Centre Number						Candidate Number					

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Mathematics   43602H

Past Paper Type Questions by Topic

Combined Booklets
Model Answers

H

For Examiner's Use

Examiner's Initials

Pages	Mark
2 – 3	
4 – 5	
6 – 7	
8 – 9	
10 – 11	
12 – 13	
TOTAL	

For this paper you must have:
● a calculator
● mathematical instruments.

Time allowed
● 1 hour

Instructions
● Use black ink or black ball-point pen. Draw diagrams in pencil.
● Fill in the boxes at the top of this page.
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● Do all rough work in this book.

Information
● The marks for questions are shown in brackets.
● The maximum mark for this paper is.
● The quality of your written communication is specifically assessed in some questions. These questions are indicated with an asterisk (*)
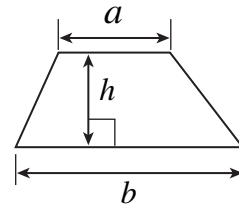● You may ask for more answer paper and graph paper. These must be tagged securely to this answer booklet.

Advice
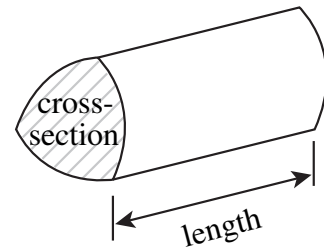● In all calculations, show clearly how you work out your answer.

Formulae Sheet: Higher Tier

Area of trapezium = $\frac{1}{2}(a+b)h$
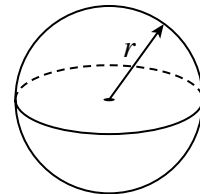
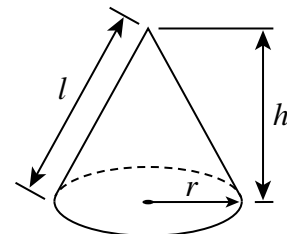**Volume of prism** = area of cross-section × length

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 = $\pi r l$
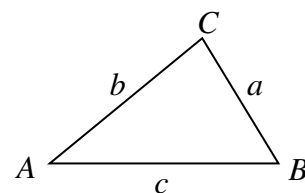
In any triangle ABC

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

Sine rule $\quad \dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

Cosine rule $\quad a^2 = b^2 + c^2 - 2bc\cos A$

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

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

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In the style of

AQA

General Certificate of Secondary Education
Foundation Tier

Mathematics   **43601H**

Past Paper Questions by Topic

A* Questions
Model Answers

H

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Advice
● In all calculations, show clearly how you work out your answer.

1   The ticket office at an ice rink records the tickets that skaters buy. Here are Monday's sales, along with the charges.

Length of time (hours)	Number of skaters	Charge (£)
0 – 1	90	1.20
1 – 2	130	2.00
2 – 3	80	3.50
more than 3	60	5.00

Monday's results are equivalent to a 20% sample for the whole week, stratified by the four time intervals.

Work out the ice rink takings for the whole week.

$$90 \times 1.20 = 108$$
$$130 \times 2.00 = 260$$
$$80 \times 3.50 = 280$$
$$60 \times 5.00 = 300$$
$$\text{TOTAL } 948$$

948 is 20% of the week's takings
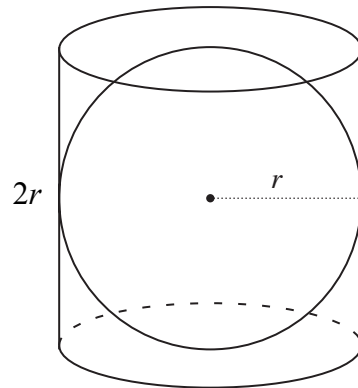
$948 \times 5 = 4740$ is the week's takings.

Answer £ ...4740..   *(3 marks)*

2   A golf ball of radius r is packaged in a cylindrical box.
The ball touