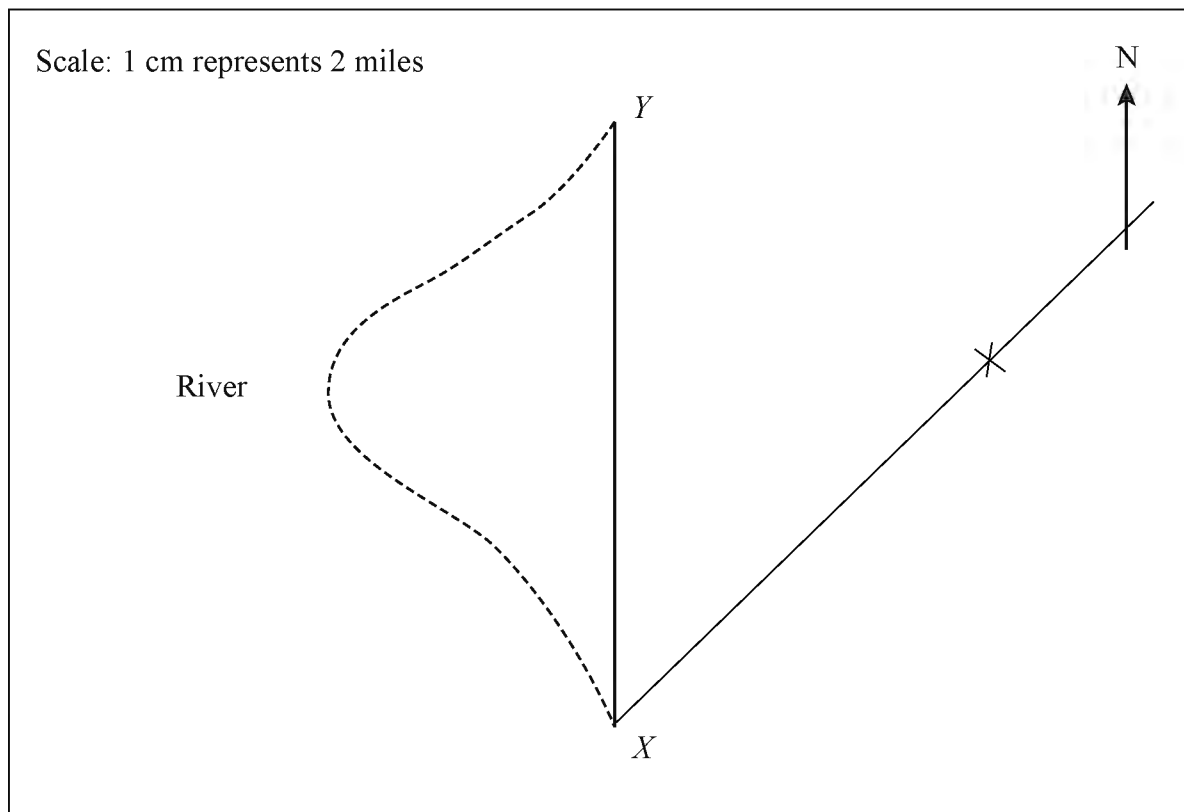
Bearing.....247..... °

$$360 - 113 = 247$$

(3)



4. An helicopter flies due North from  $X$  to  $Y$ .  
The distance from  $X$  to  $Y$  on the river is 24 miles.



- 4 (a) How much further is it from  $X$  to  $Y$  on the river than by helicopter?

$$XY = 8.1 \text{ cm}$$

$$8.1 \times 2 = 16.2 \text{ miles}$$

$$24 - 16.2 = 7.8$$

.....7.8..... miles

(3)

- (b)  $Z$  is 12 miles north-east of  $X$ .

- (i) Mark with a cross the point  $Z$  on the diagram.

(2)

- (ii) Write down the three-figure bearing of  $Z$  from  $X$ .

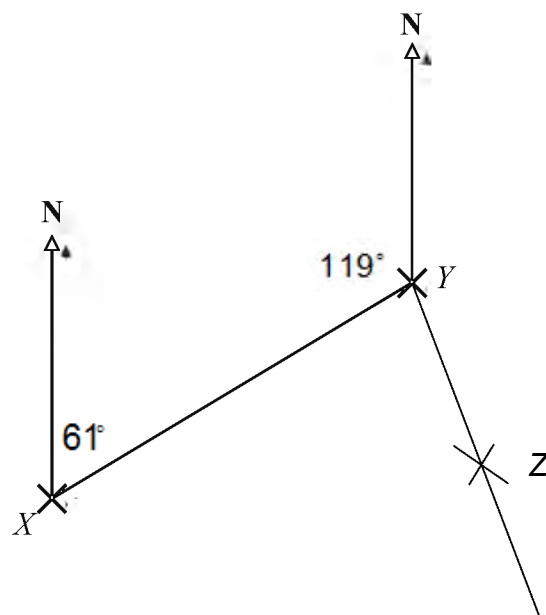
.....045.....°

(1)

(Total 6 marks)



5. The diagram shows the positions of two telephone masts,  $X$  and  $Y$ , on a map.



- (a) Measure the bearing of  $Y$  from  $X$ .

**61°**

**061°** °  
.....  
**(1)**

Another mast  $Z$  is on a bearing of  $160^\circ$  from  $Y$ .

On the map,  $Z$  is 4 cm from  $Y$ .

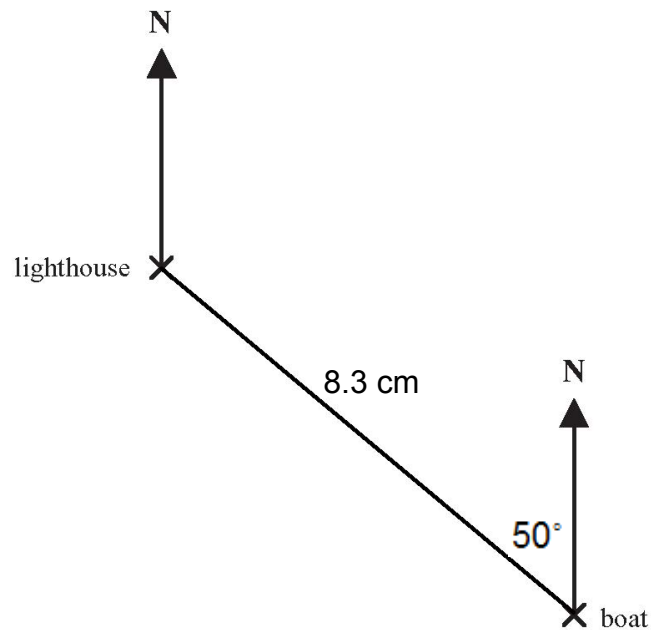
- (b) Mark the position of  $Z$  with a cross (X) and label it  $Z$ .

**(2)**

**(Total 3 marks)**



6. The diagram shows part of a map.  
It shows the positions of a lighthouse and a boat.



The scale of the map is 1:10 000

- (a) Work out the real distance between the lighthouse and the boat.  
Give your answer in metres.

$$8.3 \text{ cm} = 8.3 \times 10\,000 \text{ cm on the ground}$$

$$\text{or } 8.3 \times 100 \text{ m}$$

.....830..... m  
(2)

- (b) Find the bearing of the lighthouse from the boat.

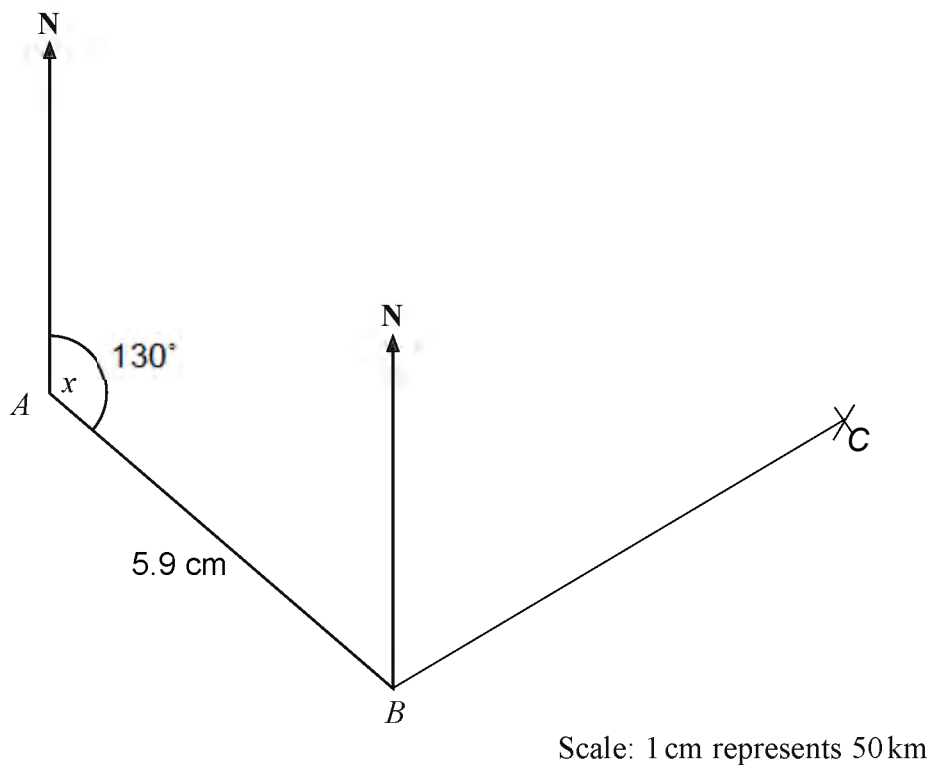
$$360^\circ - 50^\circ = 310^\circ$$

.....310°.....  
(1)

(Total 3 marks)



7. The diagram shows the position of two ports, *A* and *B*. A ship sails from port *A* to port *B*.



- (a) Measure the size of the angle marked *x*.

.....130.....<sup>°</sup>  
(1)

- (b) Work out the real distance between port *A* and port *B*.  
Use the scale 1 cm represents 50 km.

$$5.9 \times 50 = 295$$

.....295..... km  
(2)

Port *C* is 350 km on a bearing of 060° from port *B*.

- (c) On the diagram, mark airport *C* with a cross (×).  
Label it *C*.

$$350 \div 50 = 7$$

The cross will be 7 cm along the line.

(2)  
(Total 5 marks)



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Write your name here

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# Mathematics A Bounds

## Model Answers

**Higher Tier**

Past Paper Style Questions  
Arranged by Topic

Paper Reference

**1MA0/2H**

**You must have:** Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

### Instructions

- Use **black** ink or ball-point pen.
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- **Calculators may be used.**



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Turn over ►



1.  $w = \sqrt{\frac{x}{y}}$

$x = 5.43$  correct to 2 decimal places.

$y = 4.514$  correct to 3 decimal places.

By considering bounds, work out the value of  $w$  to a suitable degree of accuracy.

You must show all your working and give a reason for your final answer.

$$\begin{aligned}\text{Higher bound} &= \sqrt{\frac{5.435}{4.5135}} \\ &= 1.0973\end{aligned}$$

$$\begin{aligned}\text{Lower bound} &= \sqrt{\frac{5.425}{4.5145}} \\ &= 1.0962\end{aligned}$$

2 decimal places is a suitable degree of accuracy, as this was the degree of accuracy given in the question.

$$w = 1.10$$

(Total 5 marks)



2. An arrow is shot vertically upwards at a speed of  $V$  metres per second.

The height,  $H$  metres, to which it rises is given by

$$H = \frac{V^2}{2g}$$

where  $g \text{ m/s}^2$  is the acceleration due to gravity.

$V = 24.4$  correct to 3 significant figures.

$g = 9.8$  correct to 2 significant figures.

- (i) Write down the upper bound of  $g$ .

.....9.85.....

- (ii) Calculate the lower bound of  $H$ .  
Give your answer correct to 3 significant figures.

$$\text{Lower bound} = \frac{\text{Smallest possible number}}{\text{Largest possible number}}$$

$$\frac{24.35^2}{9.85} = 60.1951$$

.....60.2.....

(Total 3 marks)



3. A building plot is in the shape of a rectangle.

The width of the field is 26 metres, measured to the nearest metre.(a)

Work out the upper bound of the width of the field.

.....~~26~~.5..... metres  
(1)

The length of the field is 135 metres, measured to the nearest 5 metres.

- (b) Work out the upper bound for the perimeter of the field.

$$26.5 + 26.5 + 137.5 + 137.5 = 328$$

.....328..... metres  
(3)

**(Total 4 marks)**



4. Sophie drove for 238 miles, correct to the nearest mile.  
She used 26.3 litres of petrol, to the nearest tenth of a litre.

$$\text{Petrol consumption} = \frac{\text{Number of miles travelled}}{\text{Number of litres of petrol used}}$$

Work out the upper bound for the petrol consumption for Sophie's journey. Give your answer correct to 2 decimal places.

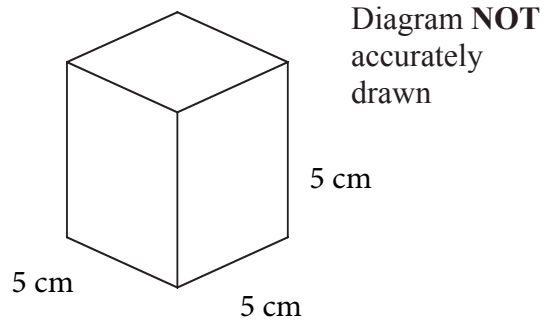
$$\begin{aligned}\text{Upper bound} &= \frac{\text{Largest possible number}}{\text{Smallest possible number}} \\ &= \frac{238.5}{26.25} \\ &= 9.0857\end{aligned}$$

..... 9.09 ..... miles per litre

**(Total 3 marks)**



5. (a) A solid cube has sides of length 5 cm.



Work out the total surface area of the cube. State the units of your answer.

$$\begin{aligned}\text{Total area} &= 6 \times (5 \times 5) \\ &= 150 \text{ cm}^2\end{aligned}$$

$$\begin{array}{r} 150 \text{ cm}^2 \\ \hline \end{array} \quad (4)$$

- (b) Change  $125 \text{ cm}^3$  into  $\text{mm}^3$ .

$$\begin{aligned}1 \text{ cm}^3 &= 1000 \text{ mm}^3 \\ 125 \text{ cm}^3 &= 125000 \text{ mm}^3\end{aligned}$$
$$\begin{array}{r} 125\,000 \text{ mm}^3 \\ \hline \end{array} \quad (2)$$

The weight of the cube is 77 grams, correct to the nearest gram.

- (c) (i) What is the minimum the weight could be?

$$\begin{array}{r} 76.5 \text{ grams} \\ \hline \end{array}$$

- (ii) What is the maximum the weight could be?

$$\begin{array}{r} 77.5 \text{ grams} \\ \hline \end{array}$$



6. The length of a line is 53 centimetres, correct to the nearest centimetre.

(a) Write down the **least** possible length of the line.

.....52.5..... centimetres  
(1)

(b) Write down the **greatest** possible length of the line.

.....53.5..... centimetres  
(1)

(Total 2 marks)



7 . The voltage  $V$  of an electronic circuit is given by the formula

$$V = IR$$

where  $I$  is the current in amps  
and  $R$  is the resistance in ohms.

Given that  $V = 208$  correct to 3 significant figures,  
 $R = 12.8$  correct to 3 significant figures,

calculate the lower bound of  $I$ .

$$V = IR$$

$$I = \frac{V}{R}$$

$$\begin{aligned}\text{Lower bound} &= \frac{\text{Smallest possible number}}{\text{Largest possible number}} \\ &= \frac{207.5}{12.85} \\ &= 16.1478\end{aligned}$$

16.1

Q7

(Total 3 marks)





8. The average fuel consumption ( $c$ ) of Tara's car, in kilometres per litre, is given by the formula

$$c = \frac{d}{f}$$

where  $d$  is the distance travelled, in kilometres, and  $f$  is the fuel used, in litres.

$d = 153$  correct to 3 significant figures.

$f = 43.3$  correct to 3 significant figures.

By considering bounds, work out the value of  $c$  to a suitable degree of accuracy.  
You must show **all** of your working **and** give a reason for your final answer.

$$\text{Upper bound} = \frac{\text{Largest possible number}}{\text{Smallest possible number}}$$

$$= \frac{153.3}{43.25}$$

$$= 3.5491$$

$$= 3.55 \text{ (3 sig fig)}$$

$$\text{Lower bound} = \frac{\text{Smallest possible number}}{\text{Largest possible number}}$$

$$= \frac{152.5}{43.35}$$

$$= 3.517877$$

$$= 3.52 \text{ (3 sig fig)}$$

$$\text{The mid point is } \frac{3.55 + 3.52}{2} = 3.535$$

The figures in the question were given to 3 significant figures, so this is a suitable degree of accuracy for the answer.

$$c = \underline{\underline{3.54}}$$

(Total 5 marks)



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Write your name here

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Candidate Number

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# Mathematics A

## Circle Theorems

### Model Answers

**Higher Tier**

Past Paper Style Questions  
Arranged by Topic

Paper Reference

**1MA0/1H**

**You must have:** Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

### Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided  
– *there may be more space than you need.*
- **Calculators must not be used.**



### Information

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- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►



1.  $ABCD$  is a cyclic quadrilateral within a circle centre  $O$ .  
 $XY$  is the tangent to the circle at  $A$ .  
 Angle  $XAB = 58^\circ$   
 Angle  $BAD = 78^\circ$   
 Angle  $DBC = 34^\circ$

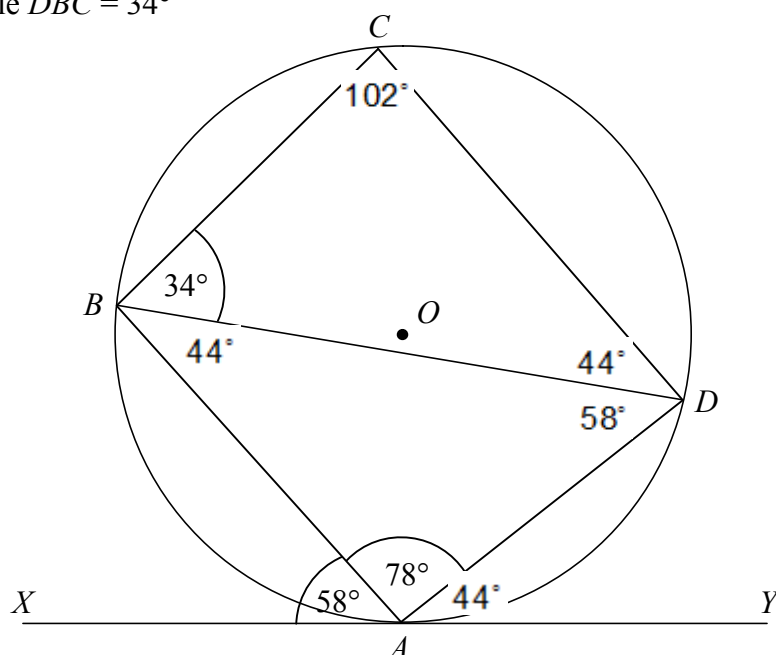


Diagram NOT  
accurately drawn

Prove that  $AB$  is parallel to  $CD$ .

First find the missing angles

$\angle DAY = 44^\circ$  (Angles on a straight line add up to  $180^\circ$ )

$\angle ABD = \angle DAY$  (The angle between a tangent and a chord through the point of contact is equal to the angle subtended by the chord in the alternate segment)

$\angle BCD = 102^\circ$  (Opposite angles in a cyclic quadrilateral add up to  $180^\circ$ )

$\angle CDB = 44^\circ$  (Angles in a triangle add up to  $180^\circ$ )

$\angle CDB = \angle ABD$  So they are alternate angles, making  $AB$  parallel with  $CD$  as required.

(5)



2.(a) Here is a circle with centre  $O$ .

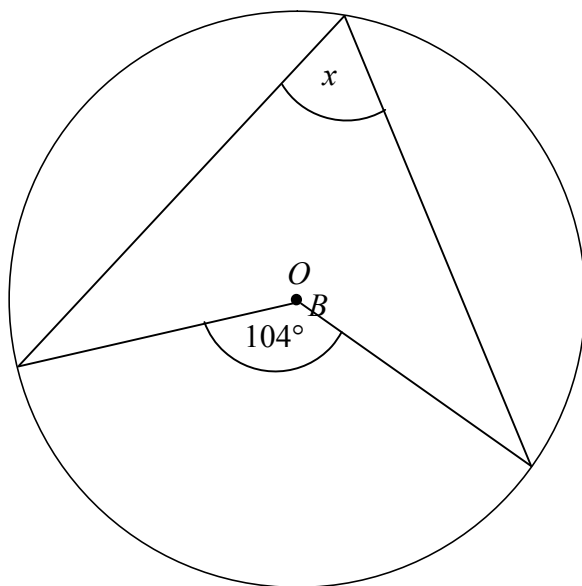


Diagram **NOT**  
accurately drawn

Write down the value of  $x$ .

.....52..... degrees  
(1)

(b) Here is a different circle.

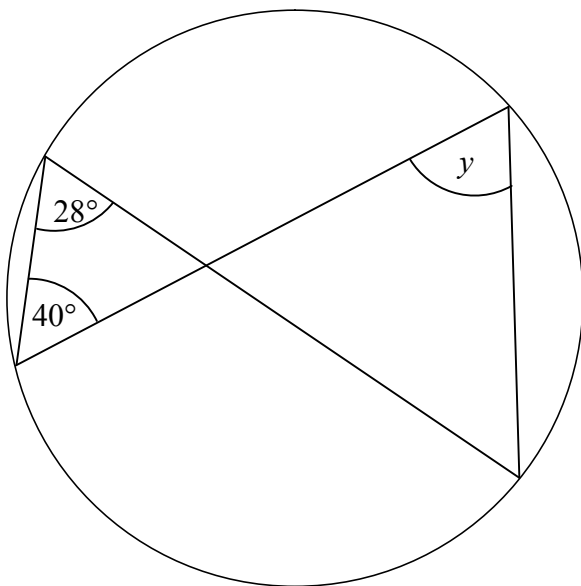


Diagram **NOT**  
accurately drawn

Write down the value of  $y$ .

.....28..... degrees  
(1)



3.

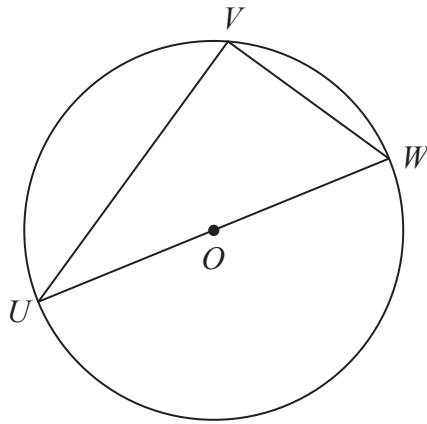


Diagram **NOT**  
accurately drawn

$U$ ,  $V$  and  $W$  are points on the circumference of a circle, centre  $O$ .  $UW$  is a diameter of the circle.

(a) (i) Write down the size of angle  $UVW$ .

.....90.....

(ii) Give a reason for your answer.

.....The angle in a semicircle is a right angle.....

(2)

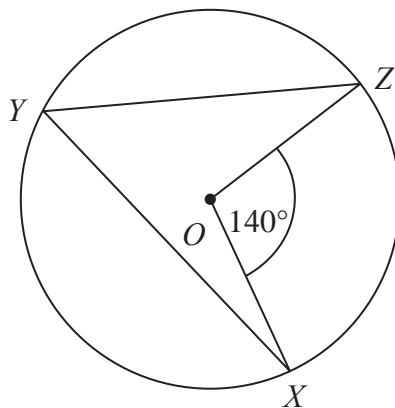


Diagram **NOT**  
accurately drawn

$X$ ,  $Y$  and  $Z$  are points on the circumference of a circle, centre  $O$ .  
Angle  $XOZ = 140^\circ$ .

(b) (i) Work out the size of angle  $XYZ$ .

.....70.....

(ii) Give a reason for your answer.

.....The angle subtended at the centre of a circle is twice the angle.....

.....subtended at the circumference.....

(2)



**\*4.**

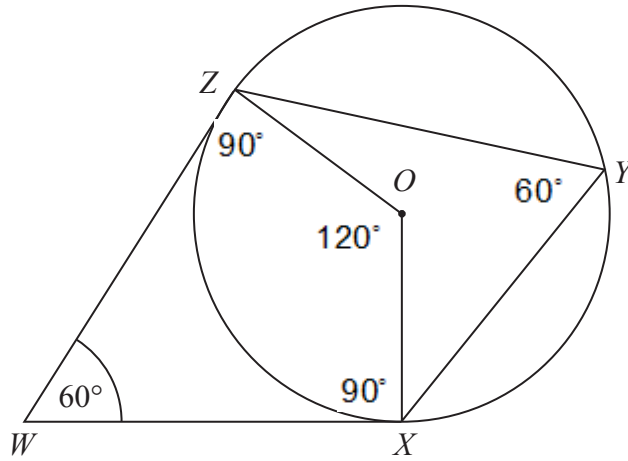


Diagram **NOT**  
accurately drawn

$X$ ,  $Y$  and  $Z$  are points on the circumference of a circle, centre  $O$ .  
 $WX$  and  $WZ$  are tangents to the circle.

Angle  $ZWX = 60^\circ$

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

$\angle W XO = 90^\circ$  and  $\angle W ZO = 90^\circ$  (The angle between a tangent and the radius drawn to the point of contact is  $90^\circ$ )

$$\angle XOZ = 120^\circ \text{ (The sum of the angles in a quadrilateral is } 360^\circ \text{)}$$

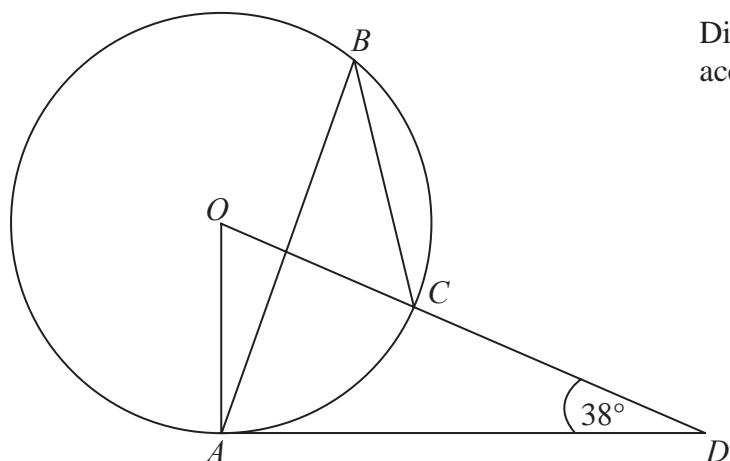
$\angle XYZ = 60^\circ$  (The angle subtended at the centre of a circle is twice the angle subtended at the circumference)

**(Total 4 marks)**



5.

Diagram **NOT**  
accurately drawn



The diagram shows a circle centre  $O$ .  
 $A$ ,  $B$  and  $C$  are points on the circumference.

$DCO$  is a straight line.  
 $DA$  is a tangent to the circle.

Angle  $ADO = 38^\circ$

$\angle DAO = 90^\circ$  (The angle between a tangent and the radius drawn to the  
point of contact is  $90^\circ$ )

$\angle AOD = 180^\circ - 90^\circ - 38^\circ$   
 $= 52^\circ$  (Angles in a triangle add up to  $180^\circ$ )

.....52.....  
(2)

(b) (i) Work out the size of angle  $ABC$ .

.....26.....

(ii) Give a reason for your answer.

The angle subtended at the centre of a circle is twice the angle subtended at the circumference.  
(3)

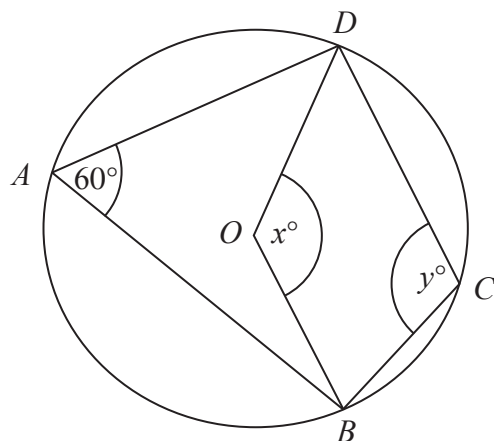
(Total 5 marks)





6.

Diagram **NOT**  
accurately drawn



In the diagram,  $A$ ,  $B$ ,  $C$  and  $D$  are points on the circumference of a circle, centre  $O$ .  
Angle  $BAD = 60^\circ$ .

Angle  $BOD = x^\circ$ .

Angle  $BCD = y^\circ$ .

(a) (i) Work out the value of  $x$ .

$$x = \dots 120 \dots$$

(ii) Give a reason for your answer.

...The angle subtended at the centre of a circle is twice the angle  
...subtended at the circumference.  
(2)

(b) (i) Work out the value of  $y$ .

$$y = \dots 120 \dots$$

(ii) Give a reason for your answer.

...The opposite angles in a cyclic quadrilateral add up to  $180^\circ$  .....  
.....  
(2)

(Total 4 marks)



7.

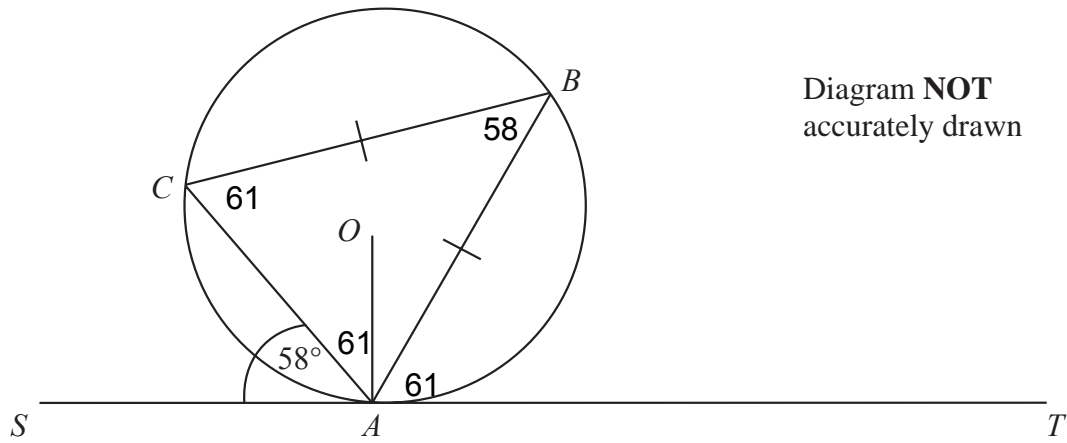


Diagram **NOT**  
accurately drawn

$A$ ,  $B$  and  $C$  are points on the circumference of a circle, centre  $O$ .  
The line  $SAT$  is the tangent at  $A$  to the circle.

$CB = AB$ .  
Angle  $CBA = 58^\circ$ .

Calculate the size of angle  $OAB$ .  
Give a reason for each stage in your working.

$$\angle CBA = 58^\circ \text{ (Alternate segment to } \angle CAS \text{)}$$

$$\angle BCA = \angle BAC \text{ (Isosceles triangle)}$$

$$= (180 - 58) \div 2$$

$$= 61^\circ$$

$$\angle BAT = 61^\circ \text{ (Alternate segment to } \angle BCA \text{)}$$

$$\angle OAT = 90^\circ \text{ (Tangent to a radius)}$$

$$\angle OAB = 90 - 61$$

$$= 29^\circ$$

.....29.....<sup>°</sup>

(Total 5 marks)



8.

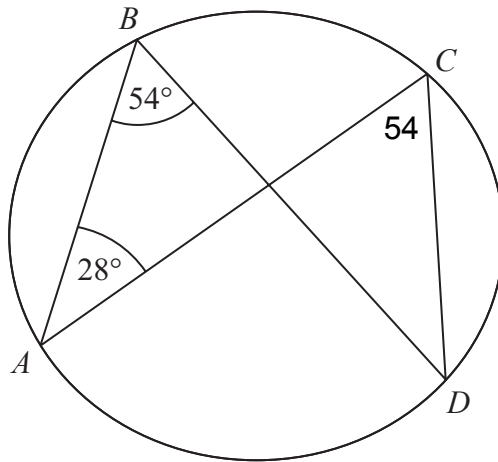


Diagram **NOT**  
accurately drawn

$A$ ,  $B$ ,  $C$  and  $D$  are points on the circumference of a circle.

Angle  $ABD = 54^\circ$ .

Angle  $BAC = 28^\circ$ .

(i) Find the size of angle  $ACD$ .

.....54.....<sup>o</sup>

(ii) Give a reason for your answer.

...Angles subtended by an arc in the same segment of a circle are equal.....

.....

(Total 2 marks)



9.

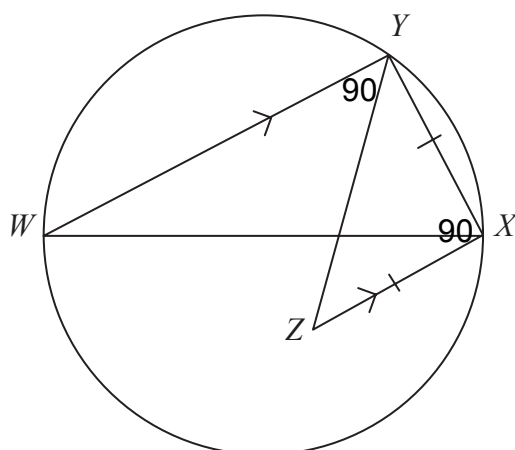


Diagram **NOT**  
accurately drawn

$WX$  is a diameter of a circle.

$Y$  is a point on the circle.

$Z$  is the point inside the circle such that  $ZX = XY$  and  $XZ$  is parallel to  $YW$ .

Find the size of angle  $XZY$ .

You must give reasons for your answer.

$$\angle WYX = 90^\circ \text{ (Angle in a semicircle is } 90^\circ \text{)}$$

$$\angle YXZ = 90^\circ \text{ (Parallel lines meet at } 90^\circ \text{)}$$

$$\begin{aligned} \angle XZY &= (180 - 90) \div 2 \text{ (Isosceles triangle, angles add up to } 180^\circ \text{)} \\ &= 45^\circ \end{aligned}$$

.....45.....<sup>°</sup> Q9  
(Total 4 marks)



10.  $ABCD$  is a cyclic quadrilateral.  
 $AE$  is a tangent at  $A$ .  
 $CDE$  is a straight line.  
Angle  $CAD = 32^\circ$   
Angle  $ABD = 40^\circ$

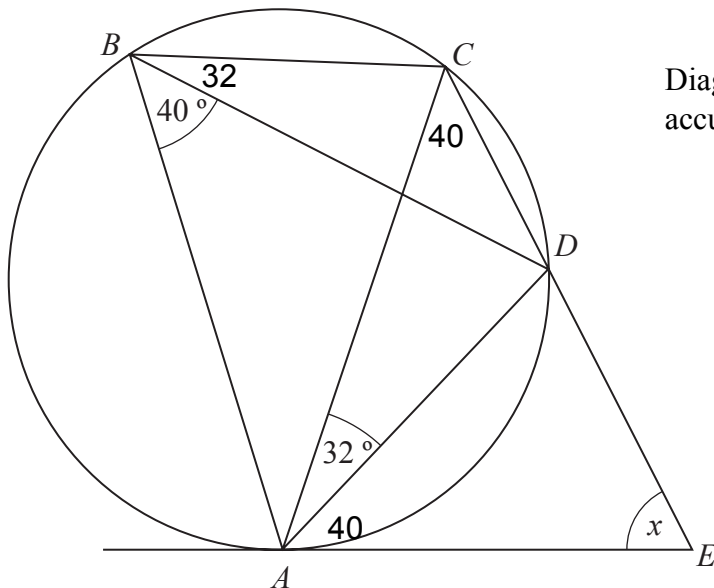


Diagram **NOT**  
accurately drawn

Work out the size of angle  $AED$ , marked  $x$ , on the diagram.  
You **must** show your working.  
Give reasons for any angles you work out.

$\angle ACB = 40^\circ$  (Angles subtended by an arc in the same segment of a circle are equal)

$\angle DAE = 40^\circ$  (Alternate segment to  $\angle ABD$ )

$$x = 180 - 40 - 32 - 40 \text{ (Angles in a triangle add up to } 180^\circ \text{)}$$

$$x = 68^\circ$$

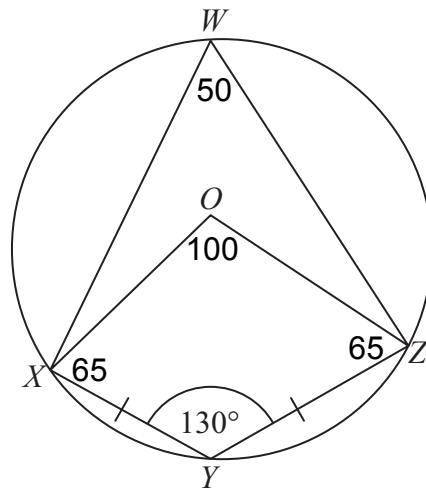
.....68..... degrees

**(Total 5 marks)**



11.

Diagram **NOT**  
accurately drawn



$W, X, Y$  and  $Z$  are points on a circle, centre  $O$ .  
 $XY = YZ$ .  
 Angle  $XYZ = 130^\circ$ .

- (a) Write down the size of angle  $XWZ$ .  
 Give a reason for your answer.

$$180 - 130 = 50$$

$\angle XWY = 50^\circ$  (Opposite angles in a cyclic quadrilateral add up to  $180^\circ$ )

.....50.....  
 (2)

- (b) Work out the size of angle  $OZY$ .  
 Give reasons for your answer.

$\angle XOZ = 100^\circ$  (The angle subtended at the centre of a circle is twice  
 the angle subtended at the circumference)

$\angle WXY = \angle WZY$  (Equal opposite angles of kite as 2 sides are radii  
 and the other 2 sides are marked equal)

$$\begin{aligned} \angle OZY &= (360 - 100 - 130) \div 2 \text{ (Angles of a quadrilateral add up to } 360^\circ) \\ &= 65^\circ \end{aligned}$$

.....65.....  
 (4)

(Total 6 marks)



Write your name here

Surname

Other names

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# Mathematics A

## Cumulative Frequency

### Model Answers

**Higher Tier**

Past Paper Style Questions  
Arranged by Topic

Paper Reference

**1MA0/1H**

**You must have:** Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

### Instructions

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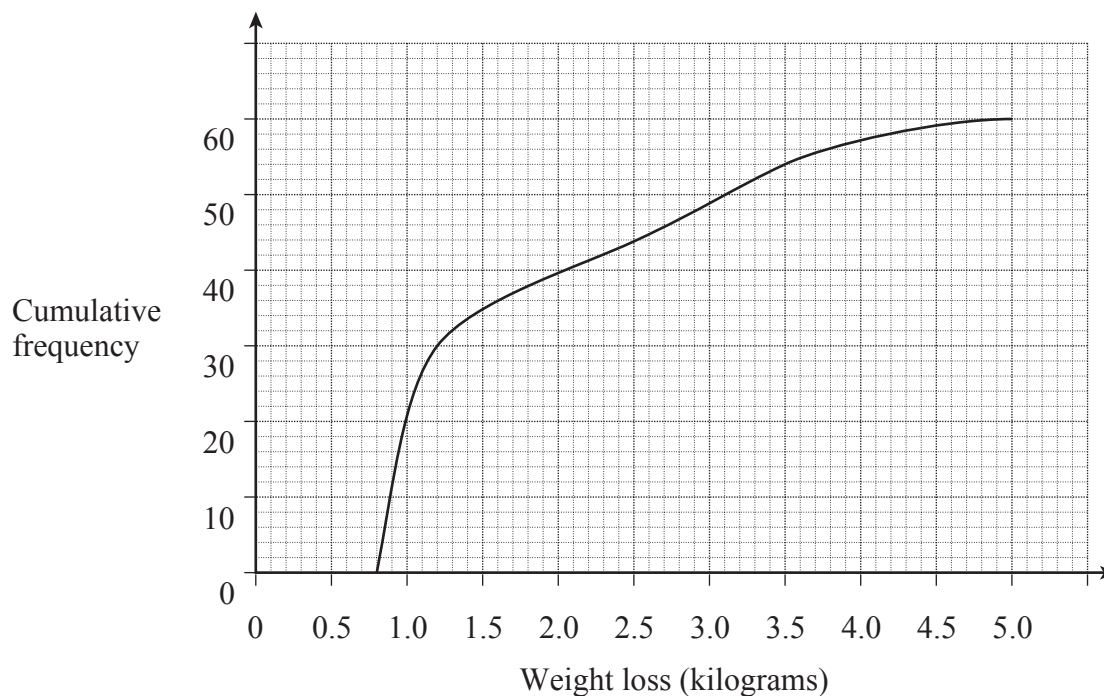
Turn over ►



1. Two groups of people are trying to lose weight.

(a) Group A join a gym.

The graph shows information about their weight loss after one month.



(i) How many people are in group A?

.....60.....  
(1)

(ii) Does everyone in group A lose weight?  
Write down how you decide.

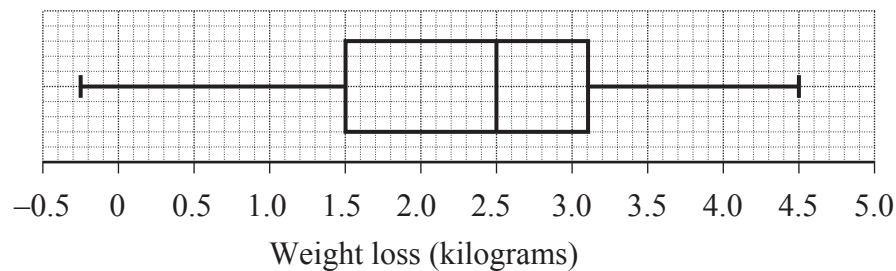
Yes. The minimum weight loss is 0.8 kg

(1)





- (b) Group B follow a diet.  
The box plot shows information about their weight loss after one month.



Does everyone in group B lose weight?  
Write down how you decide.

Not everyone loses weight. One reading shows -0.25 which is a weight gain.

(1)

- (c) Compare the weight loss of group A with group B.

Range for A:  $5 - 0.8 = 4.2$

Median for A: 1.2

Interquartile range for A:  $2.6 - 0.9 = 1.7$

Range for B:  $4.5 + 0.25 = 4.75$

Median for B = 2.5

Interquartile range for B:  $3.1 - 1.5 = 1.6$

Range higher for B, so results more variable.

Median for B higher, so greater success rate.

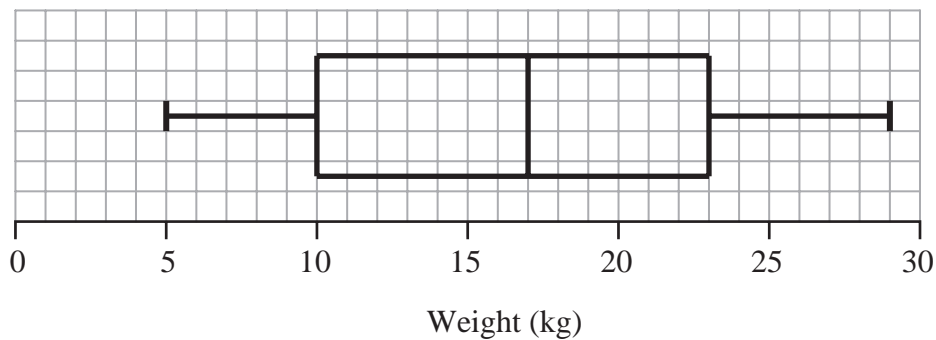
Interquartile ranges similar, so A and B both good.

(5)

(Total 8 marks)



2. The box plot gives information about the distribution of the weights of bags on a plane.



- (a) Georgina says the lightest bag weighs 10 kg.

She is **wrong**.  
Explain why.

...The lightest bag weighs 5 kg.

(1)

- (b) Write down the median weight.

.....17..... kg  
(1)

- (c) Work out the interquartile range of the weights.

$$23 - 10 = 13$$

.....13..... kg  
(1)

There are 240 bags on the plane.

- (d) Work out the number of bags with a weight of 23 kg or more.

There are 24 squares along the box plot (29 - 5)

Each square represents 10 bags (240 ÷ 24)

There are 6 squares after 23

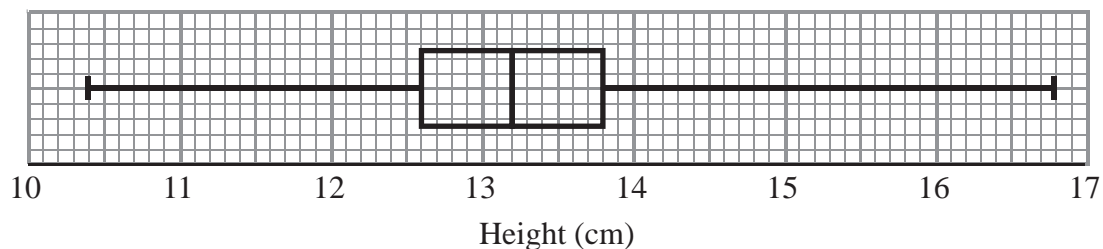
There are 60 bags (6 × 10)

.....60.....  
(2)

(Total 5 marks)



3. David measured the height, in cm, of each tomato plant in his greenhouse.  
He used the results to draw the box plot shown below.



- (a) Write down the median height.

.....13.2.....cm  
(1)

- (b) Work out the interquartile range.

$$13.8 - 12.6 = 1.2$$

.....1.2.....cm  
(2)

- (c) Explain why the interquartile range may be a better measure of spread than the range.

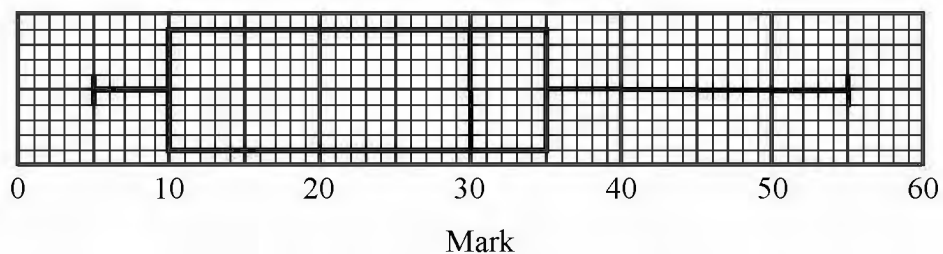
The range includes extreme values which are not typical. The interquartile range shows where half the measurements lie and so gives a good idea of the typical measurements.

(1)

**(Total 4 marks)**



4. The incomplete box plot and table show some information about some marks.



	Mark
Lowest mark	5
Lower quartile	10
Median	30
Upper quartile	35
Highest mark	55

- (a) Use the information in the table to complete the box plot.

(2)

- (b) Use the information in the box plot to complete the table.

(1)

(Total 3 marks)



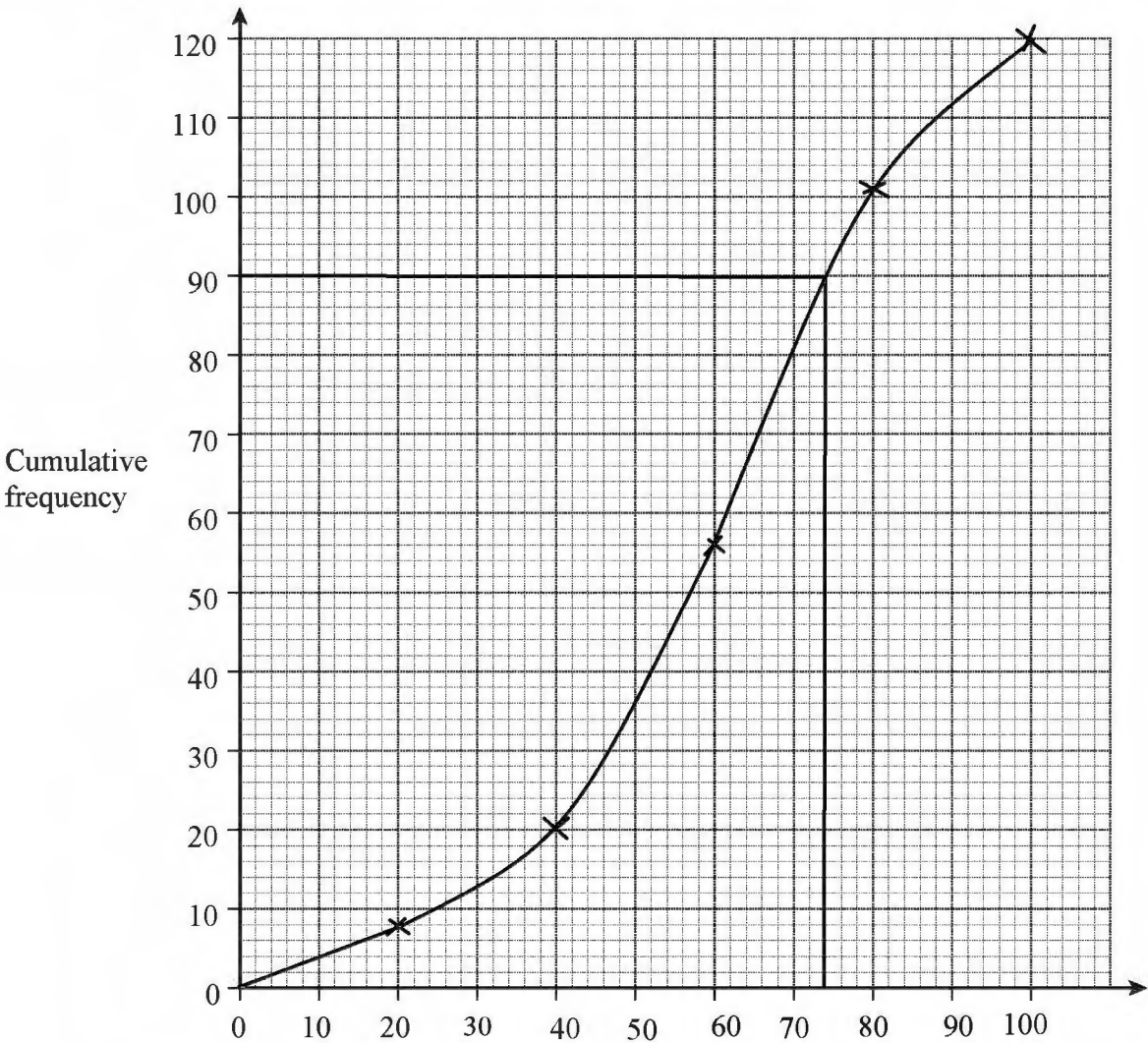
5.

The table shows a summary of the marks scored by 120 people in a test.

Mark	Frequency	Cumulative Frequency
$0 < \text{mark} \leq 20$	8	8
$20 < \text{mark} \leq 40$	12	20
$40 < \text{mark} \leq 60$	46	66
$60 < \text{mark} \leq 80$	35	101
$80 < \text{mark} \leq 100$	19	120

( a ) Three-quarters of the people pass the test.

Use a cumulative frequency graph to estimate the pass mark.



.....74.....  
(5)



( b ) Here is the table again.

Mark	Frequency
$0 < \text{mark} \leq 20$	8
$20 < \text{mark} \leq 40$	12
$40 < \text{mark} \leq 60$	46
$60 < \text{mark} \leq 80$	35
$80 < \text{mark} \leq 100$	19

Two of these 120 people are chosen at random.

(i) Work out the probability that both scored **over** 60.

$$P(\text{1st person scores over 60}) = \frac{54}{120}$$

$$P(\text{2nd person scores over 60}) = \frac{53}{119}$$

$$P(\text{Both score over 60}) = \frac{54}{120} \times \frac{53}{119} = \frac{477}{2380} \text{ or } 0.2004$$

(2)

(ii)

Work out the probability that one scored **over** 80 and the other scored 80 or **under**.

$$p(\text{1st over 80}) = \frac{19}{120}$$

$$p(\text{2nd 80 or under}) = \frac{101}{119}$$

$$p(\text{2nd over 80}) = \frac{19}{119}$$

$$p(\text{1st 80 or under}) = \frac{101}{120}$$

$$\left( \frac{19}{120} \times \frac{101}{119} \right) + \left( \frac{19}{119} \times \frac{101}{120} \right)$$

$$= \frac{1919}{7140} \text{ or } 0.268767507$$

(3)

(Total 10 marks)



6. Georgina did a survey about the amounts of money spent by 120 families during summer holidays.

The cumulative frequency table gives some information about the amounts of money spent by the 120 families.

Amount (£A) spent	Cumulative frequency
$0 \leq A < 100$	13
$0 \leq A < 150$	25
$0 \leq A < 200$	42
$0 \leq A < 250$	64
$0 \leq A < 300$	93
$0 \leq A < 350$	110
$0 \leq A < 400$	120

- (a) On the grid, draw a cumulative frequency diagram.

(2)

- (b) Use your cumulative frequency diagram to estimate the median.

£ ...245.....  
(2)

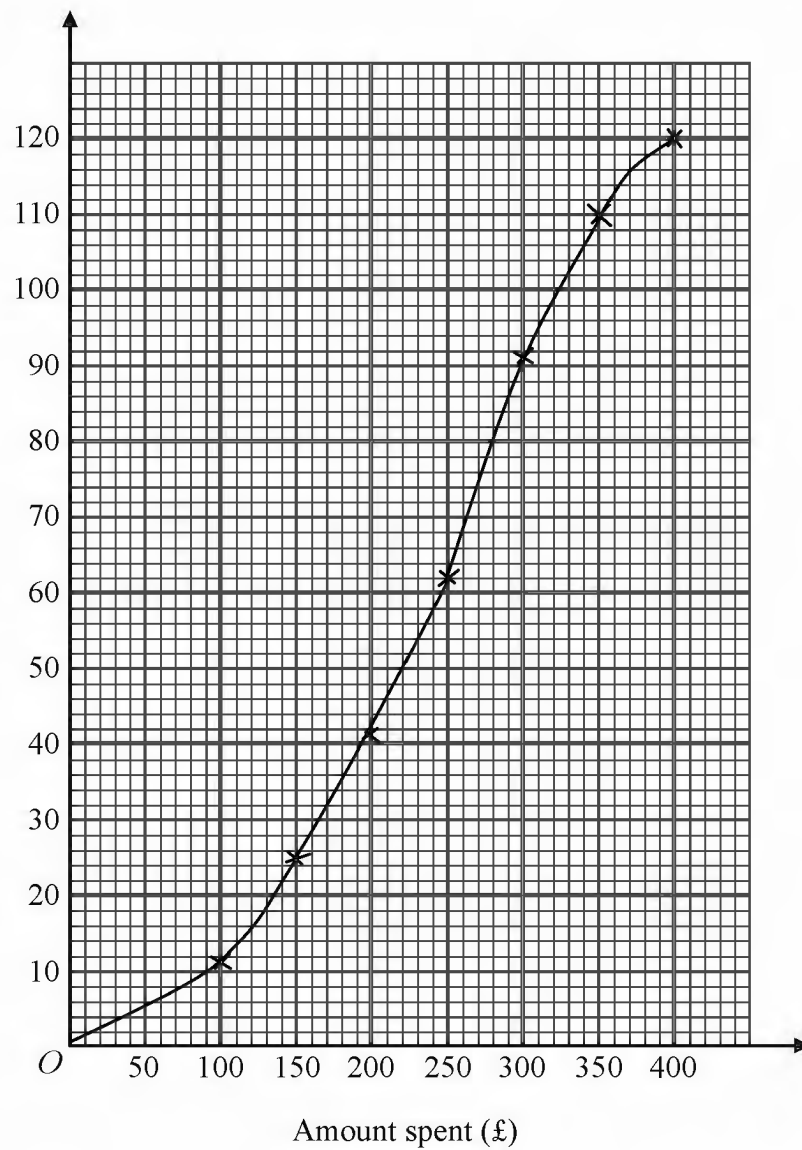
A survey of the amounts of money spent by 200 families during their Christmas holidays gave a median of £305

- (c) Compare the amounts of money spent at Christmas with the amounts of money spent in summer.

.....The median amount spent at Christmas is £60 more than in summer.....  
.....  
(1)



Cumulative frequency



(Total 5 marks)





7. The table shows information about the number of felt tip pens in 100 childrens pencil cases.

Number of pens	Frequency
$0 < n \leq 20$	18
$20 < n \leq 40$	22
$40 < n \leq 60$	35
$60 < n \leq 80$	15
$80 < n \leq 100$	8
$100 < n \leq 120$	2

(a) Complete the cumulative frequency table for this information.

Number of pens	Cumulative frequency
$0 < n \leq 20$	18
$0 < n \leq 40$	40
$0 < n \leq 60$	75
$0 < n \leq 80$	90
$0 < n \leq 100$	98
$0 < n \leq 120$	100

(1)

(b) On the grid, draw a cumulative frequency graph for your table.

(2)



8. A company tested 100 batteries.

The table shows information about the number of hours that the batteries lasted.

Time ( $t$ hours)	Frequency
$50 \leq t < 55$	12
$55 \leq t < 60$	21
$60 \leq t < 65$	36
$65 \leq t < 70$	23
$70 \leq t < 75$	8

- (a) Complete the cumulative frequency table for this information.

(1)

Time ( $t$ hours)	Cumulative frequency
$50 \leq t < 55$	12
$55 \leq t < 60$	33
$60 \leq t < 65$	69
$65 \leq t < 70$	92
$70 \leq t < 75$	100

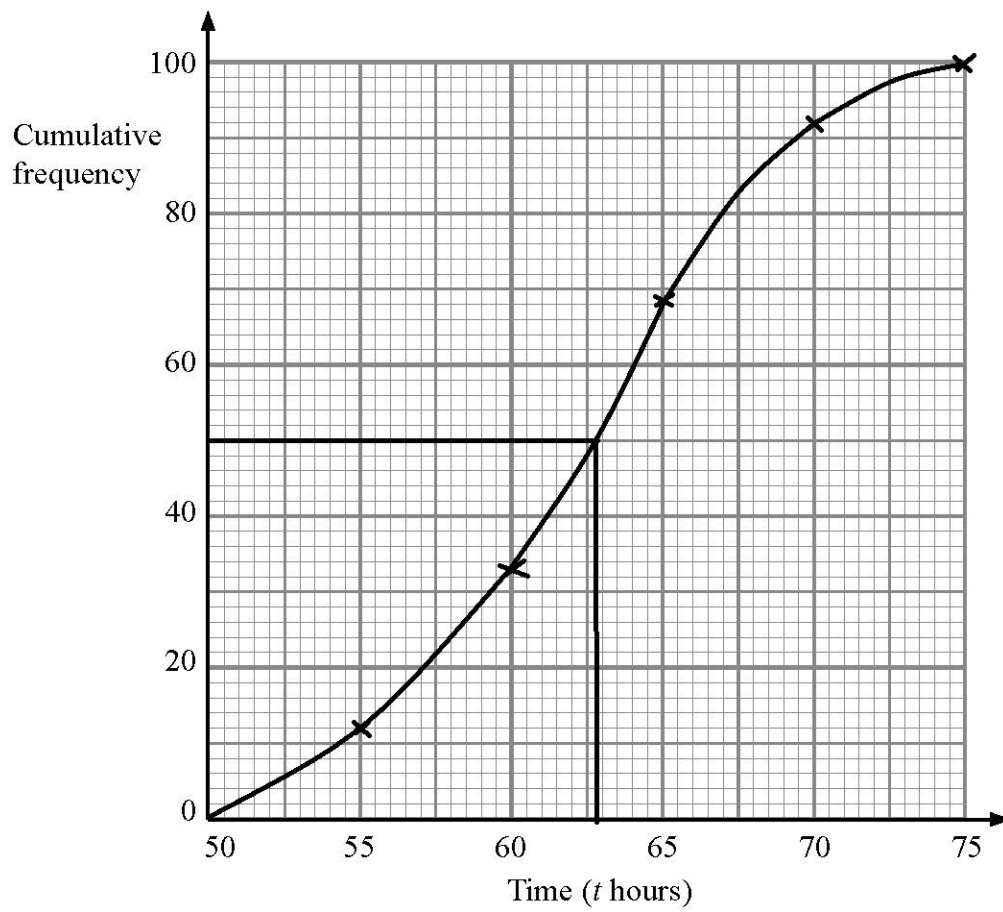
- (b) On the grid, draw a cumulative frequency graph for your completed table.

(2)

- (c) Use your completed graph to find an estimate for the median time.  
You must state the units of your answer.

.....62 hours.....  
(2)





(Total 5 marks)



9. The table gives some information about the number of fish caught in a match.

Number of fish	Frequency
$0 < n \leq 20$	16
$20 < n \leq 30$	26
$30 < n \leq 40$	23
$40 < n \leq 50$	10
$50 < n \leq 60$	5

(a) Write down the modal class interval.

$20 < n \leq 30$

.....

(1)

(b) Complete the cumulative frequency table.

Number of fish	Cumulative Frequency
$0 < n \leq 20$	16
$0 < n \leq 30$	42
$0 < n \leq 40$	65
$0 < n \leq 50$	75
$0 < n \leq 60$	80

(1)

(c) On the grid opposite, draw a cumulative frequency graph for your table.

(2)

(d) Use your graph to find an estimate for

(i) the median number of fish,

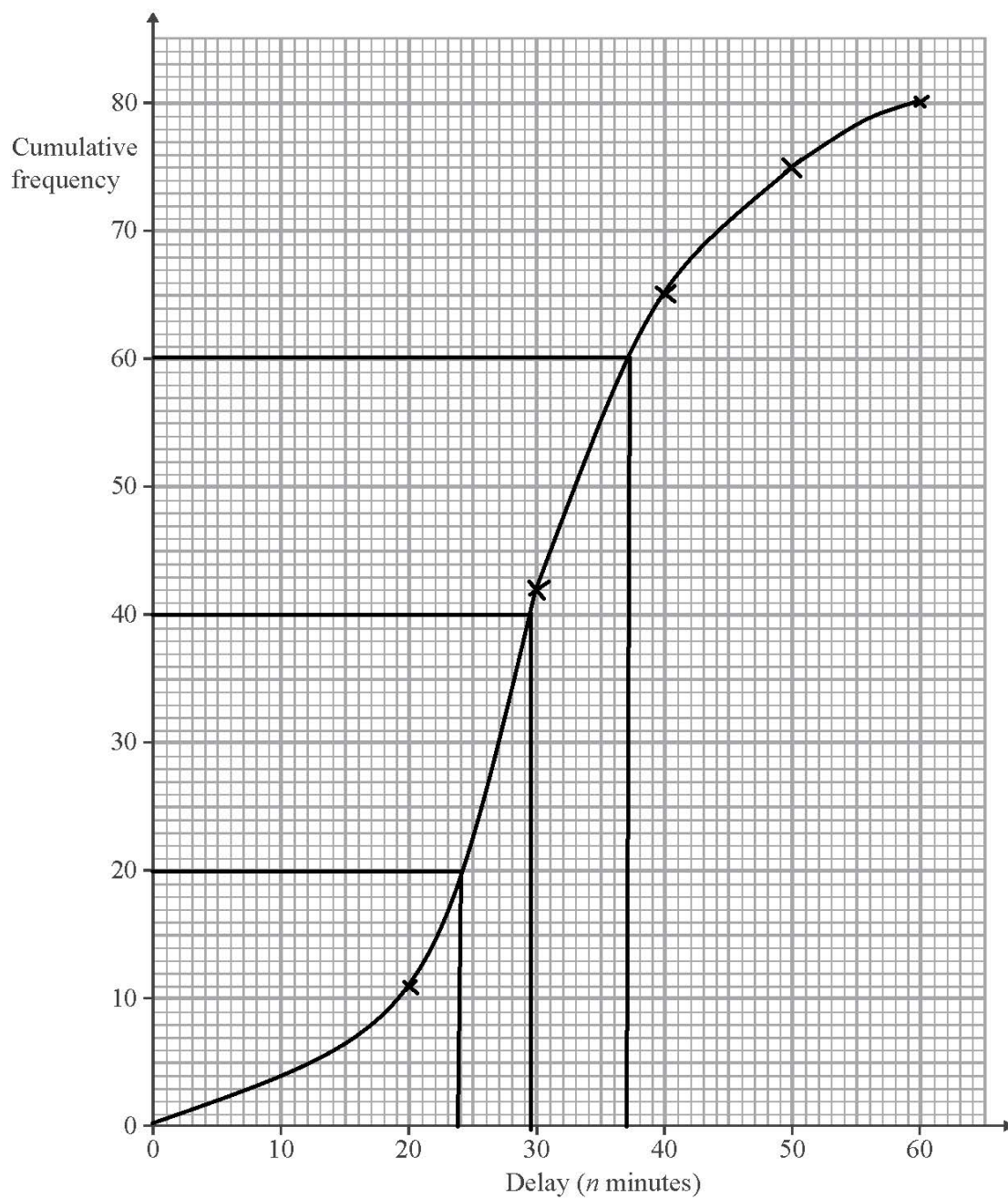
29  
.....

(ii) the interquartile range of the number of fish.

Interquartile range:  $37 - 22 = 15$

(3)

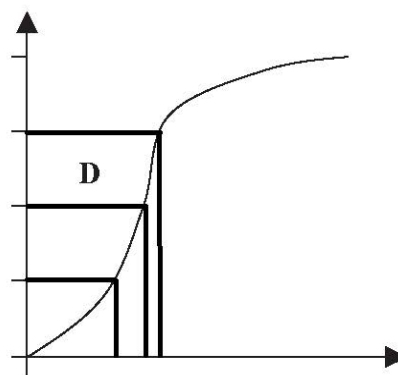
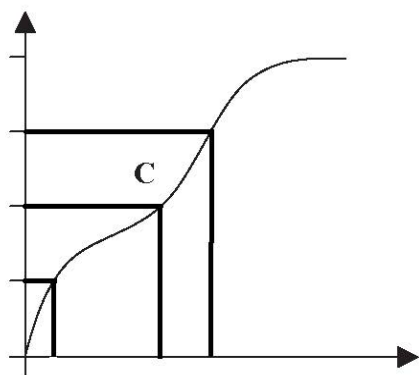
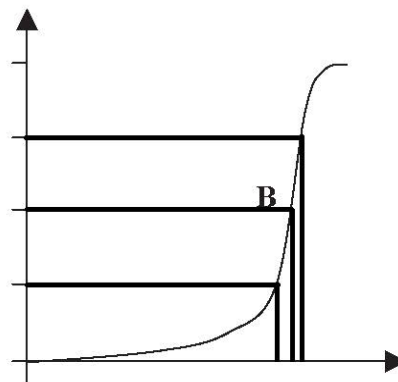
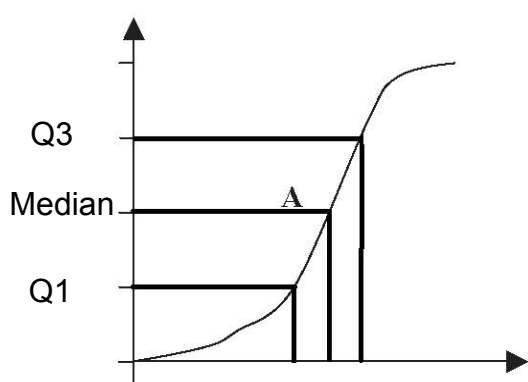




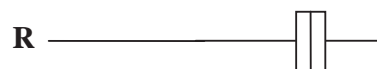
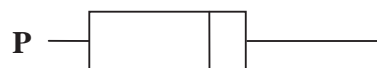
(Total 7 marks)



10. Here are four cumulative frequency diagrams.



Here are four box plots.



For each box plot, write down the letter of the appropriate cumulative frequency diagram.

P and .....C.....

Q and .....D.....

R and .....B.....

S and .....A.....

(Total 2 marks)



11. The table shows information about the height,  $m$  millimetres 120 tomato plants grow in a week.

Height ( $m$ millimetres)	Frequency
$70 < m \leq 80$	4
$80 < m \leq 90$	12
$90 < m \leq 100$	34
$100 < m \leq 110$	32
$110 < m \leq 120$	26
$120 < m \leq 130$	12

- (a) Write down the modal class interval.

$90 < m \leq 100$   
(1)

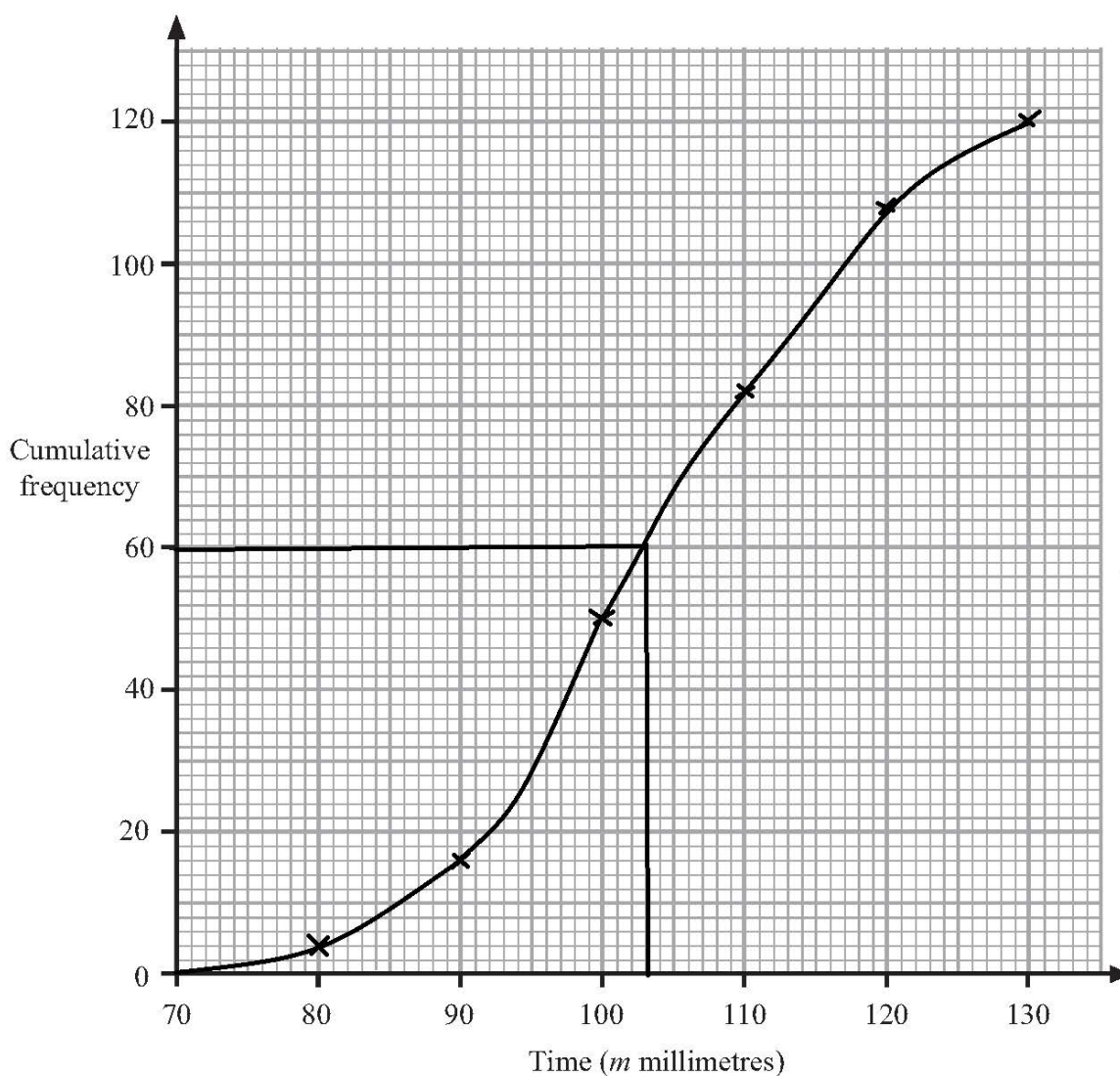
- (b) Complete the cumulative frequency table.

Height ( $m$ millimetres)	Cumulative frequency
$70 < m \leq 80$	4
$70 < m \leq 90$	16
$70 < m \leq 100$	50
$70 < m \leq 110$	82
$70 < m \leq 120$	108
$70 < m \leq 130$	120

(1)



(c) On the grid, draw a cumulative frequency graph for your cumulative frequency table.



(d) Use your graph to find an estimate for the median.

.....103..... minutes  
(1)

(Total 5 marks)





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Write your name here

Surname

Other names

In the style of:

**Edexcel GCSE**

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Candidate Number

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# Mathematics A

## Fractions

### Model Answers

**Foundation Tier**

Past Paper Style Questions  
Arranged by Topic

Paper Reference

**1MA0/2F**

**You must have:** Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

### Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided  
– *there may be more space than you need.*
- **Calculators may be used.**



### Information

- The total mark for this paper is 100
- The marks for **each** question are shown in brackets  
– *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (\*) are ones where the quality of your written communication will be assessed.

### Advice

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- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►



1. David earns a salary of £3500 per month.

He gets a pay rise of 4%.

Work out his new monthly salary.

Method 1

$$1\% \text{ of } 3500 = 35$$

$$4\% = 4 \times 35$$

$$= 140$$

$$\text{New salary} = 3500 + 140$$

$$= 3640$$

Method 2

$$3500 \times \frac{4}{100} = 140$$

$$\begin{aligned} \text{New salary} &= 3500 + 140 \\ &= 3640 \end{aligned}$$

Method 3

$$3500 \times 1.04 = 3640$$

$$\begin{array}{r} \text{.....} 3640 \text{.....} \\ (3) \end{array}$$



**2(a)**

Helen wins a race.

Her time is recorded as 50.36 seconds. Andrew comes second in the race.

His time is three-hundredths of a second slower.

Work out Andrew's time.

$$50.36 + 0.03 = 50.39$$

$$\begin{array}{r} \dots 50.39 \dots \\ (2) \end{array}$$

**(b)**

Round Michael's time of 50.36 seconds to 1 decimal place.

$$50.4$$

$$\begin{array}{r} \dots 50.4 \dots \\ (1) \end{array}$$

**(Total 6 marks)**



3. Write a number in each box to make correct statements.

(a)  $50\% = \frac{\boxed{1}}{2}$

(1)

(b)  $0.3 = \frac{\boxed{3}}{10}$

(1)

(c)  $\frac{1}{3} = \frac{\boxed{3}}{9}$

(1)

(d)  $\frac{3}{15} = \frac{\boxed{1}}{5}$

(1)

Total 4 marks)



4. Two banks calculate the yearly interest they pay customers.

**Westminster Bank**

4% of the total that you invest

For example: Invest £700

Interest = 4% of £700

**District Bank**

1% of the first £300 that you invest 6% of  
amounts over £300 that you invest

For example: Invest £700 Interest  
= 1% of £300 + 6% of £400

Ashna has £500 to invest for one year.

Work out which bank will pay her more interest.

State how much **extra** interest she will earn.

**Westminster Bank**

1% of 500 = 5

4% =  $5 \times 4$

= £20

**District Bank**

1% of 300 = 3

6% of 200 = 12

Interest =  $3 + 12$

= 15

$$20 - 15 = 5$$

Bank ...Westminster Bank.....

Extra Interest £..5.....

(5)



- 5 There are 180 people at a wedding. 20% are children.  
One-half are men. The rest are women.

How many women are at the wedding?

Children

$$10\% = 18$$

$$20\% = 36$$

There are 36 children

Men

$$\text{Half of } 180 = 90$$

Women

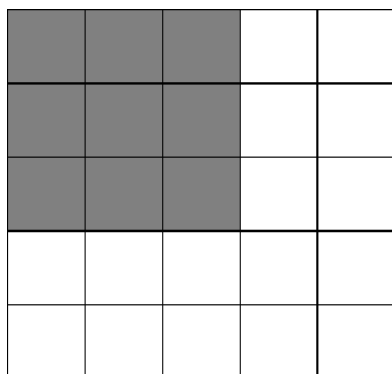
$$180 - 36 - 90 = 54$$

Answer .....54.....

(4)

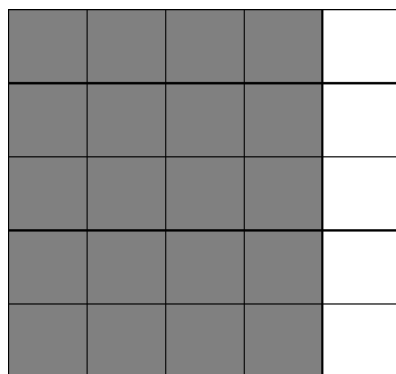


- 6 (a) Shade  $\frac{9}{25}$  of this square grid.



(1)

- (b) Shade  $\frac{4}{5}$  of this square grid.



(1)

- (c) Use your answers to part (a) and part (b) to write down the answer to

$$\frac{4}{5} - \frac{9}{25}$$

Answer  $\frac{11}{25}$  .....

(1)

- (d) Work out  $\frac{2}{3}$  of 36

$$\begin{array}{r} 21236 \\ \times 2 \\ \hline 42472 \\ 42472 \\ \hline 84944 \\ = 84944 \end{array}$$

Answer...24.....

(2)





7. (a) Use your calculator to work out  $\frac{4.7}{9.4 - 3.5}$

Write down all the figures on your calculator display.

.....0.7966101695.....  
(2)

- (b) Write these numbers in order of size.  
Start with the smallest number.

0.82	$\frac{4}{5}$	85%	$\frac{2}{3}$	$\frac{7}{8}$
	0.8	0.85	0.667	0.875

$\frac{2}{3}$	$\frac{4}{5}$	0.82	85%	$\frac{7}{8}$
.....				

(2)  
(Total 4 marks)



9. A concert ticket costs £65 plus a booking charge of 15%.

Work out the total cost of a concert ticket.

Method 1

$$65 \times \frac{15}{100} = 9.75$$

$$65 + 9.75 = 74.75$$

Method 2

$$65 \times 1.15 = 74.75$$

Method 3

Using a simple calculator key in:

$$65 + 15\% = 74.75$$

£ ...74.75.....

(Total 3 marks)

10. A school canteen sells salads and hot meals.

In one week the number of salads sold and the number of hot meals sold were in the ratio 3 : 5

The total number of salads and hot meals sold in the week was 1456

Work out the number of salads sold.

3 : 5

$$3 + 5 = 8$$

There are 8 shares

$$1456 \div 8 = 182$$

Each share is 182

$$3 \times 182 = 546$$

.....546.....

(Total 2 marks)



11. A garage sells British cars and foreign cars.

The ratio of the number of British cars sold to the number of foreign cars sold is  $2 : 7$

The garage sells 45 cars in one week.

(a) Work out the number of British cars the garage sold that week.

$$2 : 7$$

$$2 + 7 = 9$$

There are 9 shares

$$45 \div 9 = 5$$

Each share is 5

$$2 \times 5 = 10$$

$$\dots\dots\dots 10 \dots\dots\dots$$

(2)

A car tyre costs £80 plus VAT at  $17\frac{1}{2}\%$ .

(b) Work out the total cost of the tyre.

Method 1

$$80 \times 1.175 = 94$$

Method 2

Using a simple calculator key in:

$$80 + 17.5\%$$

The display will show 94

$$\pounds \dots 95 \dots\dots\dots$$

(3)

The value of a new car is £14 000

The value of the car depreciates by 20% per year.

(c) Work out the value of the car after 2 years.

Method 1

$$\text{Year 1} \dots\dots\dots 14000 \times 0.8 = 11200$$

$$\text{Year 2} \dots\dots\dots 11200 \times 0.8 = 8960$$

Method 3

Using a simple calculator key in:

$$14000 - 20\% - 20\%$$

The display shows 8960

Method 2

Year 1

$$14000 \times \frac{20}{100} = 2800$$

$$14000 - 2800 = 11200$$

Year 2

$$11200 \times \frac{20}{100} = 2240$$

$$11200 - 2240 = 8960$$

$$\pounds \dots 8960 \dots\dots\dots$$

(3)



12. There are some pens in a bag.

36 of the pens are blue.

24 of the pens are black.

- (a) Write down the ratio of the number of blue pens to the number of black pens.  
Give your ratio in its simplest form.

$$\begin{array}{l} 36 : 24 \\ 3 : 2 \end{array}$$

$$\dots\dots\dots 3 \dots\dots : \dots\dots 2 \dots\dots$$

(2)

There are some books and comics in a box.

The total number of books and comics is 54

The ratio of the number of books to the number of comics is 1 : 5

- (b) Work out the number of books in the box.

$$1:5$$

$$1+5=6$$

There are 6 shares

$$54 \div 6 = 9$$

A share is 9

Books get 1 share so there are 9 books.

$$\dots\dots\dots 9 \text{ books} \dots\dots$$

(2)

**(Total 4 marks)**



13. Louis invested £6500 for 2 years in a savings account.

He was paid 4% per annum compound interest.

(a) How much did Louis have in his savings account after 2 years?

Method 1

Year 1

$$6500 \times 1.04 = 6760$$

Year 2

$$6760 \times 1.04 = 7030.40$$

Method 2

$$6500 \times 1.04^2 = 7030.40$$

Method 3

Using a simple calculator key in:

$$6500 + 4\% + 4\%$$

The display will show 7030.4

£ ...7030.40.....

This also works with some scientific calculators

(3)

Hassan invested £2400 for  $n$  years in a savings account.

He was paid 7.5% per annum compound interest.

At the end of the  $n$  years he had £3445.51 in the savings account.

(b) Work out the value of  $n$ .

$$2400 \times 1.075^n = 3445.51$$

Trial and improvement

$$2400 \times 1.075^4 = 3205 \quad \text{Too small}$$

$$2400 \times 1.075^6 = 3703 \quad \text{Too big}$$

$$2400 \times 1.075^5 = 3445.51 \quad \text{Correct}$$

.....5.....  
(2)

(Total 5 marks)



14. (a) Work out  $\frac{2}{3} \div \frac{7}{9}$

Give your fraction in its simplest form.

$$\begin{aligned} & \frac{2}{3} \div \frac{7}{9} \\ &= \frac{2}{3} \times \frac{9}{7} \\ &= \frac{6}{7} \end{aligned}$$

$$\frac{6}{7}$$

.....

(3)

(b) Work out  $2\frac{1}{3} - 1\frac{2}{5}$

Make top heavy

$$\begin{aligned} &= \frac{7}{3} - \frac{7}{5} \\ &= \frac{35 - 21}{15} \\ &= \frac{14}{15} \end{aligned}$$

$$\frac{14}{15}$$

.....

(3)

(Total 6 marks)



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Other names

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# Mathematics A Frequency

## Model Answers

**Foundation Tier**

Past Paper Style Questions  
Arranged by Topic

Paper Reference

**1MA0/2F**

**You must have:** Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

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Turn over ►





1 (a) Basil records the types of fish that he caught during his holiday in The Bahamas.

(i) Complete the table.

Type of fish	Tally	Frequency
Mutton Fish	IIII	4
Grouper	III	3
Jack	<del>HHI</del> HII II	12
Schoolmaster	<del>HHI</del> IIII	9
	<b>Total</b>	<b>28</b>

(3)

(ii) What fraction of the fish are Mutton Fish?  
Give your answer in its simplest form.

$$\frac{4}{28} = \frac{1}{7}$$











$\frac{1}{7}$  (2)

(b) This table shows the types of fish that Peter caught during the holiday.

Type of fish	Mutton Fish	Grouper	Jack	Schoolmaster
Frequency	4	6	5	3

She has finished the first row of a pictogram to show the results. Complete the key and pictogram.

Key:  represents .....2..... fish

Mutton Fish	 
Grouper	  
Jack	  
Schoolmaster	 

(4)



- (c) 500 000 people record the types of birds in their gardens. In total, they record eight million birds.  
On average, how many birds does each person record?

$$\frac{8\,000\,000}{500\,000} = \frac{80}{5} = 16$$

.....16.....  
(3)

- (d) Here is a list of the birds at a bird table.

robin	robin	sparrow	blackbird	starling
blackbird	starling	blackbird	robin	blackbird

One bird flies away.  
Another bird arrives at the bird table.  
The new mode is robin.

What type of bird flies away and what type of bird arrives? Complete the table.

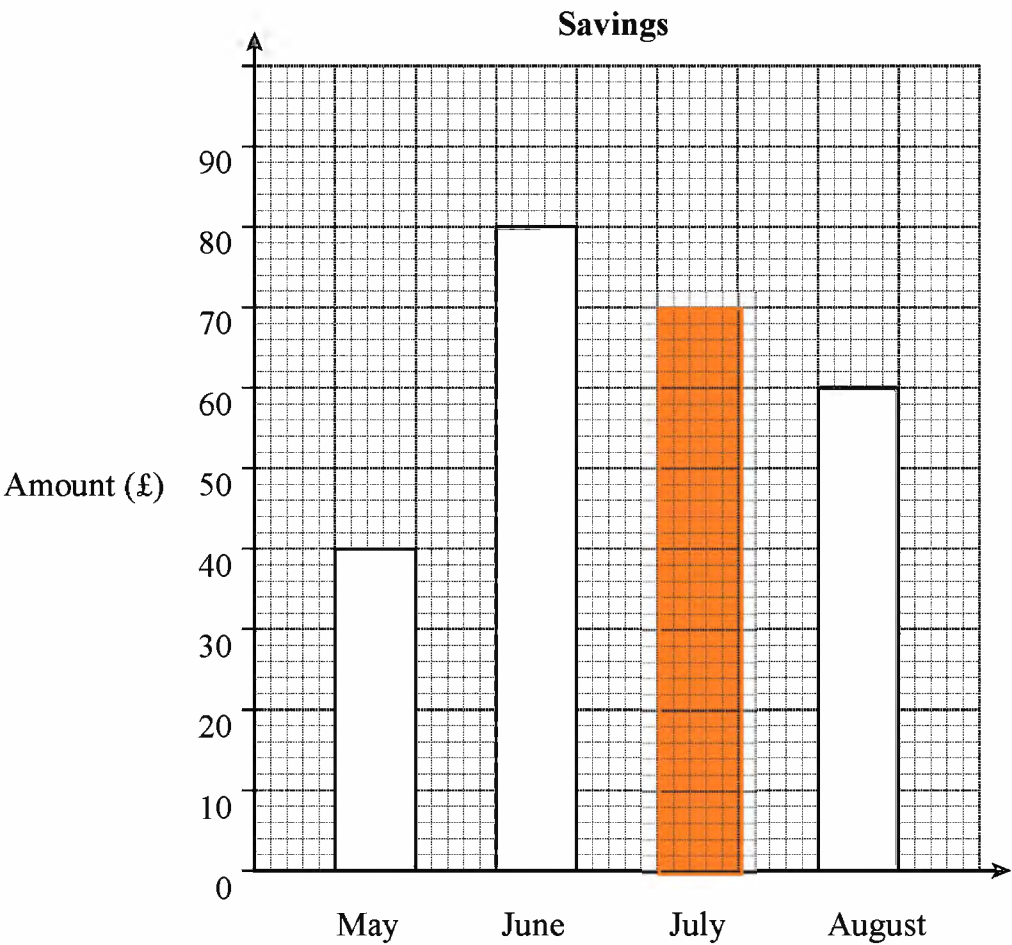
	Type of bird
Flies away	blackbird
Arrives	robin

(2)

(Total 14 marks)



2 (a)      The bar chart shows the amounts Isaac saves in May, June and August 2010.



(i)    How much does he save in May 2010?

£ ...40.....  
(1)

(ii)   From May to August he saves £250 in total.

Complete the bar chart by drawing the bar for July.

$250 - 40 - 80 - 60 = 70$

(3)



- (b) The pictogram shows the amounts Isaac saves in the next four months.

Key: 

--	--

 represents £20

May	<div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div>
June	<div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div>
July	<div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div>
August	<div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div> <div></div>

Work out the range of the amount he saves in these four months. You **must** show your working.

July £30

May £80

To find the range take the lowest from the highest

$$80 - 30 = 50$$

£ ...50.....

(2)

- (c) (i) For the next 4 months he saves £50 each month.

How much has he saved in total?

He has saved £230 so far

$$50 \times 4 = 200$$

$$230 + 200 = 430$$

£ 430.....

(3)

- (ii) Isaac spends 50% of these total savings to pay for a holiday.

How much does he pay for the holiday?

$$430 \div 2 = 215$$

£ 215.....

(2)

(Total 11 marks)



3. Is money discrete or continuous? Tick a box.

☒

Discrete

☐

Continuous

Give a reason for your answer.

Money is individually in distinct number quantities. You count discrete data and you measure continuous data.

(1)

Peter sells revision guides on a website. The sales in May are shown.

$x$ Sales (£)	$f$ Frequency	$fx$
8	10	80
10	18	180
12	7	84
15	4	60
20	1	20
	40	424

- (a) Calculate his mean price.

$$\begin{aligned}\bar{X} &= \frac{\sum fx}{\sum f} \\ &= \frac{424}{40} \\ &= 10.6\end{aligned}$$

£ .. 10.6.....

(3)

- (b) Peter says that his modal price and his median price are both £10. Is he correct?

Give reasons and working to show how you decide.

The modal price is the most frequently occurring price.  
The modal price is £10.

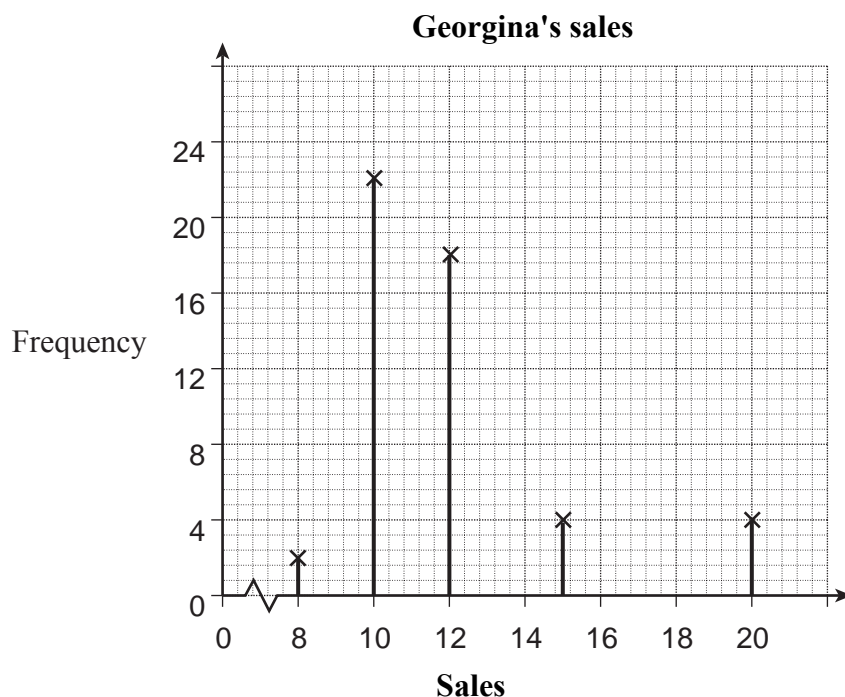
The median is the middle value when the data is arranged in order from smallest to largest. There are 40 values in the frequency column and the middle, between 20 and 21 corresponds with £10.

The median is £10.

(2)



- (c) Georgina also sells revision guides on a website



Give **one** similarity and **one** difference in the sales of Peter and Georgina.

Similarity ..... They both have £8 as their lowest price.....

.....

Difference ..... Peter has sales between £15 and £20 but Georgina does not.....

.....

(2)

(Total 10 marks)



4. Kelsi rolled a dice 10 times.

Here are her scores.

1    5    6    4    4    2    2    3    4    3

(a) Find the mode.

4 came up 3 times, which is more than any other number.

4

(1)

(b) Work out the mean.

$$1 + 5 + 6 + 4 + 4 + 2 + 2 + 3 + 4 + 3 = 34$$

$$34 \div 10 = 3.4$$

3.4

(2)

(c) Work out the range.

$$6 - 1 = 5$$

5

(2)

(Total 5 marks)



5. Here is a list of the fruit 24 people liked best.

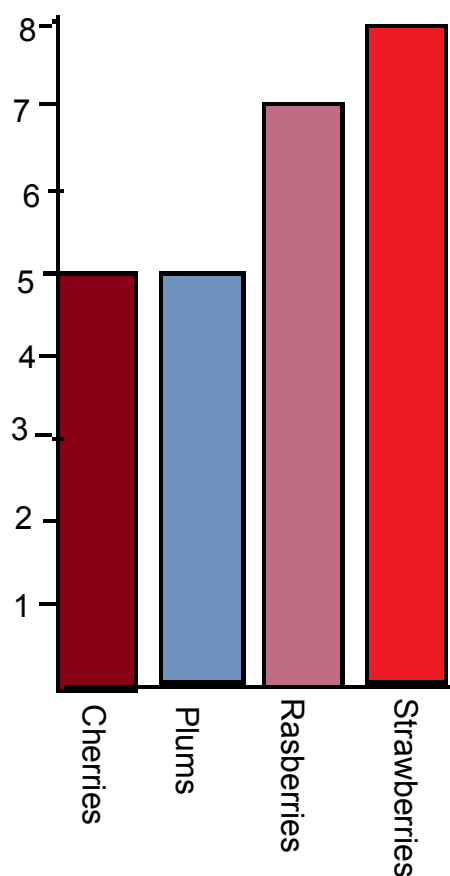
cherries      strawberries      cherries      raspberries      strawberries      plums  
 raspberries      cherries      strawberries      plums      raspberries      raspberries  
 raspberries      cherries      cherries      plums      strawberries      strawberries  
 plums      raspberries      strawberries      strawberries      plums      strawberries

(a) Complete the table for the information in the list.

Fruit	Tally	Frequency
cherries		5
plums		5
raspberries		7
strawberries		8

(2)

(b) Draw a suitable diagram to show this information in the table.  
 Use the space below.





6.

	Male	Female
First year	397	608
Second year	250	210

The table gives information about the numbers of students in the two years of a college course.

Hanna wants to interview some of these students.

She takes a random sample of 50 students stratified by year and by gender.

Work out the number of students in the sample who are male and in the first year.

Total number of students:

$$397 + 608 + 250 + 210 = 1465$$

Number of 1st year males in sample:

$$\frac{397}{1465} \times 50 = 13.55$$

or 14 students

.....14.....

(Total 3 marks)



7. Tara carried out a survey of the number of school dinners 34 students had in one week.

The table shows this information.

Number of school dinners ( $x$ )	Frequency ( $f$ )	$fx$
0	0	0
1	8	8
2	12	24
3	7	21
4	5	20
5	2	10

34

83

Calculate the mean.

$$\bar{X} = \frac{\sum fx}{\sum f}$$

$$\bar{X} = \frac{83}{34}$$

$$\bar{X} = 2.44$$

.....2.44.....

(Total 3 marks)



8. Sophie asked 32 women about the number of children they each had.

The table shows information about her results.

Number of children ( $x$ )	Frequency ( $f$ )	$fx$
0	9	0
1	6	6
2	7	14
3	8	24
4	2	8
more than 4	0	0
	32	52

(a) Find the mode.

The mode is 0 as this is the most common number

.....0.....  
(1)

(b) Calculate the mean.

$$\bar{X} = \frac{\sum fx}{\sum f}$$

$$\bar{X} = \frac{52}{32}$$

$$\bar{X} = 1.625$$

$$\text{or } 1\frac{5}{8}$$

.....1.625.....  
(3)

(Total 4 marks)



9. The table shows some information about the ages, in years, of 60 people.

	Age (in years)	Frequency
4.5	0 to 9	6
14.5	10 to 19	13
24.5	20 to 29	12
34.5	30 to 39	9
44.5	40 to 49	7
54.5	50 to 59	4
64.5	60 to 69	9

- (a) Write down the modal class.

.....10 to 19.....  
(1)

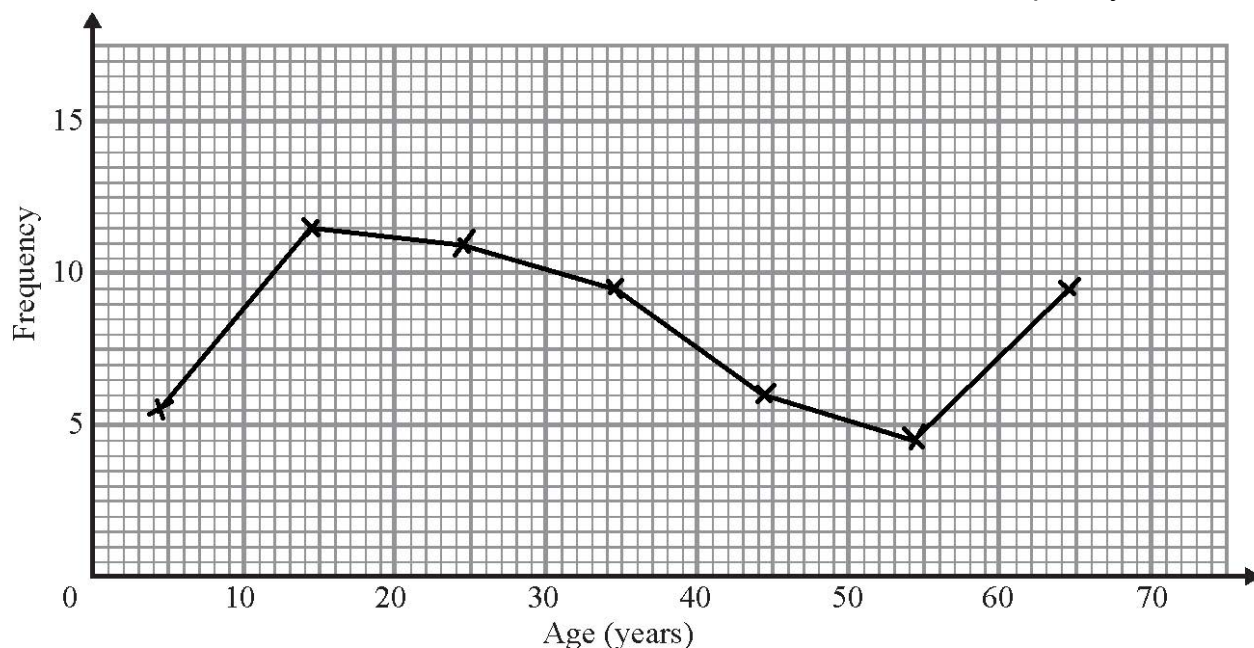
David says

‘The median lies in the class 30 to 39’

David is wrong.

- (b) Explain why.

....The median is between the 30th and the 31st number in the frequency column



- (c) On the grid, draw a frequency polygon for the information in the table.

(2)



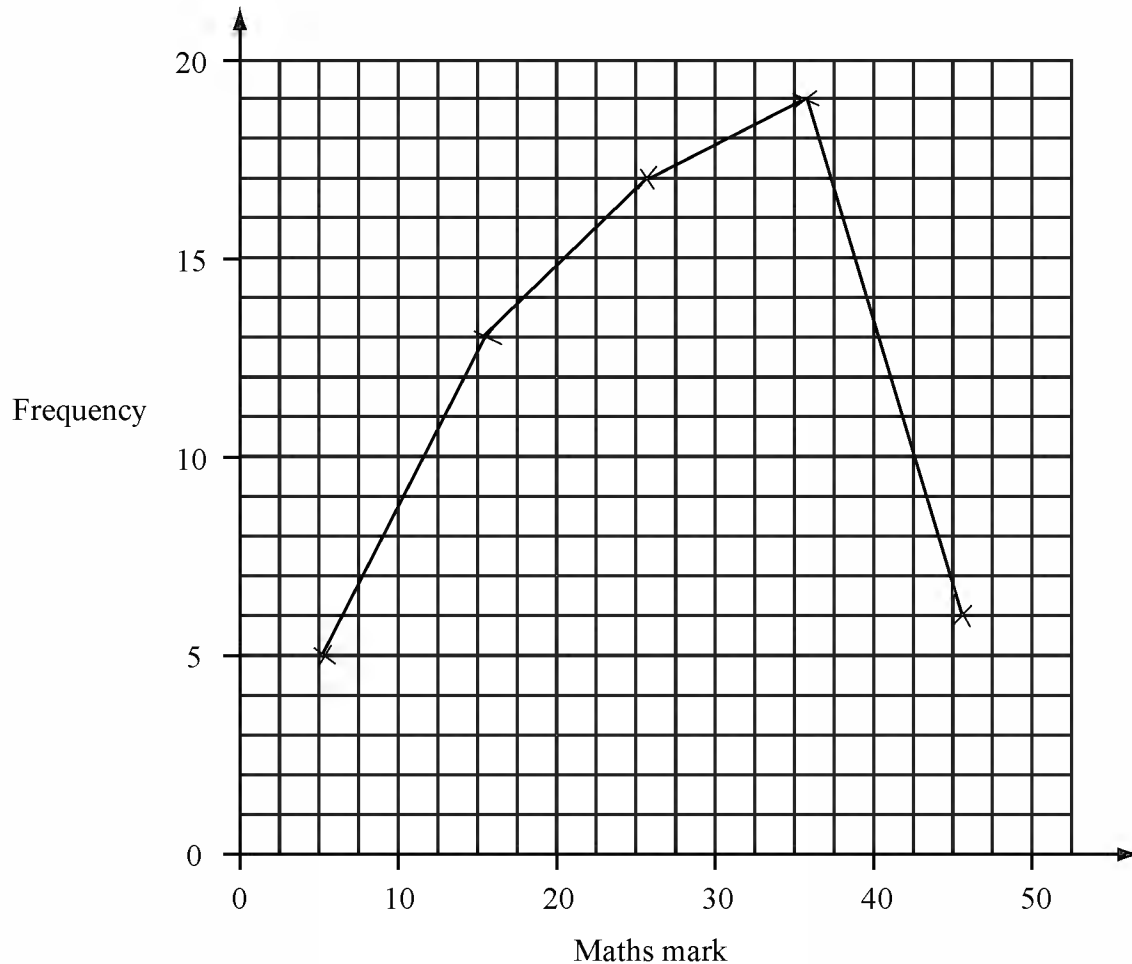
10. 60 students take a maths test.

The test is marked out of 50.

This table shows information about the students' marks.

Mid value	5.5	15.5	25.5	35.5	45.5
Maths mark	0-10	11-20	21-30	31-40	41-50
Frequency	5	13	17	19	6

On the grid, draw a frequency polygon to show this information.



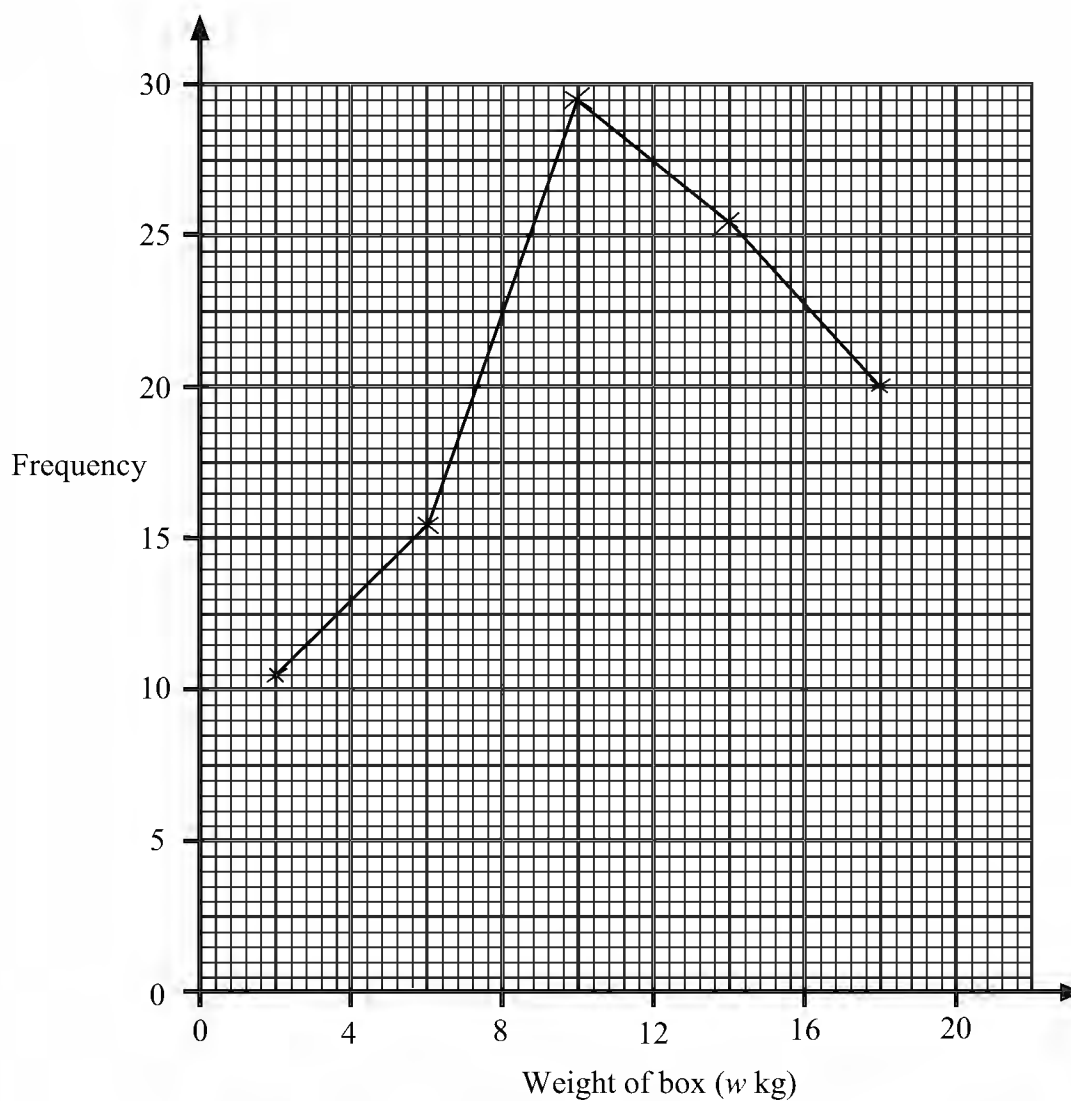
(Total 2 marks)



11. The table shows some information about the weights, in kg, of 100 boxes.

Mid value	Weight of box ( $w$ kg)	Frequency
2	$0 < w \leq 4$	11
6	$4 < w \leq 8$	16
10	$8 < w \leq 12$	29
14	$12 < w \leq 16$	26
18	$16 < w \leq 20$	20

Draw a frequency polygon to show this information.



(Total 2 marks)

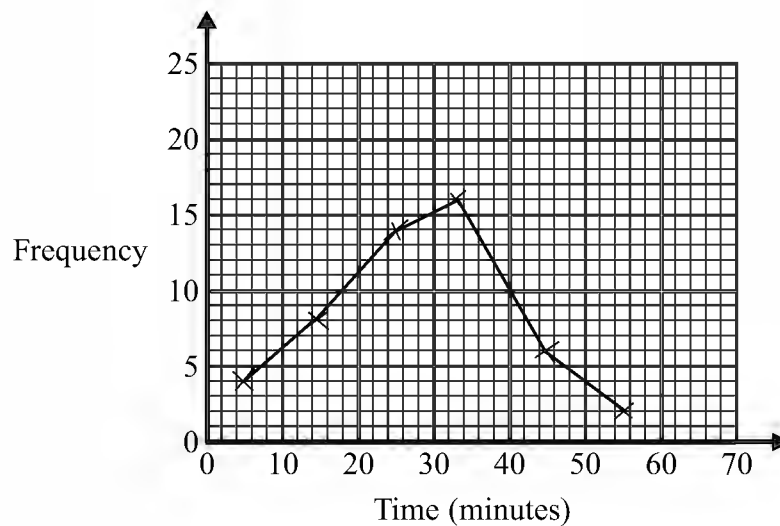


12. The frequency table gives information about the times it took some children to get to school one day.

Mid value	Time ( $t$ minutes)	Frequency
5	$0 < t \leq 10$	4
15	$10 < t \leq 20$	8
25	$20 < t \leq 30$	14
35	$30 < t \leq 40$	16
45	$40 < t \leq 50$	6
55	$50 < t \leq 60$	2

50

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



(2)

- (b) Write down the modal class interval.

$$30 < t \leq 40$$

(1)

One of the children is chosen at random.

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

8 children out of 50 took more than 40 minutes to get to school.

$$\begin{aligned}
 p(\text{a child taking more than 40 minutes}) &= \frac{8}{50} \\
 &= \frac{4}{25}
 \end{aligned}$$

$$\frac{4}{25}$$

(2)

(Total 5 marks)



Write your name here

Surname

Other names

In the style of:

**Edexcel GCSE**

Centre Number

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Candidate Number

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# Mathematics A

## Histograms

## Model Answers

**Higher Tier**

Past Paper Style Questions  
Arranged by Topic

Paper Reference

**1MA0/2H**

**You must have:** Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

### Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided  
– *there may be more space than you need.*
- **Calculators may be used.**



### Information

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- The marks for **each** question are shown in brackets  
– *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (\*) are ones where the quality of your written communication will be assessed.

### Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

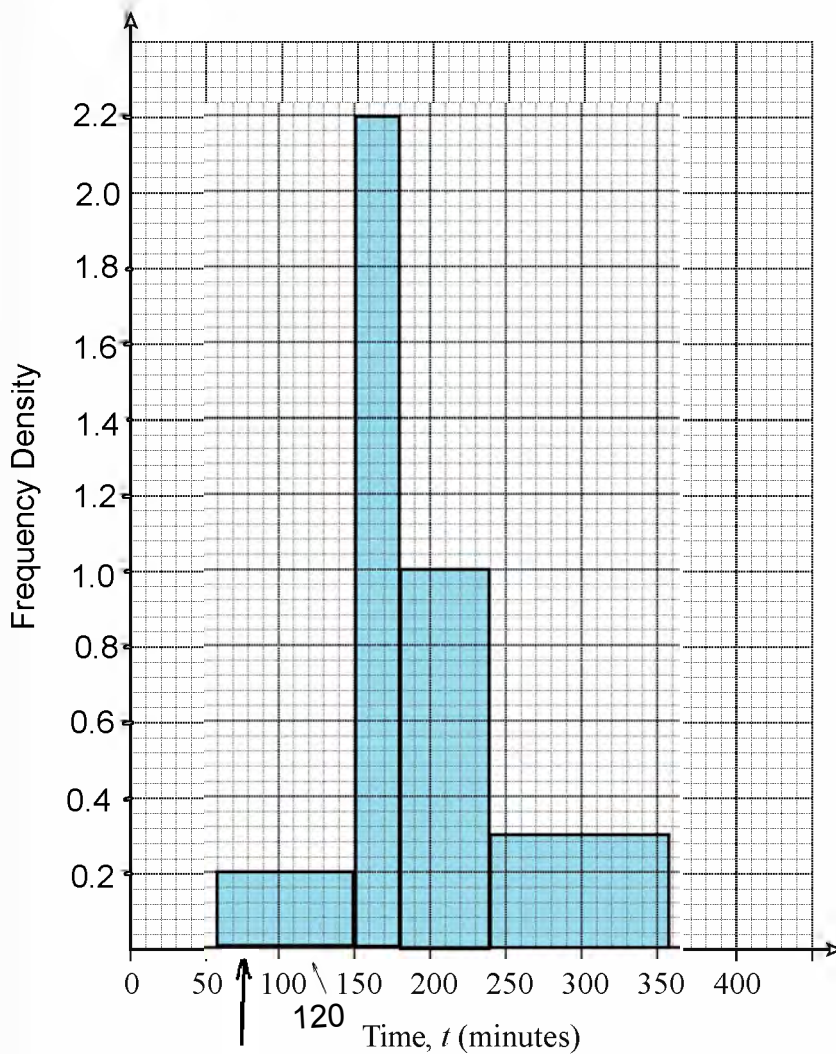




1. The table shows information about the length of time that 180 people spend gardening.

Mid value	Time, $t$ (minutes)( $x$ )	Frequency ( $f$ )	Frequency density
	$60 < t \leq 150$	18	$18 \div 90 = 0.2$
	$150 < t \leq 180$	66	$66 \div 30 = 2.2$
210	$180 < t \leq 240$	60	$60 \div 60 = 1.0$
300	$240 < t \leq 360$	36	$36 \div 120 = 0.3$

- (a) Draw a suitable frequency diagram for the data.



This box represents  
18 people, so each  
column represents  
2 people. 12 people  
are below 120.

(3)



- (b) Calculate an estimate of the average length of time for those people who are gardening for over three hours.

$$180 < t \leq 240 \text{ mid value is } \frac{180 + 240}{2} = 210$$

$$240 < t \leq 360 \text{ mid value is } \frac{240 + 360}{2} = 300$$

$$\bar{X} = \frac{\sum fx}{\sum f}$$

$$\bar{X} = \frac{23400}{96} \quad \dots 244 \dots \text{ minutes}$$

$$\bar{X} = 243.75 \quad (2)$$

- (c) Two people are chosen at random from the 180 people.

Estimate the probability that both are gardening for less than two hours.

$$p(\text{1st less than 2 hours}) = \frac{12}{180}$$

$$p(\text{2nd less than 2 hours}) = \frac{11}{179}$$

$$p(\text{Both less than 2 hours}) = \frac{12}{180} \times \frac{11}{179} \\ = \frac{11}{2685}$$

$$\frac{11}{2685} \dots \dots \dots$$

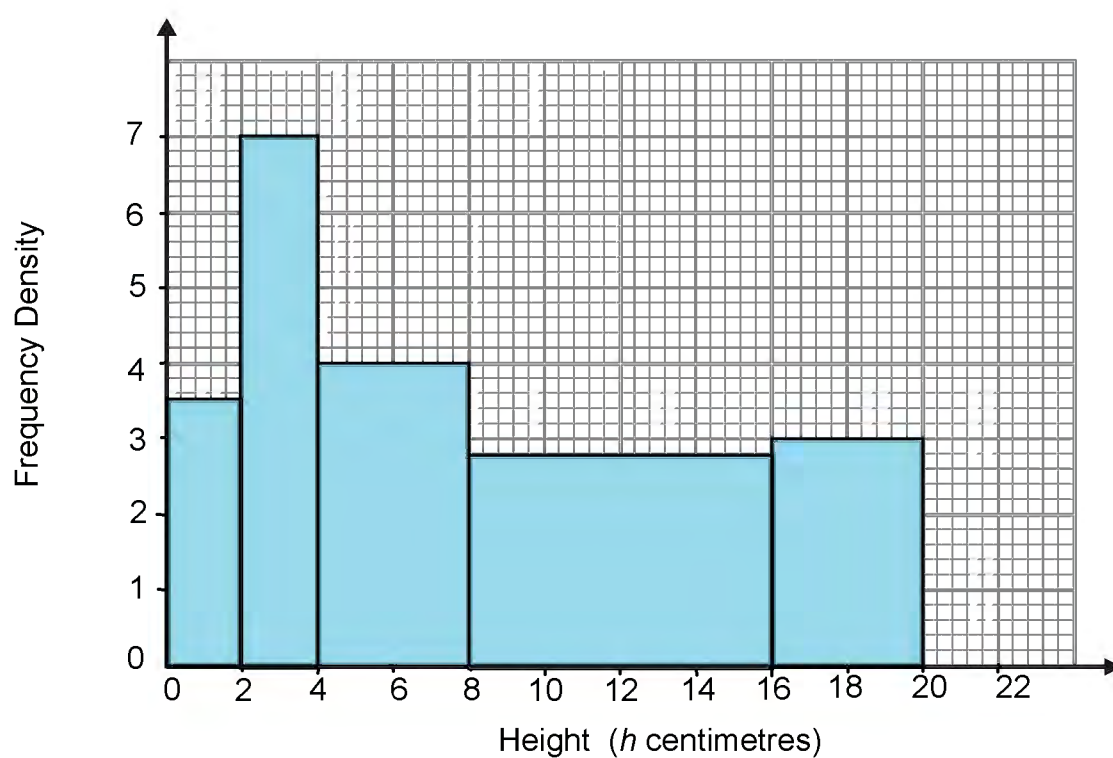
(3)



2. The table gives information about the heights,  $h$  centimetres, of plants in a greenhouse.

Height ( $h$ centimetres)	Frequency	F.D
$0 < h \leq 2$	7	3.5
$2 < h \leq 4$	14	7
$4 < h \leq 8$	16	4
$8 < h \leq 16$	22	2.75
$16 < h \leq 20$	12	3

Draw a histogram to show this information.



(Total 3 marks)

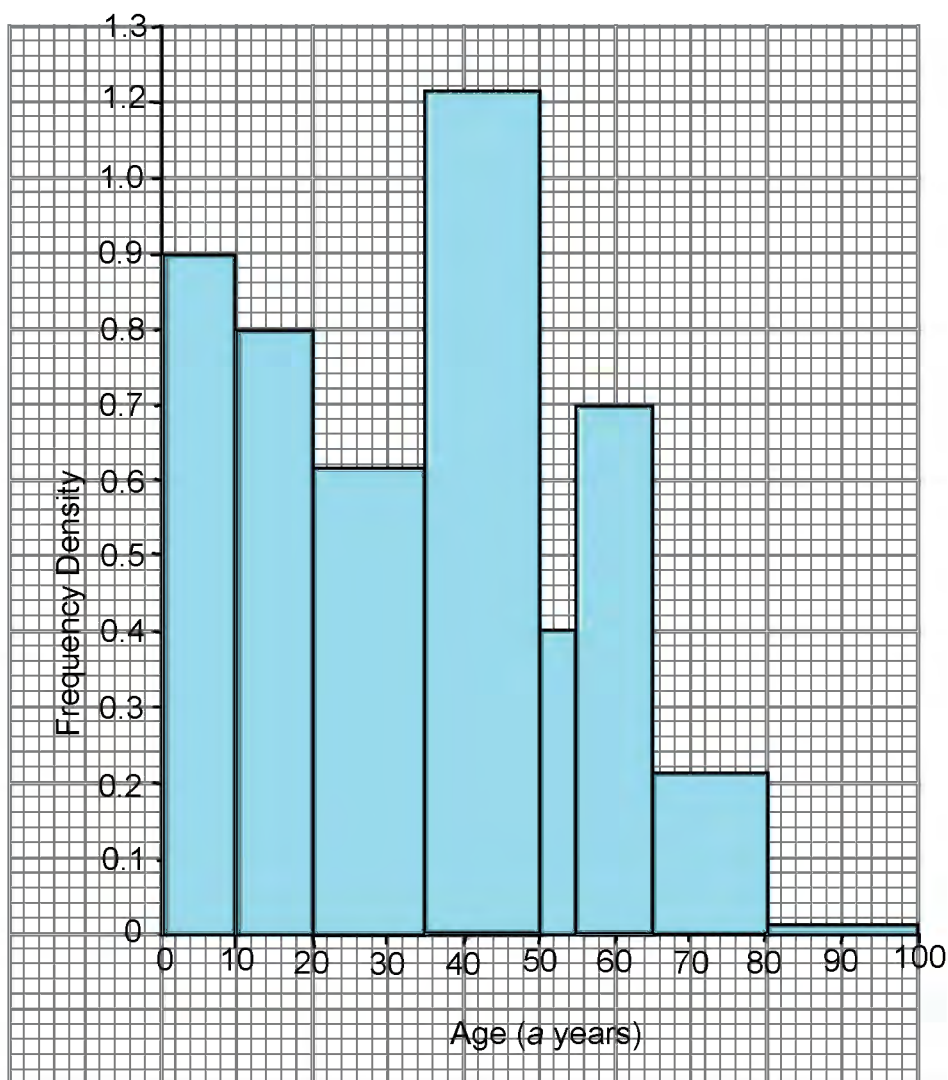


3. The table gives information about the ages of the population of a city.

$fx$	Mid value $x$	Age ( $a$ years)	$f$ Number (thousands)	Frequency Density
40.5	4.5	$0 \leq a < 10$	9	0.9
116	14.5	$10 \leq a < 20$	8	0.8
270	27	$20 \leq a < 35$	10	0.67
798	42	$35 \leq a < 50$	19	1.27
208	52	$50 \leq a < 55$	4	0.8
416.5	59.5	$55 \leq a < 65$	7	0.7
288	72	$65 \leq a < 80$	4	0.27
89.5	89.5	$80 \leq a < 100$	1	0.05
$\sum fx = 2226.5$			$\sum f = 62$	

(a) On the graph paper below, using a scale of 1 cm to represent 10 years on the Age axis, draw a histogram to represent this information.

(4)



(b) Write down the class interval in which the median lies.

$$35 \leq a < 50 \quad (1)$$

(c) Calculate, giving your answer in years and months, an estimate of the mean age of the population.

(4)

$$\bar{X} = \frac{\sum fx}{\sum f}$$

$$\bar{X} = \frac{22265}{62}$$

$$\bar{X} = 35.91$$

$$= 35 \text{ years and } 328 \text{ days}$$

$$= 35 \text{ years } 11 \text{ months}$$



4. A pub has 64 customers one evening.

The table gives information about the lengths, in minutes, of the time the customers stayed for.

Length ( $x$ ) minutes	Frequency
$0 < x \leq 5$	1
$5 < x \leq 15$	10
$15 < x \leq 30$	17
$30 < x \leq 40$	21
$40 < x \leq 45$	15

Frequency Density

0.2

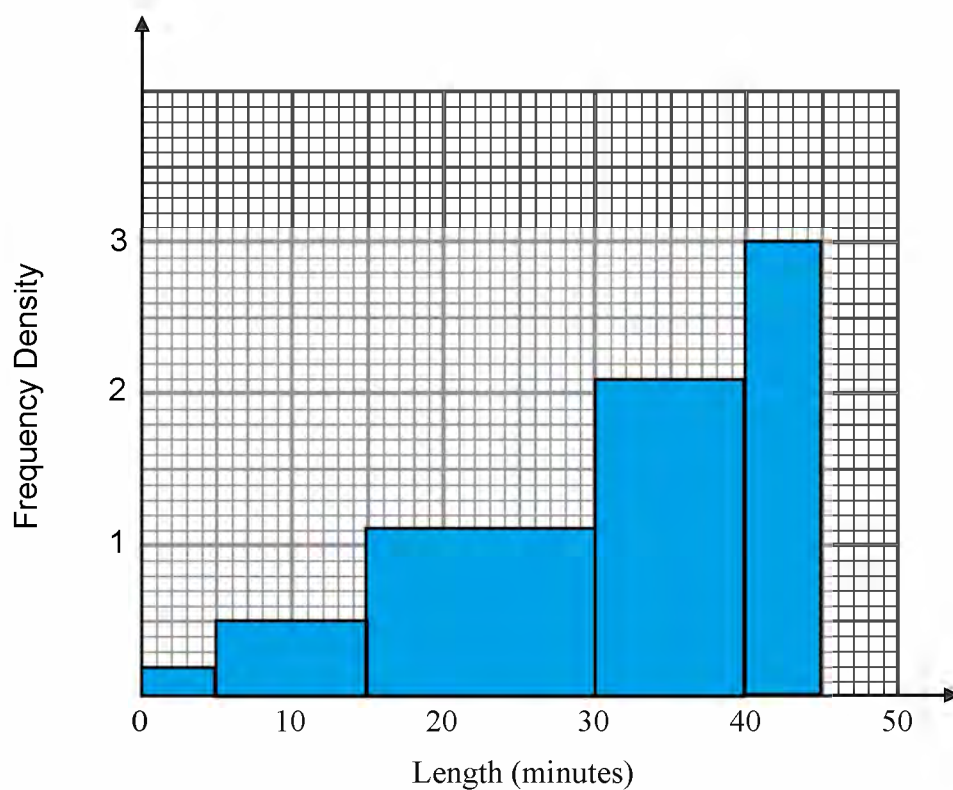
1

1.13

2.1

3

Draw a histogram for this information.



(Total 4 marks)

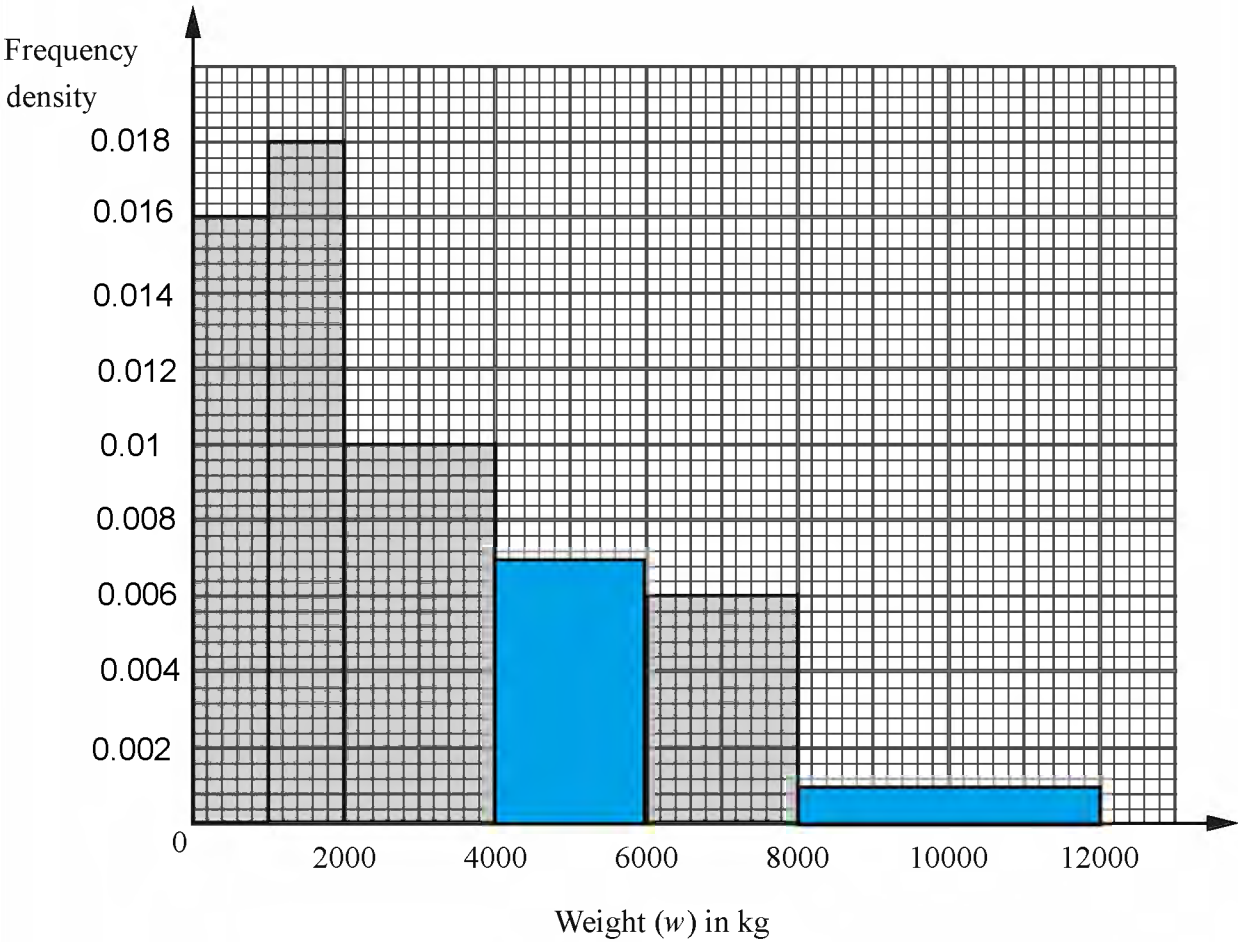


5. The incomplete histogram and table show information about the weights of some vehicles.

Weight ( $w$ ) in kg	Frequency	Frequency Density
$0 < w \leq 1000$	16	0.016
$1000 < w \leq 2000$	18	0.018
$2000 < w \leq 4000$	20	0.01
$4000 < w \leq 6000$	14	0.007
$6000 < w \leq 8000$	12	0.006
$8000 < w \leq 12000$	4	0.001

(a) Use the information in the histogram to complete the table. (2)

(b) Use the information in the table to complete the histogram. (2)



(Total 4 marks)





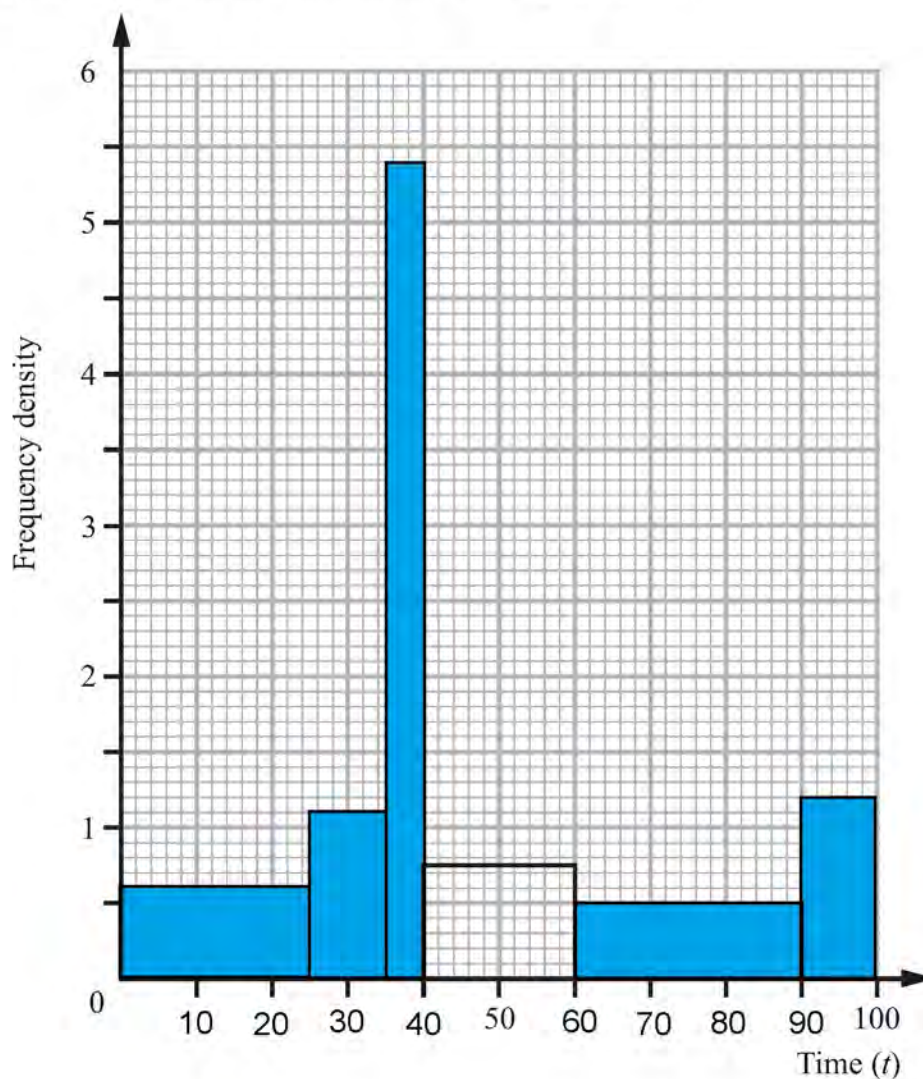
6. One hundred hikers went for a walk. The times taken by the hikers to complete the walk are summarised in the table.

$fx$	Mid value ( $x$ )	Time ( $t$ )	Number of hikers ( $f$ )	Frequency Density
180	12	$0 \leq t < 25$	15	0.6
324.5	29.5	$25 \leq t < 35$	11	1.1
999	37	$35 \leq t < 40$	27	5.4
742.5	49.5	$40 \leq t < 60$	15	0.75
1117.5	74.5	$60 \leq t < 90$	15	0.5
1134	94.5	$90 \leq t < 100$	12	1.2
4497.5			95	

- (a) Use the information given in the table to calculate an estimate for the mean time taken, to one decimal place.

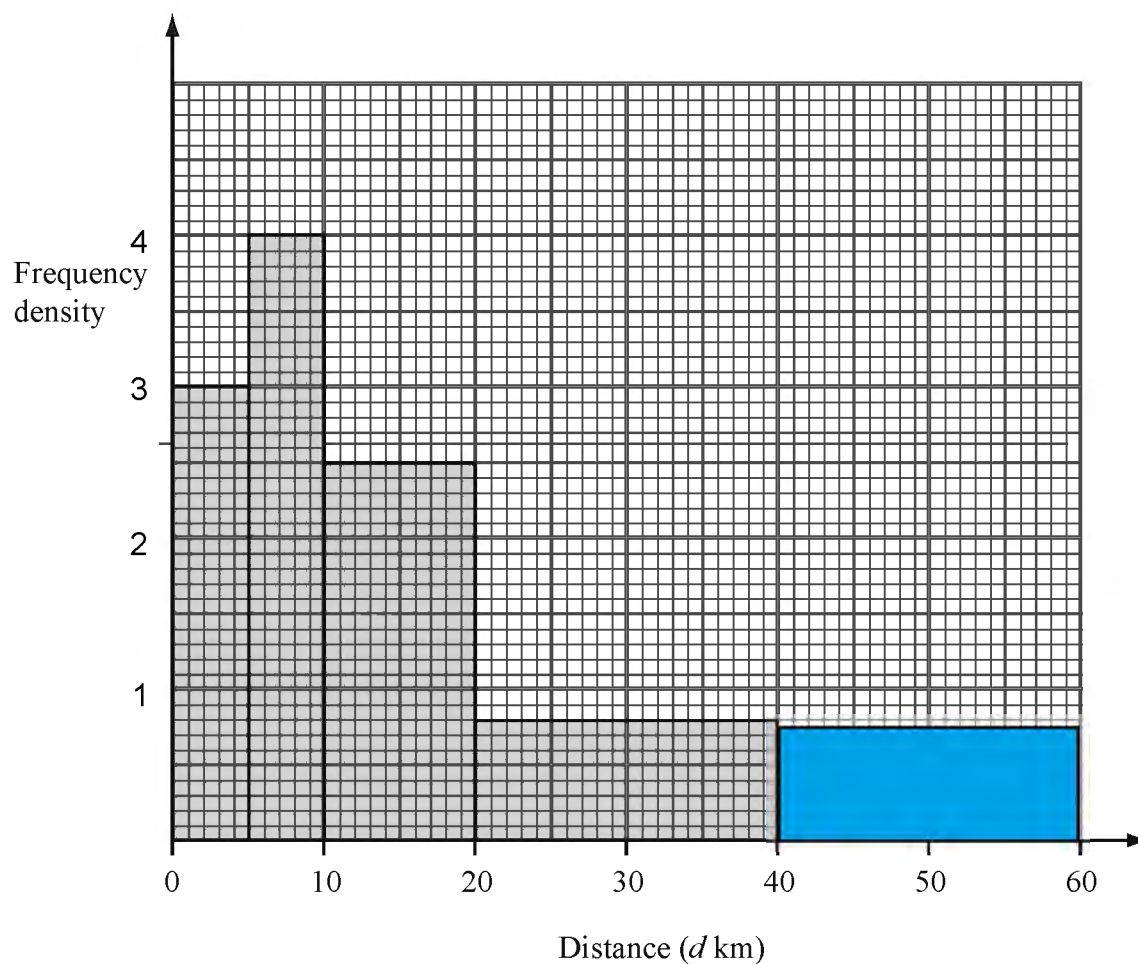
$$\bar{X} = \frac{\sum fx}{\sum f} = \frac{4497.5}{95} = 47.3 \quad (3)$$

- (b) Given that the frequency density for the  $40 \leq t < 60$  time interval is 0.75, complete the histogram to represent this information on the graph paper.





7. The incomplete histogram and table give some information about the distances some cyclists travel each day.



- (a) Use the information in the histogram to complete the frequency table.

Distance ( $d$ km)	Frequency	Frequency Density
$0 < d \leq 5$	15	3
$5 < d \leq 10$	20	4
$10 < d \leq 20$	25	2.5
$20 < d \leq 40$	16	0.8
$40 < d \leq 60$	15	0.75

(2)

- (b) Use the information in the table to complete the histogram.

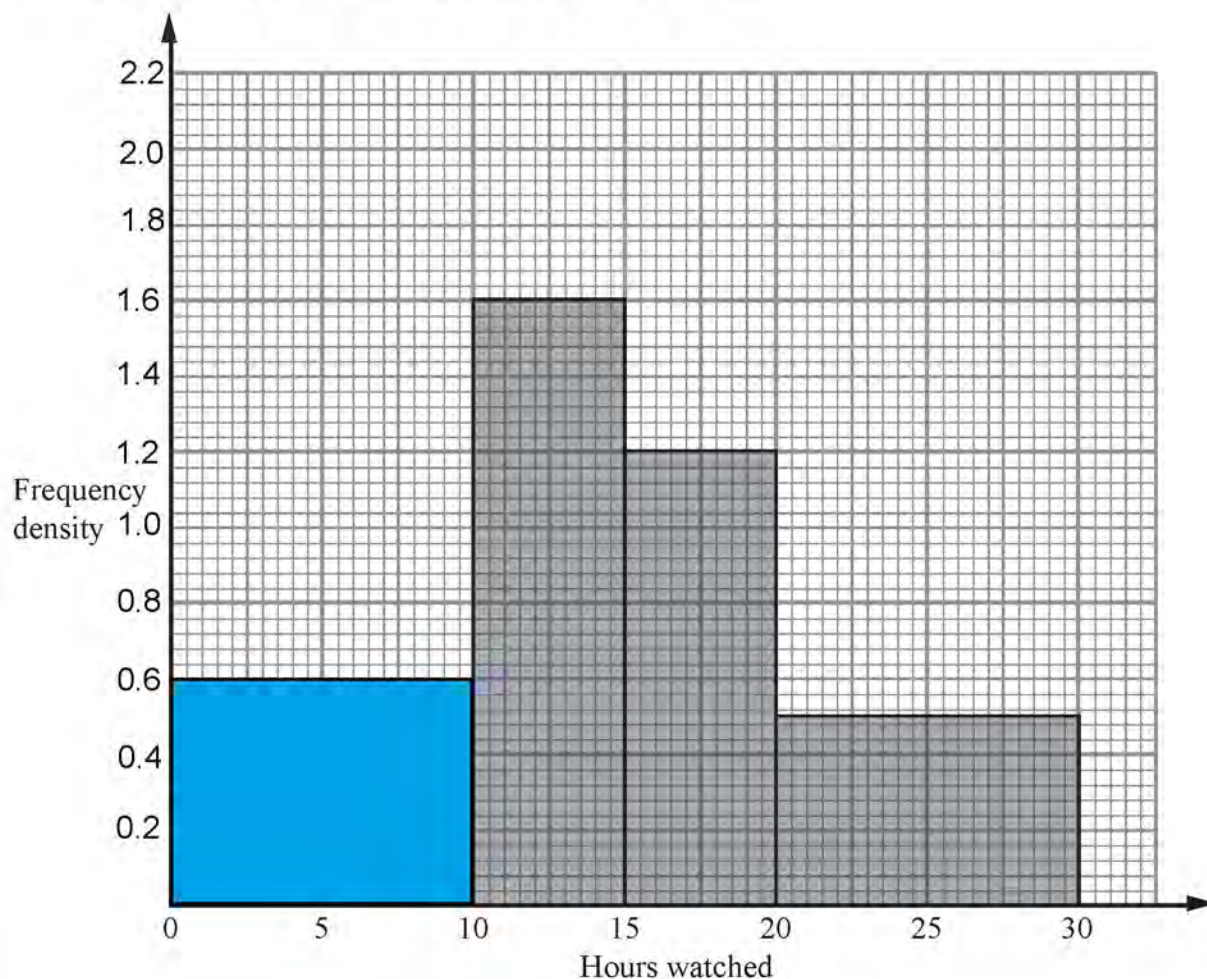
(1)

(Total 3 marks)



8. Terry asked the students in his class how many hours they played on computers last week.

The incomplete histogram was drawn using his results.



Eight students played for between 10 and 15 hours. Six students played for between 0 and 10 hours.

- (a) Use this information to complete the histogram.

*f. d.* found from given frequency

$$8 \div 5 = 1.6 \quad \text{Marked on the graph}$$

$$6 \div 10 = 0.6$$

	<i>f. d</i>	<i>f</i>
0 to 10	0.6	6
10 to 15	1.6	8
15 to 20	1.2	6
20 to 30	0.5	5
		(2)

No students watched television for more than 30 hours.

25

- (b) Work out how many students Terry asked.

Add up all the frequencies.

25

(2)

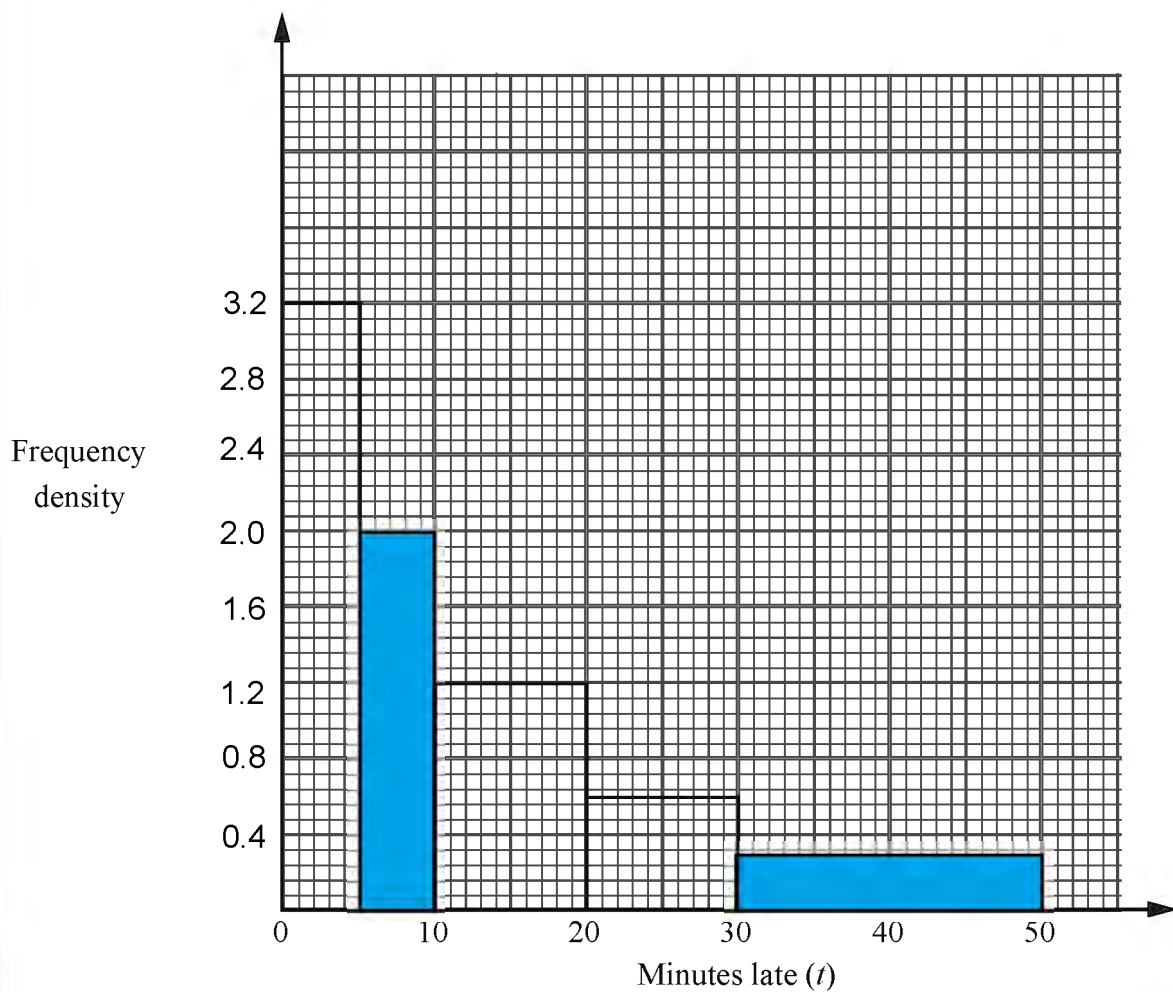
(Total 4 marks)



9. Some trains from London to Birmingham were late.

The incomplete table and histogram gives some information about how late the trains were.

Minutes late ( $t$ )	Frequency	Frequency Density
$0 < t \leq 5$	16	3.2
$5 < t \leq 10$	10	2
$10 < t \leq 20$	12	1.2
$20 < t \leq 30$	6	0.6
$30 < t \leq 50$	6	0.3



(a) Use the information in the histogram to complete the table.

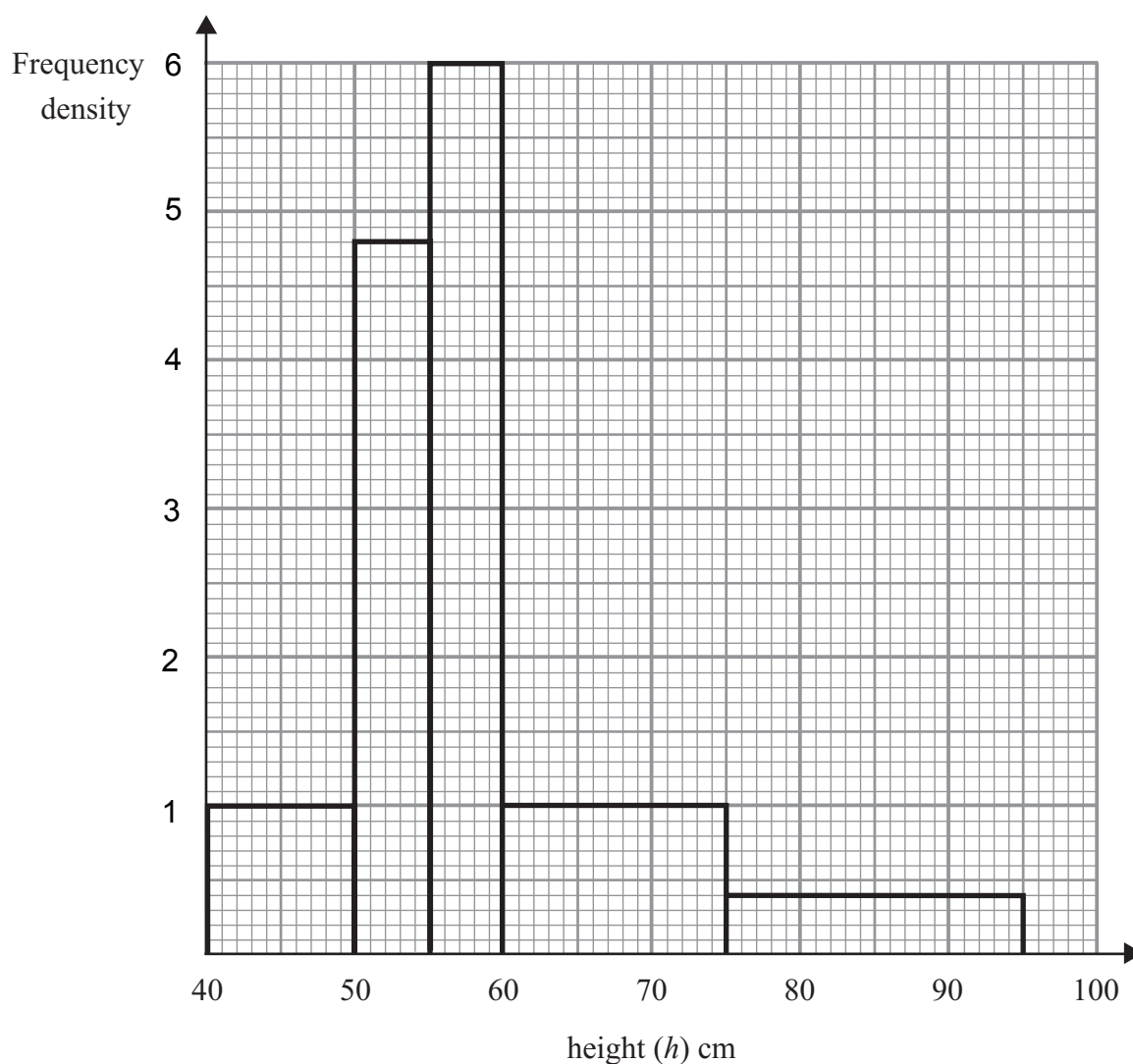
(2)

(b) Use the information in the table to complete the histogram.

(2)



10. The incomplete table and histogram give some information about the heights of some tomato plants in a greenhouse.



Use the information in the histogram to complete the frequency table.

Height ( $h$ ) cm	Frequency
$40 \leq h < 50$	10
$50 \leq h < 55$	24
$55 \leq h < 60$	30
$60 \leq h < 75$	15
$75 \leq h < 95$	8

Frequency Density

1

4.8

6

(Total 2 marks)





11. The incomplete table and histogram give some information about the weights (in kg) of some boxes.

Weight ( $w$ kg)	Frequency
$100 < w \leq 130$	30
$130 < w \leq 150$	84
$150 < w \leq 160$	60
$160 < w \leq 180$	40
$180 < w \leq 210$	18

Frequency Density

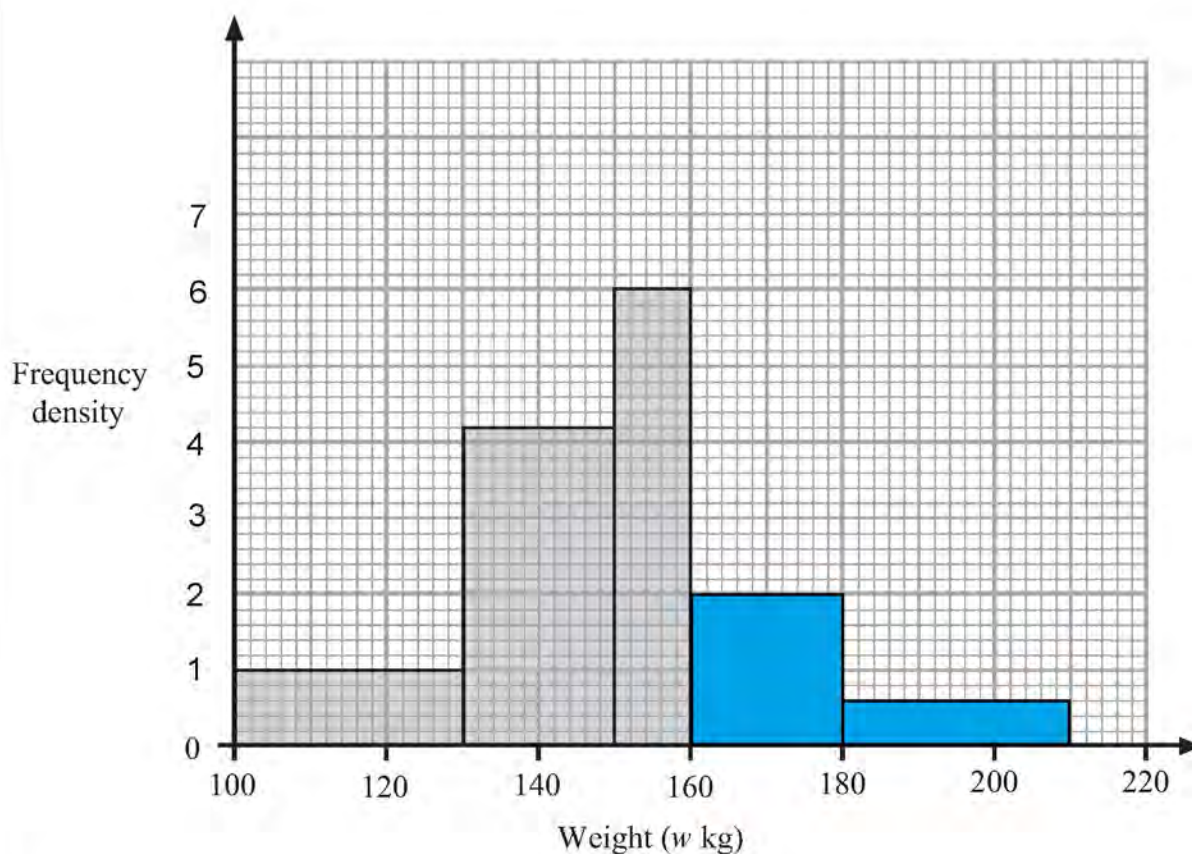
1

4.2

6

2

0.6



- (a) Use the histogram to complete the table.

(2)

- (b) Use the table to complete the histogram.

(2)

(Total 4 marks)



12. The table and histogram show information about the length of time it took 165 adults to drink some water.

Time ( $t$ seconds)	Frequency	Frequency Density
$0 < t \leq 10$	20	2
$10 < t \leq 15$	40	8
$15 < t \leq 17.5$	30	12
$17.5 < t \leq 20$	40	16
$20 < t \leq 25$	20	4
$25 < t \leq 40$	15	1

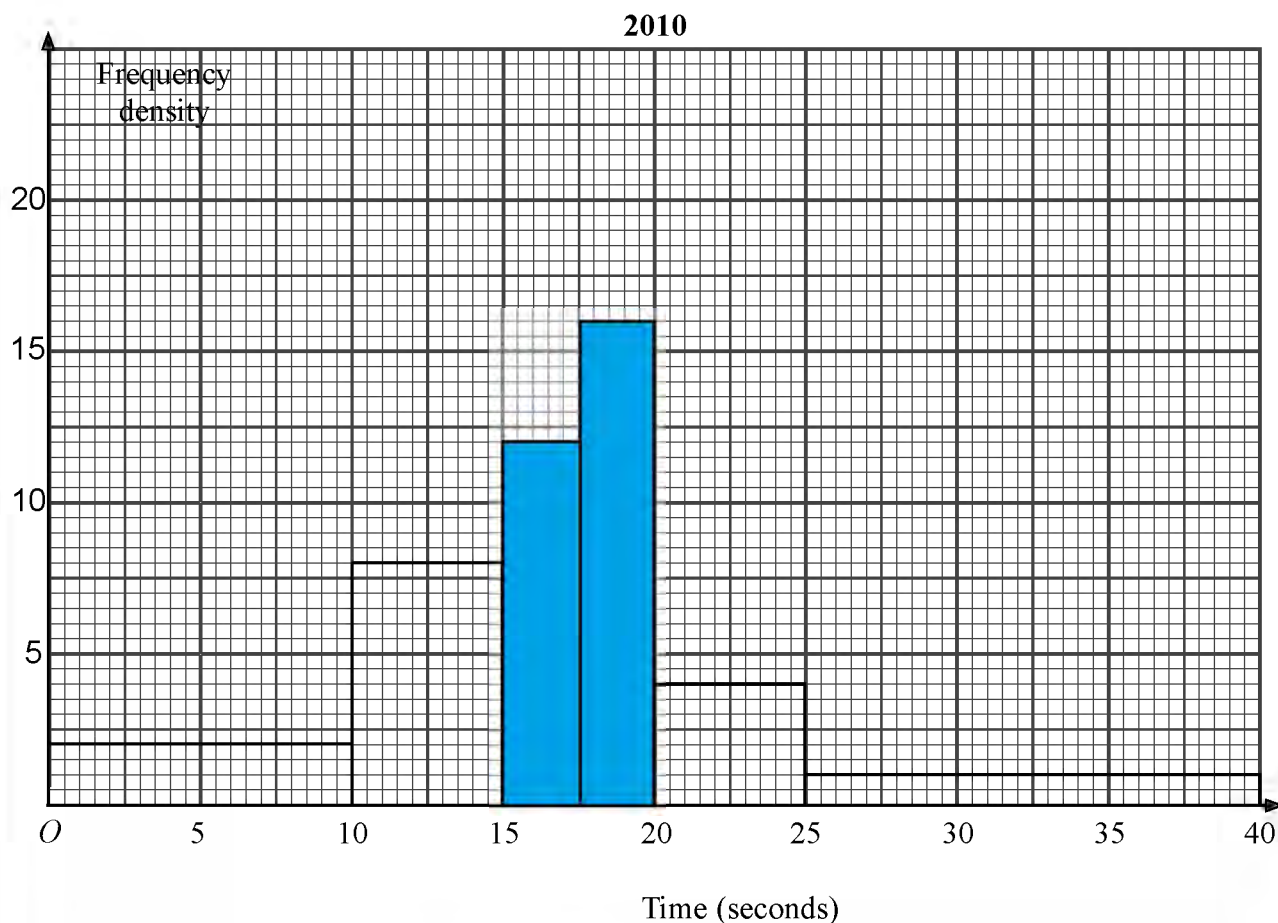
None of the adults took more than 40 seconds to drink the water

- (a) Use the table to complete the histogram.

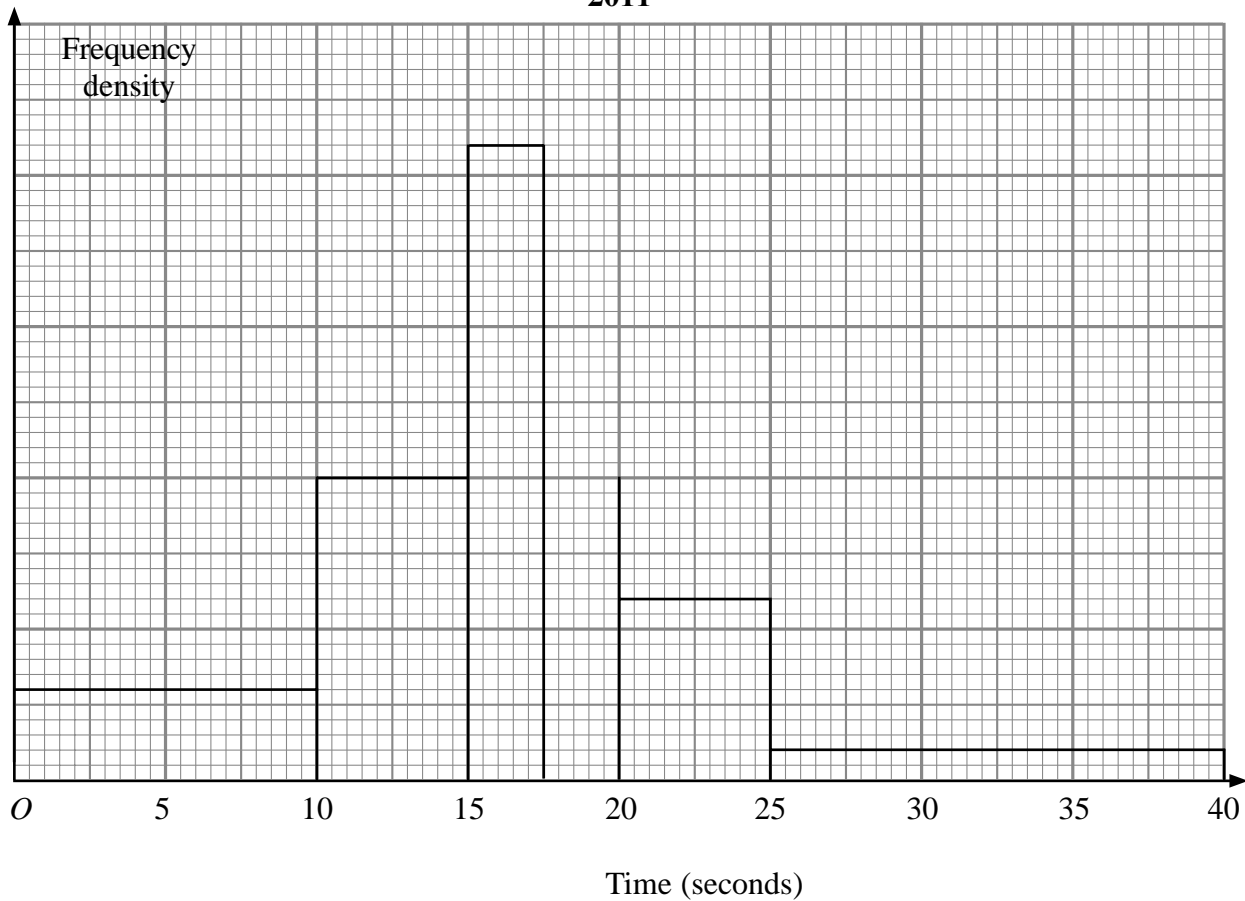
(2)

- (b) Use the histogram to complete the table.

(2)



2011



The histogram shows information about the time it took some children to drink the water. None of the children took more than 40 seconds to drink the water.

110 children took up to 12.5 seconds to drink the water.

- (c) Work out an estimate for the number of children who took 21 seconds or more to drink the water.

By counting, there are 220 small squares below 12.5, which represent 110 children. This means 2 small squares equal 1 child. There are 156 squares above 21 seconds, which is 78 children.

.....78.....  
(3)

(Total 7 marks)



Write your name here

Surname

Other names

In the style of:

**Edexcel GCSE**

Centre Number

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Candidate Number

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# Mathematics A Locus and Constructions

## Model Answers

**Higher Tier**

Past Paper Style Questions  
Arranged by Topic

Paper Reference

**1MA0/2H**

**You must have:** Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

### Instructions

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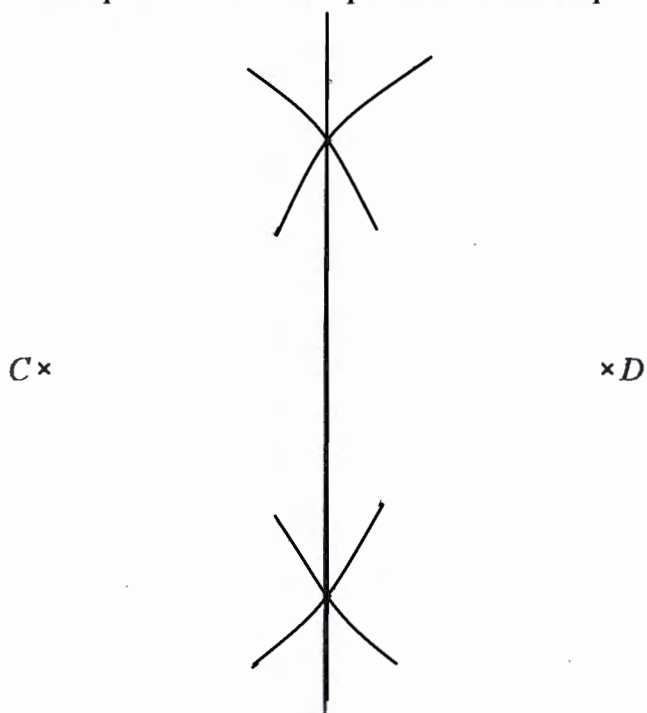
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Turn over ►



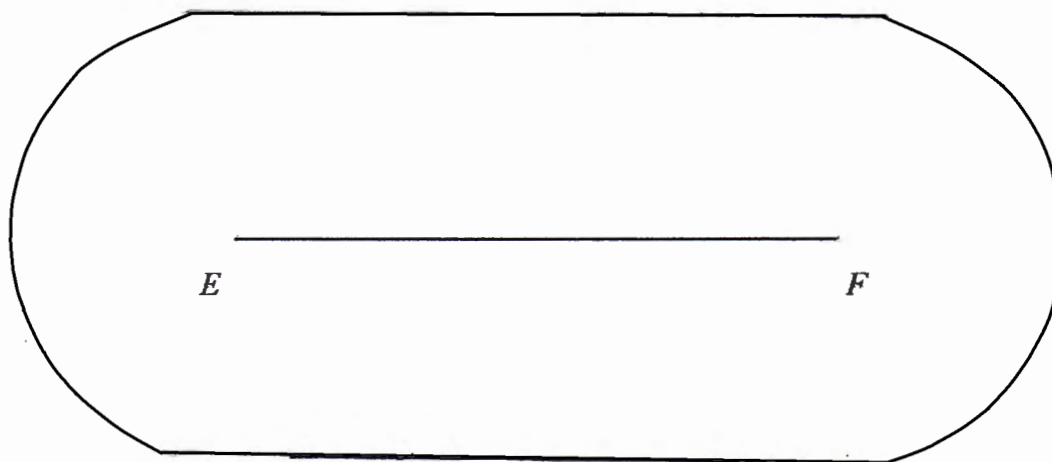


1. (a) Draw the locus of all points which are equidistant from the points  $C$  and  $D$ .



(2)

- (b) Draw the locus of all points that are exactly 3 cm from the line  $EF$ .

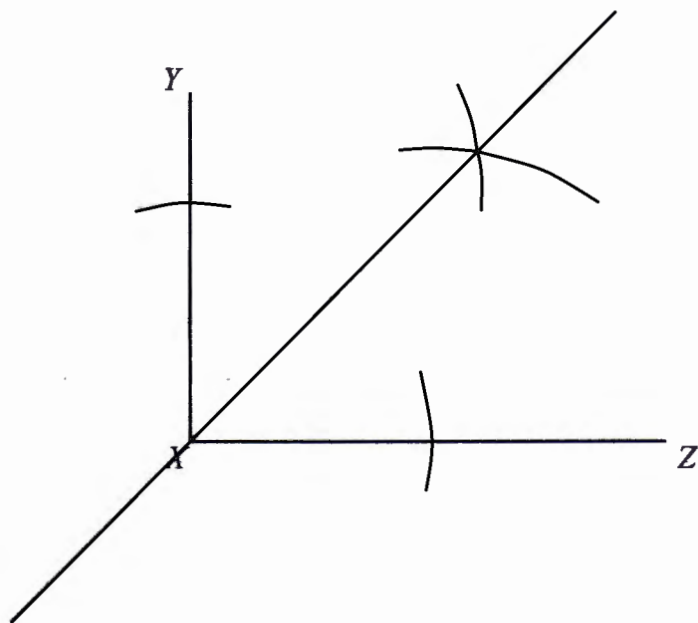


(2)

(Total 4 marks)



2. Draw the locus of all points which are equidistant from the lines  $XY$  and  $XZ$ .



(Total 2 marks)

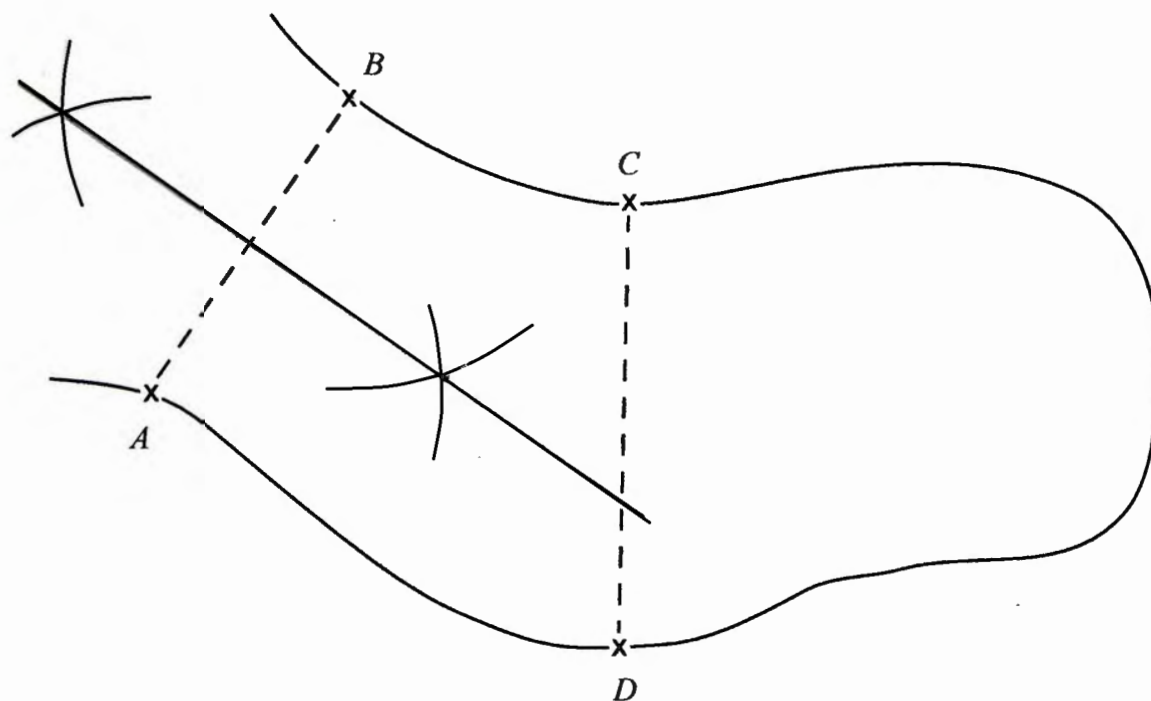


3. The map shows part of a golf course.

A golfer has to hit a ball so that its path between AB and CD is a straight line

and is always the same distance from *A* as from *B*

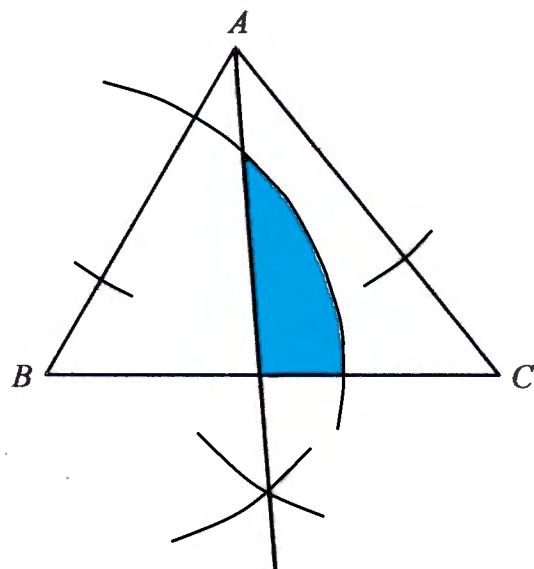
On the map, draw the path the ball should take.



(Total 2 marks)



4.



$ABC$  is a triangle.

Shade the region inside the triangle which is both

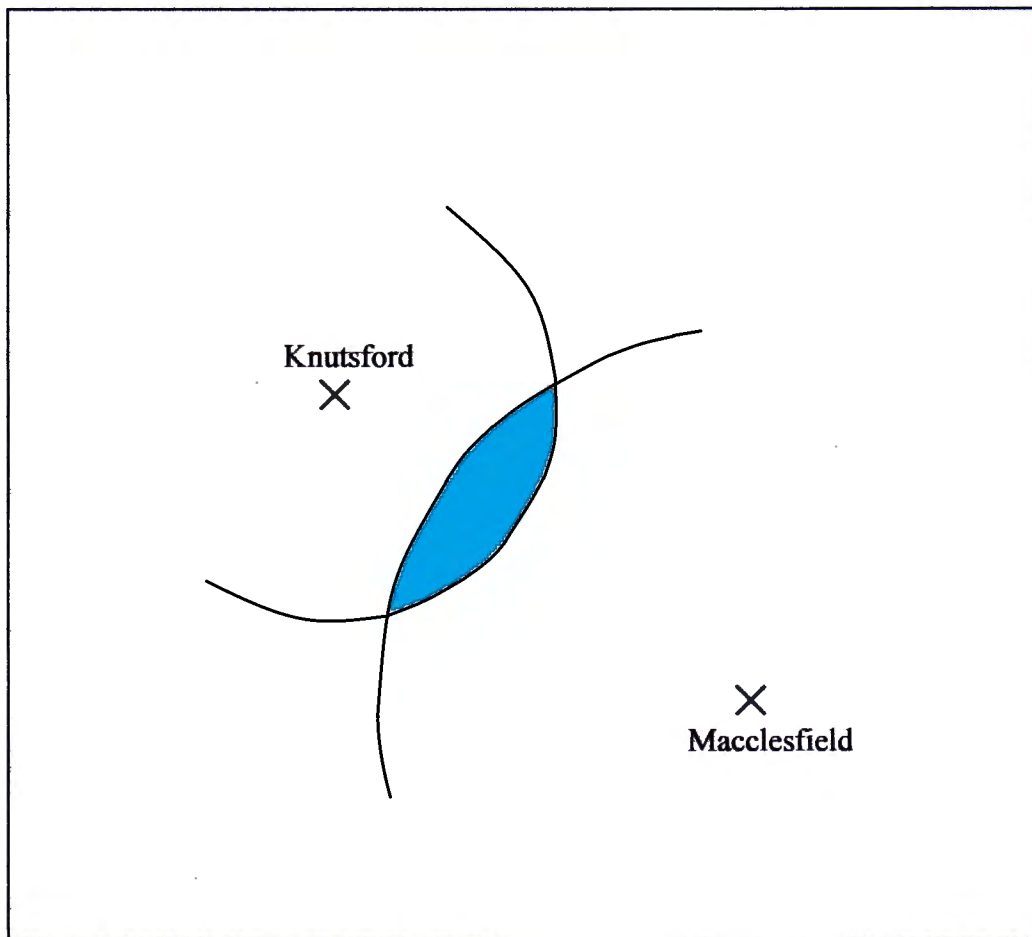
less than 4 centimetres from the point  $B$   
and closer to the line  $AC$  than the line  $AB$ .

(Total 4 marks)



5. Here is a map.

The map shows two towns, Knutsford and Macclesfield.



Scale: 1 cm represents 10 km

A company is going to build a glasshouse.

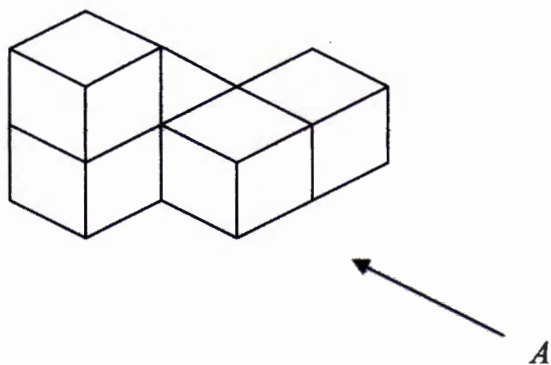
The glasshouse will be less than 30 km from Knutsford **and** less than 50 km from

Macclesfield. Shade the region on the map where the company can build the glasshouse.

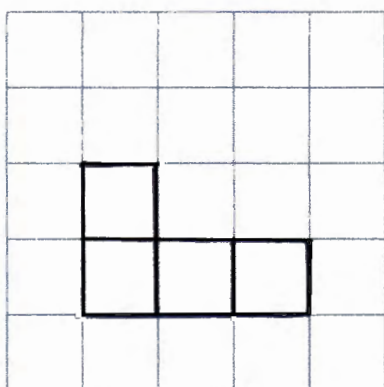
**(Total for Question 10 is 3 marks)**



6. The diagram represents a solid made from 5 identical cubes.



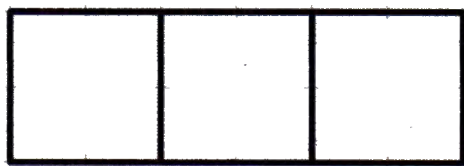
On the grid below, draw the view of the solid from direction *A*.



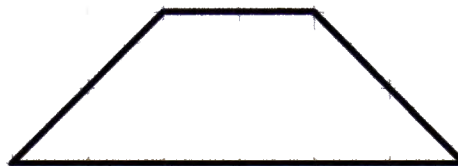
(Total 2 marks)



7. Here are the plan and front elevation of a solid shape.

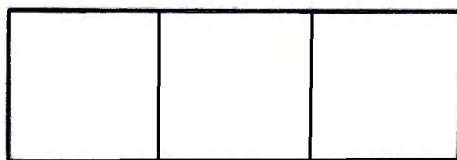


Plan



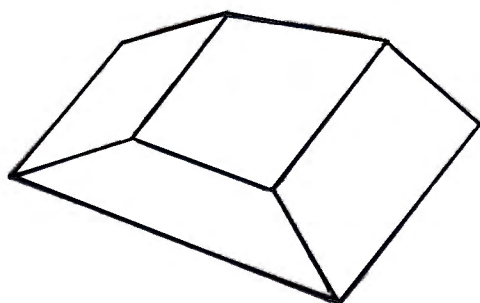
Front Elevation

(a) On the grid below, draw the side elevation of the solid shape.



(2)

(b) In the space below, draw a sketch of the solid shape.



(2)

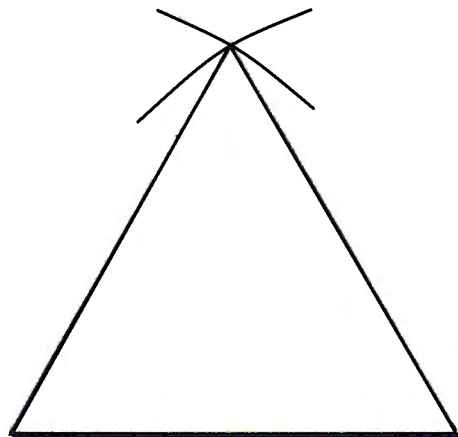
(Total 4 marks)



8. In the space below, use ruler and compasses to **construct** an equilateral triangle with sides of length 6 centimetres.

You must show all your construction lines.

One side of the triangle has already been drawn for you.



**(Total 2 marks)**





9. Here is a sketch of a quadrilateral.

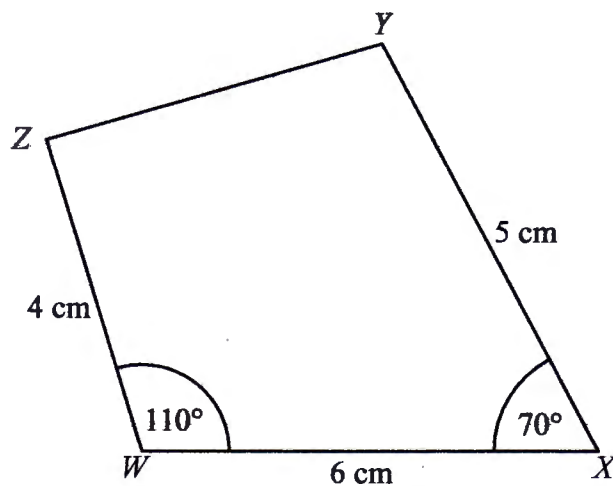
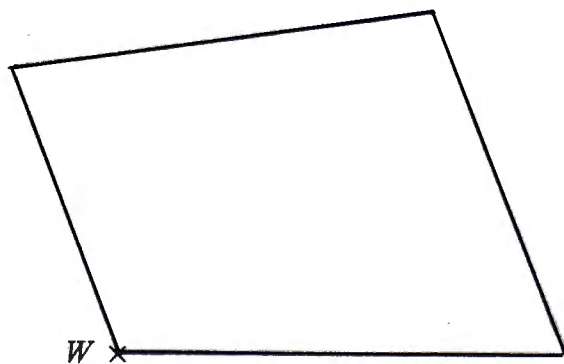


Diagram NOT  
accurately drawn

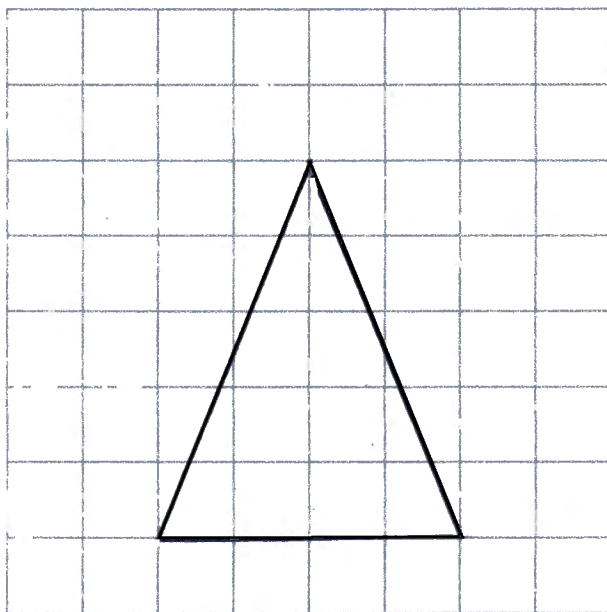
Make an accurate drawing of the quadrilateral  $WXYZ$  in the space below.  
The point  $W$ , marked with a cross ( $\times$ ), has been drawn for you.



(Total 4 marks)

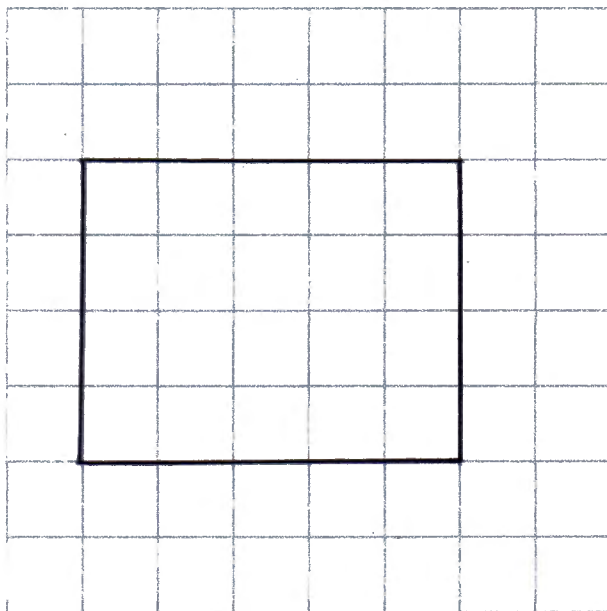


10. (a) On the grid, draw an isosceles triangle.



(1)

(b) On the grid, draw a rectangle with an area of  $20 \text{ cm}^2$ .



(2)

(Total 3 marks)

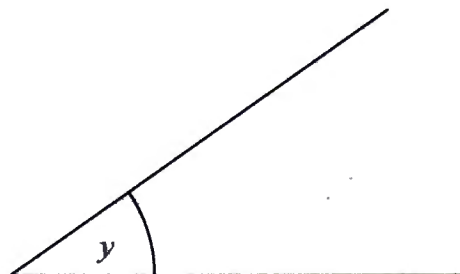


11. (a) Measure the length of the line  $AB$ .  
Give your answer in centimetres.



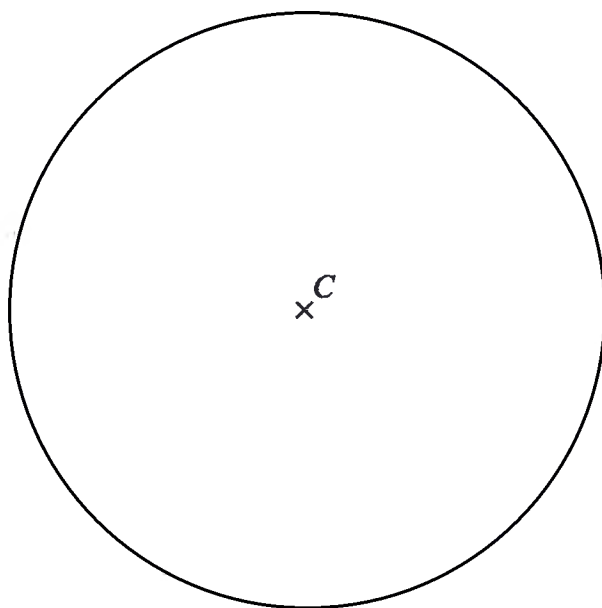
.....8.1..... cm  
(1)

- (b) Measure the size of angle  $y$ .



.....35..... °  
(1)

- (c) In the space below, draw accurately a circle of radius 4 cm.  
Use the point  $C$  as the centre of your circle.

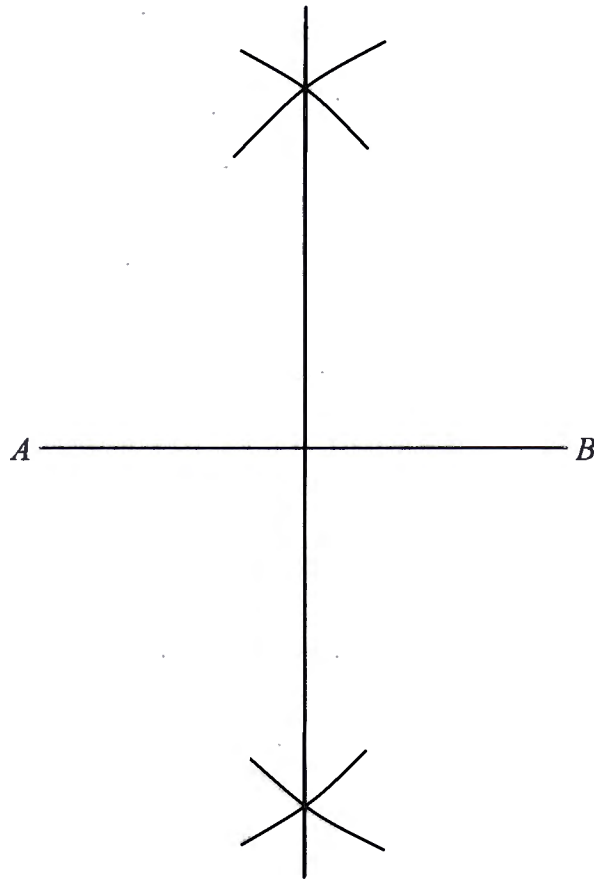


(1)



12. Use ruler and compasses to **construct** the perpendicular bisector of the line  $AB$ .

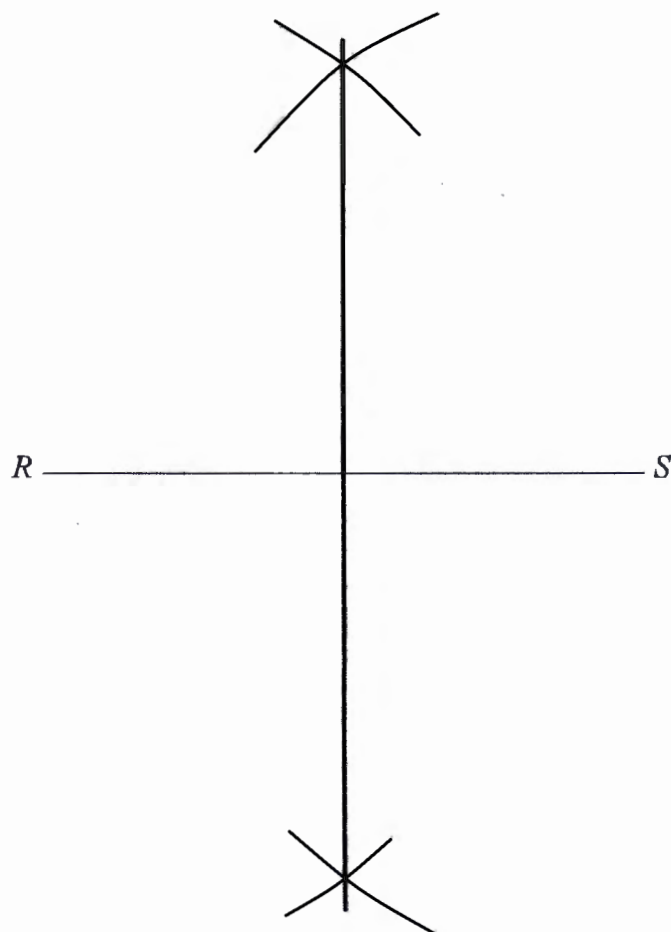
You must show all your construction lines.



(Total 2 marks)



- (b) Use ruler and compasses to construct the perpendicular bisector of the line  $RS$ .  
You must show all your construction lines.

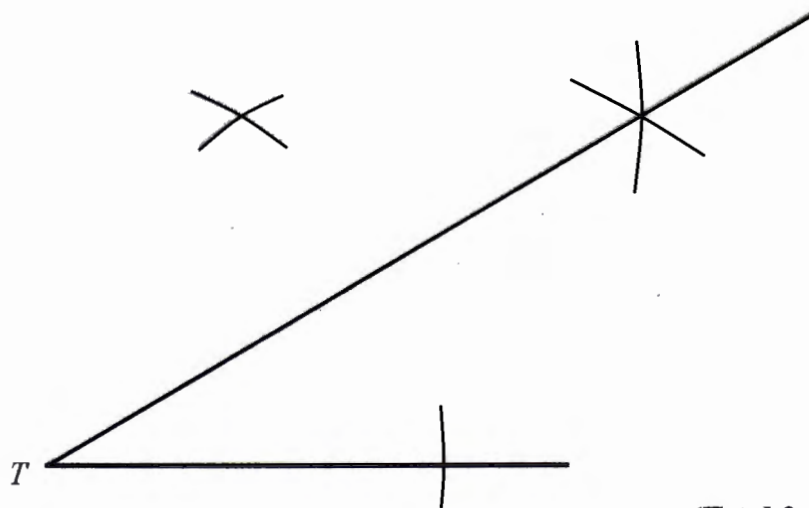


(2)

(Total 4 marks)



13. Use ruler and compasses to **construct** an angle of  $30^\circ$  at  $T$ .  
You **must** show all your construction lines.



(Total 3 marks)



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# Mathematics A Number

## Model Answers

**Foundation Tier**

Past Paper Style Questions  
Arranged by Topic

Paper Reference

**1MA0/1F**

**You must have:** Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

### Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
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### Information

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- Check your answers if you have time at the end.

Turn over ►





**1(a)** Work out  $7500 + 1500$

Write your answer in words.

$$\begin{array}{r} 7500 + \\ 1500 \\ \hline 9000 \end{array}$$

..... Nine thousand .....

**(2)**

**1(b)** Write 4748 to the nearest hundred.

..... 4700 .....

**(1)**

**1(c)** What is the value of the digit 5 in the number 425 986?

..... 5000 .....

**(1)**

**1(d)** Write down the positive square root of 121.

..... 11 .....

**(1)**

**1(e)** Which of these is equal to one million?

Circle your answer.

$10^3$

$10^4$

$10^5$

$10^6$

$10^7$



2. Use the numbers from this list to answer the questions.

5                  12                  17                  25                  28                  30                  42                  49

(a) Write down all the multiples of 5.

..... 5, 25, 30 .....

(2)

(b) Write down all the factors of 100.

..... 1, 2, 4, 5, 10, 20, 50, 100 .....

(2)

(c) Write down a square number.

..... 16 .....

(1)

(d) Write down three numbers that have a sum of 60.

..... 10 ..... and ..... 20 ..... and ..... 30 .....

(1)

3. Here are two numbers.

forty thousand

7500

Which number is bigger?

Give a reason for your answer.

Bigger number forty thousand.....

Reason ...40000 is more than 7500.....

.....

.....

(2)



4.  $w$ ,  $x$  and  $y$  are three positive whole numbers.  $w$  is one-fifth of  $y$ .  
 $x$  is one-sixth of  $y$ .  
 $y$  is less than 100.

What values could  $y$  take?

The number must be a multiple both 6 and 5  
The lowest common multiple is 30 ( $6 \times 5$ )

The highest multiple that is less than 100 is 90 ( $30 \times 3$ )

The other value possible is 60 ( $30 \times 2$ )

.....30, 60, 90.....

(5)

5. The numbers 13 and 17 are consecutive prime numbers.  
The number halfway between them is 15.  
15 is **not** a square number.

Find a pair of consecutive prime numbers less than 30 where the number halfway between them is a square number.

Prime numbers: 2, 3, 5, 7, 11, 13, 17, 19, 23, 29

Square numbers: 1, 4, 9, 16, 25

.....3.....and.....5.....

(2)

also 7 and 11



6. Work out

$$\begin{aligned} &8^2 \div 4^3 \\ &= (8 \times 8) \div (4 \times 4 \times 4) \\ &= 64 \div 64 \\ &= 1 \end{aligned}$$

.....1.....

(2)

7. You are given that  $34.7 \times 25 = 867.5$

(a) Write down the value of  $347 \times 25$

.....8675.....

(1)

(b) Write down the value of  $85.02 \div 26$

.....3.27.....

(1)

(c) Work out the value of  $32.7 \times 27$

.....882.9.....

(2)



8. A tin of baked beans costs 30p.  
A shop has a special offer on the baked beans.

**Special offer**

Pay for 2 tins and get 1 tin free

30p

30p

Free

Helen wants 12 tins of baked beans.

- (a) Work out how much she pays.

3 tins cost 60p

12 tins cost  $4 \times 60$

= £2.40

£ ..2.40.....  
(3)

The normal price of a toaster is £30

In a sale, the price of the toaster is reduced by 15%.

- (b) Work out the sale price of the toaster.

$100\% - 15\% = 85\%$

$30 \times 0.85 = 25.5$

Using a basic calculator key in:

30 - 15%

25.5 appears on the display.

£ ..25.50.....  
(3)

No calculator:

10% of 30 = 3

5% of 30 = 1.5

$30 - 3 - 1.5 = 25.5$

(Total 6 marks)



9. Work out

$$\frac{1}{5} + \frac{2}{7}$$

$$= \frac{7+10}{35}$$

$$= \frac{17}{35}$$

$$\frac{17}{35}$$

(Total 2 marks)

10.

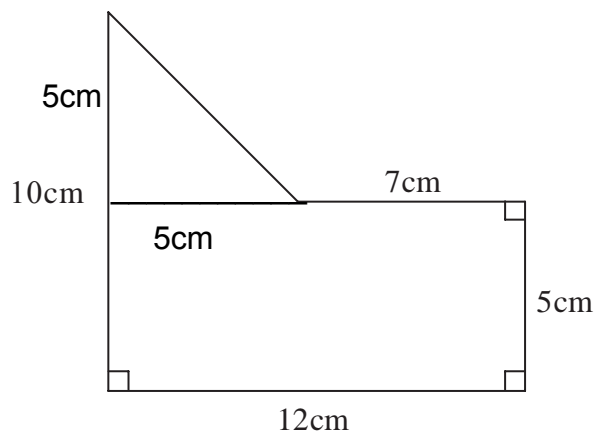


Diagram **NOT**  
accurately drawn

Work out the area of the shape.

Area of rectangle = *length*  $\times$  *width*

$$= 12 \times 5$$

$$= 60$$

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

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

$$= 12.5$$

Total area =  $60 + 12.5$

$$= 72.5$$

$$72.5 \text{ cm}^2$$

(Total 4 marks)



11. Use the information that

$$324 \times 46 = 14904$$

to find the value of

(a)  $3.24 \times 4.6$

Count the numbers to the right of the decimal points

There are 3, so count back 3 places from the right.

$$\dots\dots\dots 14.904 \dots\dots\dots$$

(1)

(b)  $0.324 \times 0.46$

There are 5 numbers to the right of the decimal points

$$\dots\dots\dots 0.14904 \dots\dots\dots$$

(1)

(c)  $14904 \div 4.6$

$$\dots\dots\dots 3240 \dots\dots\dots$$

(1)

(Total 3 marks)

12.  $2x^2 = 72$

(a) Find a value of  $x$ .

$$x^2 = 36$$

$$x = \pm 6$$

$$\dots\dots\dots \pm 6 \dots\dots\dots$$

(2)

(b) Express 72 as a product of its prime factors.

$$72$$

$$6 \times 12$$

$$2 \times 3 \times 2 \times 6$$

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

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

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

(2)

(Total 4 marks)



13. Here are the ingredients needed to make 8 pancakes.

Pancakes
Ingredients to make 8 pancakes
300 ml milk
1 egg
120 g flour
5 g butter

David makes 24 pancakes.

- (a) Work out how much milk he needs.

$$3 \times 8 = 24$$

He needs  $300 \times 3\text{ml}$  of milk.

$$= 900\text{ml}$$

.....900..... ml  
(2)

Louis makes 12 pancakes.

- (b) Work out how much flour he needs.

120g to make 8 pancakes

$$\frac{120}{8} \text{ to make 1 pancake}$$

$$\frac{120}{8} \times 12 \text{ to make 12 pancakes}$$

$$= 180$$

.....180..... g  
(2)

(Total 4 marks)





14. Shagufta has a part-time job.  
She is paid £5.60 for each hour she works.  
Last week Shagufta worked for 24 hours.  
Work out Shagufta's total pay for last week.

$$5.6 \times 24 = 134.4$$

£ ...134.40.....

(Total 3 marks)

15. Here are the ages, in years, of 15 teachers.

34   53   41   28   37  
22   32   40   50   34  
44   28   45   45   55

Draw an ordered stem and leaf diagram to show this information.  
You must include a key.

Stem   Leaf  
(tens)   (units)

2	2 8 8
3	2 4 4 7
4	0 1 4 5 5
5	0 3 5

Key:

3 2 means 32



16. Using the information that

$$4.8 \times 36 = 172.8$$

write down the value of

(a)  $48 \times 36$

.....1728.....  
(1)

(b)  $4.8 \times 3.6$

.....17.28.....  
(1)

(c)  $172.8 \div 48$

.....3.6.....  
(1)

**(Total 3 marks)**



17. This rule is used to work out the total cost, in pounds, of hiring a bicycle.

Multiply the number of days' hire by 3

Add 6 to your answer

Peter hires a bicycle.

The total cost is £18

- (a) Work out for how many days he hires the bicycle.

Work backwards. Subtract 6 and divide by 3.

$$18 - 6 = 12$$

$$12 \div 3 = 4$$

.....4..... days  
(2)

- (b) Write down an expression, in terms of  $n$ , for the total cost, in pounds, of hiring a bicycle for  $n$  days.

..... $3n + 6$ .....  
(2)

(Total 4 marks)



18.

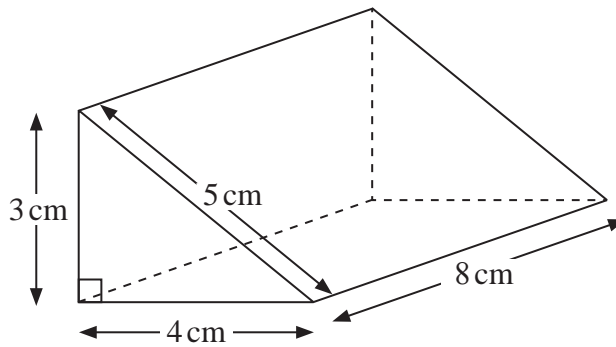


Diagram **NOT**  
accurately drawn

Work out the total surface area of the triangular prism.  
Give the units with your answer.

Area of front triangle = Area of back triangle

$$\begin{aligned}\text{Area of front triangle} &= \frac{1}{2} \times 4 \times 3 \\ &= 6\end{aligned}$$

Area of back triangle = 6

$$\begin{aligned}\text{Area of back rectangle} &= 8 \times 3 \\ &= 24\end{aligned}$$

$$\begin{aligned}\text{Area of base} &= 8 \times 4 \\ &= 32\end{aligned}$$

$$\begin{aligned}\text{Area of sloping face} &= 8 \times 5 \\ &= 40\end{aligned}$$

$$\begin{aligned}\text{Total Area} &= 6 + 6 + 24 + 32 + 40 \\ &= 108\end{aligned}$$

108 cm<sup>2</sup>

(Total 4 marks)



19. Work out an estimate for  $\frac{302 \times 9.96}{0.51}$

$$\approx \frac{300 \times 10}{0.5}$$

$$= \frac{3000}{0.5}$$

$$= 3000 \div 0.5$$

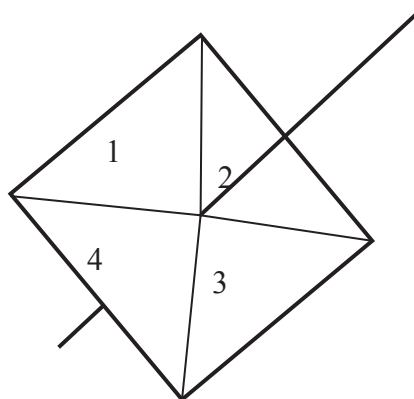
$$= 30000 \div 5 \text{ (Both numbers } \times 10 \text{ to remove decimal point)}$$

$$= 6000$$

.....6000.....

(Total 3 marks)

20. Here is a 4-sided spinner.



The sides of the spinner are labelled 1, 2, 3 and 4.

The spinner is biased.

The table shows the probability that the spinner will land on each of the colours 1, 4 and 3.

Colour	1	2	3	4
Probability	0.2		0.3	0.1

Work out the probability the spinner will land on 2.

$$p(2) = 1 - 0.2 - 0.3 - 0.1$$

$$= 0.4$$

.....0.4.....

(Total 2 marks)



21. (a) Write down the reciprocal of 5

$$\frac{1}{5}$$

$$\frac{1}{5}$$

.....

(1)

- (b) Work out the value of  $2\frac{4}{5} - 1\frac{3}{4}$

Give your answer as a fraction in its simplest form.

$$\begin{aligned} &= 1\frac{4}{5} - \frac{3}{4} \\ &= 1\frac{16-15}{20} \\ &= 1\frac{1}{20} \end{aligned}$$

$$1\frac{1}{20}$$

.....

(3)

- (c) Derek says that  $4\frac{1}{3}$  is equal to 4.3

Derek is **wrong**.

Explain why.

$$4\frac{1}{3} = 4.333 \text{ which is greater than } 4.3.$$

.....

.....

(1)

(Total 5 marks)



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# Mathematics A

## Probability Tree

## Model Answers

**Higher Tier**

Past Paper Style Questions  
Arranged by Topic

Paper Reference

**1MA0/1H**

**You must have:** Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

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Turn over ►

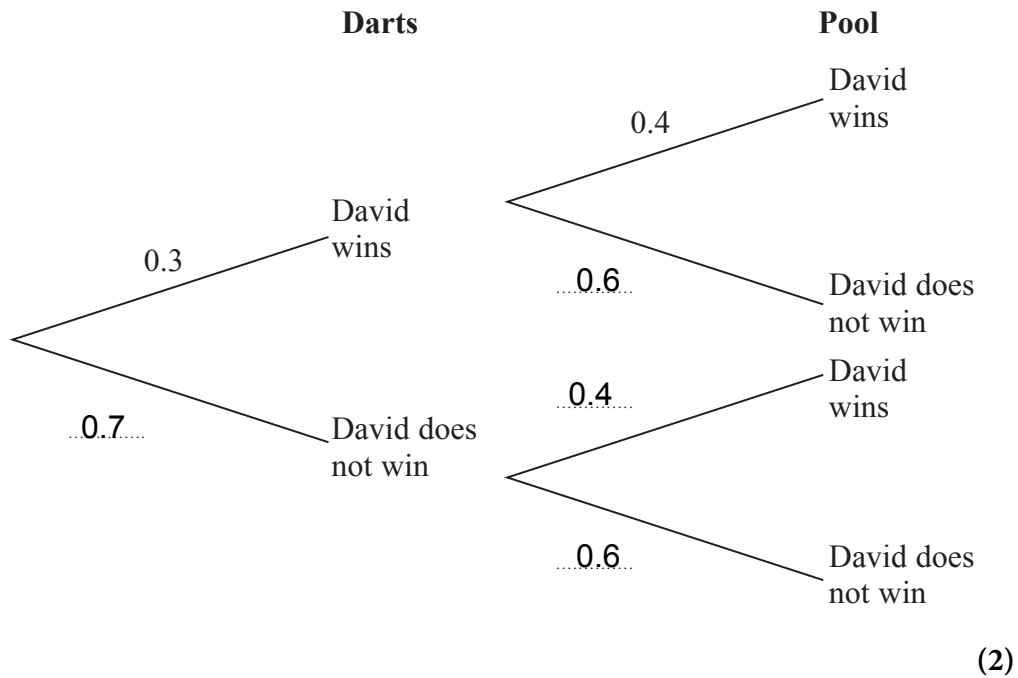




1. David goes to a club.  
He has one go at Darts. He  
has one go at Pool.

The probability that he wins at Darts is 0.3  
The probability that he wins at Pool is 0.4

- (a) Complete the probability tree diagram.



- (b) Work out the probability that David wins at Darts and also wins at Pool.

$$0.3 \times 0.4 = 0.12$$

.....0.12.....  
(2)

**Total for Question 1 is 4 marks)**

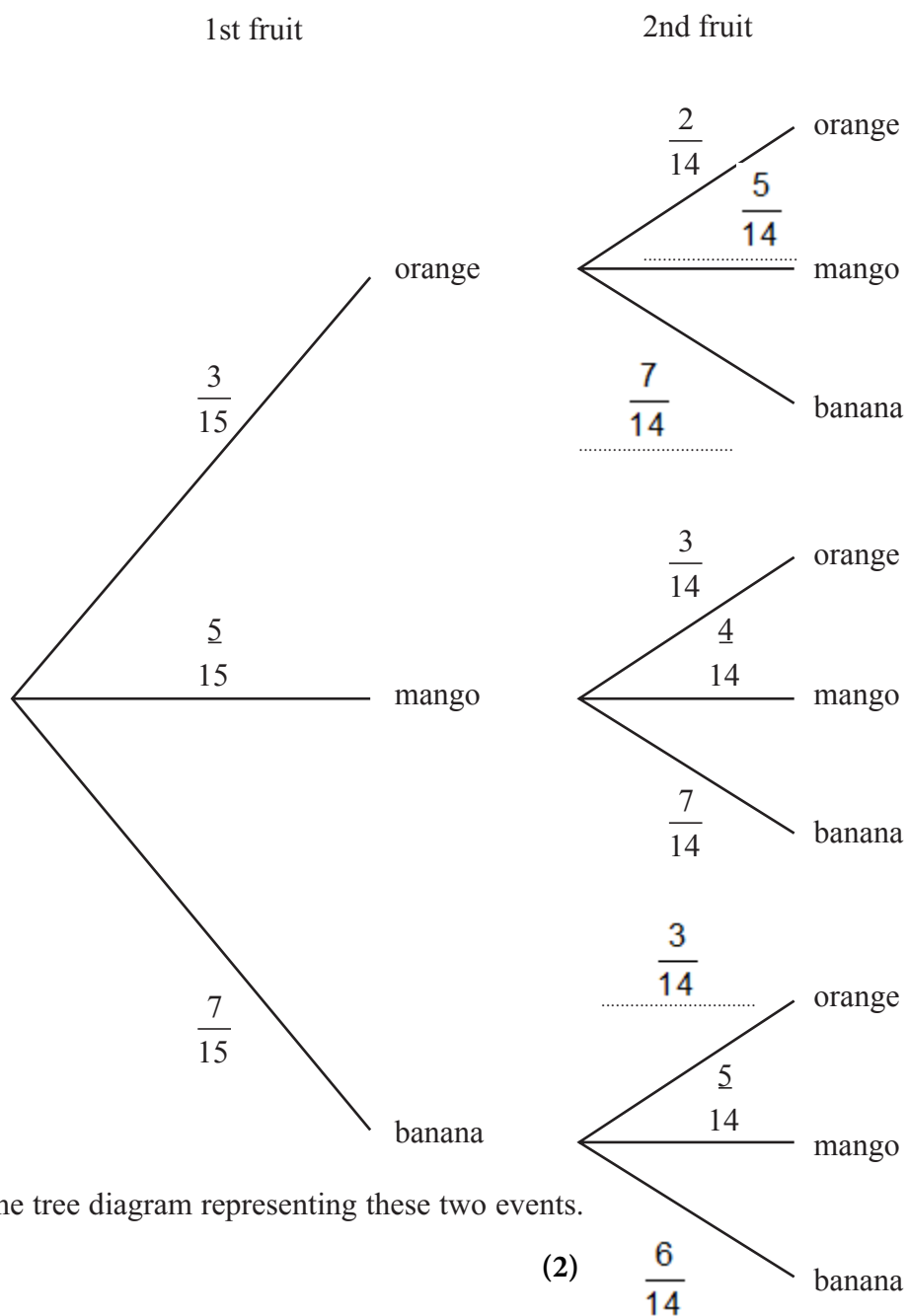


- 2.** A bowl contains 3 oranges, 5 mangoes and 7 bananas.

One fruit is taken, at random, from the bowl and **not** replaced.

Another fruit is then taken, at random, from the bowl.

A tree diagram representing these two events is shown below.



- (a) Complete the tree diagram representing these two events.

- (b) Find the probability that both fruit are bananas. Give your answer as a simplified fraction.

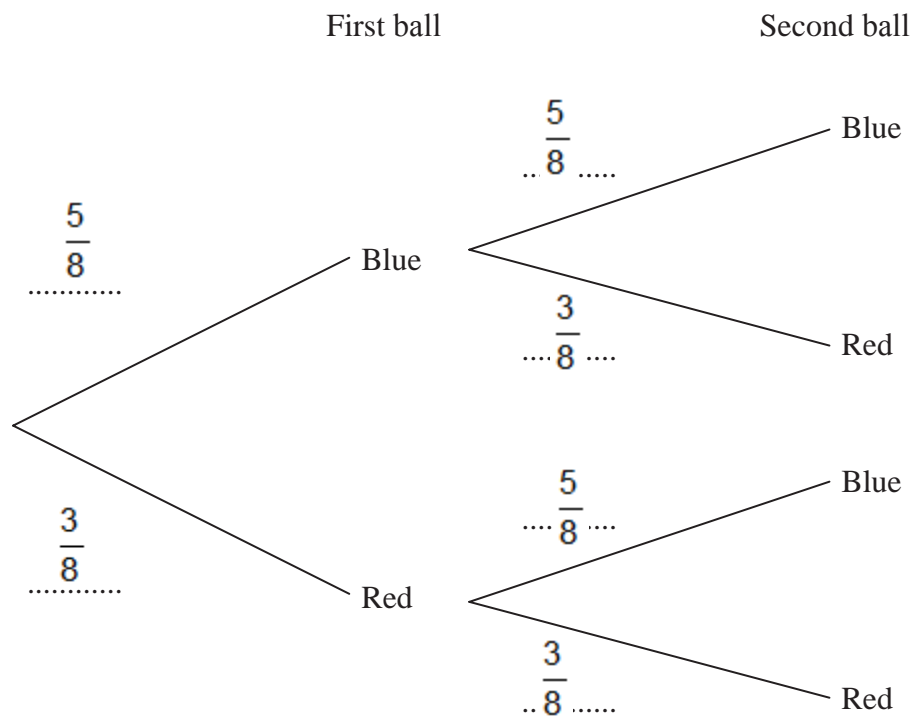
$$\begin{aligned} p(\text{Both bananas}) &= \frac{7}{15} \times \frac{6}{14} \\ &= \frac{42}{210} \\ &= \frac{1}{5} \end{aligned}$$

(2)



- Tara takes at random a ball from the box and writes down its colour.  
Tara puts the ball back in the box.

(a) Complete the probability tree diagram.



(b) Work out the probability that Tara takes exactly one ball of each colour from the box.

$$p(\text{blue, red}) = \frac{5}{8} \times \frac{3}{8} \\ = \frac{15}{64}$$

$$p(\text{red, blue}) = \frac{3}{8} \times \frac{5}{8}$$
$$= \frac{15}{64}$$

$$\frac{15}{64} + \frac{15}{64} = \frac{30}{64}$$

**(Total 5 marks)**

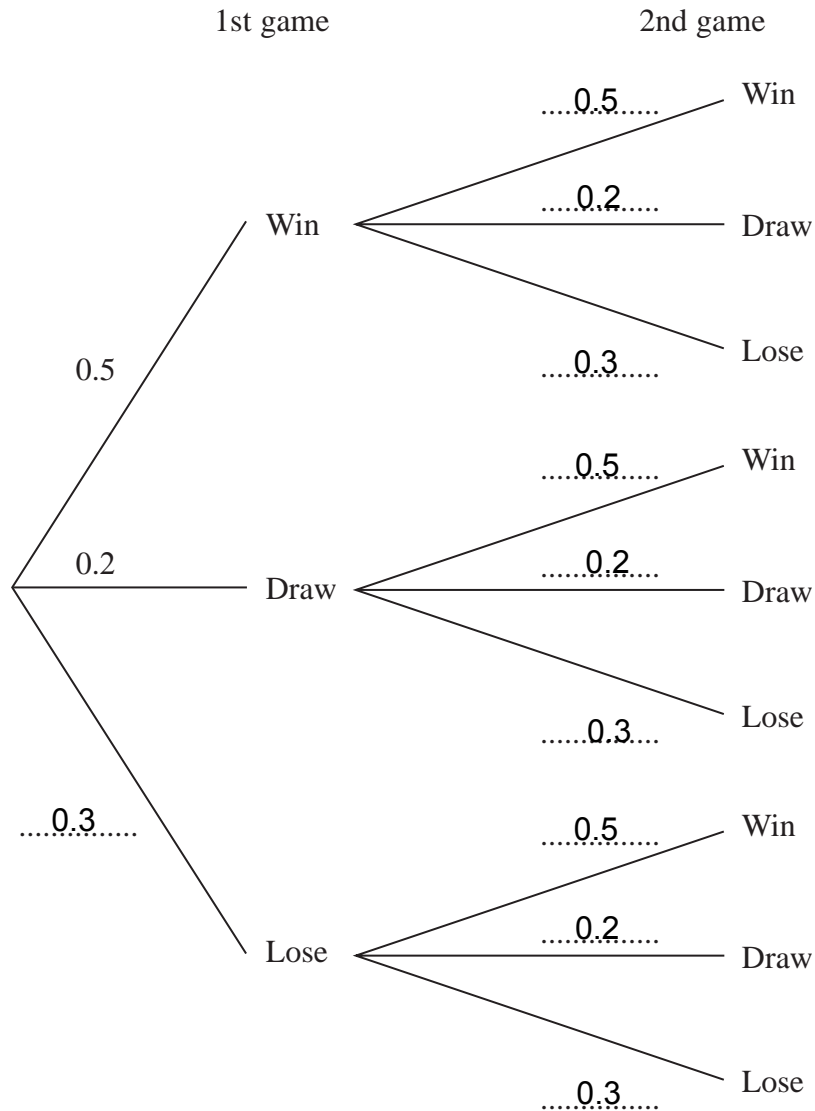
4. In a game of chess, a player can either win, draw or lose.

The probability that Sophie wins any game of chess is 0.5

The probability that Sophie draws any game of chess is 0.2

Sophie plays 2 games of chess.

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that Sophie will win both games.

$$p(\text{win, win}) = 0.5 \times 0.5$$

$$= 0.25$$

0.25

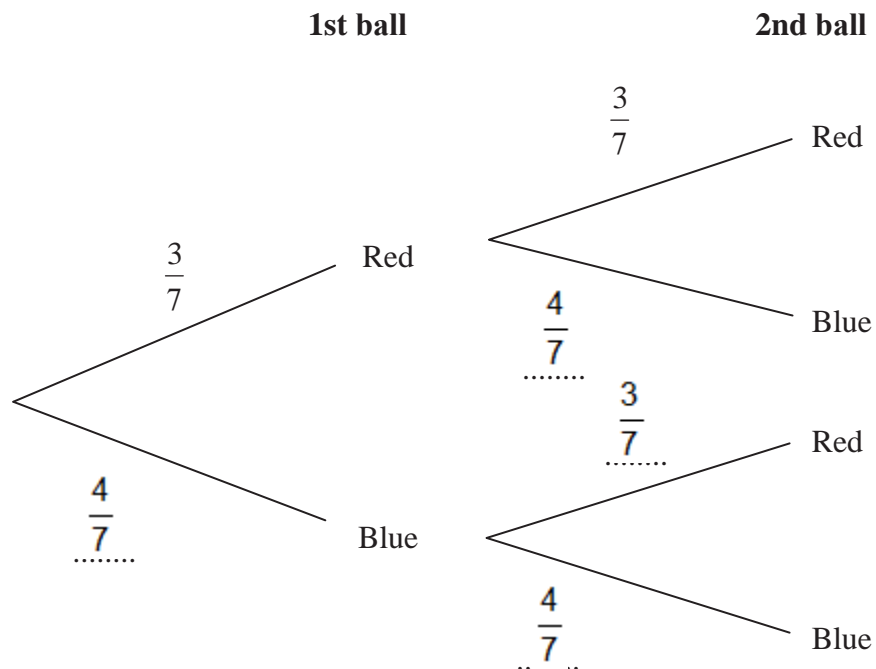
(2)

(Total 4 marks)



5. Louis puts 3 red balls and 4 blue balls in a bag.  
 He takes at random a ball from the bag.  
 He writes down the colour of the ball.  
 He puts the ball in the bag again.  
 He then takes at random a second ball from the bag.

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that Louis takes two red balls.

$$\begin{aligned}
 p(\text{red, red}) &= \frac{3}{7} \times \frac{3}{7} \\
 &= \frac{9}{49}
 \end{aligned}$$

$$\frac{9}{49}$$

(2)

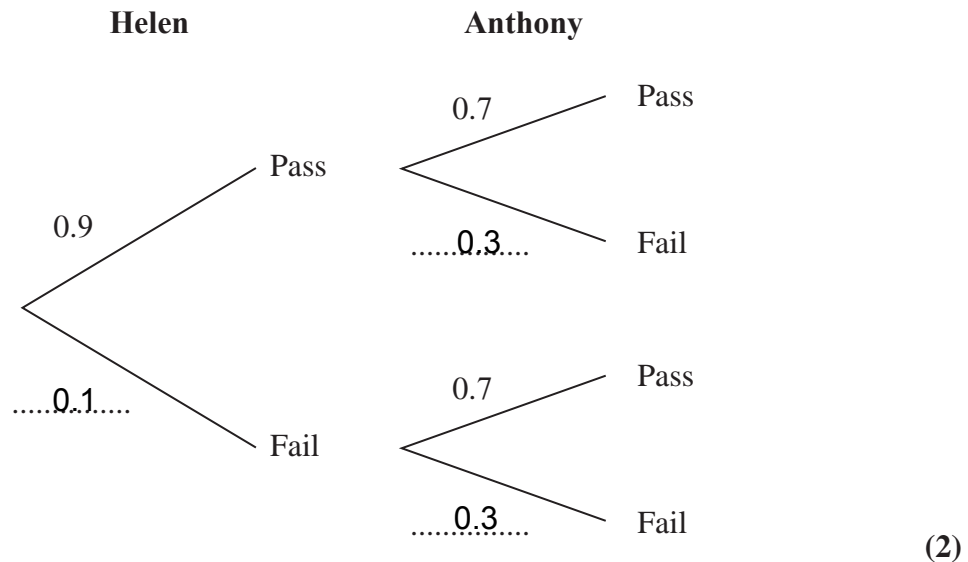
**(Total 4 marks)**



6. Helen and Anthony each take a medical.

The probability that Helen will pass the medical is 0.9 The probability that Anthony will pass the medical is 0.7

(a) Complete the probability tree diagram.



(b) Work out the probability that both Helen and Anthony will pass the medical.

$$\begin{aligned}
 p(\text{pass, pass}) &= 0.9 \times 0.7 \\
 &= 0.63
 \end{aligned}$$

.....0.63.....  
(2)

(c) Work out the probability that only one of them will pass the medical.

$$\begin{aligned}
 p(\text{pass, fail}) &= 0.9 \times 0.3 \\
 &= 0.27
 \end{aligned}$$

$$\begin{aligned}
 p(\text{fail, pass}) &= 0.1 \times 0.7 \\
 &= 0.07
 \end{aligned}$$

$$\begin{aligned}
 p(\text{one pass and one fail}) &= 0.27 + 0.07 \\
 &= 0.34
 \end{aligned}$$

.....0.34.....  
(3)

(Total 7 marks)



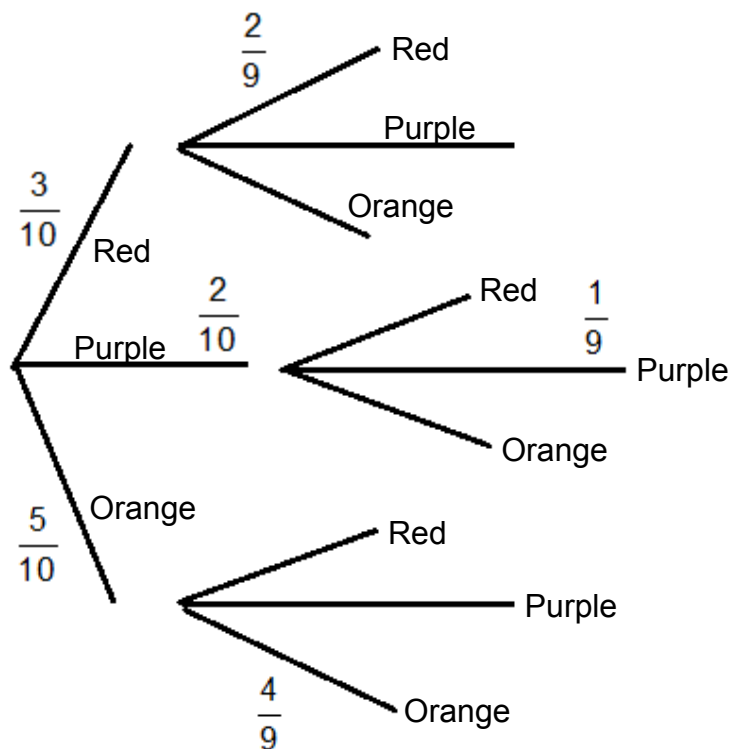
7. There are 3 red sweets, 2 purple sweets and 5 orange sweets in a bag.

Georgina takes a sweet at random.

She eats the sweet.

She then takes another sweet at random.

Work out the probability that both the sweets are the same colour.



$$p(\text{Red, Red}) = \frac{3}{10} \times \frac{2}{9} \\ = \frac{6}{90}$$

$$p(\text{Purple, Purple}) = \frac{2}{10} \times \frac{1}{9} \\ = \frac{2}{90}$$

$$p(\text{Orange, Orange}) = \frac{5}{10} \times \frac{4}{9} \\ = \frac{20}{90}$$

$$p(\text{Two the same colour}) = \frac{6}{90} + \frac{2}{90} + \frac{20}{90} \\ = \frac{28}{90}$$

$$\frac{28}{90}$$

(Total 4 marks)

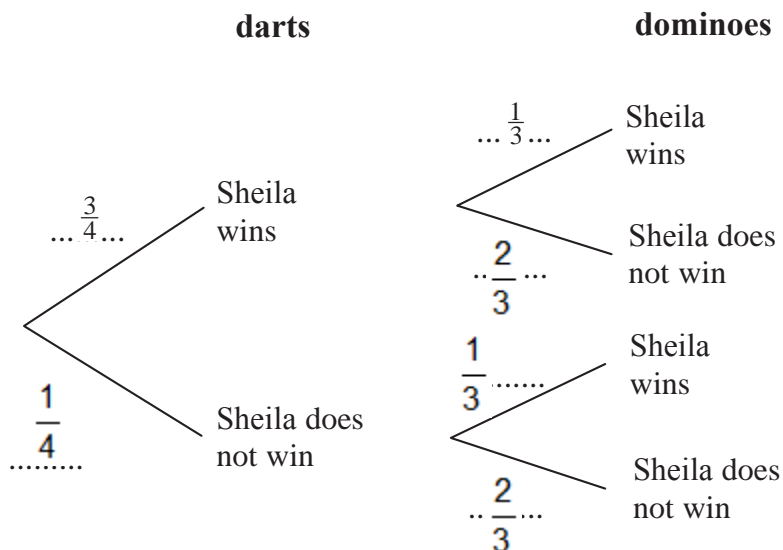


8. Sheila is going to play one game of darts and one game of dominoes.

The probability that she will win the game of darts is  $\frac{3}{4}$

The probability that she will win the game of dominoes is  $\frac{1}{3}$

is (a) Complete the probability tree diagram.



(2)

(b) Work out the probability that Sheila will win **exactly** one game.

$$p(\text{Win darts, lose dominoes}) = \frac{3}{4} \times \frac{2}{3} = \frac{6}{12}$$

$$p(\text{Lose darts, win dominoes}) = \frac{1}{4} \times \frac{1}{3} = \frac{1}{12}$$

$$p(\text{Wins one game only}) = \frac{6}{12} + \frac{1}{12} = \frac{7}{12}$$

$$\frac{7}{12}$$

(3)

Sheila played one game of darts and one game of dominoes on a number of Fridays.  
She won at **both** darts and dominoes on 21 Fridays.

(c) Work out an estimate for the number of Fridays on which Sheila did not win either game.

$$p(\text{Win darts, win dominoes}) = \frac{3}{4} \times \frac{1}{3} = \frac{1}{4}$$

This means 21 is  $\frac{1}{4}$  of the Fridays

Total number of Fridays:  $21 \times 4 = 84$

$$p(\text{lose, lose}) = \frac{1}{4} \times \frac{2}{3} = \frac{2}{12}$$

Number of Fridays she loses both games:

$$84 \times \frac{2}{12} = 14$$

$$\dots\dots\dots 14 \dots\dots\dots$$

(3)

(Total 8 marks)

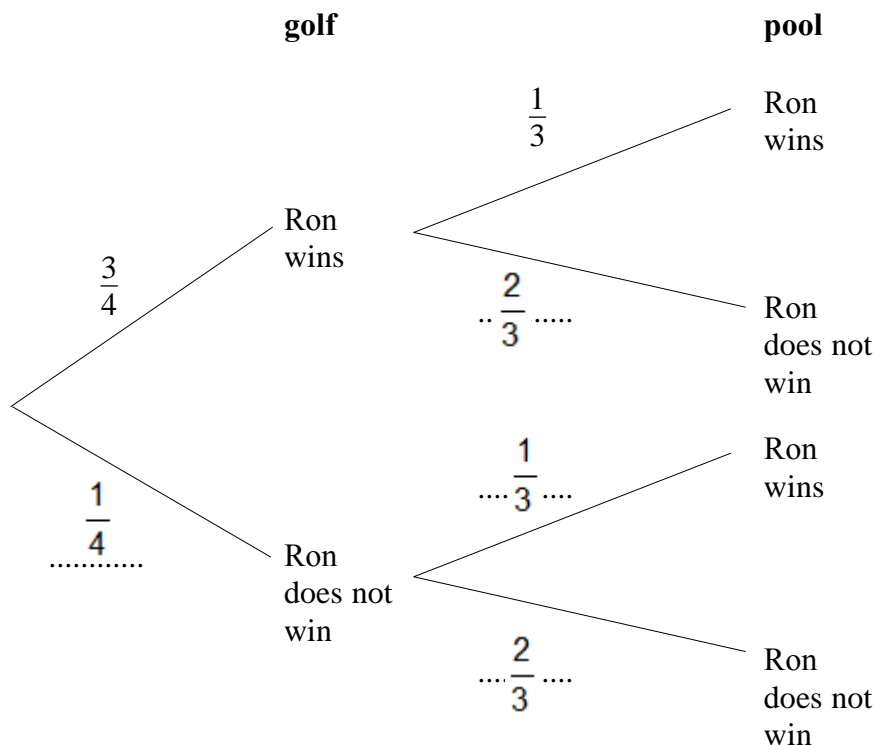




9. Ron plays one game of golf and one game of pool.

The probability that Ron will win at golf is  $\frac{3}{4}$  The probability that Ron will win at pool is  $\frac{1}{3}$

(a) Complete the probability tree diagram below.



(2)

(b) Work out the probability that Ron wins both games.

$$p(\text{win, win}) : \frac{3}{4} \times \frac{1}{3} = \frac{3}{12}$$

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

(2)

(c) Work out the probability that Ron will win only one game.

$$p(\text{win, lose}) : \frac{3}{4} \times \frac{2}{3} = \frac{6}{12}$$

$$p(\text{lose, win}) : \frac{1}{4} \times \frac{1}{3} = \frac{1}{12}$$

$$p(\text{win one game}) : \frac{6}{12} + \frac{1}{12} = \frac{7}{12}$$

$$\frac{7}{12}$$

(3)

(Total 7 marks)



Write your name here

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# Mathematics A

## Quadratic Graphs

### Model Answers

**Higher Tier**

Past Paper Style Questions  
Arranged by Topic

Paper Reference

**1MA0/1H**

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Turn over ►



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

$x$	-4	-3	-2	-1	0	1	2
$y$	10	4	0	-2	-2	0	4

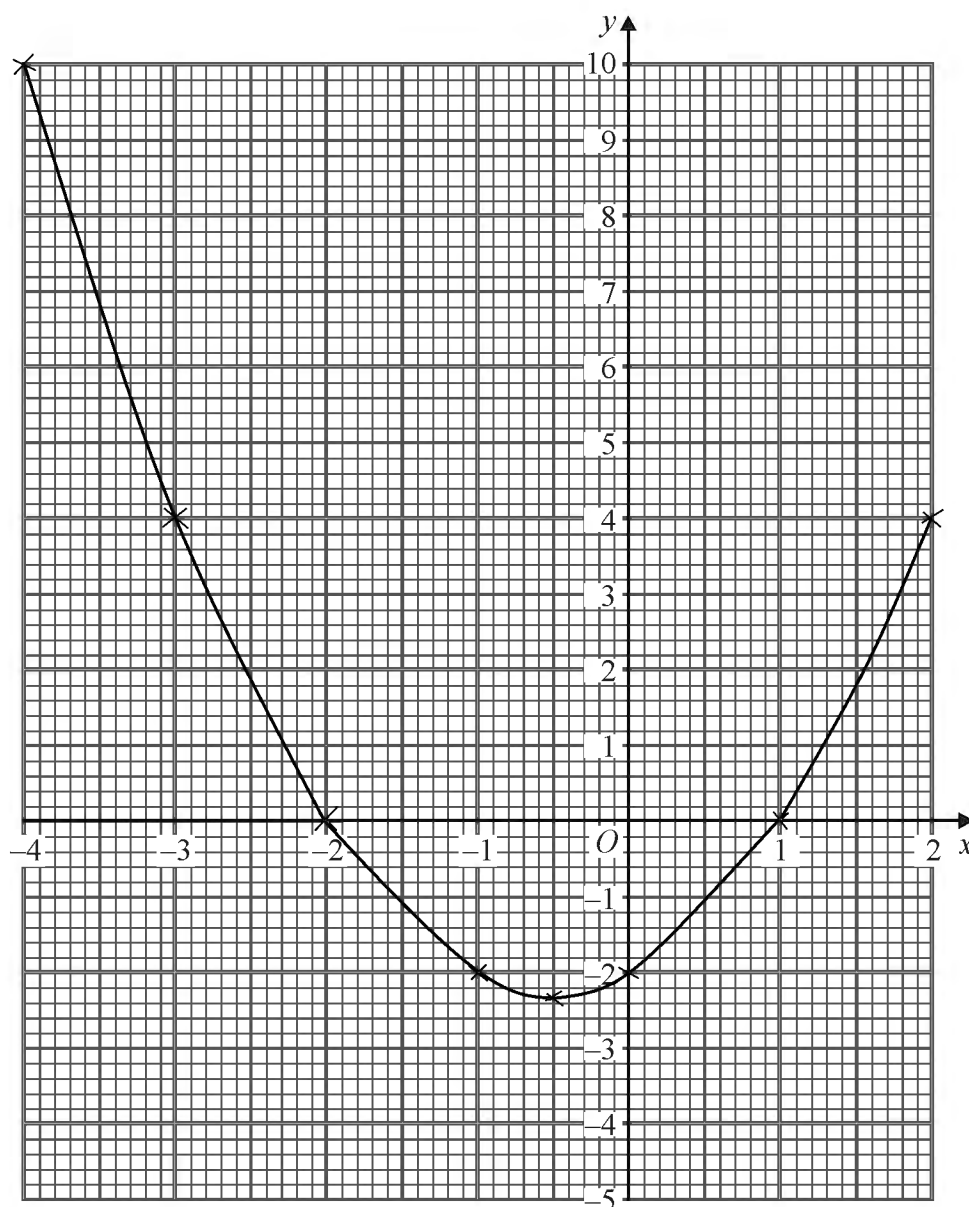
-0.5

-2.25

(2)

(b) On the grid below, draw the graph of  $y = x^2 + x - 2$  for values of  $x$  from -4 to 2

(2)



(c) Use your graph to find estimates for the solutions of  $x^2 + x - 2 = 0$

$$x = \dots -2 \dots$$

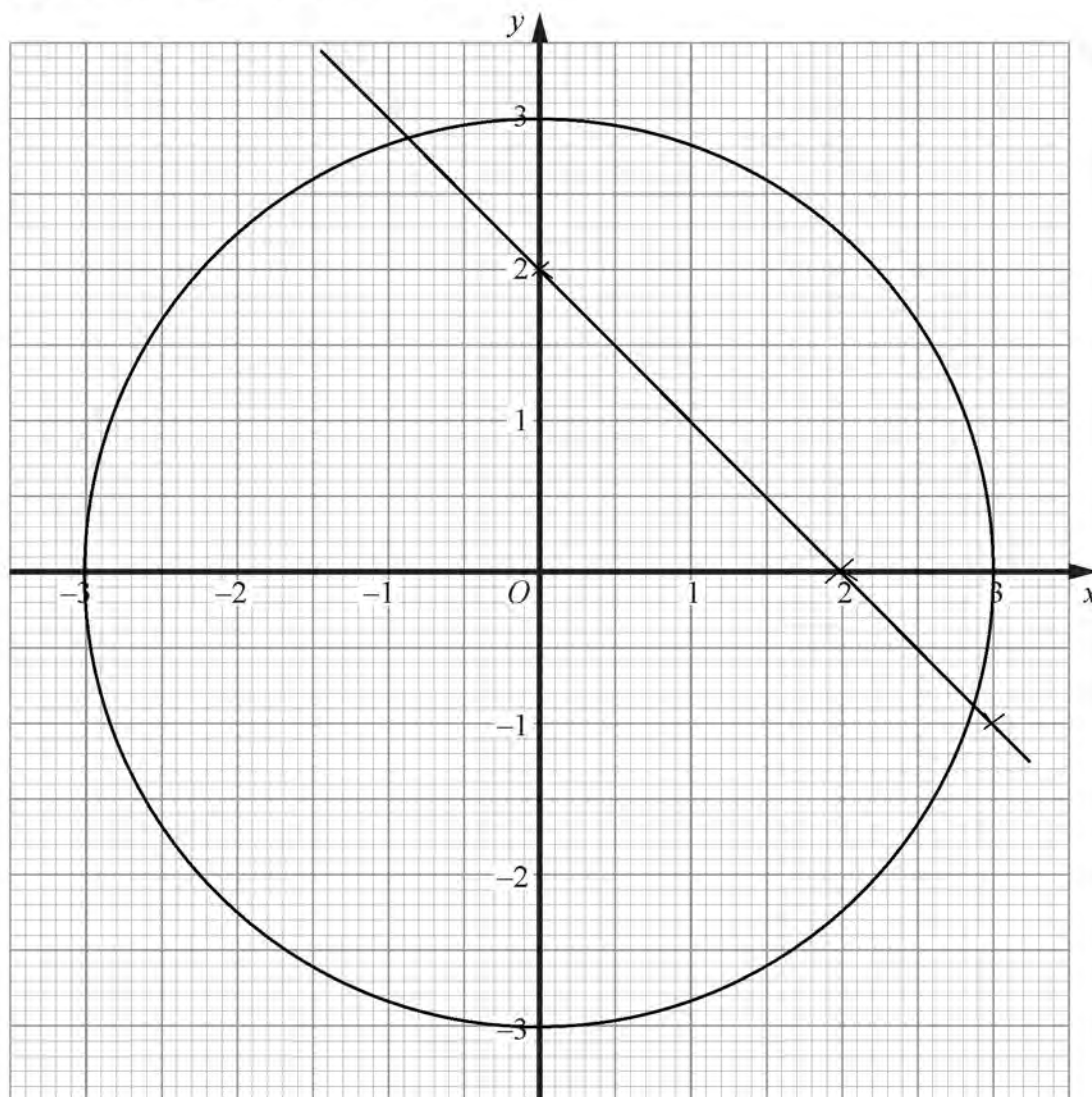
$$x = \dots 1 \dots$$

(1)

**(Total 5 marks)**



2. (a) Construct the graph of  $x^2 + y^2 = 9$



(2)

(b) By drawing the line  $x + y = 2$  on the grid, solve the equations  $x^2 + y^2 = 9$   
 $x + y = 2$

$$x = \dots -0.9 \dots, y = \dots 2.9 \dots$$

$$\text{or } x = \dots 2.9 \dots, y = \dots 0.9 \dots$$

(3)

(Total 5 marks)

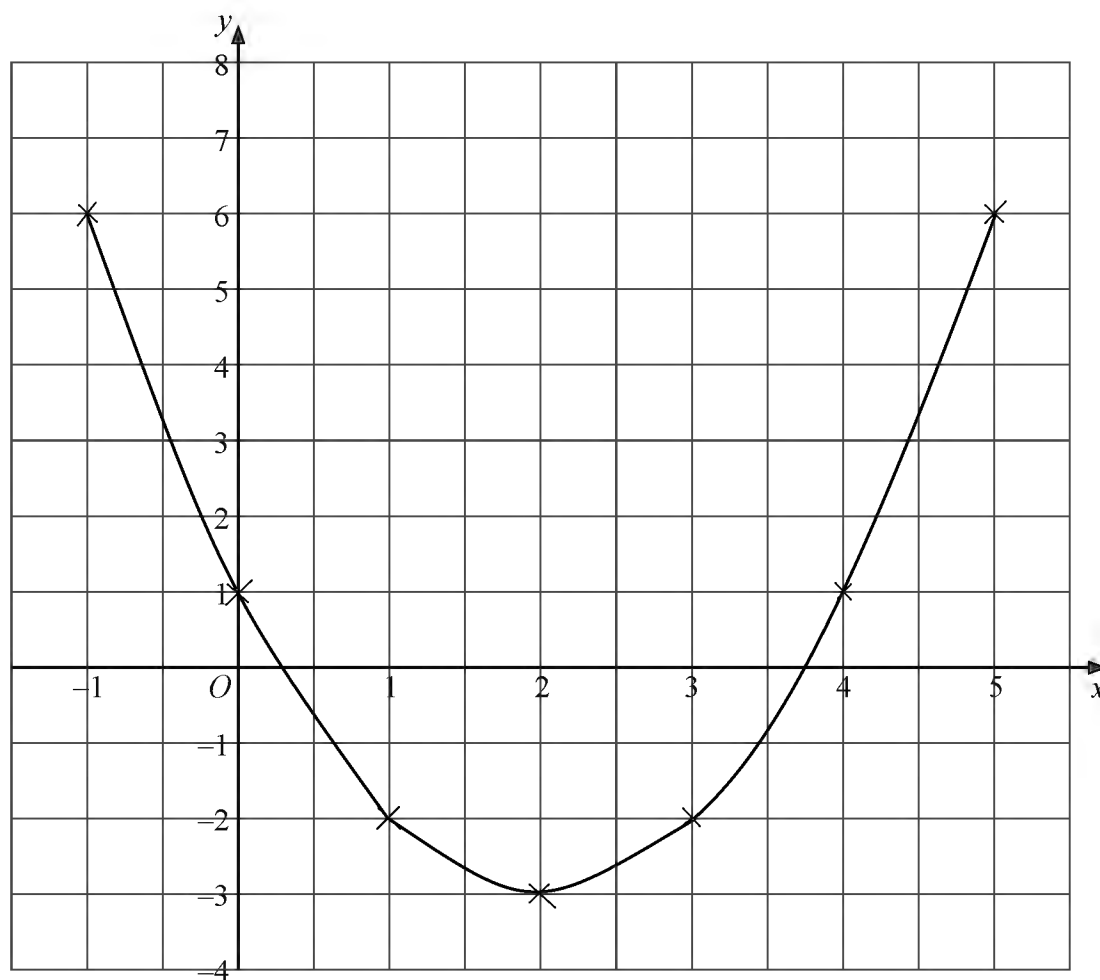


3. (a) Complete the table of values for  $y = x^2 - 4x + 1$

$x$	-1	0	1	2	3	4	5
$y$	6	1	-2	-3	-2	1	6

(2)

(b) On the grid, draw the graph of  $y = x^2 - 4x + 1$



(2)

(Total 4 marks)

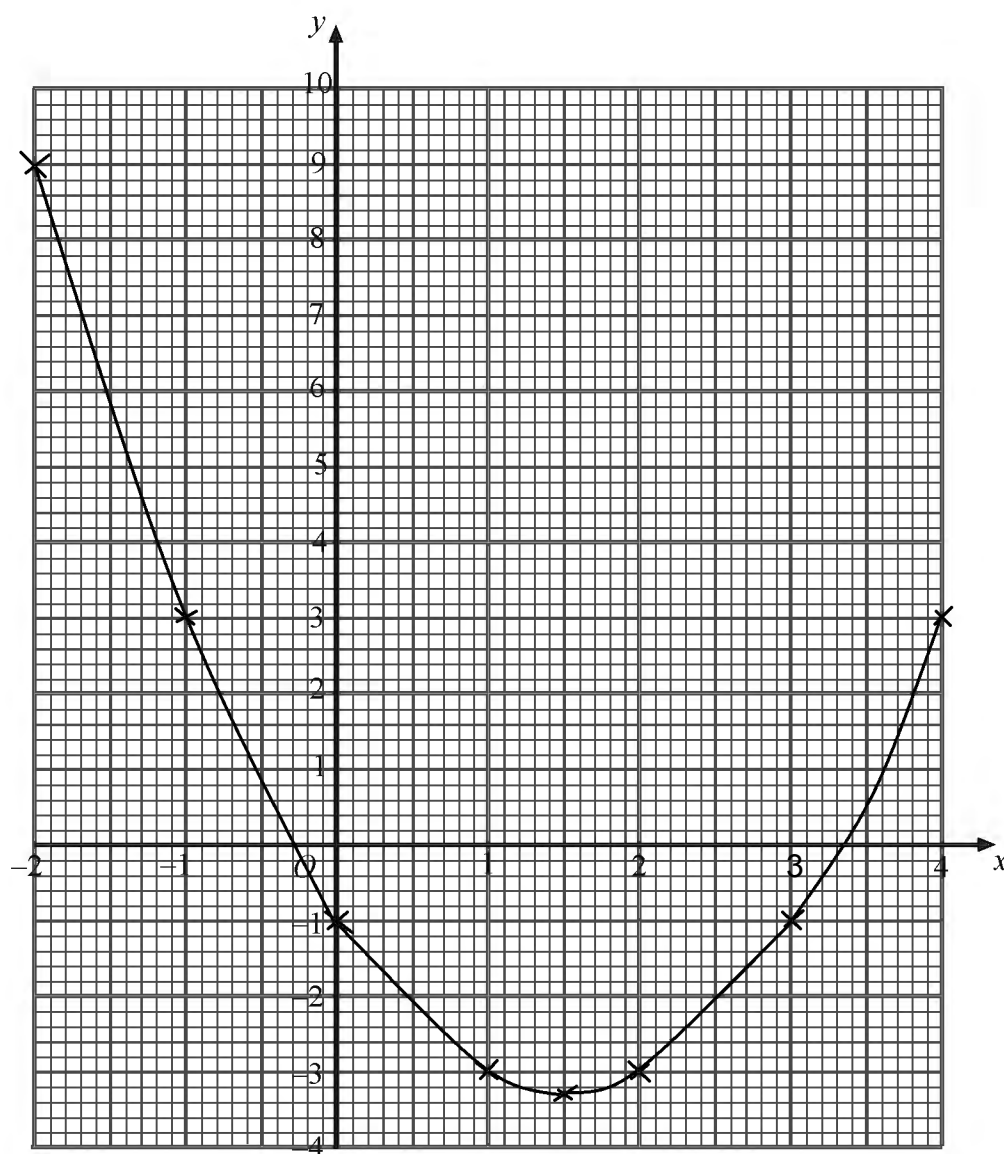


4. (a) Complete the table of values for  $y = x^2 - 3x - 1$

$x$	-2	-1	0	1	2	3	4	1.5
$y$	9	3	-1	-3	-3	-1	3	-3.25

(2)

(b) On the grid, draw the graph of  $y = x^2 - 3x - 1$  for values of  $x$  from -2 to 4



(2)

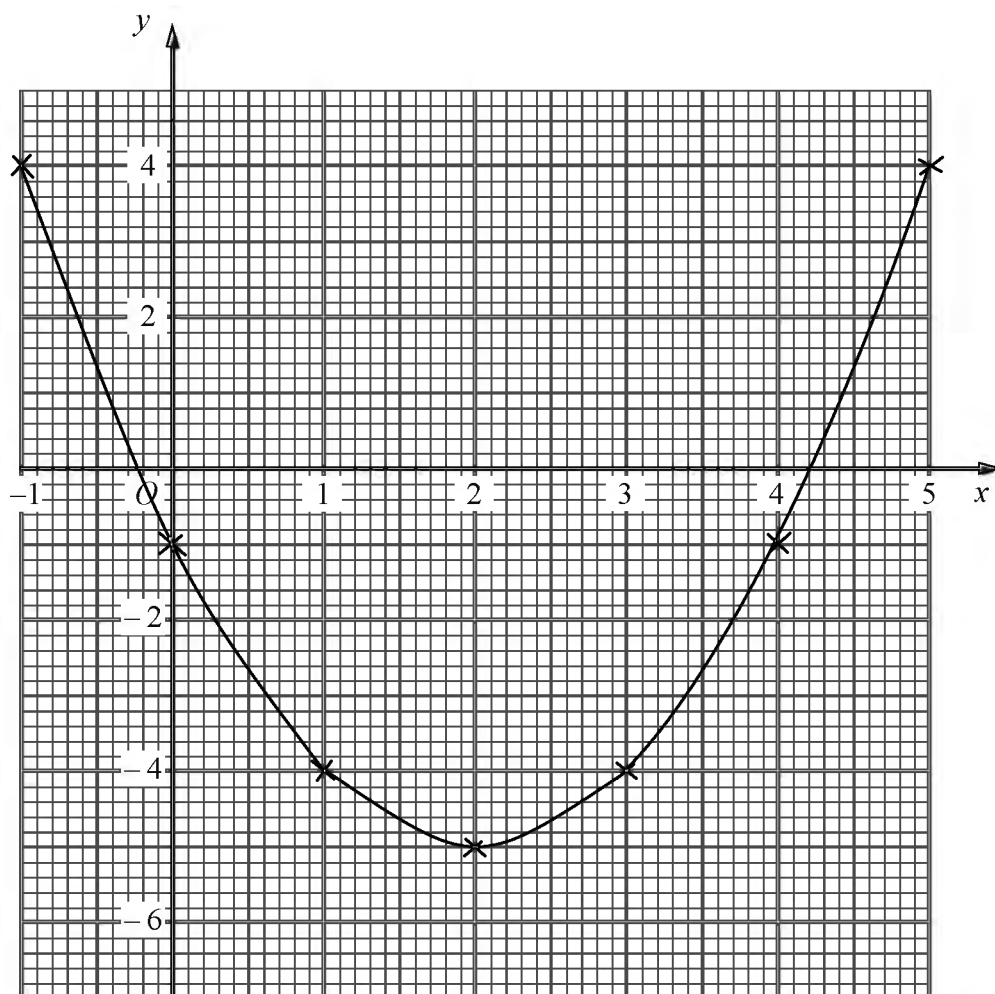


5. (a) Complete the table of values for  $y = x^2 - 4x - 1$

$x$	-1	0	1	2	3	4	5
$y$	4	-1	-4	-5	-4	-1	4

(2)

- (b) On the grid, draw the graph of  $y = x^2 - 4x - 1$



(2)

- (c) Use your graph to estimate the values of  $x$  when  $y = -3$

$x = \dots\dots 0.6 \dots\dots$

$x = \dots\dots 3.4 \dots\dots$

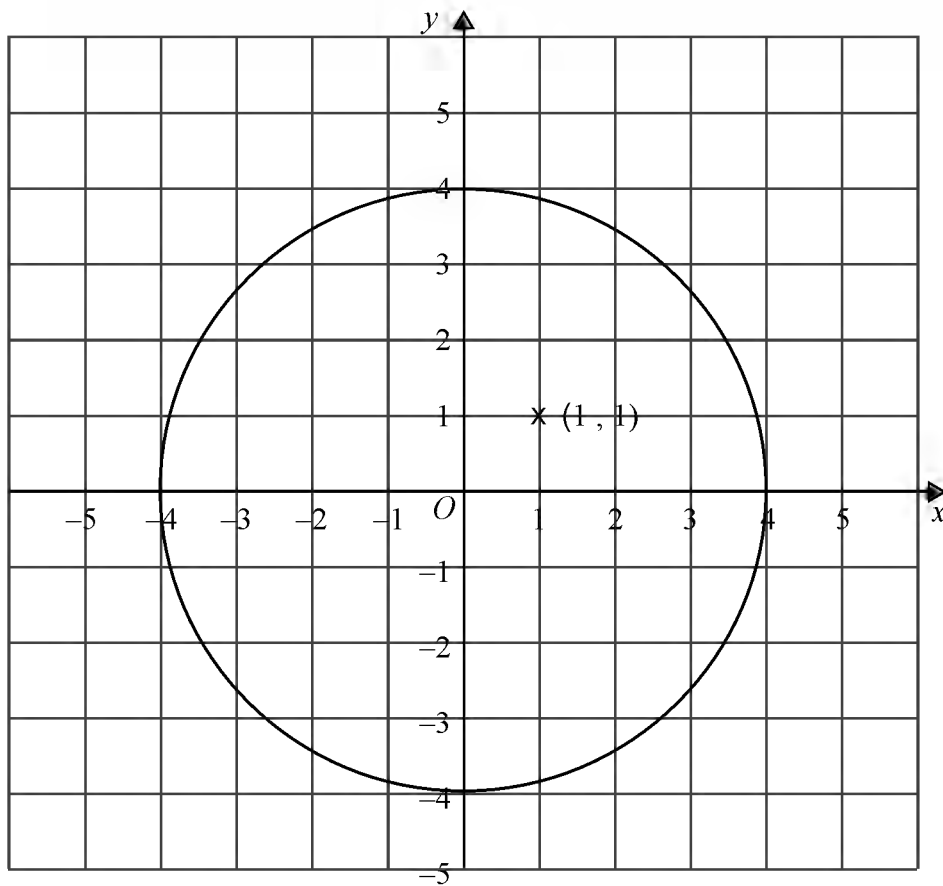
(2)

(Total 6 marks)





6. Show that any straight line that passes through the point  $(1, 1)$  must intersect the curve with equation  $x^2 + y^2 = 16$  at two points.



The graph of the equation  $x^2 + y^2 = 16$  is a circle with its centre at the origin and the radius is 4. The circle surrounds the point  $(1, 1)$ , so any line must pass through the circle twice.

**(Total 3 marks)**



Write your name here

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# Mathematics A

## Quadratic Equations

### Model Answers

**Higher Tier**

Past Paper Style Questions  
Arranged by Topic

Paper Reference

**1MA0/1H**

**You must have:** Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

### Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided  
– *there may be more space than you need.*
- **Calculators must not be used.**



### Information

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### Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►



1. Simplify fully  $\frac{6x^2 + x - 1}{4x^2 - 1}$

$$\begin{aligned} & \frac{6x^2 + x - 1}{4x^2 - 1} \text{ Notice this is a difference of two squares} \\ &= \frac{(2x+1)(3x-1)}{(2x+1)(2x-1)} \quad a^2 - b^2 = (a+b)(a-b) \\ &= \frac{3x-1}{2x-1} \end{aligned}$$

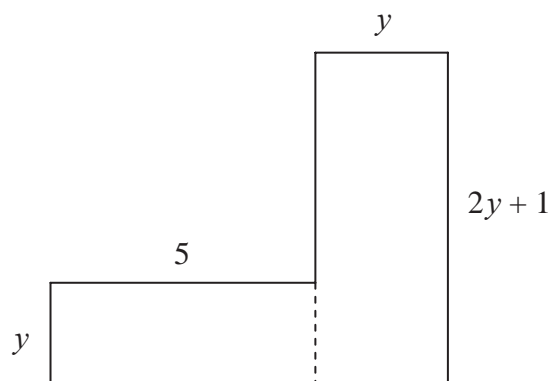
$$\frac{3x-1}{2x-1}$$

.....  
(Total 4 marks)



2. The diagram below shows a 6-sided shape.  
 All the corners are right angles.  
 All the measurements are given in centimetres.

Diagram **NOT**  
 accurately drawn



The area of the shape is  $95 \text{ cm}^2$ .

- (a) Show that  $2y^2 + 6y - 95 = 0$

$$y(2y + 1) + 5y = 95$$

$$2y^2 + y + 5y = 95$$

$$2y^2 + 6y - 95 = 0$$

(3)

- (b) Solve the equation

$$2y^2 + 6y - 95 = 0$$

Give your solutions correct to 3 significant figures.

$$a = 2 \quad b = 6 \quad c = -95$$

$$y = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$y = \frac{-6 \pm \sqrt{36 - (4 \times 2 \times [-95])}}{2 \times 2}$$

$$y = \frac{-6 + \sqrt{796}}{4} = 5.5534$$

or

$$y = \frac{-6 - \sqrt{796}}{4} = -8.5533$$

$$y = 5.55 \dots \dots \dots \text{ or } y = -8.55 \dots \dots \dots$$

(3)



4. (a) Rearrange this equation

$$\frac{5}{x+2} = \frac{4-3x}{x-1}$$

to give  $3x^2 + 7x - 13 = 0$

$$5(x-1) = (x+2)(4-3x)$$

$$5x - 5 = 4x - 3x^2 + 8 - 6x$$

$$5x - 5 - 4x + 3x^2 - 8 + 6x = 0$$

$$3x^2 + 7x - 13 = 0$$

(3)

(b) Solve  $3x^2 + 7x - 13 = 0$   
correct to 2 decimal places.

$$a = 3 \quad b = 7 \quad c = -13$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-7 \pm \sqrt{7^2 - (4 \times 3 \times [-13])}}{2 \times 3}$$

$$x = \frac{-7 \pm \sqrt{49 - (-156)}}{6}$$

$$x = \frac{-7 + \sqrt{205}}{6} = 2.3452$$

or

$$x = \frac{-7 - \sqrt{205}}{6} = -3.5529$$

$$x = \underline{2.35} \dots \dots \dots \text{ or } x = \underline{-3.55} \dots \dots \dots$$

(3)

(Total 6 marks)



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

$$= x^2 - 2x + 3x - 6$$

$$= x^2 + x - 6$$

$$\dots\dots\dots x^2 + x - 6 \dots\dots\dots$$

(2)

(b) Factorise

$$x^2 + 7x + 10$$

$$(x + 2)(x + 5)$$

$$\dots\dots\dots (x + 2)(x + 5) \dots\dots\dots$$

(2)

(c)  $x = 3y + 4(z - y)$

Find the value of  $x$  when  $y = 6$  and  $z = 5$

$$x = 18 + 4(5 - 6)$$

$$x = 18 + 4(-1)$$

$$x = 18 - 4$$

$$x = 14$$

$$x = \dots\dots 14 \dots\dots\dots$$

(3)

**(Total 7 marks)**



6. (a) Factorise  $x^2 - 7x + 10$

$$(x - 2)(x - 5)$$

$$\dots\dots\dots(x - 2)(x - 5)\dots\dots\dots$$

(2)

(b) Solve  $x^2 - 7x + 10 = 0$

$$(x - 2)(x - 5)$$

$$x = \dots 2 \dots\dots\dots$$

$$\text{or } x = \dots 5 \dots\dots\dots$$

(1)

**(Total 3 marks)**



7. (a) Simplify  $4a + 3c - 2a + c$

$$2a + 4c$$

$$2(a + 2c)$$

$$\dots\dots\dots 2(a + 2c) \dots\dots\dots$$

(1)

(b)  $S = \frac{1}{2}at^2$

Find the value of  $S$  when  $t = 3$  and  $a = \frac{1}{4}$

$$S = \frac{1}{2} \times \frac{1}{4} \times 3^2$$

$$= \frac{1}{8} \times \frac{9}{1}$$

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

$$= 1\frac{1}{8}$$

$$S = \dots\dots\dots 1\frac{1}{8} \dots\dots\dots$$

(2)

(c) Factorise  $x^2 - 5x$

$$\dots\dots\dots x(x - 5) \dots\dots\dots$$

(2)

(d) Expand and simplify  $(x + 3)(x + 4)$

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

$$= x^2 + 7x + 12$$

$$\dots\dots\dots x^2 + 7x + 12 \dots\dots\dots$$

(2)

(e) Factorise  $y^2 + 8y + 15$

$$\dots\dots\dots (y + 3)(y + 5) \dots\dots\dots$$

(2)

(Total 9 marks)





8 (a) Simplify  $(c^2 k^5)^4$

$$\dots\dots\dots c^8 k^{20} \dots\dots\dots$$

**(1)**

(b) Expand and simplify  $(3x + 5)(4x - 1)$

$$= 12x^2 - 3x + 20x - 5$$

$$= 12x^2 + 17x - 5$$

$$\dots\dots 12x^2 + 17x - 5 \dots\dots\dots$$

**(2)**

(c) Solve  $x^2 - 3x - 10 = 0$

$$(x + 2)(x - 5) = 0$$

$$x = -2 \text{ or } 5$$

$$x = \dots\dots\dots x = -2 \text{ or } 5 \dots\dots\dots$$

**(Total 6 marks)**



9 The plan below shows a large rectangle of length  $(2x + 6)$  m and width  $x$  m.

A smaller rectangle of length  $x$  m and width 3 m is cut out and removed.

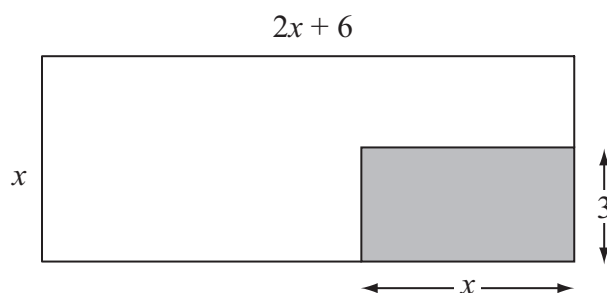


Diagram **NOT** accurately drawn

The area of the shape that is left is  $100 \text{ m}^2$ .

(a) Show that  $2x^2 + 3x - 100 = 0$

$$x(2x + 6) - 3x = 100$$

$$2x^2 + 6x - 3x = 100$$

$$2x^2 + 3x - 100 = 0$$

(3)

(b) Calculate the length of the smaller rectangle.  
Give your answer correct to 3 significant figures.

$$2x^2 + 3x - 100 = 0$$

$$a = 2 \quad b = 3 \quad c = -100$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-3 \pm \sqrt{9 - (4 \times 2 \times 3 \times [-100])}}{2 \times 2}$$

$$x = \frac{-3 \pm \sqrt{9 - (-2400)}}{4}$$

$$x = \frac{-3 + \sqrt{2409}}{4}$$

$$x = 11.5204$$

Only the positive value needed

.....11.5..... m

(4)



9 The plan below shows a large rectangle of length  $(2x + 6)$  m and width  $x$  m.

A smaller rectangle of length  $x$  m and width 3 m is cut out and removed.

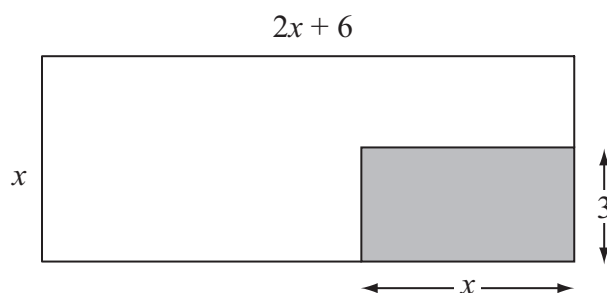


Diagram **NOT** accurately drawn

The area of the shape that is left is  $100 \text{ m}^2$ .

(a) Show that  $2x^2 + 3x - 100 = 0$

$$x(2x + 6) - 3x = 100$$

$$2x^2 + 6x - 3x = 100$$

$$2x^2 + 3x - 100 = 0$$

(3)

(b) Calculate the length of the smaller rectangle.  
Give your answer correct to 3 significant figures.

$$2x^2 + 3x - 100 = 0$$

$$a = 2 \quad b = 3 \quad c = -100$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-3 \pm \sqrt{3^2 - (4 \times 2 \times [-100])}}{2 \times 2}$$

$$x = \frac{-3 \pm \sqrt{9 - (-800)}}{4}$$

$$x = \frac{-3 + \sqrt{809}}{4}$$

$$x = 6.3607$$

$$\dots\dots\dots 6.36 \dots\dots\dots \text{m}$$

(4)

Only the positive value needed



Write your name here

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# Mathematics A

## Questionnaires

## Model Answers

**Higher Tier**

Past Paper Style Questions  
Arranged by Topic

Paper Reference

**1MA0/1H**

**You must have:** Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

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### Advice

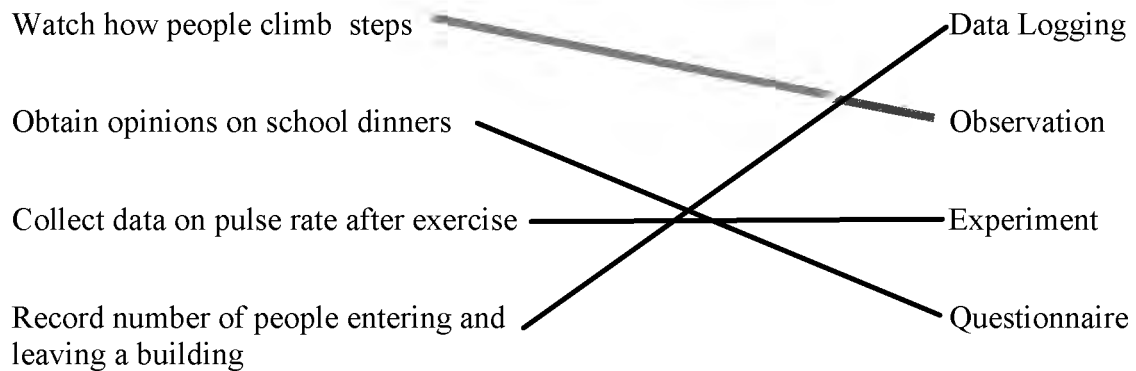
- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►



1. (a) Match the data collection methods to **the** situations.

The first one is done for you.



(2)

Design a questionnaire to find out the age and gender of some people.

Write **two** questions. You should include some response boxes.

. Question 1

Please tick the box which shows your age group.

☐

0 - 19

☐

20 - 39

☐

40 - 59

☐

60 and over

Question 2

Please tick the box which shows your gender.

☐

Male

☐

Female

(4)



2. Peter wants to find out how much people spend on their lunch. He uses this question on a questionnaire.

How much do you spend on your lunch?		
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
£1–£5	£5–£10	£10–£15

- (a) Write down **two** things that are wrong with this question.

1 ....The question does not specify the length of time such as a day or a week

.....

2 ....The classes overlap, so £5 could go in 2 boxes.....

.....The possible responses are not exhaustive. Someone could spend less than £1 or more than £15. (2)

- (b) Design a better question for his questionnaire to find out how much people spend on their lunch.  
You should include some response boxes.

How much do you spend on your lunch in a week?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
£0 - £1.99	£2 - £3.99	£4 - £5.99	£6 and above

(2)

(Total 4 marks)



3. Ron is going to take a survey of the games played by students.

He wants to design a questionnaire.

- (a) Design a suitable question that he could use to find out what types of game students play.

What types of games have you played in the last 2 weeks?

☐

Electronic

☐

Board

☐

Cards

☐

Sport

(2)

Ron put the question below on his questionnaire.

‘How many games have you played?’

A few

A lot

- (b) Design a better question.

You should include some response boxes.

How many games have you played during the last 2 weeks?

☐

0 - 5

☐

6 - 10

☐

11 - 15

☐

16 or more

(2)

(Total 4 marks)



4. Georgina wants to find out how often adults go to the library. She uses this question on a questionnaire.

“How many times do you go to the library?”

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Not very often	Sometimes	A lot

- (a) Write down **two** things wrong with this question.

- 1 ... She has not specified a period of time, such as 4 weeks.
- 2 ... She has not asked for precise numbers, making it hard to choose
- which box to tick.
- (2)

- (b) Design a better question for her questionnaire to find out how often adults go to the library.  
You should include some response boxes.

How many times do you visit the library in 6 months?

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0 - 2	3 - 5	6 - 8	9 or more

(2)

(Total 4 marks)





5. Will wants to find out how many tunes people download.

He uses this question on a questionnaire.

How many tunes do you download?

☐

1 – 5

☐

5 – 10

☐

10 – 15

☐

15 – 20

Write down **two** different things wrong with this question.

1 .....The classes overlap, so some numbers, such as 5 could go in more than one box.

.....

2 .....It is not exhaustive. No provision for 0 downloads or over 20.....

.....There is no time period specified, such as a week.....

(Total 2 marks)



6. Sophie wants to find out the amount of time people listen to music. She will use a questionnaire.

- (a) Design a suitable question for Sophie to use in her questionnaire. You must include some response boxes.

How many hours did you listen to music during the last 7 days?

☐

0 - 5

☐

6 - 10

☐

11 - 15

☐

16 - 20

☐

21 or more

(2)

Sophie asks the people at a concert to complete her questionnaire. This may **not** be a suitable sample.

- (b) Give a reason why.

.....The people who go to concerts probably like music more than a random  
.....sample of people.....

(1)

(Total 3 marks)



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# Mathematics A

## Scattergraphs

## Model Answers

**Higher Tier**

Past Paper Style Questions  
Arranged by Topic

Paper Reference

**1MA0/2H**

**You must have:** Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

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Turn over ►



1. (a) Andy, Lauren and Noah are playing with a normal fair dice. They each predict the next seven throws.

Andy	1	2	1	2	1	2	1
Lauren	3	5	2	2	4	6	1
Noah	4	4	4	4	4	4	4

Which, if any, of these predictions is the most likely? Circle your choice and explain your answer.

Andy

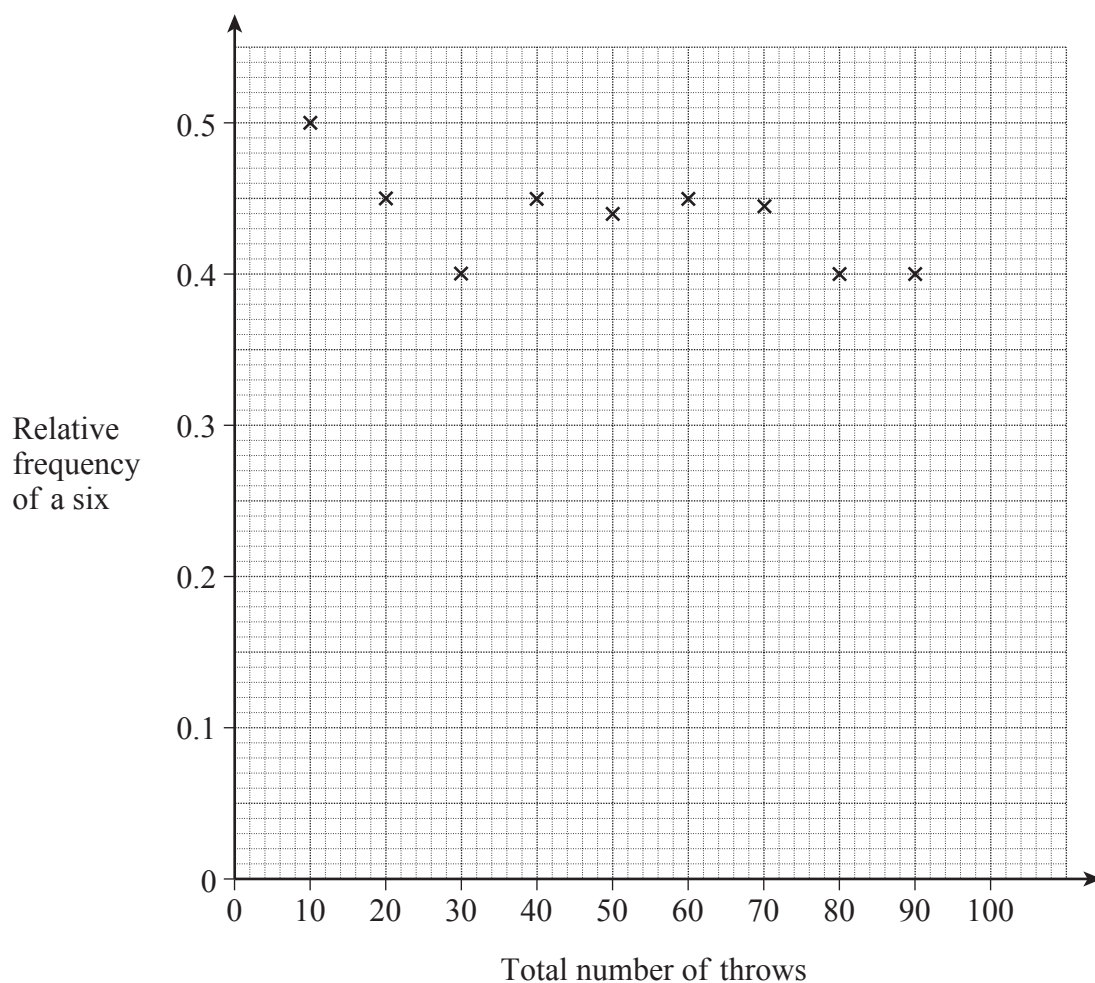
Lauren

Noah

All are equally likely

(2)

- (b) Nikki makes a six-sided dice.  
To test the dice she throws it 100 times.  
After each 10 throws she records the number of sixes thrown.  
The relative frequencies for the first 90 throws are shown on the graph.



- (b) (i) How many sixes were there in the first 10 throws?

$$10 \times 0.5 = 5$$

(1)

- (ii) After 100 throws there were 42 sixes.

Calculate and plot the relative frequency of a six after 100 throws.

$$\text{Relative frequency} = \frac{x}{N}$$

$$= \frac{42}{100} = 0.42$$

(1)

- (iii) How many sixes would you expect to get after 100 throws of a **fair** dice?

$$\frac{100}{6} = 16.67$$

.....17.....

(1)

- (iv) Is Nikki's dice fair?

Tick the correct box.

☐

Yes

☒

No

Give a reason for your answer.

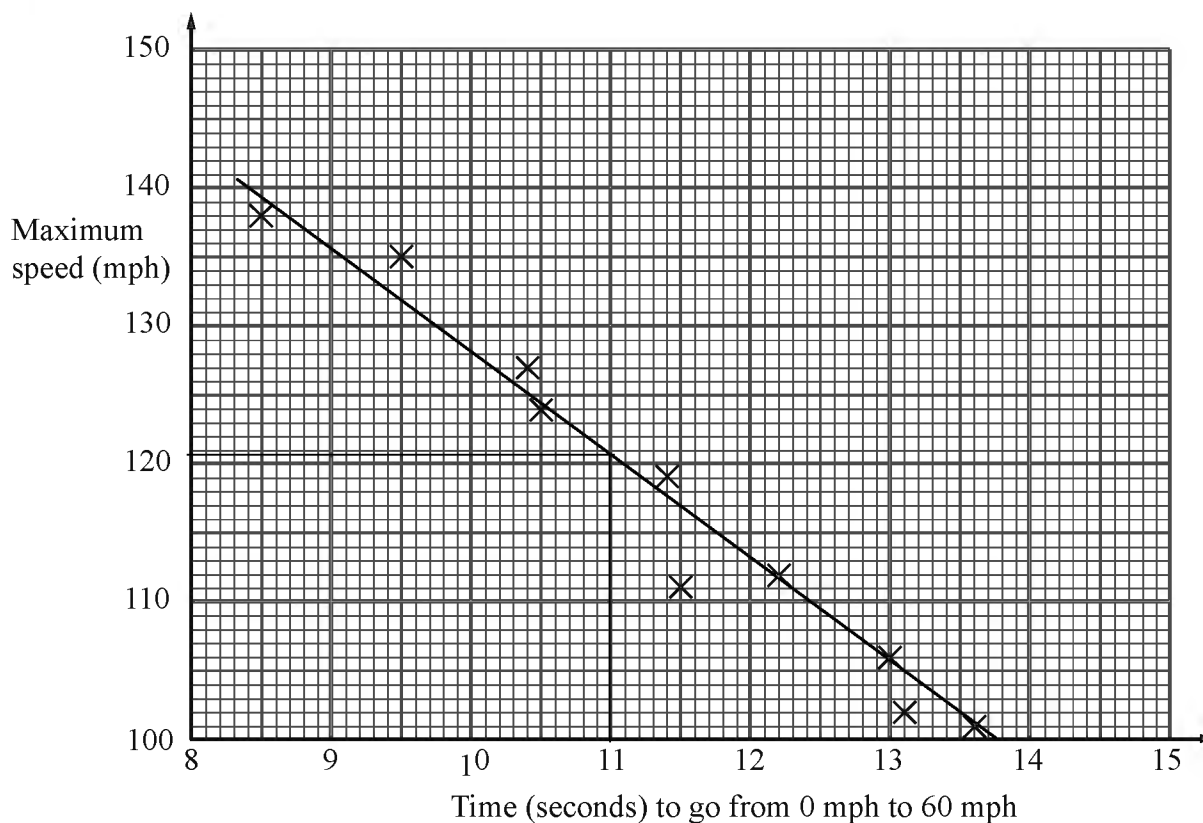
There is a 1 in 6 probability of getting a six as the dice has 6 sides. Nikki got 42 sixes, not 17.

(1)

(Total 6 marks)



2. The scatter graph shows some information about 10 cars.  
It shows the time, in seconds, it takes each car to go from 0 mph to 60 mph.  
For each car, it also shows the maximum speed, in mph.



- (a) What type of correlation does this scatter graph show?

..... Negative correlation  
(1)

The time a car takes to go from 0 mph to 60 mph is 11 seconds.

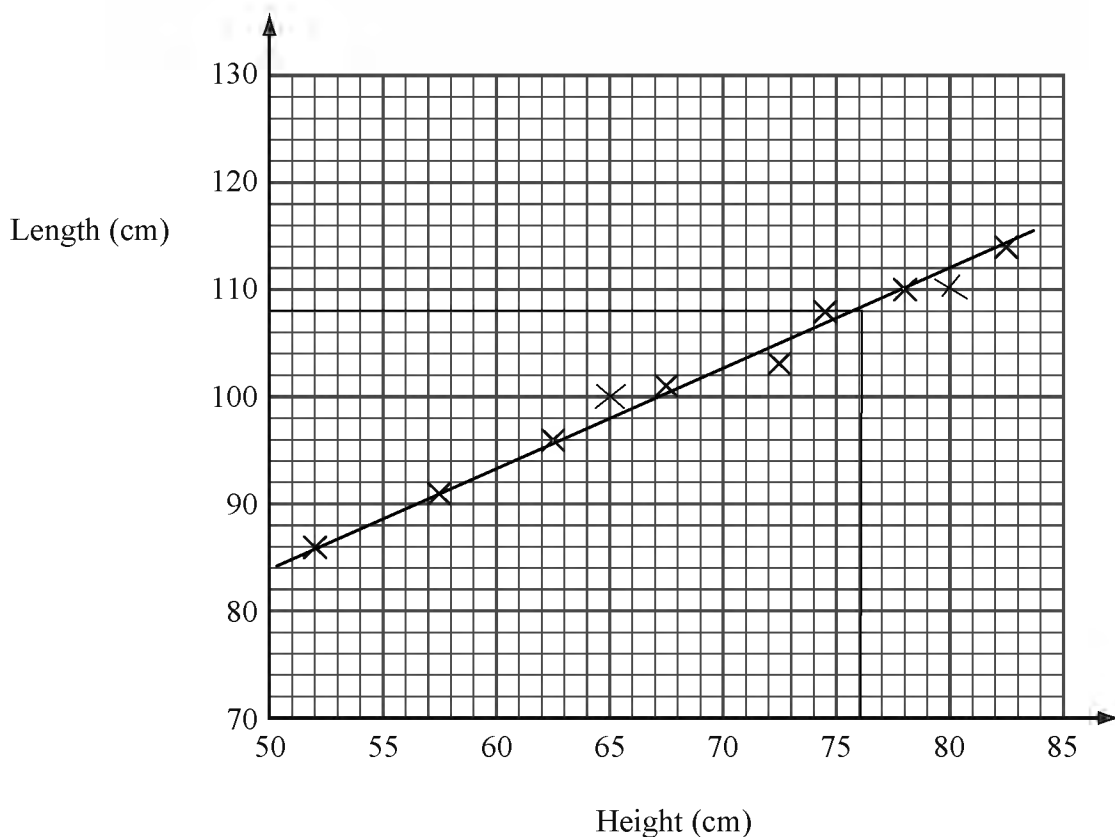
- (b) Estimate the maximum speed for this car.

..... 121 ..... mph  
(2)

**(Total 3 marks)**



3. The scatter graph shows information about eight dogs. It shows the height and the length of each dog.



The table gives the height and the length of two more dog.

Height (cm)	65	80
Length (cm)	100	110

- (a) On the scatter graph, plot the information from the table.

(1)

- (b) Describe the relationship between the height and the length of these dog.

.....Positive correlation. As the height increases, so does the length.....

(1)

The height of a dog is 76 cm.

- (c) Estimate the length of this dog.

.....108.....cm

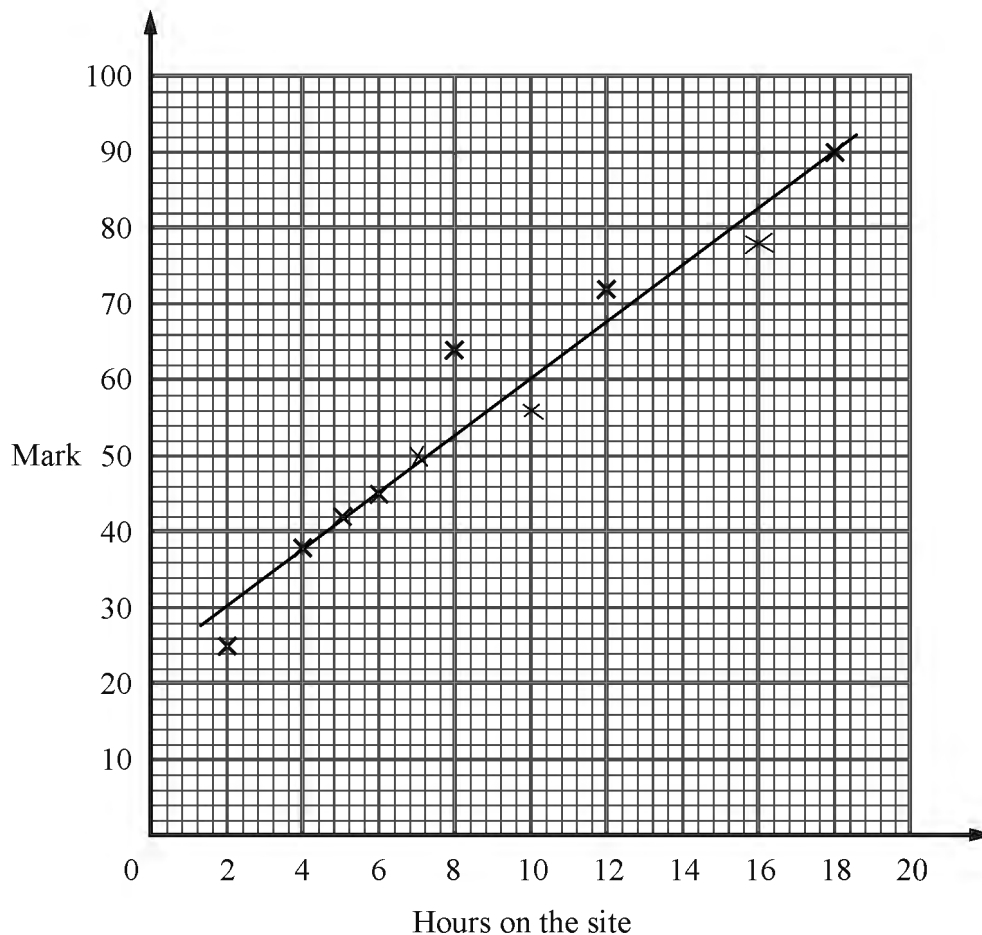
(2)

**(Total 4 marks)**





4. Some students revised for a mathematics exam.  
They used a private tutor.  
The scatter graph shows the times seven students spent with the tutor and the marks the students got in the mathematics exam.



Here is the information for 3 more students.

Hours with tutor	7	10	16
Mark	50	56	78

- (a) Plot this information on the scatter graph.

(1)

- (b) What type of correlation does this scatter graph show?

Positive correlation.....

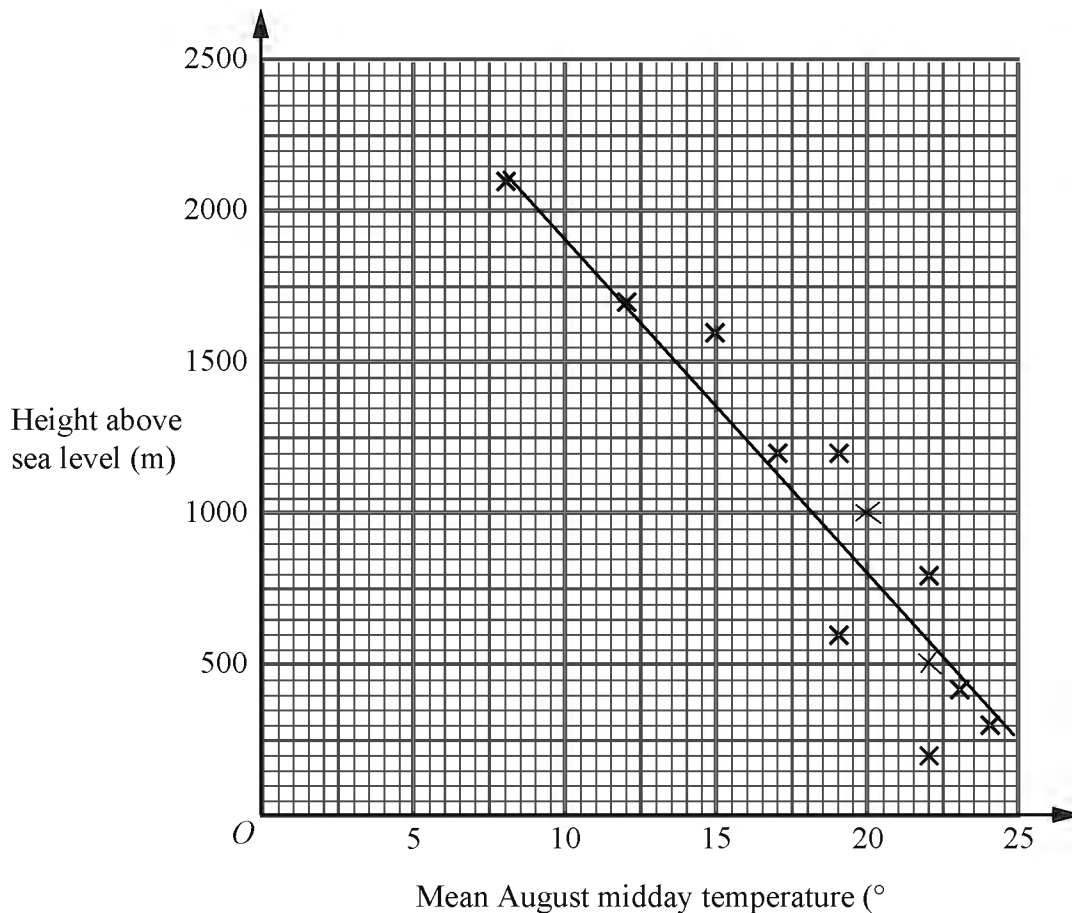
(1)

- (c) Draw a line of best fit on the scatter graph.

(1)



5. The scatter graph shows information for some weather stations. It shows the height of each weather station above sea level (m) and the mean August midday temperature ( $^{\circ}\text{C}$ ) for that weather station.



C) The table shows this information for two more weather stations.

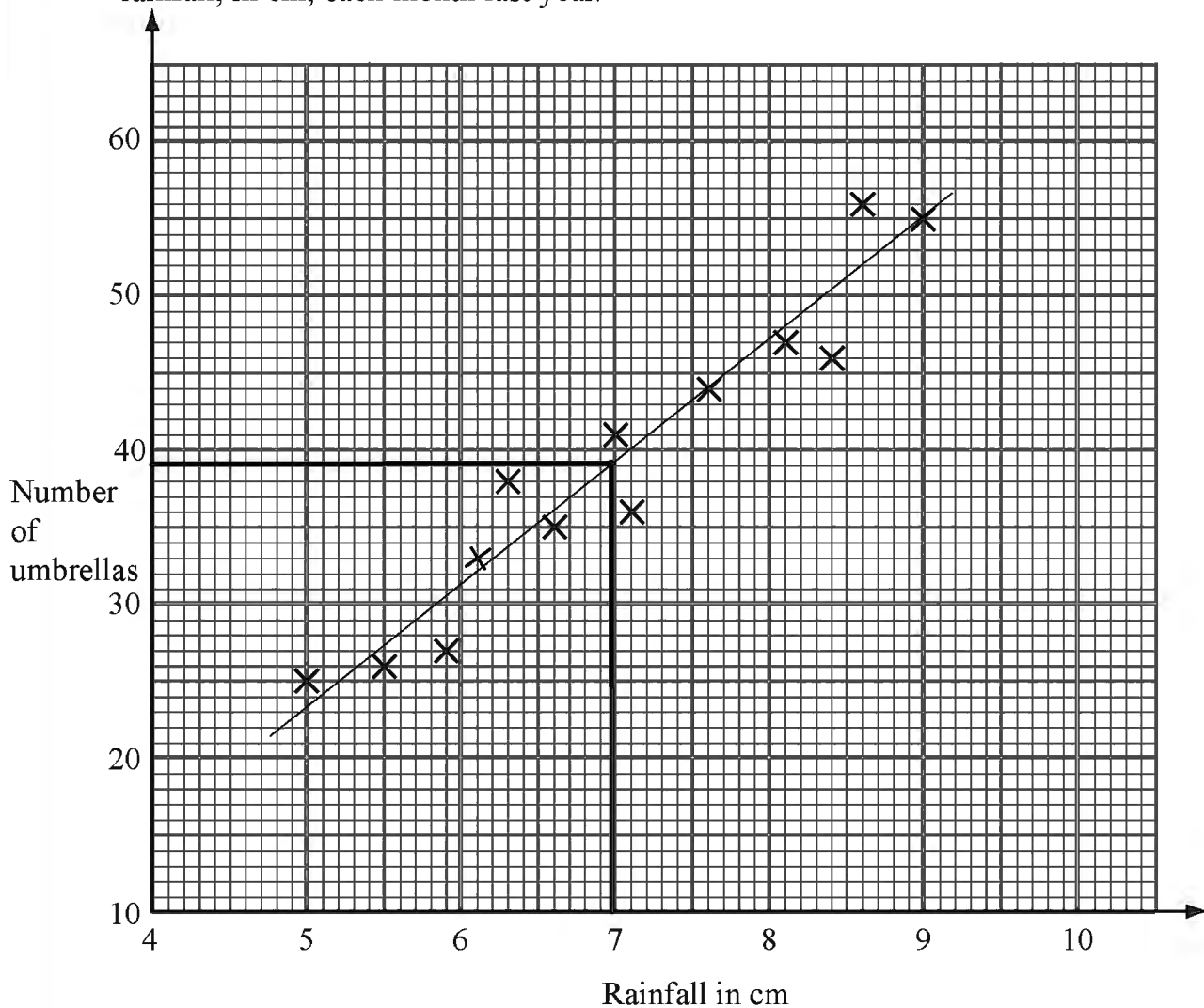
Height of weather station above sea level (m)	1000	500
Mean August midday temperature ( $^{\circ}\text{C}$ )	20	22

- (a) Plot this information on the scatter graph. (1)
- (b) What type of correlation does this scatter graph show?  
 ..... Negative correlation..... (1)
- (c) Draw a line of best fit on the scatter graph. (1)



6. Mr Davies sells umbrellas.

The scatter graph shows some information about the number of umbrellas he sold and the rainfall, in cm, each month last year.



In January of this year, the rainfall was 6.1 cm.

During January, Mr Davies sold 33 umbrellas.

(a) Show this information on the scatter graph.

(1)

(b) What type of correlation does this scatter graph show?

.....Positive correlation.....

(1)

In February of this year, Mr Davies sold 39 umbrellas.

(c) Estimate the rainfall for February.

.....7..... cm

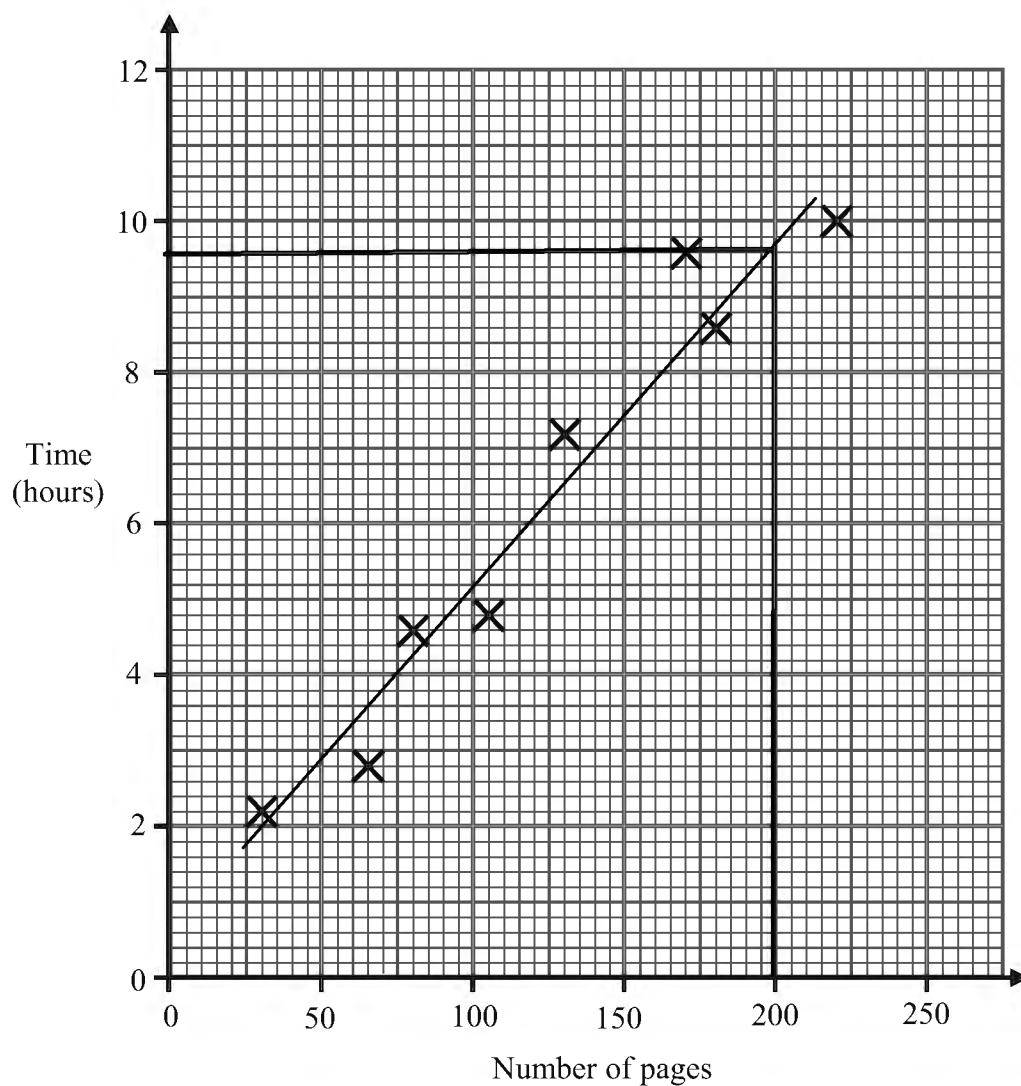
(2)



7. Sophie reads eight books.

For each book she recorded the number of pages and the time she takes to read it.

The scatter graph shows information about her results.



- (a) Describe the relationship between the number of pages in a book and the time Sophie takes to read it.

.....This is a positive correlation. The greater the number of pages the longer.....  
it takes to read the book. (1)

Sophie reads another book.  
The book has 200 pages.

- (b) Estimate the time it takes Sophie to read it.

.....9.6..... hours  
(2)

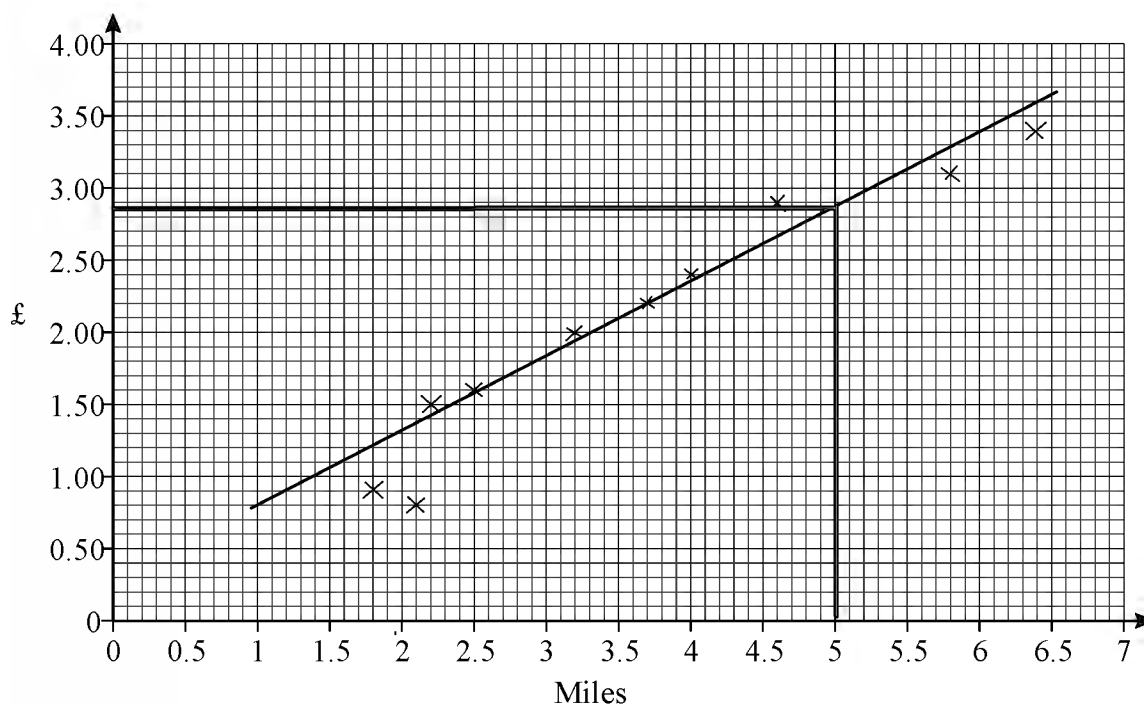
(Total 3 marks)



8. The table shows the cost and length of different tram journeys across a city.

Length of journey (miles)	1.8	2.1	2.2	2.5	3.2	3.7	4.0	4.6	5.8	6.4
Cost of journey (£)	0.90	0.80	1.50	1.60	2.00	2.20	2.40	2.90	3.10	3.40

- (a) Draw a scatter diagram for the data on the grid below.



- (b) Estimate the cost of tram journey of length 5 miles.  
Give your answer to the nearest ten pence.

(2)

£ .. 2.90 .....

(2)



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# Mathematics A

## Sequences

## Model Answers

**Higher Tier**

Past Paper Style Questions  
Arranged by Topic

Paper Reference

**1MA0/1H**

**You must have:** Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

### Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
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- Answer the questions in the spaces provided  
– *there may be more space than you need.*
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### Information

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– *use this as a guide as to how much time to spend on each question.*
- Questions labelled with an **asterisk** (\*) are ones where the quality of your written communication will be assessed.

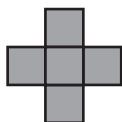
### Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

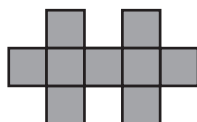
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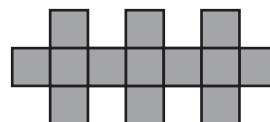
1. Here are some patterns made from squares.



Pattern number 1

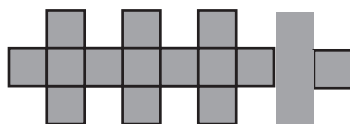


Pattern number 2

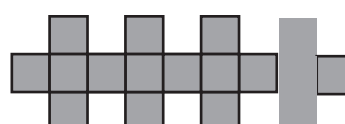


Pattern number 3

(a) The diagram below shows part of Pattern number 5  
Complete the diagram for Pattern number 5



Pattern number 4



Pattern number 5

(1)

(b) Complete the table.

Pattern number	1	2	3	4	5
Number of squares	5	9	13	17	21

(1)

(c) Find the number of squares used for Pattern number 12

$n$	$4n$	Pattern	
1	4	5	$n\text{th term} = 4n + 1$
2	8	9	$12\text{th term} = (4 \times 12) + 1$
3	12	13	$= 49$
$n$	$4n$	$4n + 1$	

.....49.....

(1)

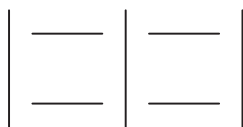
(Total 3 marks)



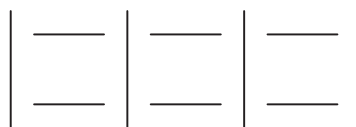
2. Here are some patterns made using sticks.



Pattern number 1

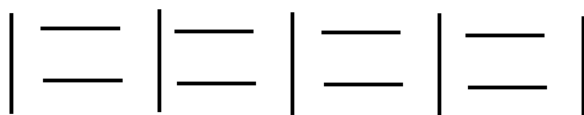


Pattern number 2



Pattern number 3

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



Pattern number 4

(1)

(b) Complete the table.

Pattern number	1	2	3	4	5
Number of sticks	4	7	10	13	16

(1)

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

$n$	$3n$	Number of sticks	$n$ th term = $3n + 1$
1	3	4	
2	6	7	10th term = $(3 \times 10) + 1$
3	9	10	= 31
$n$	$3n$	$3n + 1$	

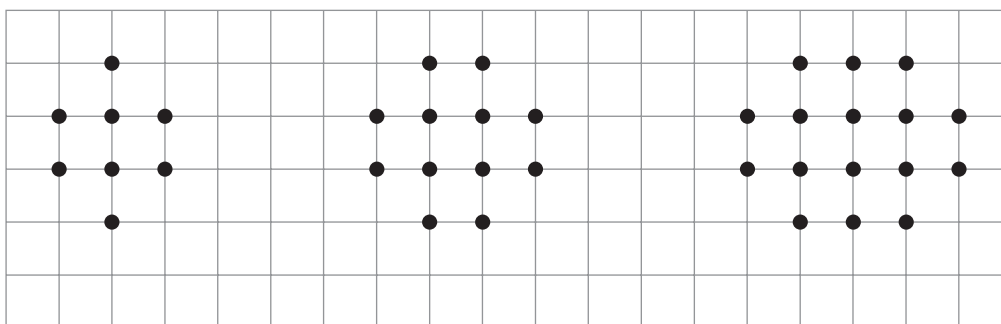
.....31.....  
(1)

(Total 3 marks)





3. Here are some patterns made with dots.

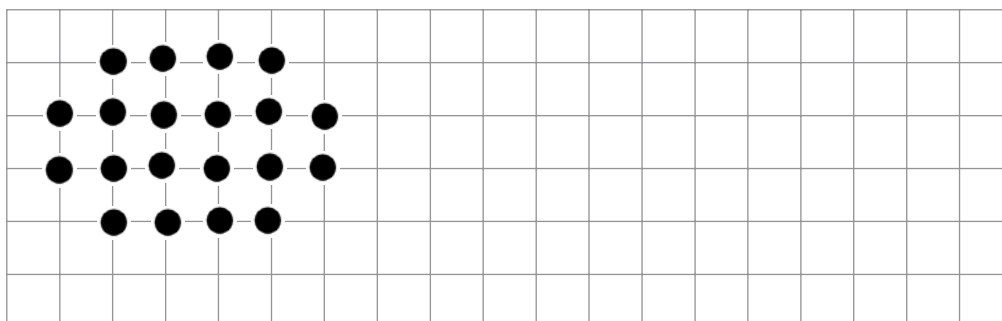


Pattern number 1

Pattern number 2

Pattern number 3

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



Pattern number 4

(1)

(b) Complete the table.

Pattern number	1	2	3	4	5
Number of dots	8	12	16	20	24

(2)

(Total 3 marks)





4. The first even number is 2


(a) Write down the 4th even number.

.....8.....  
(1)

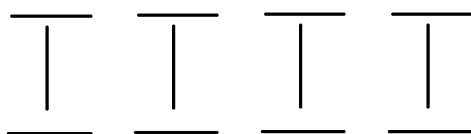
Here are some patterns made from sticks.

  
Pattern number 1

  
Pattern number 2

  
Pattern number 3

(b) Draw Pattern number 4



Pattern number 4

(1)

(c) Complete the table.

Pattern number	1	2	3	4	5
Number of sticks	3	6	9	12	15

(2)

Jenny wants to find the number of sticks in Pattern number 100

(d) Write down a method she could use.

The number of sticks is  $3 \times$  the Pattern number

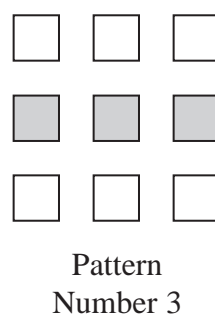
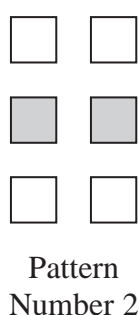
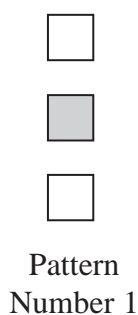
She should therefore multiply 100 by 3.

(1)

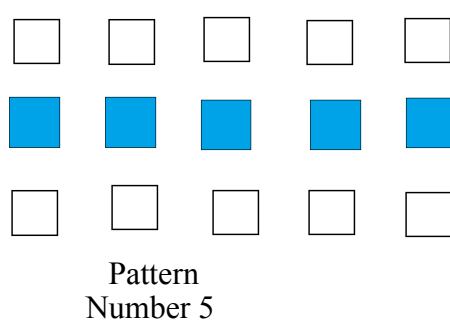
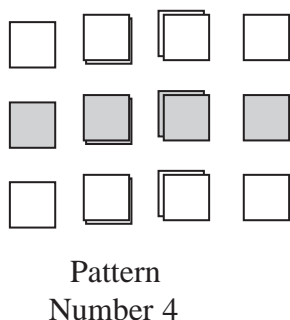
(Total 5 marks)



5. Here is a sequence of patterns made from grey squares and white squares.



(a) Complete Pattern Number 5



(1)

(b) Complete the table.

Pattern Number	1	2	3	4	5
Total number of squares	3	6	9	12	15

(1)

One of the patterns in the sequence has 10 grey squares.

(c) How many white squares does this pattern have?

There are  $2 \times$  the number of white squares:

$$2 \times 10 = 20$$

.....20.....

(1)

Another pattern in the sequence has a total of 18 squares.

(d) How many grey squares does the pattern have?

$\frac{1}{3}$ rd of the squares are grey.

$$18 \div 3 = 6$$

.....6.....

(1)

(Total 4 marks)



6. Here are the first four terms of a number sequence.

5    9    13    17

(a) (i) Write down the next term of the number sequence.

.....21.....

(ii) Explain how you found your answer.

.....The term to term rule is + 4.....  
17 + 4 = 21 (2)

The 24th term of the number sequence is 97

(b) Work out the 25th term of the number sequence.

$$97 + 4 = 101$$

.....101.....  
(1)

**(Total 3 marks)**



7 . The  $n$ th term of a number sequence is given by  $3n + 1$

(a) Work out the first **three** terms of the number sequence.

$n$	$3n$	$3n + 1$	
1	3	4	
2	6	7	
3	9	10	.....4, 7, 10.....

**(1)**

Here are the first four terms of another number sequence.

1      5      9      13

(b) Find, in terms of  $n$ , an expression for the  $n$ th term of this number sequence.

$n$	$4n$	$4n - 3$	
1	4	1	
2	8	5	
3	12	9	..... $4n - 3$ .....
4	16	13	

**(2)**

**(Total 3 marks)**



8. Write down the next term in each sequence.

(a)(i) 5 8 11 14 ...17

.....

(1)

(a)(ii) 6 4 2 0 ...-2

.....

(1)

(a)(iii) 2 4 8 16 ...32

.....

(1)

(b) The numbers in this sequence increase by the same amount each time.

11 ..... 35  $35 - 11 = 24$

What are the missing numbers?

There are 3 steps up from 11 to 35

$24 \div 3 = 8$

.....

...19...and...27...

(2)



9. The  $n$ th term of a sequence is  $100 - 3n$ .

(a) Work out the first three terms.

$n$	$100 - 3n$
1	97
2	94
3	91

.....97...94...91,.....

(2)

(b) Work out the first term of the sequence that is negative.

$$100 \div 3 = 33 \frac{1}{3}$$

The 34th number will give the first negative term because  $3n$  becomes more than 100.

.....34.....

(2)



10. (a) Here are the first three terms of a sequence.

12                      8                      6                      5

The rule for working out the next term in the sequence is

Add 4 to the previous term and then divide by 2

Work out the first term that is **not** a whole number.

$$(6 + 4) \div 2 = 5$$

$$(5 + 4) \div 2 = 4\frac{1}{2}$$

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

(2)

- (b) This sequence uses the same rule.

Add 4 to the previous term and then divide by 2

The third term of this sequence is 9.

....                      ....                      9                      ....

Work out the first term.

Work backwards doing the opposite operations

$$(9 \times 2) - 4 = 14$$

$$(14 \times 2) - 4 = 24$$

$$24$$

(3)





11. (a) Write down the next term of each sequence.

(a) (i)            3        8        13        18        ...~~23~~

.....  
(1)

(a) (ii)            5.1    5.3    5.5        5.7        ...~~5.9~~

.....  
(1)

(a) (iii)            2        -1        -4        -7...~~-10~~

.....  
(1)

(b) Here is a different sequence.

The third term is 20 and the fourth term is 36.

.....    .....    20    36    .....

The term to term rule for this sequence is

Double and subtract four

Work out the first term of the sequence.

Work backwards doing the opposite operations

$$(20 \div 2) + 4 = 14$$

$$(14 \div 2) + 4 = 11$$

.....11.....

(2)



12.(a) The numbers in this sequence decrease by the same amount each time.

74    ..66..    58    50    42    ...34..

What are the **two** missing numbers?

.....66..... and .....34.....

(b) The numbers in this different sequence decrease by the same amount each time. (2)

26    .....    .....    .....    6

What are the **three** missing numbers?

$$26 - 6 = 20$$

There are 4 steps down from 26 to 6

$$20 \div 4 = 5$$

The term to term rule is subtract 5

.....21..... ,    .....16..... ,    .....11.....

(2)



13.(a) Here are the first two terms of a sequence.

5      4      .....      .....      .....

The rule for finding the next term in the sequence is

Multiply the previous term by 2 and subtract 6

Work out the first negative term of the sequence.

$$(4 \times 2) - 6 = 2$$

$$(2 \times 2) - 6 = -2$$

.....-2.....  
(2)

(b) Here are the first three terms of another sequence.

1      4      7      ...      ...      ...      ---      ...

Which of the following is the  $n$ th term for this sequence? Circle the correct answer.

$n$	$3n$	Term
1	3	1
2	6	4
3	9	7

..... $3n - 2$ .....

$n + 3$        $3n + 1$        $3n - 2$        $3n + 2$

(1)



14. (a) A sequence starts

49    46    43    40

(a) (i) Write down the next two terms.

.....37..... and .....34.....

(2)

(a) (ii) What is the rule for continuing the sequence?

.....Subtract 3.....

(b) Another sequence starts

(1)

57    50    43    36

This sequence is continued.

What is the first negative number in this sequence?

36 29 22 15 8 1 -6

.....-6.....

(c) The first sequence is also continued.

(1)

The two sequences have the number 43 in common.

What is the next number that the two sequences have in common?

34 31 28 25 22

.....22.....

(2)



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# Mathematics A

## Simultaneous Equations

### Model Answers

**Higher Tier**

Past Paper Style Questions  
Arranged by Topic

Paper Reference

**1MA0/1H**

**You must have:** Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

### Instructions

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Turn over ►



1. Solve the simultaneous equations

$$3x + 2y = 8 \quad \dots\dots\dots(1)$$

$$2x + 5y = -2 \quad \dots\dots\dots(2)$$

$$(1) \times 2$$

$$6x + 4y = -16 \quad \dots\dots\dots(3)$$

$$(2) \times 3$$

$$6x + 15y = -6 \quad \dots\dots\dots(4)$$

$$(4) - (3)$$

$$11y = -22$$

$$y = -2$$

$$\text{subs } y = -2 \text{ in } (1)$$

$$3x - 4 = 8$$

$$3x = 12$$

$$x = 4$$

$$\text{Check in } (2)$$

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

$$2x + 5y = -2$$

$$8 - 10 = -2$$

$$-2 = -2 \quad \checkmark$$

$$x = \dots 4 \dots\dots\dots$$

$$y = \dots -2 \dots\dots\dots$$

(Total 4 marks)



2. Solve the simultaneous equations

$$6x + 2y = -3 \quad \dots\dots\dots (1)$$

$$4x - 3y = 11 \quad \dots\dots\dots (2)$$

$$(1) \times 3$$

$$18x + 6y = -9 \quad \dots\dots\dots (3)$$

$$(2) \times 2$$

$$8x - 6y = 22 \quad \dots\dots\dots (4)$$

$$(3) + (4)$$

$$26x = 13$$

$$x = \frac{1}{2}$$

$$\text{Subs } x = \frac{1}{2} \text{ in (1)}$$

$$3 + 2y = -3$$

$$2y = -6$$

$$y = -3$$

$$\text{Check in (2)}$$

$$x = \frac{1}{2} \quad y = -3$$

$$4x - 3y = 11$$

$$2 - -9 = 11$$

$$2 + 9 = 11$$

$$11 = 11 \quad \checkmark$$

$$x = \dots\dots \frac{1}{2} \dots\dots\dots, y = \dots\dots -3 \dots\dots\dots$$

(Total 4 marks)





3. Solve the simultaneous equations

$$x^2 + y^2 = 5 \quad \dots\dots\dots (1)$$

$$y = 3x + 1 \quad \dots\dots\dots (2)$$

Subs  $y = 3x + 1$  in (1)

$$x^2 + (3x + 1)^2 = 5$$

$$x^2 + (3x + 1)(3x + 1) = 5$$

$$x^2 + 9x^2 + 3x + 3x + 1 = 5$$

$$10x^2 + 6x - 4 = 0$$

$$(2x + 2)(5x - 2) = 0$$

$$x = -1 \text{ or } \frac{2}{5}$$

Subs  $x = \frac{2}{5}$  in (2)

$$y = \frac{6}{5} + 1$$

$$y = 2\frac{1}{5}$$

Check in (1)

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

$$x^2 + y^2 = 5$$

$$1 + 4 = 5$$

$$5 = 5$$

$$x = \frac{2}{5} \quad y = 2\frac{1}{5}$$

$$0.4^2 + 2.2^2 = 5$$

$$0.16 + 4.84 = 5$$

$$5 = 5 \quad \checkmark$$

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

$$\text{or } x = \dots\dots\frac{2}{5}\dots\dots y = \dots\dots2\frac{1}{5}\dots\dots$$

(Total 6 marks)



4. Solve the simultaneous equations

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

$$4x - 3y = 7 \quad \text{.....} \quad (2)$$

$$(1) - (2)$$

$$4y = -8$$

$$y = -2$$

Subs  $y = -2$  in (1)

$$4x - 2 = -1 + 2$$

$$4x = 1$$

$$x = \frac{1}{4}$$

Check in (2)

$$4x - 3y = 7$$

$$1 - -6 = 7$$

$$1 + 6 = 7$$

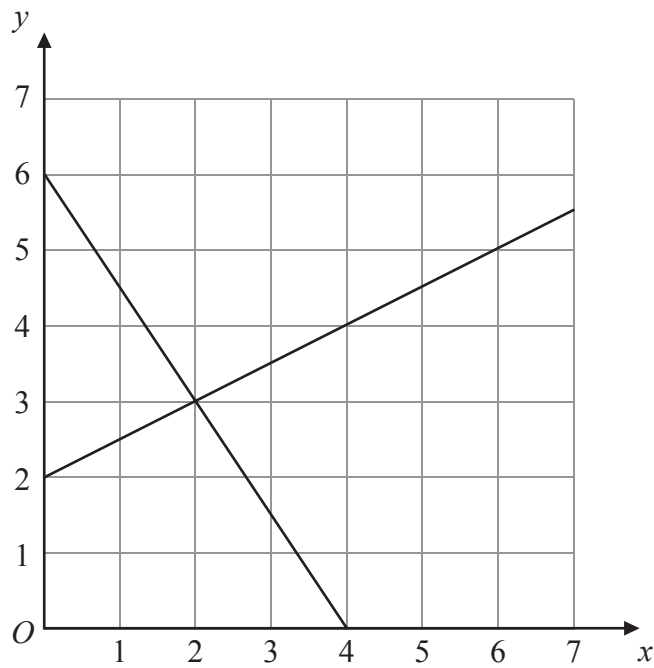
$$7 = 7 \quad \checkmark$$

$$x = \text{.....} \frac{1}{4} \text{.....} \quad y = \text{.....} -2 \text{.....}$$

(Total 3 marks)



5.



The diagram shows graphs of  $y = \frac{1}{2}x + 2$

and  $2y + 3x = 12$

(a) Use the diagram to solve the simultaneous equations

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

$$2y + 3x = 12$$

$$x = \dots 2 \dots \dots \dots y = \dots 3 \dots \dots \dots \quad (1)$$

(b) Find an equation of the straight line which is parallel to the line  $y = \frac{1}{2}x + 2$  and passes through the point (0, 4).

$$\dots \dots y = \frac{1}{2}x + 4 \dots \dots \quad (2)$$

(Total 3 marks)



8. Solve the simultaneous equations

$$6x + 2y = -3 \quad \dots\dots\dots (1)$$

$$4x - 3y = 11 \quad \dots\dots\dots (2)$$

$$(1) \times 3$$

$$18x + 6y = -9 \quad \dots\dots\dots (3)$$

$$(2) \times 2$$

$$8x - 6y = 22 \quad \dots\dots\dots (4)$$

$$(3) + (4)$$

$$26x = 13$$

$$x = \frac{1}{2}$$

$$\text{Subs } x = \frac{1}{2} \text{ in (1)}$$

$$6x + 2y = -3$$

$$3 + 2y = -3$$

$$2y = -6$$

$$y = -3$$

$$\text{Check in (2)}$$

$$4x - 3y = 11$$

$$2 - -9 = 11$$

$$2 + 9 = 11$$

$$11 = 11 \quad \checkmark$$

$$x = \dots\dots\dots \frac{1}{2} \dots\dots\dots, y = \dots\dots -3 \dots\dots\dots$$

(Total 4 marks)



9. Solve the simultaneous equations

$$4x + y = 10$$

$$2x - 3y = 19$$

$$4x + y = 10 \quad \dots\dots\dots(1)$$

$$2x - 3y = 19 \quad \dots\dots\dots(2)$$

$$(1) \times 3$$

$$14x = 49$$

$$x = 3\frac{1}{2}$$

$$\text{Subs } x = 3\frac{1}{2} \text{ in (1)}$$

$$14 + y = 10$$

$$y = 10 - 14$$

$$y = -4$$

$$\text{Check in (2)}$$

$$2x - 3y = 19$$

$$7 - -12 = 19$$

$$7 + 12 = 19$$

$$19 = 19 \quad \checkmark$$

$$x = \dots 3\frac{1}{2} \dots\dots\dots$$

$$y = \dots -4 \dots\dots\dots$$

(Total 3 marks)



Write your name here

Surname

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Candidate Number

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# Mathematics A

## Surds and Indices

### Model Answers

**Higher Tier**

Past Paper Style Questions  
Arranged by Topic

Paper Reference

**1MA0/1H**

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Turn over ►



1. Work out  $(2 + \sqrt{5})(2 - \sqrt{5})$

Give your answer in its simplest form.

$$\begin{aligned} &= 4 - 2\sqrt{5} + 2\sqrt{5} - 5 \\ &= -1 \end{aligned}$$

.....-1.....

2. (a) Write down the value of  $64^{\frac{1}{2}}$

$$\begin{aligned} 4^{\frac{1}{2}} &= \sqrt{64} \\ &= 8 \end{aligned}$$

.....8.....  
(1)

- (b) Write  $\sqrt{45}$  in the form  $k\sqrt{5}$ , where  $k$  is an integer.

An integer is a whole number.

$$\begin{aligned} \sqrt{45} &= \sqrt{9} \times \sqrt{5} \\ &= 3\sqrt{5} \end{aligned}$$

..... $3\sqrt{5}$ .....  
(1)

(Total 2 marks)



3. Find the value of

(i)  $8^0$

Anything to the power of 0, except 0, is 1

.....1.....

(ii)  $64^{\frac{1}{2}}$

.....8.....

(iii)  $\left(\frac{27}{8}\right)^{\frac{2}{3}}$   
 $= \left(\sqrt[3]{\frac{27}{8}}\right)^2$   
 $= \left(\frac{3}{2}\right)^2$   
 $= \frac{9}{4}$   
 $= 2\frac{1}{4}$

..... $2\frac{1}{4}$ .....

(Total 4 marks)





4. (a) Simplify  $4x \times 5y$

..... $20xy$  .....  
(1)

(b) Simplify  $x \times x \times x \times x$

..... $x^4$  .....  
(1)

(c) Expand  $4(3n - 7)$

..... $12n - 28$  .....  
(2)

(d) Expand and simplify  $2(2x + 3) + 3(x + 1)$   
 $= 4x + 6 + 3x + 3$   
 $= 7x + 9$

..... $7x + 9$  .....  
(2)

(e) Simplify  $n^2 \times n$

..... $n^3$  .....  
(1)

(f) Simplify  $p^5 \div p^3$

Subtract the powers.

..... $p^2$  .....  
(1)

(Total 8 marks)



5. (a) Simplify  $q^5 \times q^4$

Add the powers.

..... $q^9$ .....  
(1)

(b) Simplify  $r^5 \div r^2$

Subtract the powers.

..... $r^3$ .....  
(1)

(c) Simplify  $12tv^6 \div 6tv^5$

..... $2v$ .....  
(2)

(d) Simplify  $(9w^2y^6)^{\frac{1}{2}}$

$$= \sqrt{(9w^2y^6)}$$

$$= 3wy^3$$

..... $3wy^3$ .....  
(2)

- (e) For  $y > 1$ , write the following expressions in order of size.  
Start with the expression with the least value.

$$y^0 \quad y^2 \quad y \quad y^{-2} \quad y^{\frac{1}{2}}$$

If you are unsure, try putting in a number. Let  $y$  be 2

$$2^0 = 1$$

$$2^2 = 4$$

$$2 = 2$$

$$2^{-2} = \frac{1}{2^2} = 0.25$$

$$2^{\frac{1}{2}} = \sqrt{2} = 1.41$$

..... $y^{-2}$   $y^0$   $y^{\frac{1}{2}}$   $y^{(1)}$   $y^2$ .....  
(2)

(Total 8 marks)



6. (a) Simplify  $n^3 \times n^4$

$$\dots\dots\dots n^7 \dots\dots\dots$$

(1)

(b) Simplify  $q^7 \div q^3$

$$\dots\dots\dots q^4 \dots\dots\dots$$

(1)

(c) Simplify  $a^2b^3 \times 3ab^2$

$$\dots\dots\dots 3a^3b^5 \dots\dots\dots$$

(2)

(Total 4 marks)

7. (a) Expand and simplify  $3(a + 4) + 5(2a + 1)$

$$3a + 12 + 10a + 5$$
$$= 13a + 17$$

$$\dots\dots\dots 13a + 17 \dots\dots\dots$$

(2)

(b) Simplify  $x^4 \times x^6$

$$\dots\dots\dots x^{10} \dots\dots\dots$$

(1)

(c) Simplify  $y^8 \div y^5$

$$\dots\dots\dots y^3 \dots\dots\dots$$

(1)

(d) Simplify  $(z^4)^3$

Multiply the powers

$$\dots\dots\dots z^{12} \dots\dots\dots$$

(1)

(Total 5 marks)



8. (a) Simplify  $v^6 \times v^2$

$$\begin{array}{r} v^8 \\ \hline \end{array} \quad (1)$$

(b) Simplify  $\frac{m^8}{m^3} = m^8 \div m^3$   
Subtract the powers  
 $= m^5$

$$\begin{array}{r} m^5 \\ \hline \end{array} \quad (1)$$

(c) Simplify  $(2y)^3$

$$\begin{array}{r} 8y^3 \\ \hline \end{array} \quad (2)$$

(d) Simplify  $3a^2h \times 4a^5h^4$

$$\begin{array}{r} 12a^7h^5 \\ \hline \end{array} \quad (2)$$

**(Total 6 marks)**



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# Mathematics A

## Transformations

### Model Answers

**Foundation Tier**

Past Paper Style Questions  
Arranged by Topic

Paper Reference

**1MA0/1F**

**You must have:** Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

### Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
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### Advice

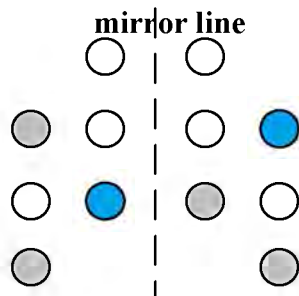
- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►



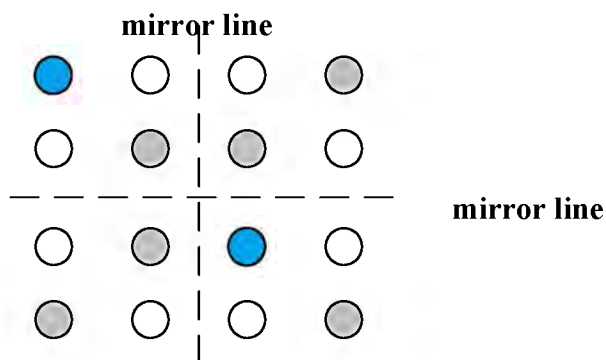
1. Here are some patterns of circles.

(a) Shade **two** more circles to give this pattern symmetry in the mirror line.



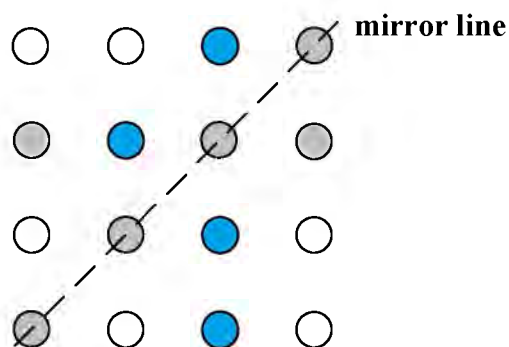
(2)

(b) Shade **two** more circles to give this pattern symmetry in both mirror lines.



(2)

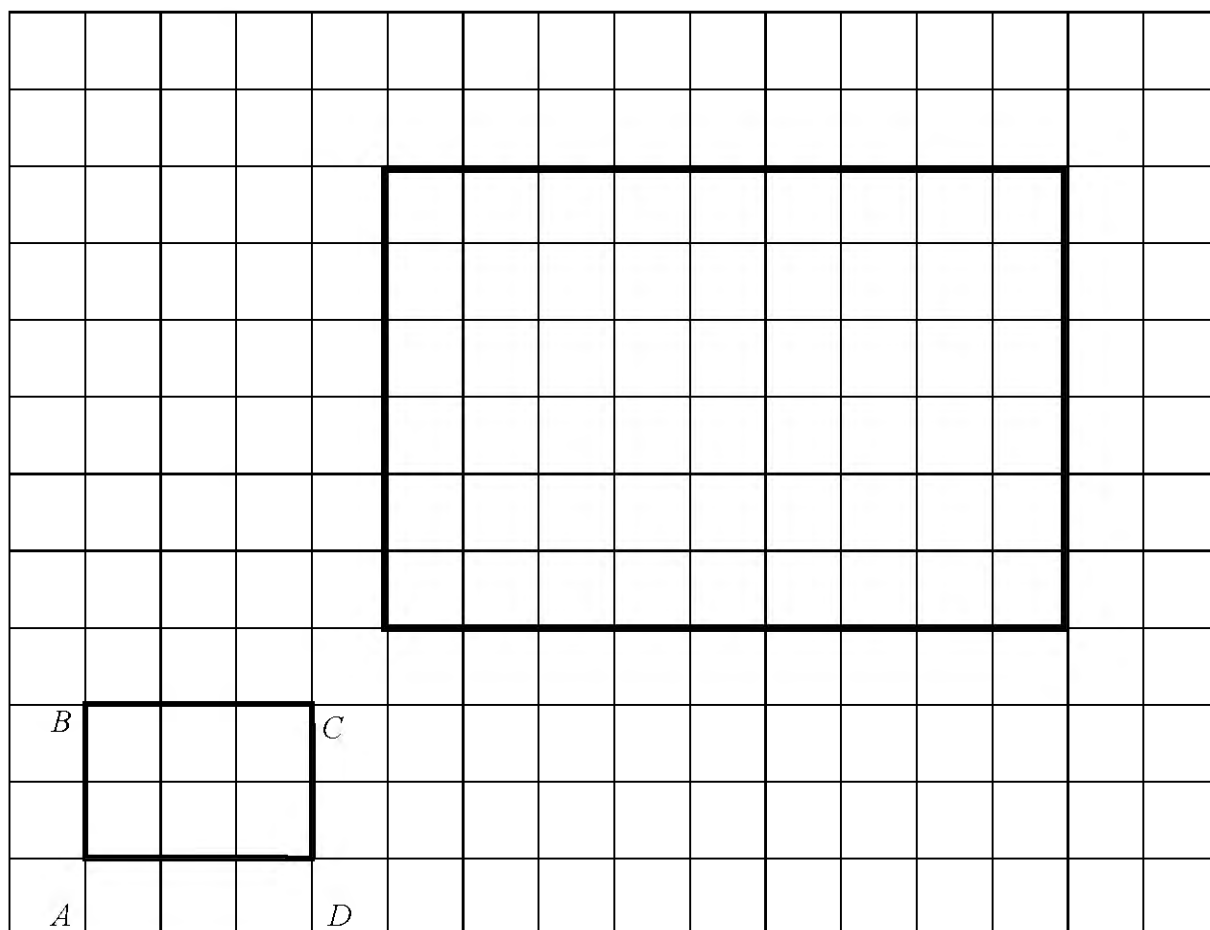
(c) Shade **four** more circles to give this pattern symmetry in the mirror line.



(2)



2. The shape  $ABCD$  is drawn on a grid.



- (a) Enlarge  $ABCD$  by scale factor 3. (2)

- (b) How many times bigger is the area of the enlarged shape than the area of  $ABCD$ ?

.....9 times.....

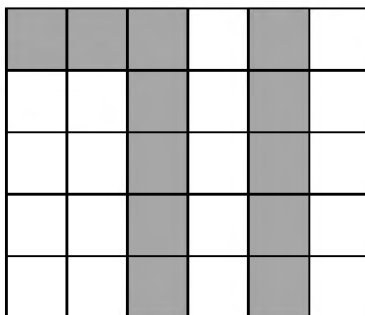
(2)





3.

The number 71 is shaded on the grid.



(a) What fraction of the grid is shaded?

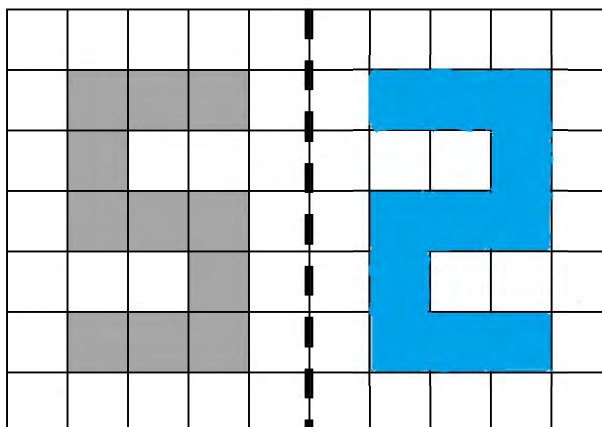
Give your answer in its simplest form.

$$\frac{12}{30} = \frac{2}{5}$$

$$\frac{2}{5}$$

(b) The letter S is shaded on this grid.

(3)



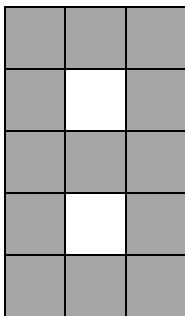
mirror line

Draw the reflection of the letter S in the mirror line.

(2)



3. (c) The number eight is drawn.



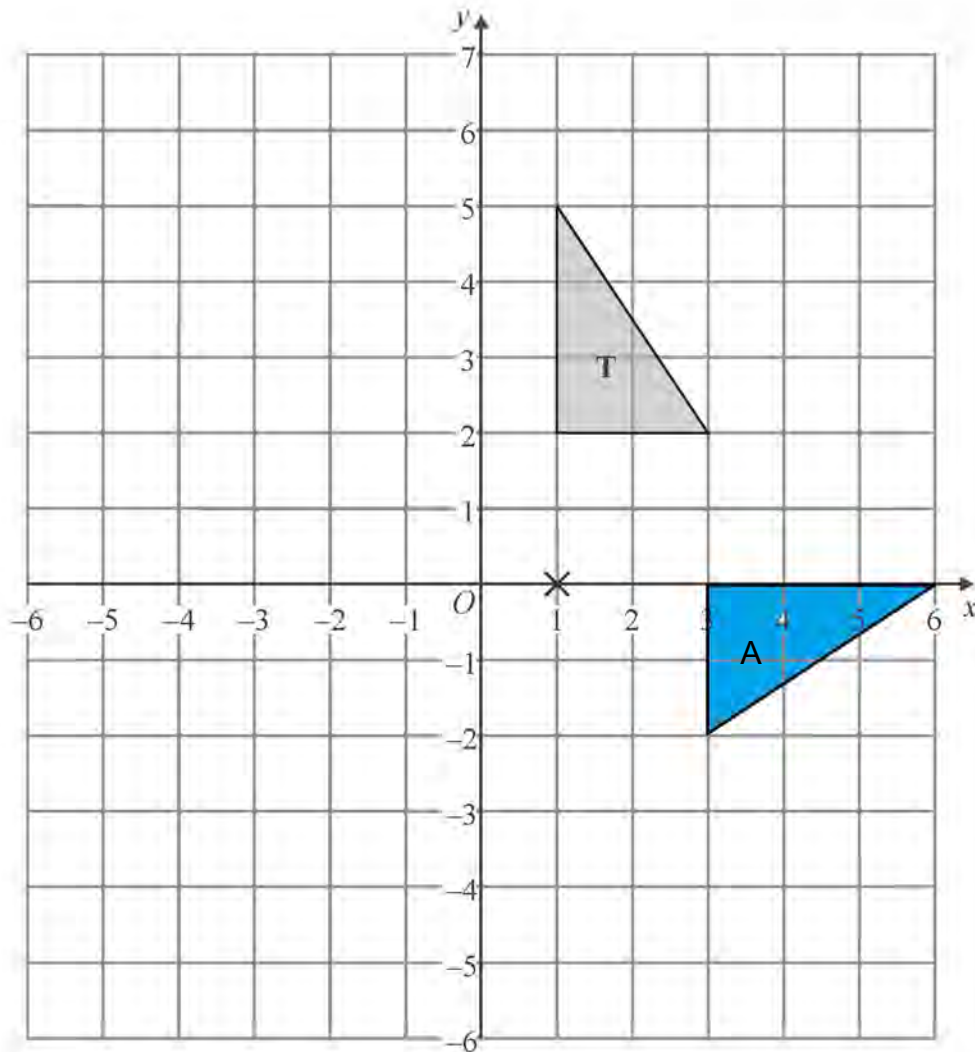
Write down the order of rotational symmetry.

.....2.....

(1)



4.



Triangle **T** has been drawn on the grid.

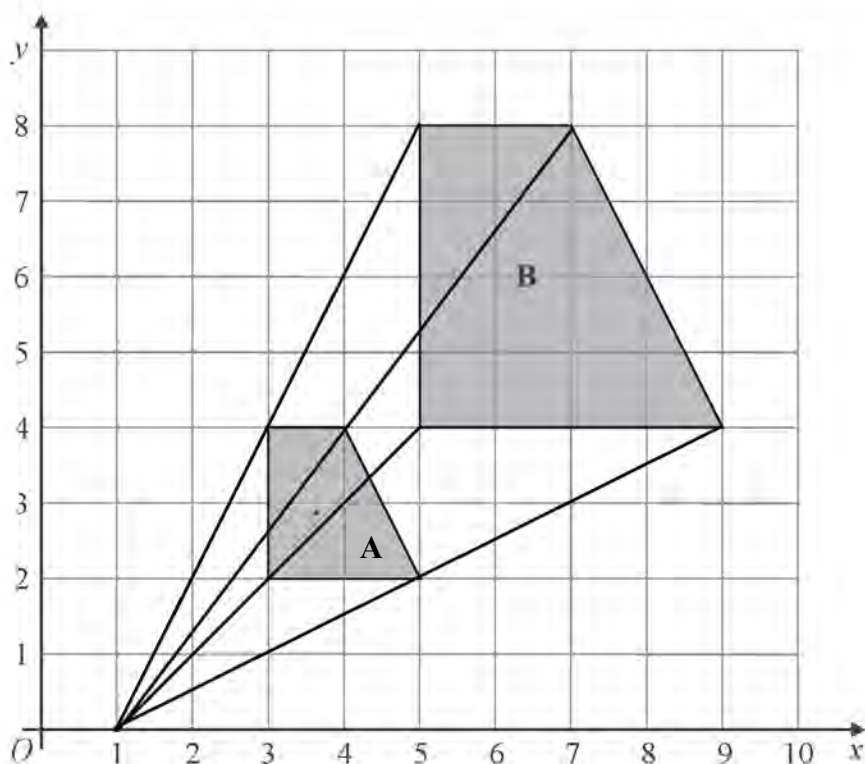
Rotate triangle **T**  $90^\circ$  about the point (1, 0).

Label the new triangle **A**.

(Total 2 marks)



5.



Describe fully the single transformation which maps shape **A** onto shape **B**.

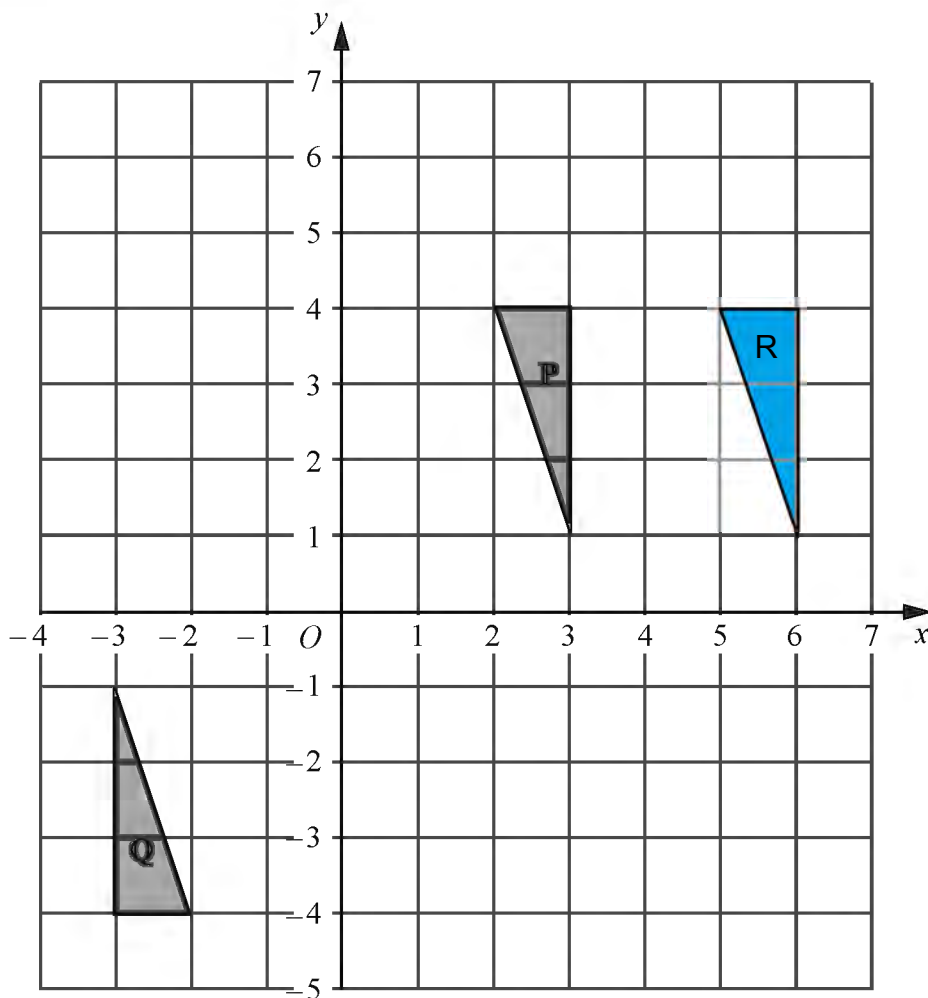
....Shape A has been enlarged by a scale factor of 2 about the point (1, 0).....

.....

(Total 3 marks)



6.



You should use tracing paper to help you with this question.  
Triangle **P** and triangle **Q** are drawn on the grid.

- (a) Describe fully the single transformation which maps triangle **P** onto triangle **Q**.

Triangle **Q** is the image of triangle **P** after rotation through 180 degrees  
about point (0, 0).

(3)

- (b) Translate triangle **P** by the vector  $\begin{pmatrix} 3 \\ 0 \end{pmatrix}$ .

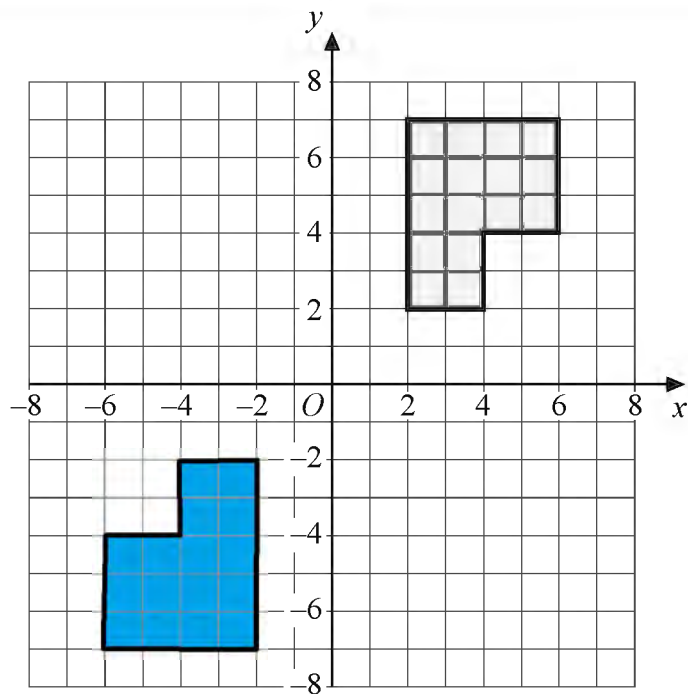
Label the new triangle **R**.

(1)

(Total 4 marks)

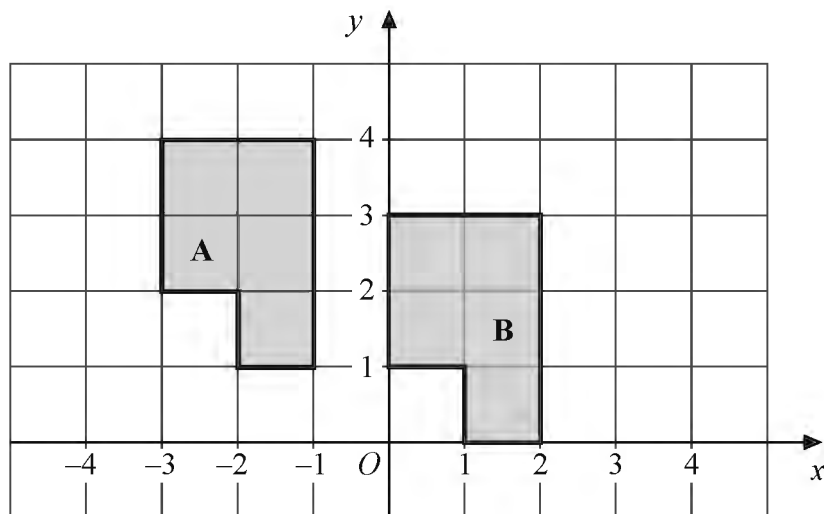


7.



(a) Rotate the shaded shape  $180^\circ$  about the point  $O$ .

(2)



(b) Describe fully the single transformation that will map shape **A** onto shape **B**.

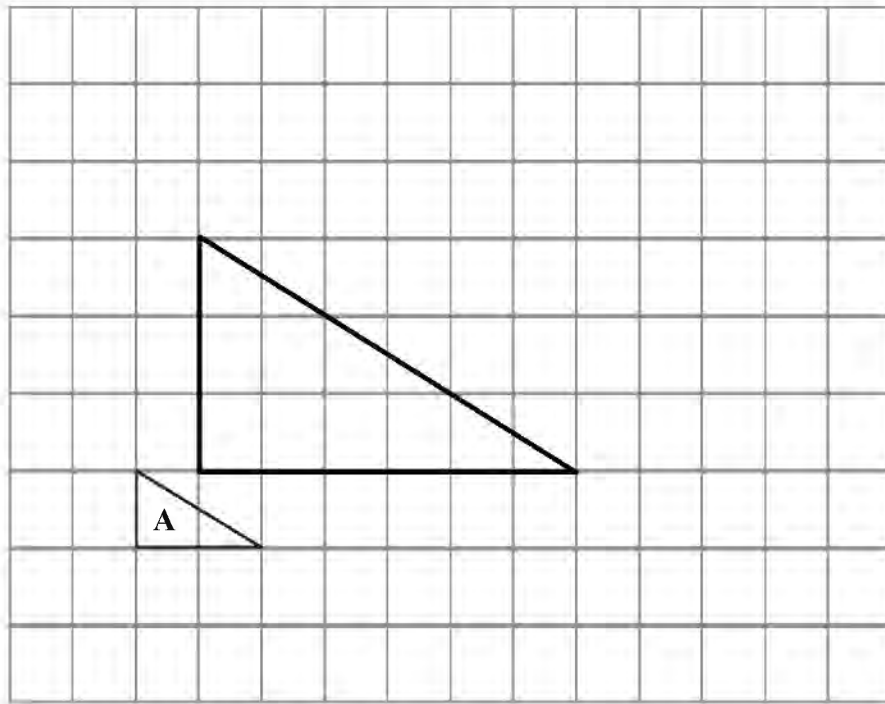
**B** is the image of **A** after translation with the vector  $\begin{bmatrix} 3 \\ -1 \end{bmatrix}$

(2)

(Total 4 marks)

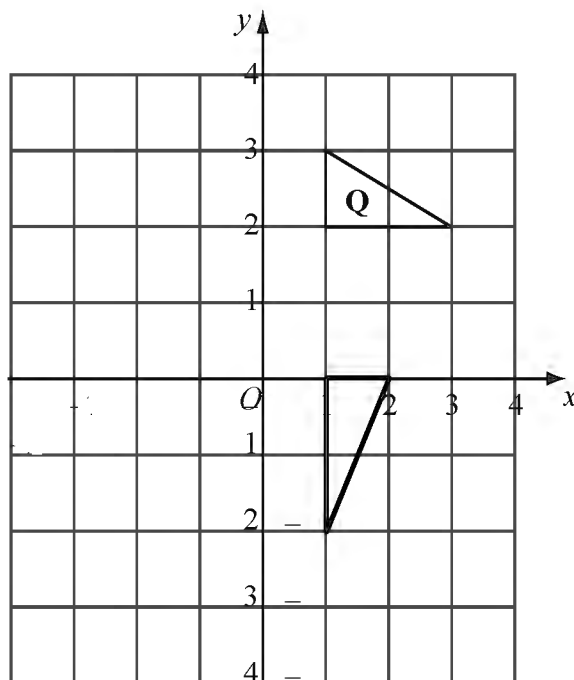


8.



Triangle **A** has been drawn on a grid.

- (a) On the grid, draw an enlargement of the triangle **A** with a scale factor 3.

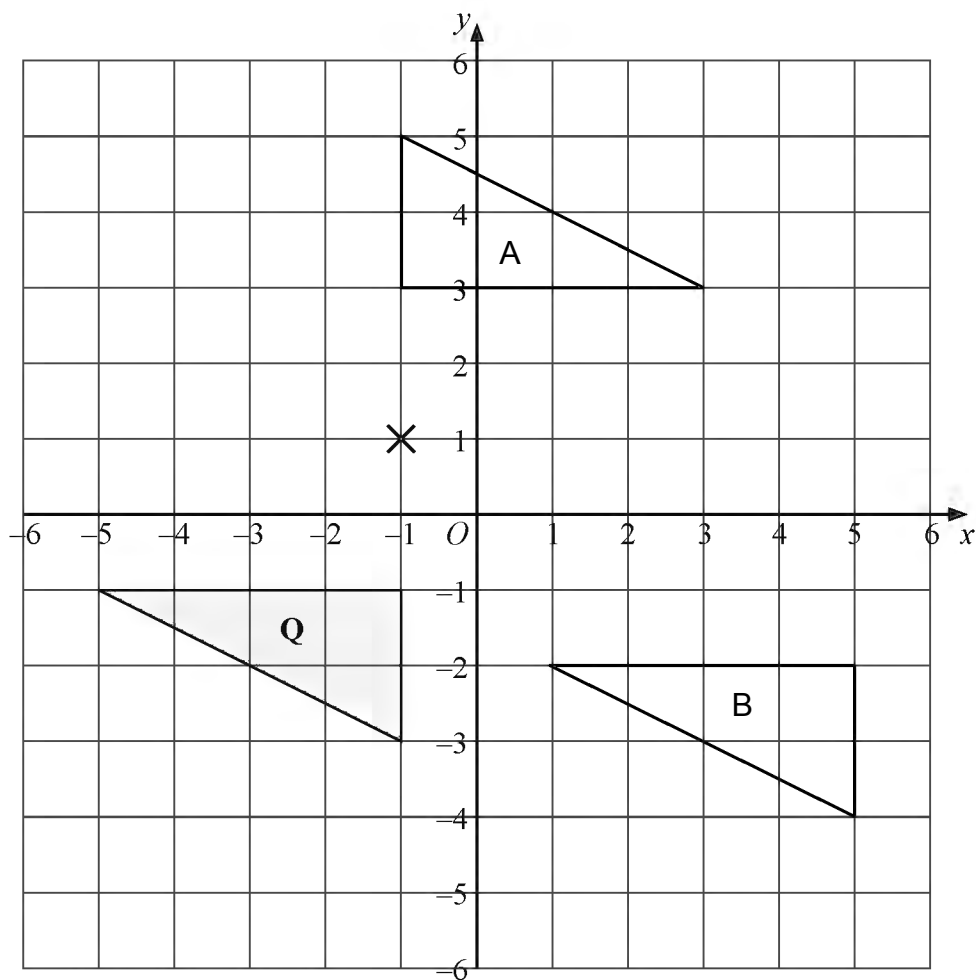


Triangle **Q** has been drawn on a grid.

- (b) On the grid, rotate triangle **Q**  $90^\circ$  clockwise, centre **O**.



9.



(a) Rotate triangle **Q**  $180^\circ$  about the point  $(-1, 1)$ .

Label the new triangle **A**.

(2)

(b) Translate triangle **Q** by the vector  $\begin{pmatrix} 6 \\ -1 \end{pmatrix}$ .

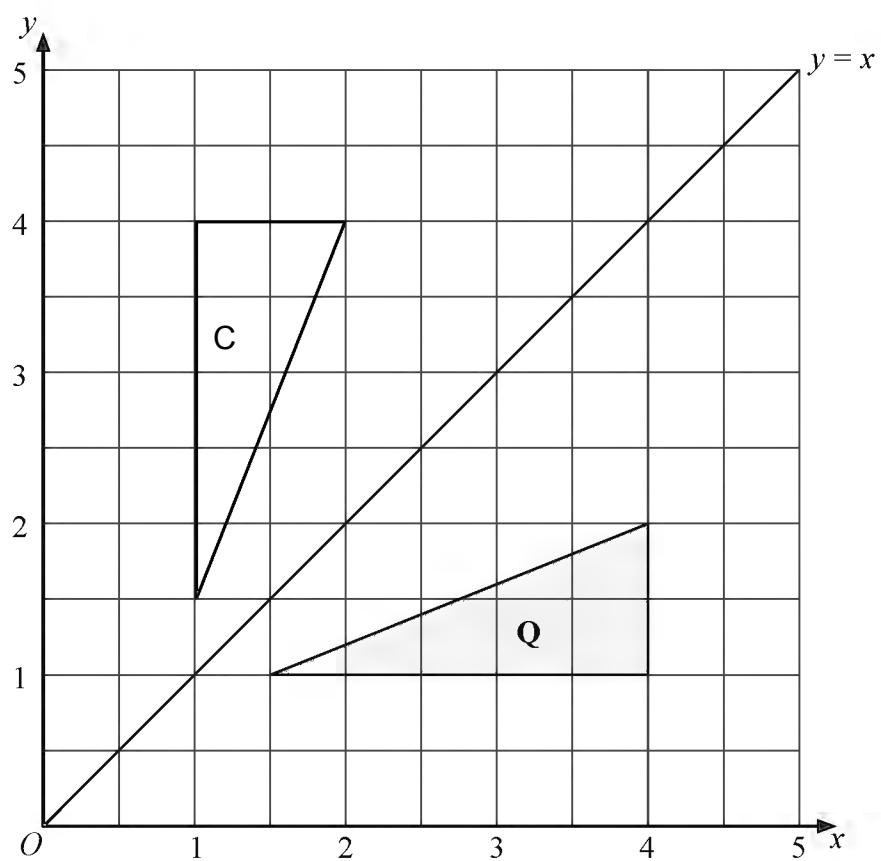
Label the new triangle **B**.

(1)





10.



(c) Reflect triangle **Q** in the line  $y = x$ .

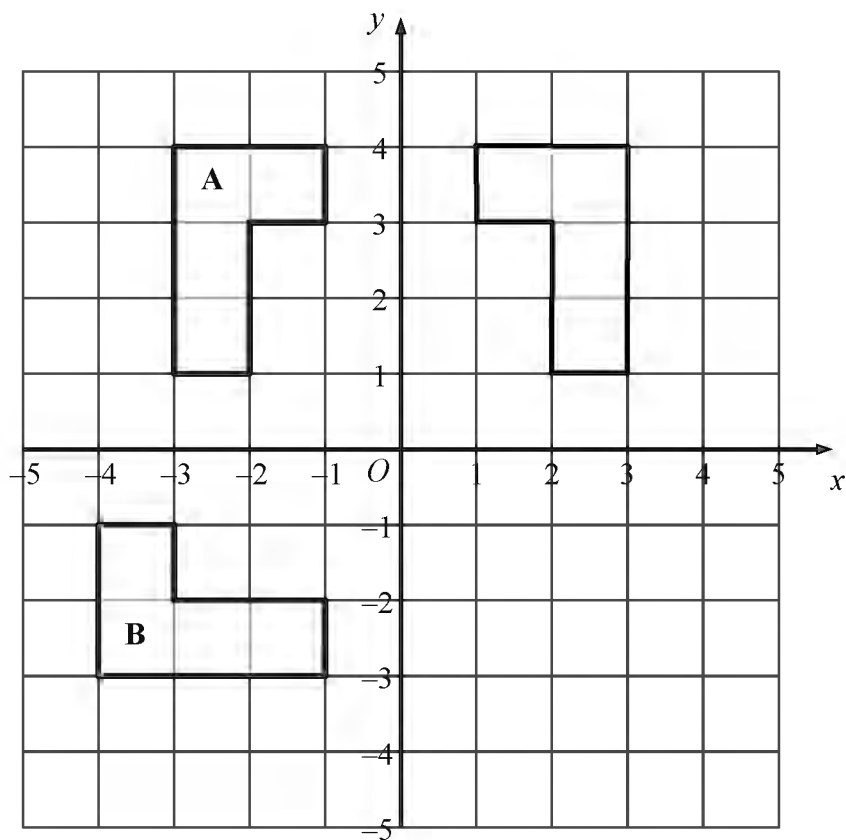
Label the new triangle **C**.

(2)

(Total 5 marks)



11.



(a) Reflect shape A in the  $y$  axis.

(2)

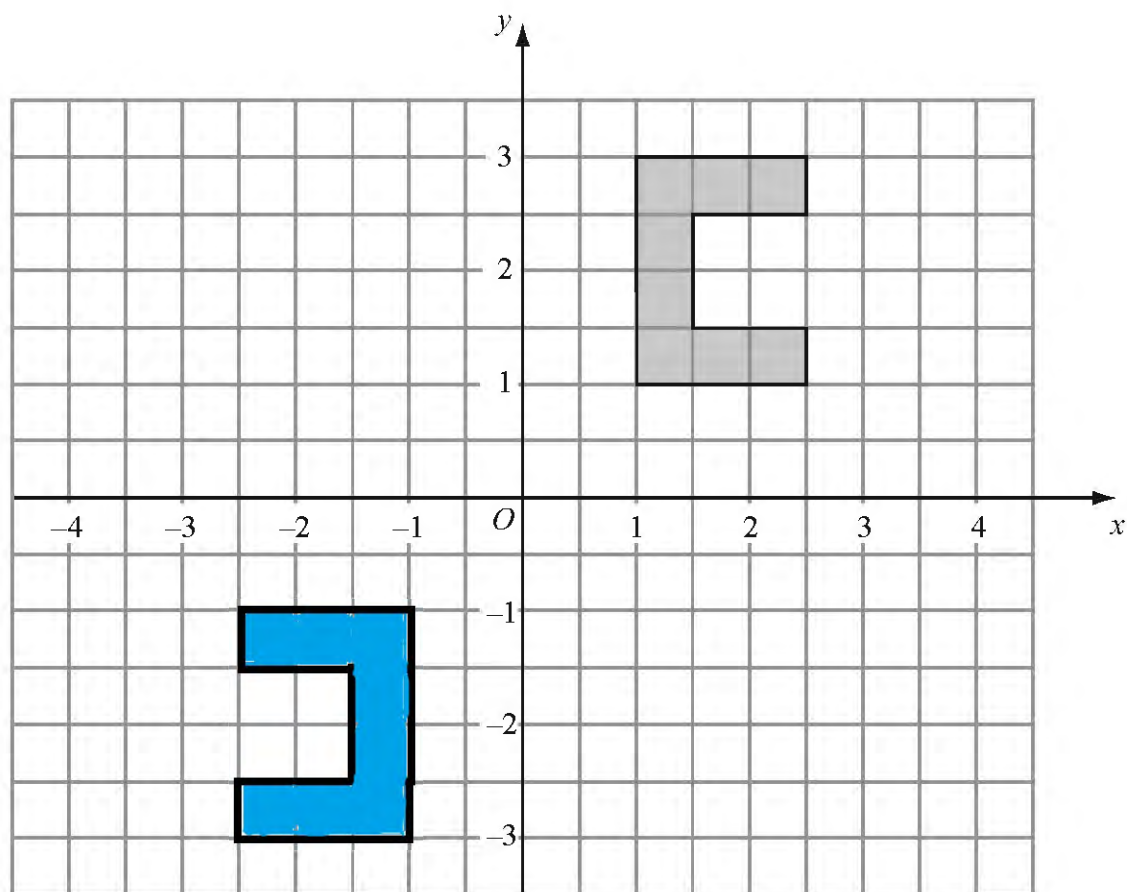
(b) Describe fully the **single** transformation which takes shape A to shape B.

..... Image B is the image of A rotated through 90 degrees anticlockwise .....  
about point O. (3)

(Total 5 marks)



12.

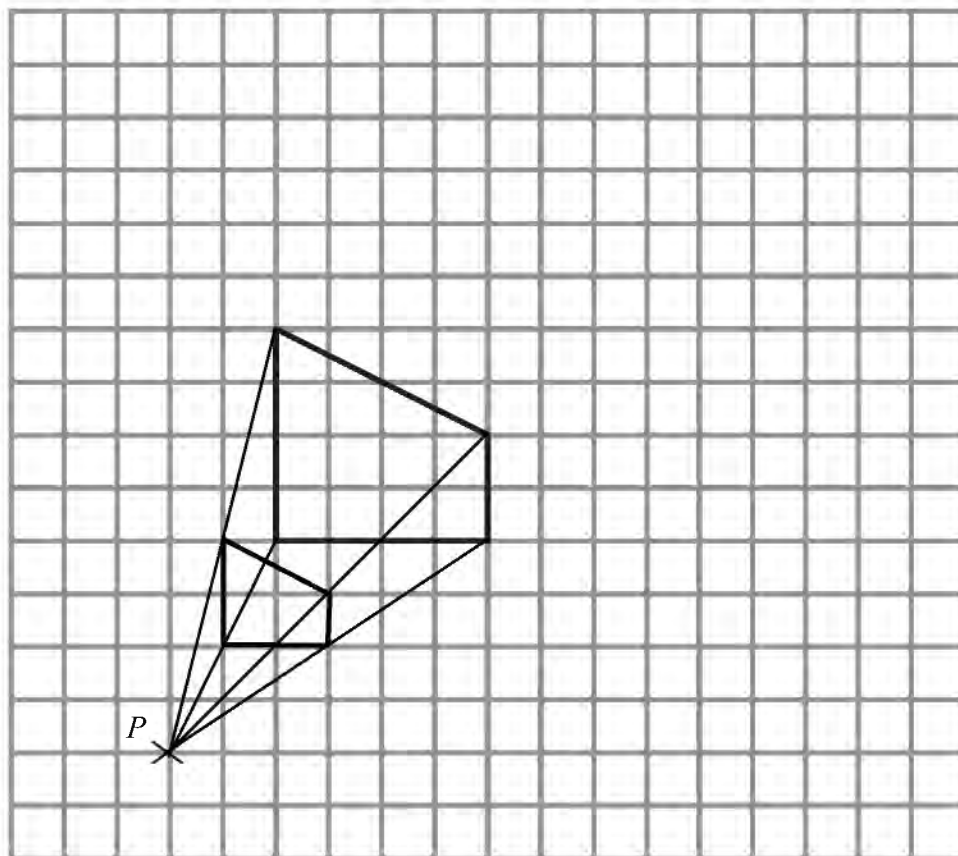


Rotate the shape  $180^\circ$  centre  $O$ .

(Total 2 marks)



13.

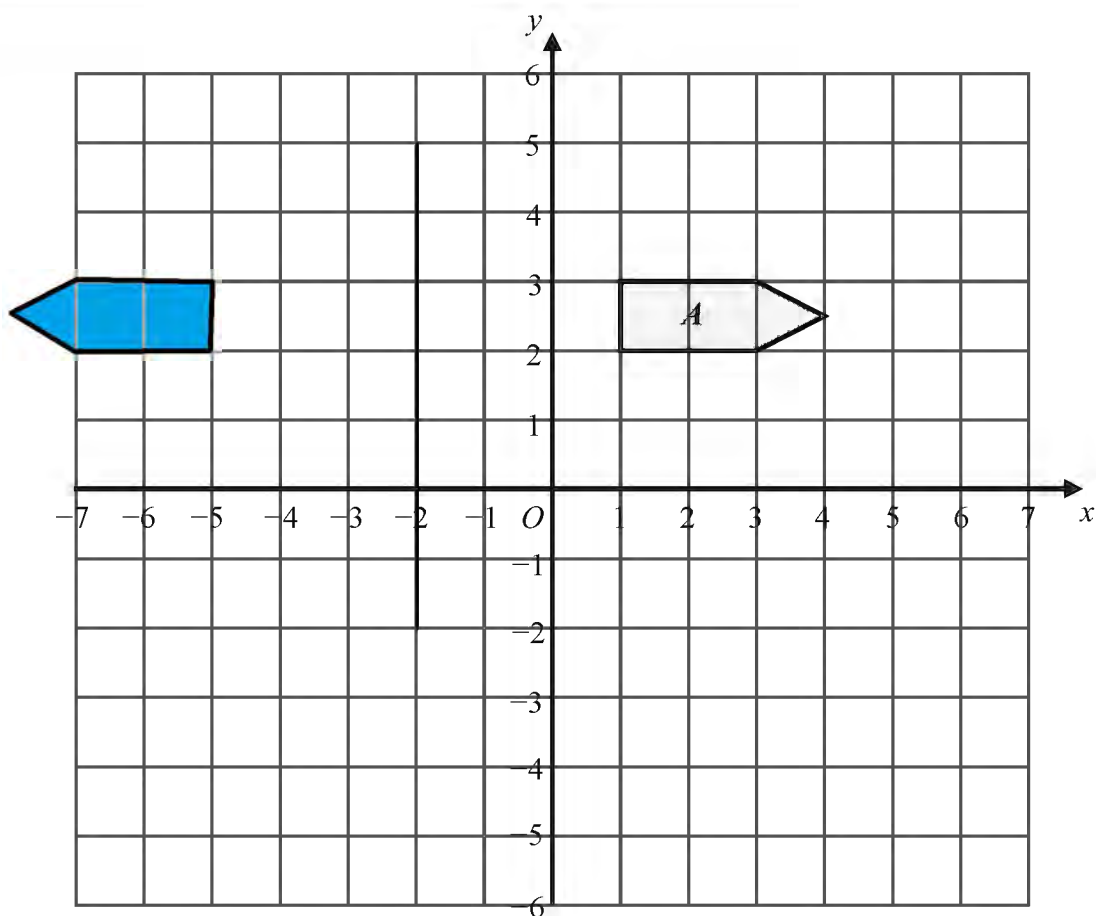


On the grid, enlarge the shape with a scale factor of  $\frac{1}{2}$ , centre  $P$ .

**(Total 3 marks)**

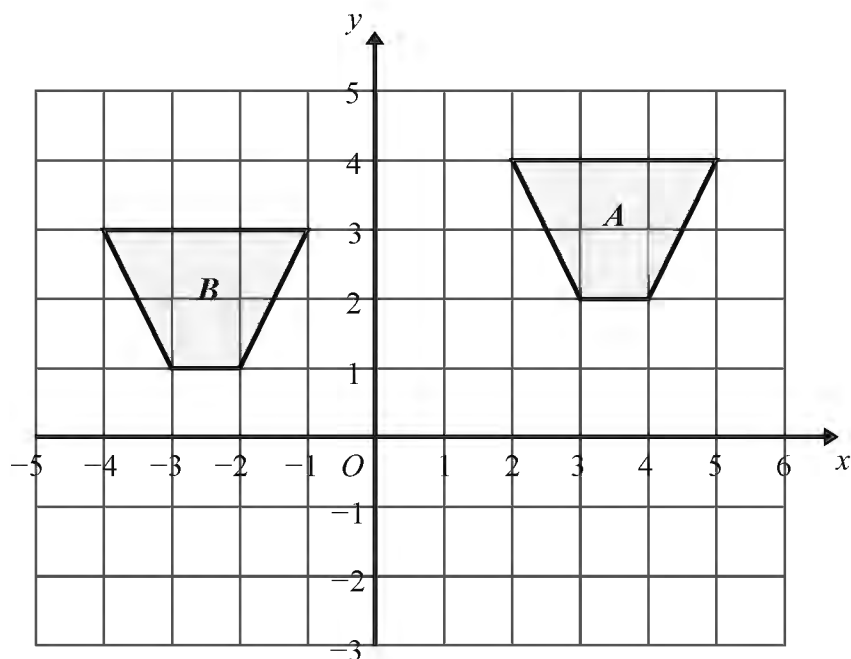


14.



(a) On the grid above, reflect shape *A* in the line  $x = -2$

(2)



(b) Describe fully the single transformation that will map shape *A* onto shape *B*.

...B is the image of A after translation with the vector  $\begin{bmatrix} -6 \\ -1 \end{bmatrix}$  .....

(2)

(Total 4 marks)



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# Mathematics A

## Transformation of Curves

### Model Answers

**Higher Tier**

Past Paper Style Questions  
Arranged by Topic

Paper Reference

**1MA0/1H**

**You must have:** Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

### Instructions

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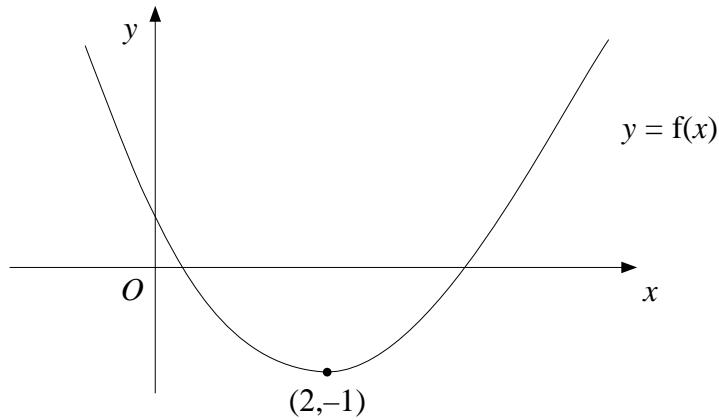
### Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►



1.



The diagram shows part of the curve with equation  $y = f(x)$

The minimum point of the curve is at  $(2, -1)$

(a) Write down the coordinates of the minimum point of the curve with equation

(i)  $y = f(x - 2)$

Graph moves right 2

.....  $(4, -1)$  .....

(ii)  $y = 2f(x)$

Stretch  $y$  by 2

.....  $(2, -2)$  .....

(iii)  $y = f(2x)$

Shrink  $x$  by 2

.....  $(1, -1)$  ..... (3)

The curve  $y = f(x)$  is reflected in the  $y$  axis.

(b) Find the equation of the curve following this transformation.

See summary of rules below question 2

$y = \dots f(-x) \dots$  (1)

The curve with equation  $y = f(x)$  has been transformed to give the curve with equation  $y = f(x) + 2$

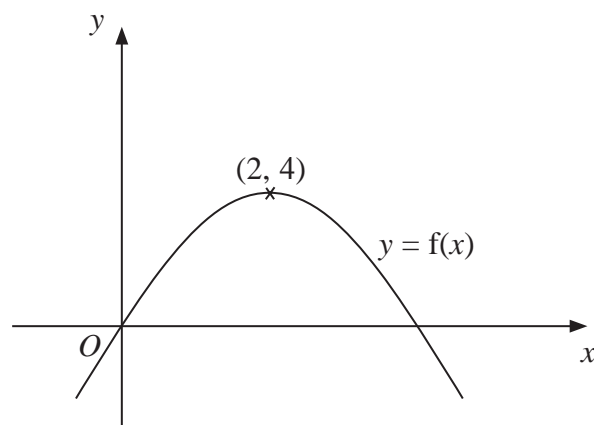
(c) Describe the transformation.

..... Translation by 2 units parallel to the  $y$  axis. (Graph moves up 2) ..... (1)

(Total 5 marks)



2.



The diagram shows part of the curve with equation  $y = f(x)$ .  
The coordinates of the maximum point of this curve are (2, 3).

Write down the coordinates of the maximum point of the curve with equation

(a)  $y = f(x - 2)$

Move graph right 2

(...4.... , ...4....)  
(1)

(b)  $y = 2f(x)$

Stretch  $y$  by 2

(...2.... , ...8....)  
(1)

(Total 2 marks)

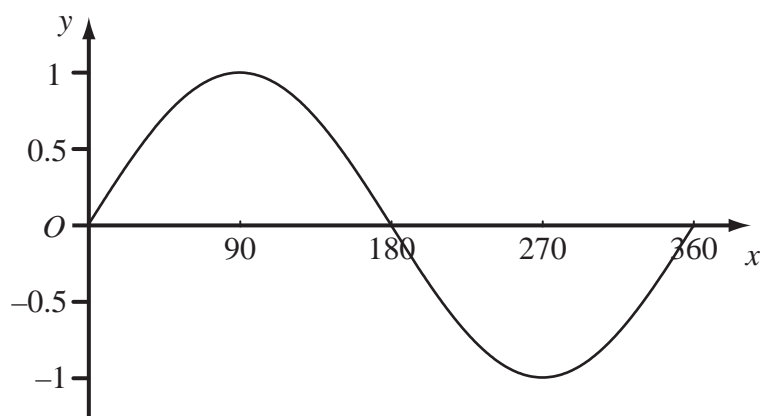
#### Summary of rules

$f(x) + 2$	$y + 2$	move graph up 2
$f(x + 2)$	$x - 2$	move graph left 2
$2f(x)$	$2y$	stretch $y$ by 2
$f(2x)$	$\frac{x}{2}$	shrink $x$ by 2
$-f(x)$		Reflect in $x$ -axis
$f(-x)$		Reflect in $y$ -axis





3. The diagram shows a sketch of the curve  $y = \sin x^\circ$  for  $0 \leq x \leq 360$



The exact value of  $\sin 60^\circ = \frac{\sqrt{3}}{2}$

(a) Write down the exact value of

(i)  $\sin 120^\circ$ ,

$$\frac{\sqrt{3}}{2}$$

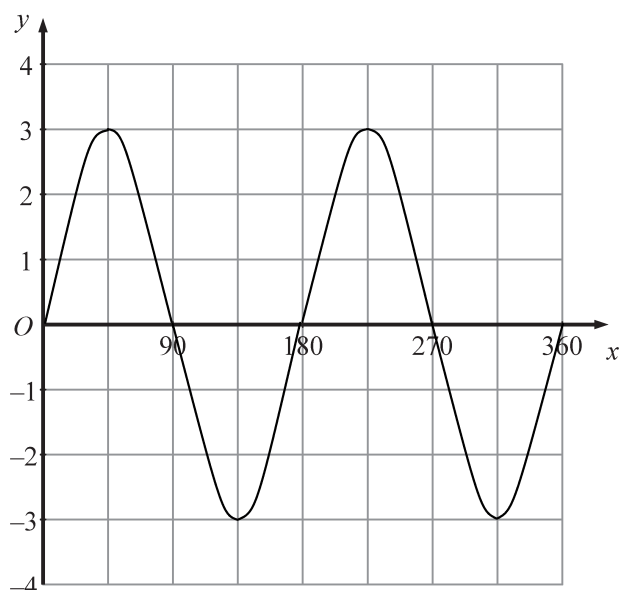
(ii)  $\sin 300^\circ$ .

$$-\frac{\sqrt{3}}{2}$$

(2)

(b) On the grid below, sketch the graph of  $y = 3 \sin 2x^\circ$  for  $0 \leq x \leq 360$

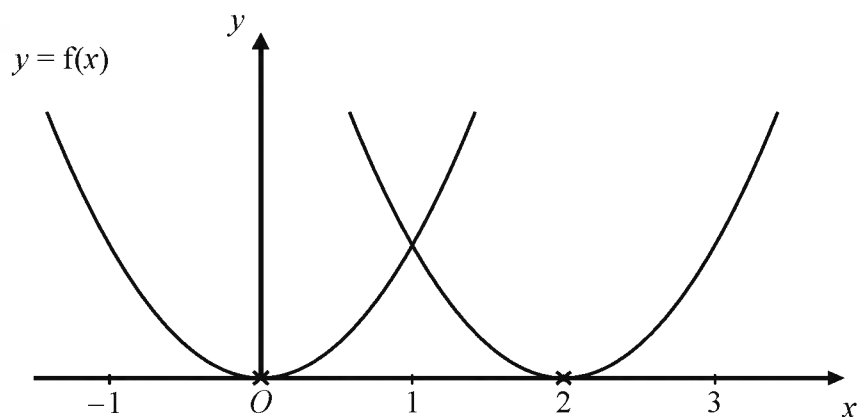
Stretch  $y$  by 3 and shrink  $x$  by 2



(2)



4.

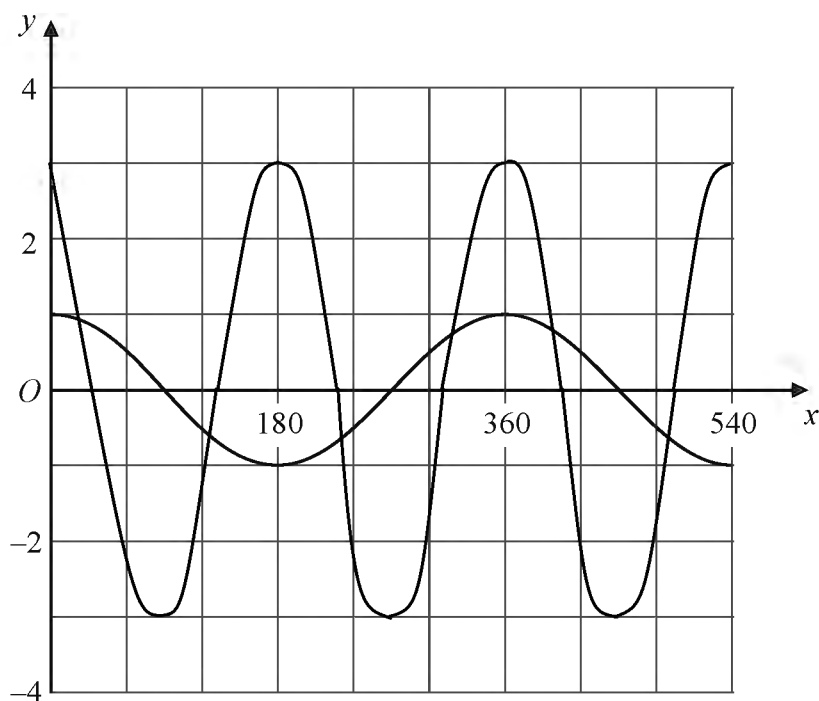


The curve with equation  $y = f(x)$  is translated so that the point at  $(0, 0)$  is mapped onto the point  $(2, 0)$ .

(a) Find an equation of the translated curve.

$$y = f(x - 2)$$

(2)



The grid shows the graph of  $y = \cos x^\circ$  for values of  $x$  from 0 to 540

(b) On the grid, sketch the graph of  $y = 3 \cos(2x^\circ)$  for values of  $x$  from 0 to 540

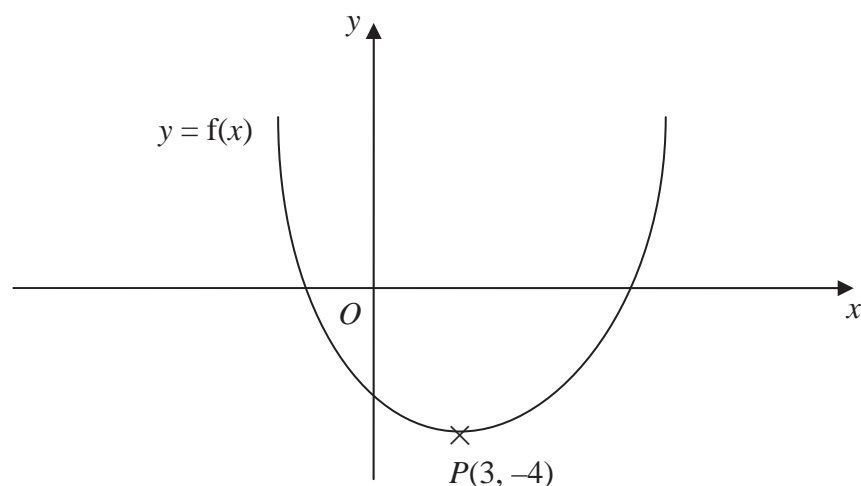
Stretch  $y$  by 3, shrink  $x$  by 2

(2)

(Total 4 marks)



5. This is a sketch of the curve with the equation  $y = f(x)$ .  
The only minimum point of the curve is at  $P(3, -4)$ .



- (a) Write down the coordinates of the minimum point of the curve with the equation  $y = f(x - 2)$

Graph moves right 2

(.....5..... , .....-4.....)  
(2)

- (b) Write down the coordinates of the minimum point of the curve with the equation  $y = f(x + 5) + 6$

Graph moves left 5 and up 6

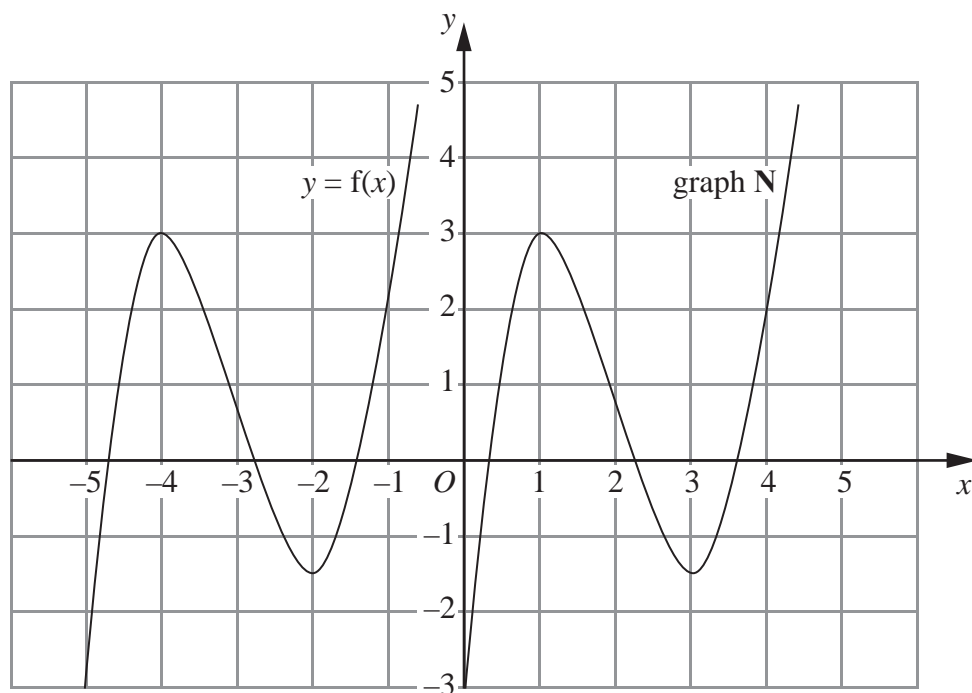
$$3 - 5 = -2$$

$$-4 + 6 = 2$$

(.....-2..... , .....2.....)



6. The graph of  $y = f(x)$  is shown on the grid.



The graph N is a translation of the graph of  $y = f(x)$ .

- (a) Write down in terms of  $f$ , the equation of graph N

$$y = \dots f(x - 5) \dots \dots \dots (1)$$

The graph of  $y = f(x)$  has a maximum point at  $(-4, 3)$ .

- (b) Write down the coordinates of the maximum point of the graph of  $y = f(-x)$ .

$y = f(-x)$  means reflect in the  $y$ -axis

The maximum point is  $(4, 3)$

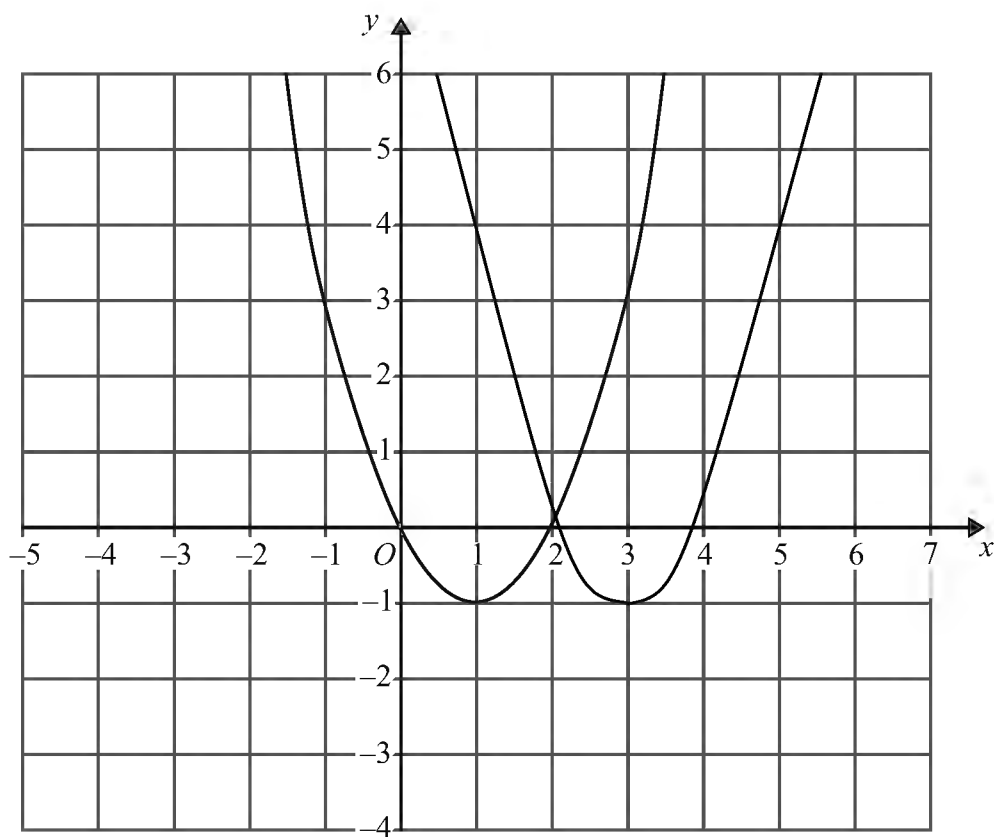
$$(\dots 4 \dots, \dots 3 \dots) (2)$$

(Total 3 marks)



7. The graph of  $y = f(x)$  is shown on each of the grids.

(a) On this grid, sketch the graph of  $y = f(x - 2)$

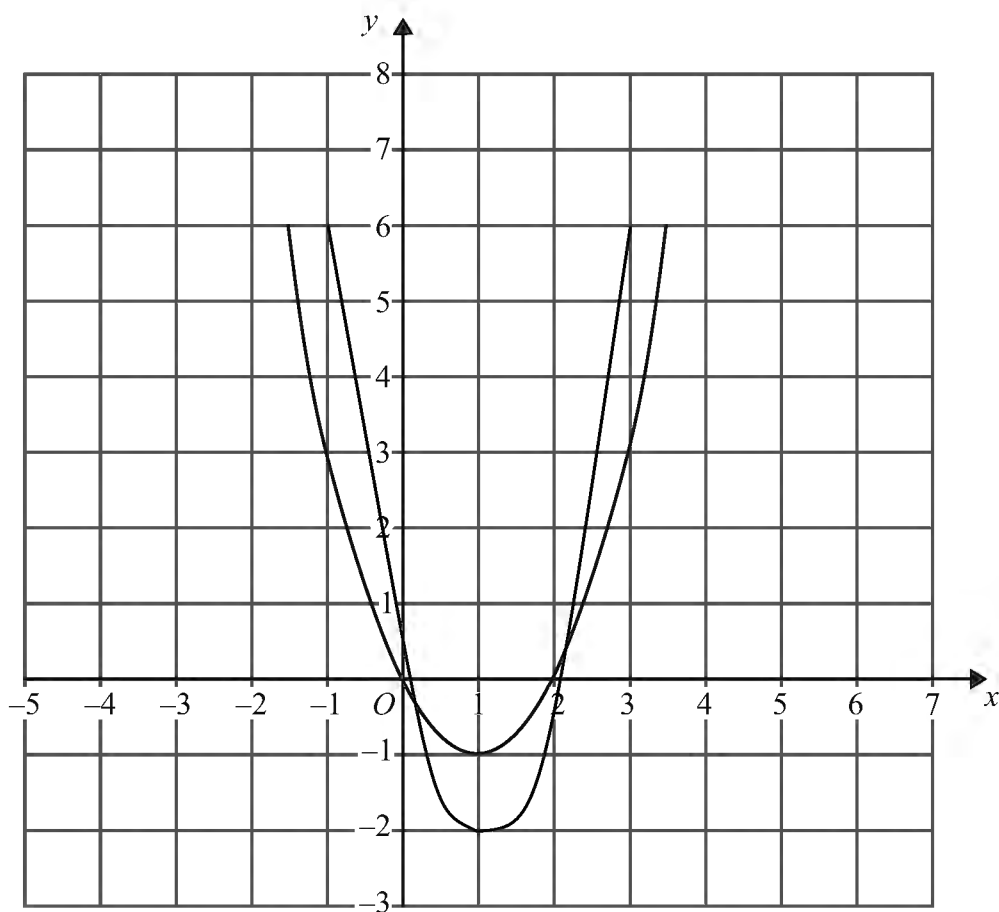


Graph moves right 2

(2)



(b) On this grid, sketch the graph of  $y = 2f(x)$



Stretch  $y$  by 2

(Total 4 marks)



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# Mathematics A Trial and Improvement Model Answers

**Higher Tier**

Past Paper Style Questions  
Arranged by Topic

Paper Reference

**1MA0/2H**

**You must have:** Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

## Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided  
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- **Calculators may be used.**



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1. The equation

$$x^3 + 20x = 73$$

has a solution between 2 and 3

Use a trial and improvement method to find this solution.

Give your answer correct to one decimal place.

You must show **ALL** your working.

Try:

$$x = 2.5 \quad 2.5^3 + (20 \times 2.5) = 65.25 \quad \text{Too low}$$

$$x = 2.6 \quad 2.6^3 + (20 \times 2.6) = 69.576 \quad \text{Too low}$$

$$x = 2.7 \quad 2.7^3 + (20 \times 2.7) = 73.683 \quad \text{Too high}$$

$$x = 2.65 \quad 2.65^3 + (20 \times 2.65) = 71.609 \quad \text{Too low}$$

The solution is above 2.65 so to 1 dp it is rounded up to 2.7

$$x = \dots\dots 2.7 \dots\dots$$

(Total 4 marks)



2. The equation

$$x^3 - x = 29$$

has a solution between 3 and 4

Use a trial and improvement method to find this solution.

Give your answer correct to 1 decimal place.

You must show **all** your working.

Try:

Try:

$$x = 3.5 : 3.5^3 - 3.5 = 30.375 \quad \text{Too large}$$

$$x = 3.3 : 3.3^3 - 3.3 = 32.637 \quad \text{Too large}$$

$$x = 3.2 : 3.2^3 - 3.2 = 29.568 \quad \text{Too large}$$

$$x = 3.1 : 3.1^3 - 3.1 = 26.691 \quad \text{Too small}$$

$$x = 3.15 : 3.15^3 - 3.15 = 28.106 \quad \text{Too small}$$

3.15 is too small so the answer is 3.2 to 1 dp.

$$x = \dots 3.2 \dots$$

(Total 4 marks)



3. The equation

$$x^3 + 10x = 24$$

has a solution between 1 and 2

Use a trial and improvement method to find this solution.  
Give your answer correct to one decimal place.  
You must show **all** your working.

Try:

$$x = 1.5 : 1.5^3 + 15 = 18.375 \quad \text{Too small}$$

$$x = 1.8 : 1.8^3 + 18 = 23.832 \quad \text{Too small}$$

$$x = 1.9 : 1.9^3 + 19 = 25.859 \quad \text{Too large}$$

$$x = 1.85 : 1.85^3 + 18.5 = 24.832 \quad \text{Too Large}$$

The answer is less than 1.85 but more than 1.8  
so when rounded to 1dp it is 1.8.

$$x = \dots\dots\dots 1.8 \dots\dots\dots$$

(Total 4 marks)



4. The equation

$$x^3 + 10x = 50$$

has a solution between 2 and 3

Use a trial and improvement method to find this solution.

Give your answer correct to 1 decimal place.

You must show **all** your working.

Try:

$$x = 2.5: \quad 2.5^3 + 25 = 40.625 \quad \text{Too small}$$

$$x = 2.7: \quad 2.7^3 + 27 = 46.683 \quad \text{Too small}$$

$$x = 2.8: \quad 2.8^3 + 28 = 49.952 \quad \text{Too small}$$

$$x = 2.85: \quad 2.85^3 + 28.5 = 51.64 \quad \text{Too large}$$

So the answer to 1 dp is 2.8

$$x = \underline{2.8} \dots\dots\dots$$

(Total 4 marks)



5. The equation

$$x^3 + 5x = 66$$

has a solution between 3 and 4

Use a trial and improvement method to find this solution.

Give your answer correct to one decimal place.

You must show **ALL** your working.

Try:

3.5:  $3.5^3 + (5 \times 3.5) = 60.375$  Too small

3.6:  $3.6^3 + (5 \times 3.6) = 64.376$  Too small

3.7:  $3.7^3 + (5 \times 3.7) = 69.153$  Too Large

3.65:  $3.65^3 + (5 \times 3.65) = 66.877$  Too large

The answer is less than 3.65 so it is 3.6 to 1 dp.

$x = \dots\dots\dots 3.6 \dots\dots\dots$

(Total 4 marks)



6. The equation

$$2x^3 - x = 80$$

has a solution between 3 and 4

Use a trial and improvement method to find this solution.  
Give your answer correct to one decimal place.  
You must show **ALL** your working.

Try:

3.5:  $(2 \times 3.5^3) - 3.5 = 82.25$  Too large

3.4:  $(2 \times 3.4^3) - 3.4 = 75.208$  Too small

3.45:  $(2 \times 3.45^3) - 3.45 = 78.677$  Too small

The answer is between 3.45 and 3.5 so is 3.5 to 1 dp.

$$x = \dots 3.5 \dots$$

**(Total 4 marks)**



7. The equation

$$x^3 + 2x = 78$$

has a solution between 4 and 5

Use a trial and improvement method to find this solution.

Give your answer correct to one decimal place.

You must show **ALL** your working.

Try:

4.5:  $4.5^3 + (2 \times 4.5) = 100.125$  Too large

4.3:  $4.3^3 + (2 \times 4.3) = 88.107$  Too large

4.2:  $4.2^3 + (2 \times 4.2) = 82.488$  Too large

4.1:  $4.1^3 + (2 \times 4.1) = 77.121$  Too small

4.15:  $4.15^3 + (2 \times 4.15) = 79.773$  Too small

The answer is more than 4.15 so it is 4.2 to 1 dp.

$$x = \dots\dots 4.2 \dots\dots\dots$$

**(Total 4 marks)**



8. The equation  $x^3 + 3x = 41$

has a solution between 3 and 4

Use a trial and improvement method to find this solution.

Give your answer correct to one decimal place.

You must show **ALL** your working.

Try:

3.5:  $3.5^3 + (3 \times 3.5) = 53.375$  Too large

3.4:  $3.4^3 + (3 \times 3.4) = 49.504$  Too large

3.2:  $3.2^3 + (3 \times 3.2) = 42.368$  Too large

3.1:  $3.1^3 + (3 \times 3.1) = 39.091$  Too small

3.15:  $3.15^3 + (3 \times 3.15) = 40.706$  Too large

The answer is less than 3.15 so it is 3.1 to 1 dp

$x = \dots\dots 3.1 \dots\dots$

(Total 4 marks)





9. The equation

$$x^3 - 6x = 72$$

has a solution between 4 and 5

Use a trial and improvement method to find this solution.

Give your answer correct to one decimal place.

You must show **ALL** your working.

Try:

4.5:  $4.5^3 - (6 \times 4.5) = 64.125$  Too small

4.6:  $4.6^3 - (6 \times 4.6) = 69.736$  Too small

4.7:  $4.7^3 - (6 \times 4.7) = 75.623$  Too large

4.65:  $4.65^3 - (6 \times 4.65) = 72.645$  Too large

The answer is below 4.65. It is 4.6 to 1 dp.

$x = 4.6$

(Total 4 marks)



Write your name here

Surname

Other names

In the style of:

**Edexcel GCSE**

Centre Number

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Candidate Number

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# Mathematics A

## Trigonometry

### Model Answers

**Higher Tier**

Past Paper Style Questions  
Arranged by Topic

Paper Reference

**1MA0/2H**

**You must have:** Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser, calculator. Tracing paper may be used.

Total Marks

### Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided  
– *there may be more space than you need.*
- **Calculators may be used.**



### Information

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- The marks for **each** question are shown in brackets  
– *use this as a guide as to how much time to spend on each question.*
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### Advice

- Read each question carefully before you start to answer it.
- Keep an eye on the time.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►



1.  $ABC$  is a right-angled triangle.  $AB = 18$  cm  
and  $BC = 6$  cm.  
The line  $BD$  bisects the angle  $ABC$ .

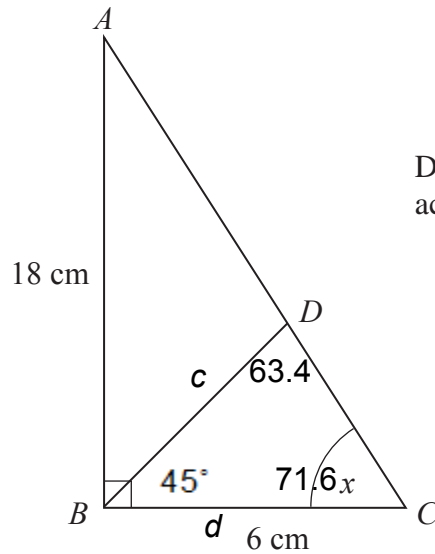


Diagram **NOT**  
accurately drawn

- (a) Write down the value of  $\tan x$ .

$$\tan = \frac{\text{Opposite}}{\text{adjacent}}$$

$$= \frac{18}{6}$$

$$\dots\dots\dots 3 \dots\dots\dots$$

(1)

- (b) Calculate the length  $BD$ .

$$\tan x = 3$$

$$x = 71.57$$

$$= 71.6 \text{ (3 sig fig)}$$

Sine Rule:

$$\frac{c}{\sin C} = \frac{d}{\sin D}$$

$$\frac{c}{\sin 71.6} = \frac{6}{\sin 63.4}$$

$$c = \frac{6 \sin 71.6}{\sin 63.4}$$

$$c = 6.36$$

$$\dots\dots\dots 6.36 \dots\dots \text{ cm}$$

(5)

**(Total 6 marks)**



2. Here is a right-angled triangle.

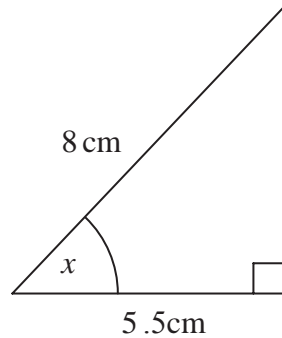


Diagram **NOT**  
accurately drawn

- (a) Calculate the size of the angle marked  $x$ .  
Give your answer correct to 1 decimal place.

$$\cos = \frac{\text{Adjacent}}{\text{Hypotenuse}}$$

$$\cos x = \frac{5.5}{8}$$

Use the  $\cos^{-1}$  key

$$x = 46.567$$

$$x = \dots 46.6 \dots \text{ }^\circ$$

(3)

Here is another right-angled triangle.

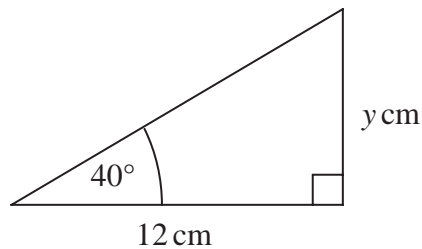


Diagram **NOT**  
accurately drawn

- (b) Calculate the value of  $y$ .  
Give your answer correct to 1 decimal place.

$$\tan = \frac{\text{Opposite}}{\text{Adjacent}}$$

$$\tan 40^\circ = \frac{y}{12}$$

$$y = 12 \tan 40^\circ$$

$$y = 10.069$$

$$y = \dots 10.1 \text{ cm} \dots$$

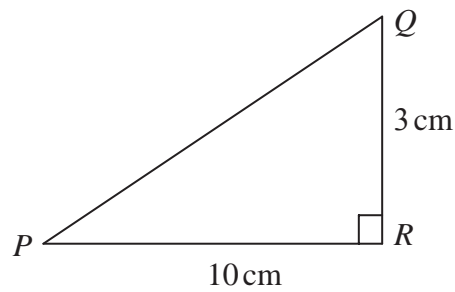
(3)

(Total 6 marks)



3.

Diagram **NOT**  
accurately drawn



$PQR$  is a right-angled triangle.

$$QR = 3 \text{ cm}$$

$$PR = 10 \text{ cm}$$

Work out the size of angle  $RPQ$ .

Give your answer correct to 3 significant figures.

$$\tan = \frac{\text{Opposite}}{\text{Adjacent}}$$

$$\tan RPQ = \frac{3}{10}$$

Use the  $\tan^{-1}$  key

$$\angle RPQ = 16.699^\circ$$

$$\dots\dots\dots 16.7^\circ$$

(Total 3 marks)



4.

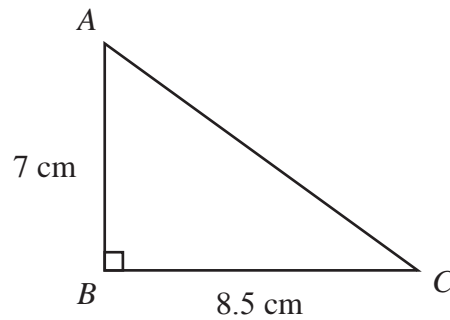


Diagram **NOT**  
accurately drawn

$ABC$  is a right-angled triangle.

$AB = 7$  cm,

$BC = 8.5$  cm.

(a) Work out the area of the triangle.

$$\begin{aligned}\text{Area} &= \frac{1}{2}bh \\ &= \frac{1}{2} \times 8.5 \times 7 \\ &= 29.75 \text{ cm}^2\end{aligned}$$

.....29.75.....  $\text{cm}^2$   
(2)

(b) Work out the length of  $AC$ .  
Give your answer correct to 2 decimal places.

Pythagoras

$$\begin{aligned}AC^2 &= AB^2 + BC^2 \\ &= 7^2 + 8.5^2 \\ &= 49 + 72.25 \\ &= 121.25 \\ AC &= \sqrt{121.25} \\ &= 11.011\end{aligned}$$

.....11.01..... cm  
(3)



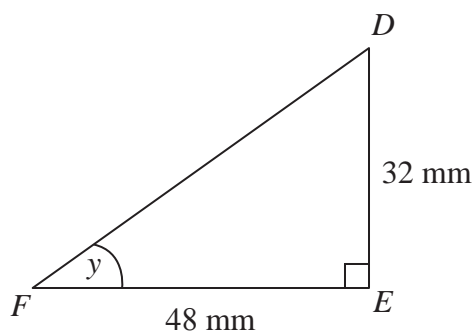


Diagram **NOT**  
accurately drawn

$DEF$  is another right-angled triangle.

$DE = 32$  mm,

$FE = 48$  mm.

- (c) Calculate the size of angle  $y$ .  
Give your answer correct to 1 decimal place.

$$\tan = \frac{\text{Opposite}}{\text{Adjacent}}$$

$$\tan y = \frac{32}{48}$$

Use the  $\tan^{-1}$  key

$$y = 33.690$$

.....33.7°  
(3)

(Total 8 marks)



5.

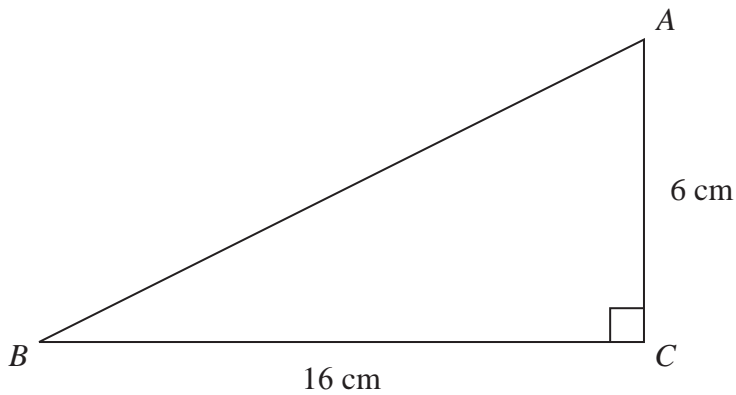


Diagram **NOT**  
accurately drawn

$ABC$  is a right-angled triangle.

$AC = 6$  cm.

$BC = 16$  cm.

(a) Work out the area of triangle  $ABC$ .

$$\begin{aligned}\text{Area} &= \frac{1}{2}bh \\ &= \frac{1}{2} \times 16 \times 6 \\ &= 48\end{aligned}$$

.....48.....  $\text{cm}^2$   
(2)

(b) Calculate the length of  $AB$ .

Give your answer correct to 2 decimal places.

**Pythagoras**

$$AB^2 = AC^2 + BC^2$$

$$= 6^2 + 16^2$$

$$= 36 + 256$$

$$= 292$$

$$AB = \sqrt{292}$$

$$= 17.088$$

.....17.09..... cm  
(3)

(Total 5 marks)





6.

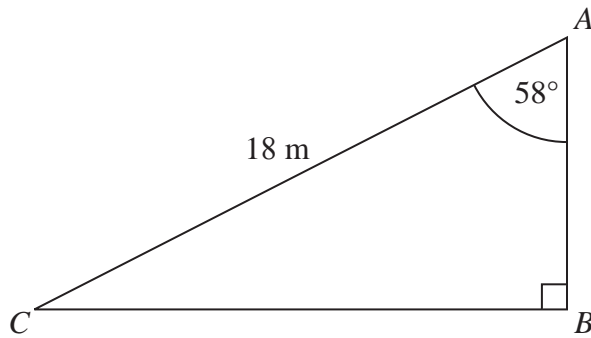


Diagram **NOT**  
accurately drawn

$ABC$  is a right-angled triangle.

$AC = 18$  m.

Angle  $CAB = 58^\circ$

Calculate the length of  $AB$ .

Give your answer correct to 3 significant figures.

$$\cos = \frac{\text{Adjacent}}{\text{Hypotenuse}}$$

$$\cos 58^\circ = \frac{AB}{18}$$

$$AB = 18 \cos 58^\circ$$

$$AB = 9.539$$

.....9.54..... m

(Total 3 marks)



7.

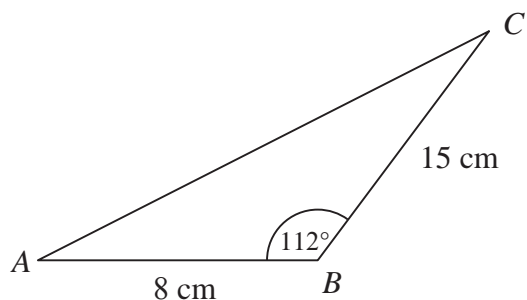


Diagram **NOT**  
accurately drawn

$ABC$  is a triangle.

$AB = 8 \text{ cm}$

$BC = 15 \text{ cm}$

Angle  $ABC = 112^\circ$

Calculate the area of the triangle.

Give your answer correct to 3 significant figures.

$$\begin{aligned}\text{Area} &= \frac{1}{2}ac \sin B \\ &= \frac{1}{2} \times 15 \times 8 \sin 112^\circ \\ &= 55.631\end{aligned}$$

.....55.6.....  $\text{cm}^2$

**(Total 3 marks)**



8. Town  $B$  is 4.6 km due West of town  $C$ .  
Town  $A$  is 2.3 km due North of town  $B$ .

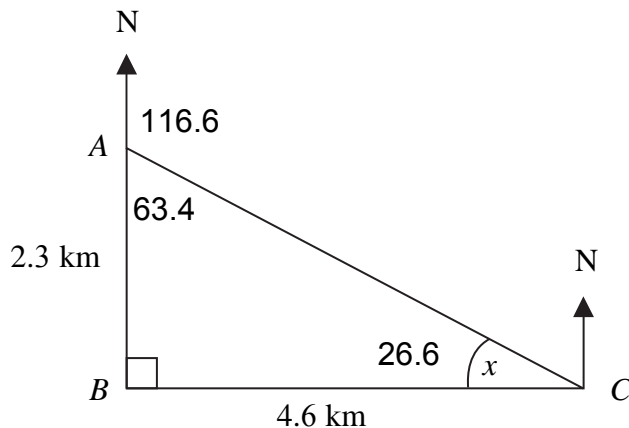


Diagram **NOT**  
accurately drawn

- (a) Calculate the size of the angle marked  $x$ .  
Give your answer correct to 3 significant figures.

$$\tan = \frac{\text{Opposite}}{\text{Adjacent}}$$

$$\tan x = \frac{2.3}{4.6}$$

$$\text{Use the } \tan^{-1} \text{ key} \\ = 26.565$$

$$x = \dots\dots\dots 26.6 \dots\dots\dots^\circ \\ \text{(3)}$$

- (b) Find the bearing of town  $C$  from town  $A$ .  
Give your answer correct to 3 significant figures.

$$\angle BAC = 180 - 90 - 26.6 \\ = 63.463.4$$

$$\text{Bearing of } C \text{ from } A = 180 - 63.4 \\ = 116.6$$

$$\dots\dots\dots 116.6 \dots\dots\dots^\circ \\ \text{(1)}$$

**(Total 4 marks)**



9.

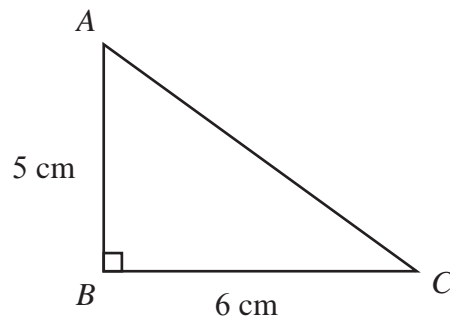


Diagram **NOT**  
accurately drawn

$ABC$  is a right-angled triangle.

$AB = 5$  cm,

$BC = 6$  cm.

(a) Work out the area of the triangle.

$$\begin{aligned}\text{Area} &= \frac{1}{2}bh \\ &= \frac{1}{2} \times 6 \times 5 \\ &= 15\end{aligned}$$

.....15.....  $\text{cm}^2$   
(2)

(b) Work out the length of  $AC$ .  
Give your answer correct to 2 decimal places.

**Pythagoras**

$$\begin{aligned}AC^2 &= AB^2 + BC^2 \\ &= 5^2 + 6^2 \\ &= 25 + 36 \\ &= 61\end{aligned}$$

$$\begin{aligned}AC &= \sqrt{61} \\ &= 7.810\end{aligned}$$

.....7.81..... cm  
(3)



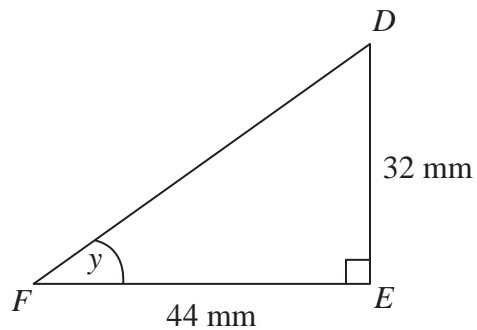


Diagram **NOT**  
accurately drawn

$DEF$  is another right-angled triangle.

$DE = 32$  mm,

$FE = 44$  mm.

- (c) Calculate the size of angle  $y$ .  
Give your answer correct to 1 decimal place.

$$\tan = \frac{\text{Opposite}}{\text{Adjacent}}$$

$$\tan y = \frac{32}{44}$$

Use the  $\tan^{-1}$  key

$$y = 36.027$$

.....36.0.....<sup>°</sup>  
(3)

(Total 8 marks)



10.

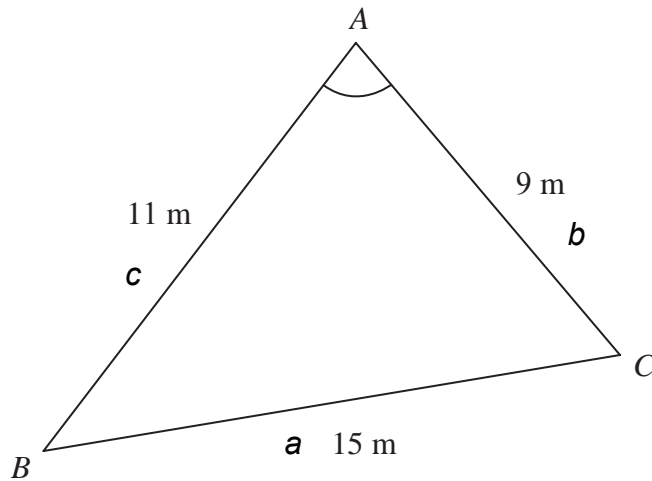


Diagram **NOT**  
accurately drawn

$ABC$  is a triangle.

$AB = 11$  m.

$AC = 9$  m.

$BC = 15$  m.

Calculate the size of angle  $BAC$ .

Give your answer correct to one decimal place.

**Cosine Rule**

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

$$a = 15 \quad b = 9 \quad c = 11$$

$$\cos A = \frac{9^2 + 11^2 - 15^2}{2 \times 9 \times 11}$$

$$= \frac{-23}{198}$$

Use the  $\cos^{-1}$  key

$$A = 96.670$$

.....96.7.....°

**(Total 3 marks)**



11.

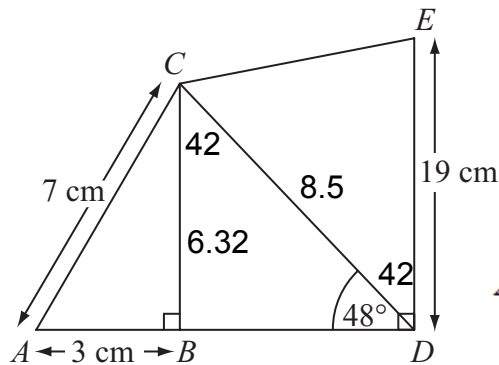


Diagram **NOT**  
accurately drawn

$$\angle CDE = 42^\circ (90^\circ - 48^\circ)$$

$$\angle BCD = \angle CDE \text{ (Alternate angles)}$$

$$AC = 7 \text{ cm.}$$

$$AB = 3 \text{ cm.}$$

$$DE = 19 \text{ cm.}$$

$$\text{Angle } ABC = \text{angle } CBD = \text{angle } BDE = 90^\circ.$$

$$\text{Angle } BDC = 48^\circ.$$

- (a) Calculate the length of  $CD$ .

Give your answer correct to 3 significant figures.

Pythagoras

$$CB^2 = AC^2 - AB^2$$

$$= 7^2 - 3^2$$

$$= 40$$

$$CB = \sqrt{40}$$

$$= 6.32$$

$$\sin = \frac{\text{Opposite}}{\text{Hypotenuse}}$$

$$\sin 48^\circ = \frac{6.32}{CD}$$

$$CD \sin 48^\circ = 6.32$$

$$CD = \frac{6.32}{\sin 48^\circ}$$

$$= 8.504$$

$$\dots\dots\dots 8.50 \dots\dots\dots \text{ cm}$$

(4)

- (b) Calculate the length of  $CE$ .

Give your answer correct to 3 significant figures.

Cosine Rule

$$d^2 = e^2 + c^2 - (2ec \cos D)$$

$$c = 19 \quad e = 8.5 \quad D = 42^\circ$$

$$d^2 = 8.5^2 + 19^2 - (2 \times 8.5 \times 19 \cos 42^\circ)$$

$$= 433.25 - 240.036$$

$$= 193.214$$

$$d = \sqrt{193.214}$$

$$= 13.9$$

$$\dots\dots\dots 13.9 \dots\dots\dots \text{ cm}$$

(3)



12

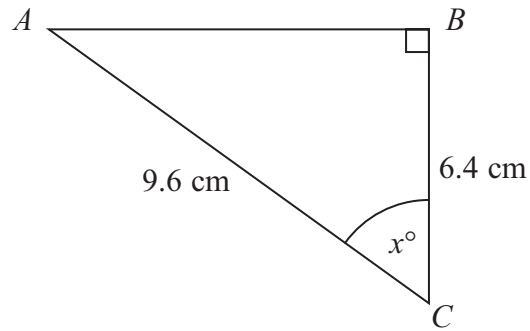


Diagram **NOT**  
accurately drawn

$ABC$  is a right-angled triangle.  
 $AC = 9.6$  cm.  
 $BC = 6.4$  cm.

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

$$\cos = \frac{\text{Adjacent}}{\text{Hypotenuse}}$$

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

Use the  $\cos^{-1}$  key

$$x = 48.189^\circ$$

..... 48.2 °

(Total 3 marks)





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Write your name here

Surname

Other names

In the style of:

**Edexcel GCSE**

Centre Number

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Candidate Number

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# Mathematics A

## Vectors

### Model Answers

**Higher Tier**

Past Paper Style Questions  
Arranged by Topic

Paper Reference

**1MA0/1H**

**You must have:** Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

### Instructions

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Turn over ►



1.

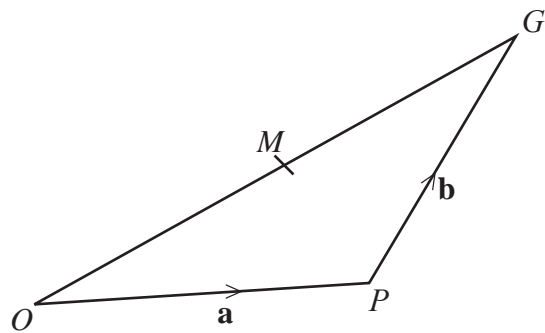


Diagram **NOT**  
accurately drawn

$OGP$  is a triangle.

$M$  is the midpoint of  $OG$ .

$$\vec{OP} = \mathbf{a}$$

$$\vec{PG} = \mathbf{b}$$

(a) Express  $\vec{OM}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$ .

$$\vec{OG} = \vec{OP} + \vec{PG}$$

$$= \mathbf{a} + \mathbf{b}$$

$$\vec{OM} = \frac{1}{2}\vec{OG}$$

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

$$\vec{OM} = \frac{1}{2}(\mathbf{a} + \mathbf{b}) \dots\dots\dots (2)$$

(b) Express  $\vec{PM}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$   
Give your answer in its simplest form.

$$\vec{PM} = -\mathbf{a} + \frac{1}{2}(\mathbf{a} + \mathbf{b})$$

$$= -\mathbf{a} + \frac{1}{2}\mathbf{a} + \frac{1}{2}\mathbf{b}$$

$$= -\frac{1}{2}\mathbf{a} + \frac{1}{2}\mathbf{b}$$

$$= \frac{1}{2}\mathbf{b} - \frac{1}{2}\mathbf{a}$$

$$= \frac{1}{2}(\mathbf{b} - \mathbf{a})$$

$$\vec{PM} = \frac{1}{2}(\mathbf{b} - \mathbf{a}) \dots\dots\dots (2)$$

(Total 4 marks)



2.

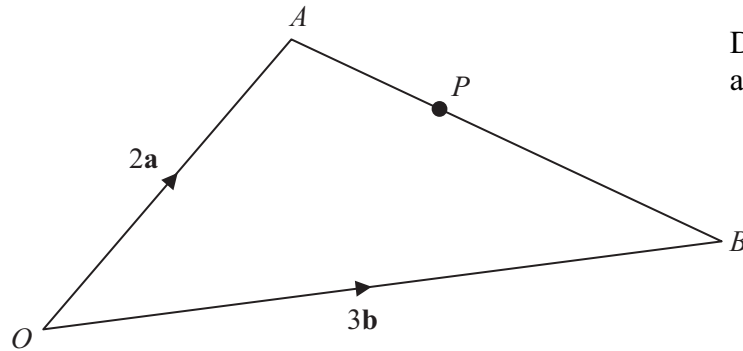


Diagram **NOT**  
accurately drawn

$OAB$  is a triangle.

$$\overrightarrow{OA} = 2\mathbf{a}$$

$$\overrightarrow{OB} = 3\mathbf{b}$$

(a) Find  $\overrightarrow{AB}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$ .

$$\begin{aligned}\overrightarrow{AB} &= \overrightarrow{AO} + \overrightarrow{OB} \\ &= -2\mathbf{a} + 3\mathbf{b}\end{aligned}$$

$$\overrightarrow{AB} = -2\mathbf{a} + 3\mathbf{b} \dots\dots\dots (1)$$

$P$  is the point on  $AB$  such that  $AP : PB = 2 : 3$

(b) Show that  $\overrightarrow{OP}$  is parallel to the vector  $\mathbf{a} + \mathbf{b}$ .

$$\begin{aligned}\overrightarrow{OP} &= 2\mathbf{a} + \frac{2}{5}(-\mathbf{a} + 3\mathbf{b}) \\ &= 2\mathbf{a} - \frac{4}{5}\mathbf{a} + \frac{6\mathbf{b}}{5} \\ &= \frac{10\mathbf{a}}{5} - \frac{4\mathbf{a}}{5} + \frac{6\mathbf{b}}{5} \\ &= \frac{6\mathbf{a}}{5} + \frac{6\mathbf{b}}{5} \\ &= \frac{6}{5}(\mathbf{a} + \mathbf{b})\end{aligned}$$

$\mathbf{a} + \mathbf{b}$  and  $\frac{6}{5}(\mathbf{a} + \mathbf{b})$  both contain the same vector  
so they are parallel.

(3)

(Total 4 marks)



3.

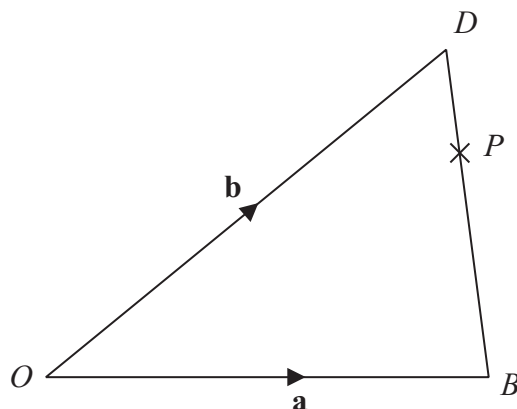


Diagram **NOT**  
accurately drawn

$ODB$  is a triangle.

$$\vec{OB} = \mathbf{a}$$

$$\vec{OD} = \mathbf{b}$$

(a) Find  $\vec{BD}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$ .

$$\vec{BD} = -\mathbf{a} + \mathbf{b}$$

$$\dots\dots\dots -\mathbf{a} + \mathbf{b} \dots\dots\dots$$

(1)

$P$  is the point on  $DB$  such that  $DP : PB = 3 : 1$

(b) Find  $\vec{OP}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$ .

Give your answer in its simplest form.

$$\vec{OD} = \mathbf{b}$$

$$\vec{DB} = -\mathbf{b} + \mathbf{a}$$

$$\vec{DP} = \frac{1}{4}(-\mathbf{b} + \mathbf{a})$$

$$\vec{OP} = \mathbf{b} + \frac{1}{4}(-\mathbf{b} + \mathbf{a})$$

$$= \mathbf{b} - \frac{\mathbf{b}}{4} + \frac{\mathbf{a}}{4}$$

$$= \frac{4\mathbf{b}}{4} - \frac{\mathbf{b}}{4} + \frac{\mathbf{a}}{4}$$

$$= \frac{3\mathbf{b}}{4} + \frac{\mathbf{a}}{4}$$

$$= \frac{1}{4}(3\mathbf{b} + \mathbf{a})$$

$$\dots\dots\dots \frac{1}{4}(3\mathbf{b} + \mathbf{a}) \dots\dots\dots$$

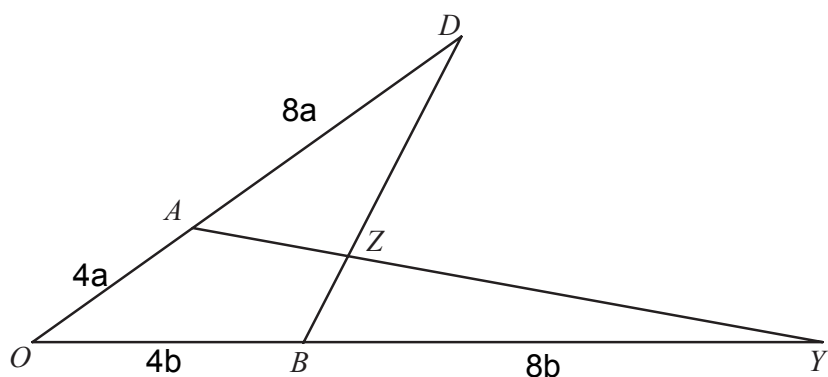
(3)

(Total 4 marks)



4.

Diagram **NOT**  
accurately drawn



In the diagram,

$$\overrightarrow{OA} = 4\mathbf{a} \quad \text{and} \quad \overrightarrow{OB} = 4\mathbf{b}$$

$OAD$ ,  $OBY$  and  $BZD$  are all straight lines

$$AD = 2OA \quad \text{and} \quad BZ : ZD = 1 : 3$$

(a) Find, in terms of  $\mathbf{a}$  and  $\mathbf{b}$ , the vectors which represent

$$\overrightarrow{BD} = \overrightarrow{BO} + \overrightarrow{OA} + \overrightarrow{AD} \quad (4)$$

$$\begin{aligned} \text{(i)} \quad \overrightarrow{BD} &= -4\mathbf{b} + 4\mathbf{a} + 8\mathbf{a} \\ &= -4\mathbf{b} + 12\mathbf{a} \\ &= 4(-\mathbf{b} + 3\mathbf{a}) \end{aligned} \quad \dots\dots 4(-\mathbf{b} + 3\mathbf{a}) \dots\dots$$

$$\begin{aligned} \text{(ii)} \quad \overrightarrow{AZ} \quad \overrightarrow{BZ} &= \frac{1}{4} \text{ of } \overrightarrow{BD} \\ &= -\mathbf{b} + 3\mathbf{a} \\ \overrightarrow{AZ} &= \overrightarrow{AO} + \overrightarrow{OB} + \overrightarrow{BZ} \\ &= -4\mathbf{a} + 4\mathbf{b} - \mathbf{b} + 3\mathbf{a} \\ &= -\mathbf{a} + 3\mathbf{b} \end{aligned} \quad \dots\dots -\mathbf{a} + 3\mathbf{b} \dots\dots$$

Given that  $\overrightarrow{BY} = 8\mathbf{b}$

(b) Show that  $AZY$  is a straight line.

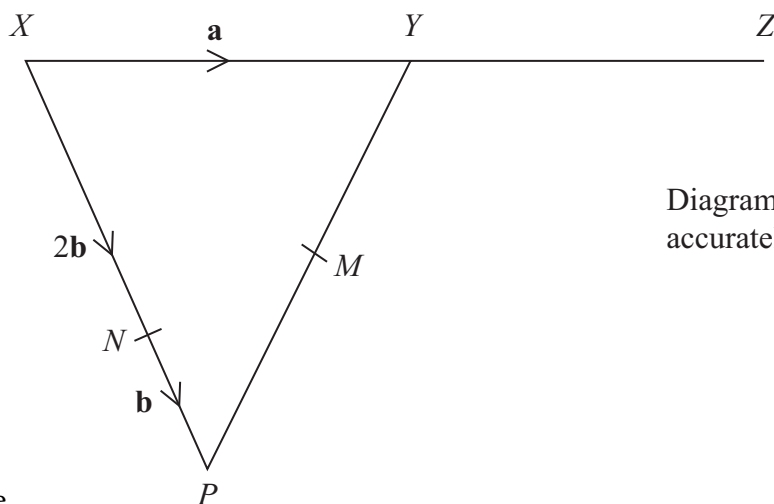
$$\begin{aligned} \overrightarrow{ZY} &= \overrightarrow{ZB} + \overrightarrow{BY} \\ &= \mathbf{b} - 3\mathbf{a} + 8\mathbf{b} \\ &= -3\mathbf{a} + 9\mathbf{b} \\ &= 3(-\mathbf{a} + 3\mathbf{b}) \end{aligned} \quad (3)$$

$\overrightarrow{AZ}$  and  $\overrightarrow{ZY}$  is straight as both vectors have  
the same direction.

(Total 7 marks)



5.

Diagram **NOT**  
accurately drawn

$XYP$  is a triangle  
 $N$  is a point on  $AP$

$$\vec{XY} = \mathbf{a} \quad \vec{XN} = 2\mathbf{b} \quad \vec{NP} = \mathbf{b}$$

(a) Find the vector  $\vec{PX}$ , in terms of  $\mathbf{a}$  and  $\mathbf{b}$ .

$$\begin{aligned}\vec{PX} &= \vec{PN} + \vec{NP} \\ &= -\mathbf{b} - 2\mathbf{b} \\ &= -3\mathbf{b}\end{aligned}$$

..... $-3\mathbf{b}$ .....  
**(1)**

$Y$  is the midpoint of  $XZ$   
 $M$  is the midpoint of  $PY$

(b) Show that  $NMZ$  is a straight line.

$$\begin{aligned}\vec{PY} &= \vec{PX} + \vec{XY} \\ &= -\mathbf{b} - 2\mathbf{b} + \mathbf{a} \\ &= -3\mathbf{b} + \mathbf{a} \\ \vec{PM} &= \frac{1}{2}\vec{PY} \\ &= \frac{1}{2}(-3\mathbf{b} + \mathbf{a})\end{aligned}$$

$$\begin{aligned}\vec{NM} &= \mathbf{b} + \frac{1}{2}(-3\mathbf{b} + \mathbf{a}) \\ &= \mathbf{b} - \frac{3\mathbf{b}}{2} + \frac{\mathbf{a}}{2} \\ &= \frac{2\mathbf{b}}{2} - \frac{3\mathbf{b}}{2} + \frac{\mathbf{a}}{2} \\ &= -\frac{\mathbf{b}}{2} + \frac{\mathbf{a}}{2}\end{aligned}$$

$$\begin{aligned}\vec{MZ} &= \vec{MY} + \vec{YZ} \\ &= \frac{1}{2}(-3\mathbf{b} + \mathbf{a}) + \mathbf{a} \\ &= -\frac{3\mathbf{b}}{2} + \frac{\mathbf{a}}{2} + \mathbf{a} \\ &= -\frac{3\mathbf{b}}{2} + \frac{\mathbf{a}}{2} + \frac{2\mathbf{a}}{2} \\ &= -\frac{3\mathbf{b}}{2} + \frac{3\mathbf{a}}{2} \\ &= 3\left(-\frac{\mathbf{b}}{2} + \frac{\mathbf{a}}{2}\right)\end{aligned}$$

The vectors have the same  
direction so form a line.

**(4)**

**(Total 5 marks)**



6.

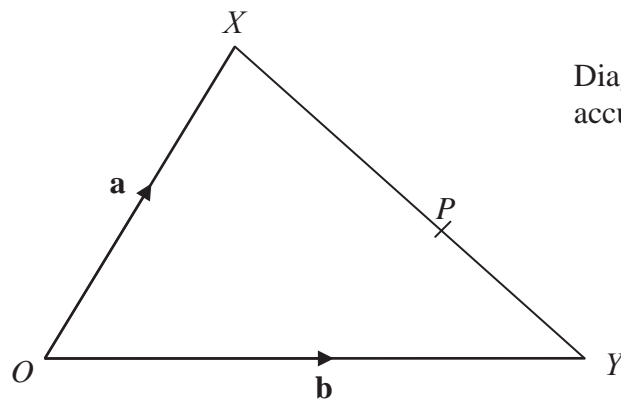


Diagram **NOT**  
accurately drawn

$OXY$  is a triangle.

$$\overrightarrow{OX} = \mathbf{a}$$

$$\overrightarrow{OY} = \mathbf{b}$$

(a) Find the vector  $\overrightarrow{XY}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$ .

$$\overrightarrow{XY} = \dots -\mathbf{a} + \mathbf{b} \dots \dots \dots (1)$$

$P$  is the point on  $XY$  such that  $XP : PY = 3 : 2$

(b) Show that  $\overrightarrow{OP} = \frac{1}{5}(2\mathbf{a} + 3\mathbf{b})$

$$\begin{aligned} \overrightarrow{OP} &= \mathbf{a} - \frac{3\mathbf{a}}{5} + \frac{3\mathbf{b}}{5} \\ &= \frac{5\mathbf{a}}{5} - \frac{3\mathbf{a}}{5} + \frac{3\mathbf{b}}{5} \\ &= \frac{2\mathbf{a}}{5} + \frac{3\mathbf{b}}{5} \\ &= \frac{1}{5}(2\mathbf{a} + 3\mathbf{b}) \end{aligned}$$

(3)

(Total 4 marks)





7.

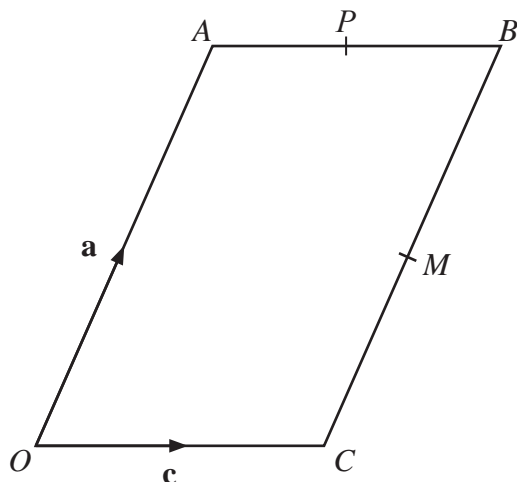


Diagram **NOT**  
accurately drawn

$OABC$  is a parallelogram.

$M$  is the midpoint of  $CB$ .

$P$  is the midpoint of  $AB$ .

$$\overrightarrow{OA} = \mathbf{a}$$

$$\overrightarrow{OC} = \mathbf{c}$$

(a) Find, in terms of  $\mathbf{a}$  and/or  $\mathbf{c}$ , the vectors

(i)  $\overrightarrow{MB}$ ,

$$\dots\dots\dots \frac{1}{2}\mathbf{a} \dots\dots\dots$$

(ii)  $\overrightarrow{MP}$ .

$$\frac{1}{2}\mathbf{a} - \frac{1}{2}\mathbf{c}$$

$$\dots\dots\dots \frac{1}{2}(\mathbf{a} - \mathbf{c}) \dots\dots\dots (2)$$

(b) Show that  $CA$  is parallel to  $MP$ .

$$\overrightarrow{CA} = \overrightarrow{CB} + \overrightarrow{BA}$$

$$= \mathbf{a} - \mathbf{c}$$

They both contain the vector  $\mathbf{a} - \mathbf{c}$  so  
they are parallel.

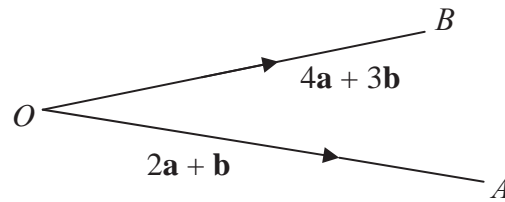
(2)

(Total 4 marks)



8.

Diagram **NOT**  
accurately drawn



$$\overrightarrow{OA} = 2\mathbf{a} + \mathbf{b}$$

$$\overrightarrow{OB} = 4\mathbf{a} + 3\mathbf{b}$$

- (a) Express the vector  $\overrightarrow{AB}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$   
Give your answer in its simplest form.

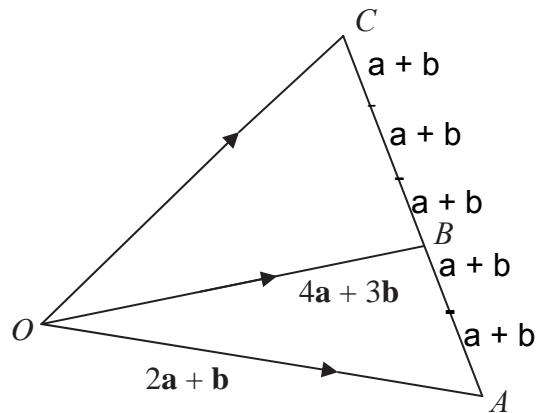
$$\begin{aligned}\overrightarrow{AB} &= -2\mathbf{a} - \mathbf{b} + 4\mathbf{a} + 3\mathbf{b} \\ &= 2\mathbf{a} + 2\mathbf{b} \\ &= 2(\mathbf{a} + \mathbf{b})\end{aligned}$$

$$\dots\dots\dots 2(\mathbf{a} + \mathbf{b}) \dots\dots\dots$$

(2)



Diagram **NOT**  
accurately drawn



$ABC$  is a straight line.  
 $BC : AB = 3 : 2$

- (b) Express the vector  $\overrightarrow{OC}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$   
Give your answer in its simplest form.

$$\begin{aligned}\overrightarrow{AB} &= \overrightarrow{AO} + \overrightarrow{OB} \\ &= -2\mathbf{a} - \mathbf{b} + 4\mathbf{a} + 3\mathbf{b} \\ &= 2\mathbf{a} + 2\mathbf{b} \\ \overrightarrow{OC} &= 2\mathbf{a} + \mathbf{b} + 5\mathbf{a} + 5\mathbf{b} \\ &= 7\mathbf{a} + 6\mathbf{b}\end{aligned}$$

..... $7\mathbf{a} + 6\mathbf{b}$ .....  
(3)

(Total 5 marks)



9.

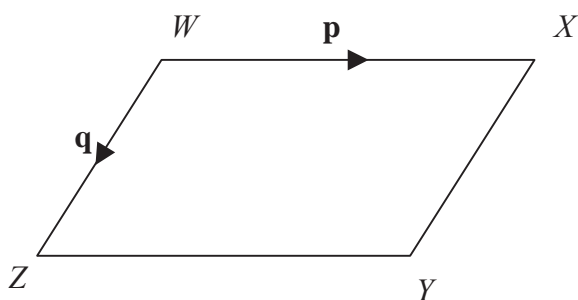


Diagram **NOT**  
accurately drawn

$WXYZ$  is a parallelogram.

$WX$  is parallel to  $ZY$ .  $WZ$  is parallel to  $XY$ .

$$\vec{WX} = \mathbf{p}$$

$$\vec{WZ} = \mathbf{q}$$

(a) Express, in terms of  $\mathbf{p}$  and  $\mathbf{q}$

(i)  $\vec{WY}$

(i)..... $\mathbf{p} + \mathbf{q}$  .....

(ii)  $\vec{XZ}$

(ii).... $-\mathbf{p} + \mathbf{q}$ .....  
(2)

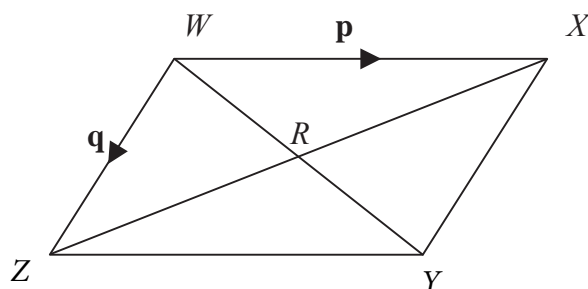


Diagram **NOT**  
accurately drawn

$WX$  and  $XZ$  are diagonals of parallelogram  $WXYZ$ .

$WY$  and  $XZ$  intersect at  $R$

(b) Express  $\vec{WR}$  in terms of  $\mathbf{p}$  and  $\mathbf{q}$ .

$$\vec{WY} = \vec{WZ} + \vec{ZY}$$

$$= \mathbf{q} + \mathbf{p}$$

$$\vec{WR} = \frac{1}{2} \vec{WY}$$

$$= \frac{1}{2}(\mathbf{q} + \mathbf{p})$$

..... $\frac{1}{2}(\mathbf{q} + \mathbf{p})$ .....  
(1)

(Total 3 marks)



10.

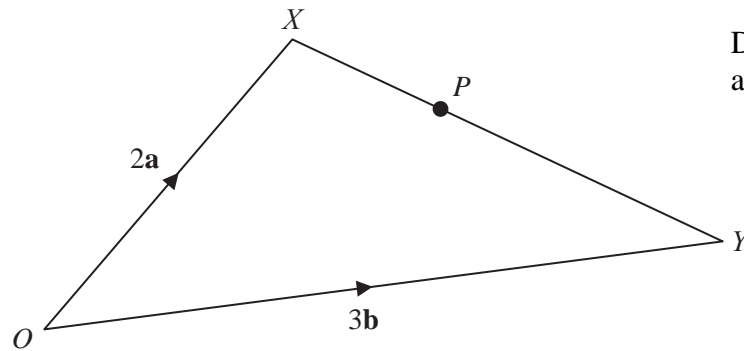


Diagram **NOT**  
accurately drawn

$OXY$  is a triangle.

$$\overrightarrow{OX} = 2\mathbf{a}$$

$$\overrightarrow{OY} = 3\mathbf{b}$$

(a) Find  $\overrightarrow{XY}$  in terms of  $\mathbf{a}$  and  $\mathbf{b}$ .

$$\overrightarrow{XY} = -2\mathbf{a} + 3\mathbf{b} \dots\dots\dots (1)$$

$P$  is the point on  $XY$  such that  $XP : PY = 2 : 3$

(b) Show that  $\overrightarrow{OP}$  is parallel to the vector  $\mathbf{a} + \mathbf{b}$

$$\overrightarrow{XP} = \frac{2}{5} \overrightarrow{XY}$$

$$\overrightarrow{OP} = \overrightarrow{OX} + \overrightarrow{XP}$$

$$= 2\mathbf{a} + \frac{2}{5}(-2\mathbf{a} + 3\mathbf{b})$$

$$= 2\mathbf{a} - \frac{4\mathbf{a}}{5} + \frac{6\mathbf{b}}{5}$$

$$= \frac{10\mathbf{a}}{5} - \frac{4\mathbf{a}}{5} + \frac{6\mathbf{b}}{5}$$

$$= \frac{6\mathbf{a}}{5} + \frac{6\mathbf{b}}{5}$$

$$= \frac{6}{5}(\mathbf{a} + \mathbf{b})$$

They both contain the vector  
 $\mathbf{a} + \mathbf{b}$  so they are parallel.

(3)

(Total 4 marks)

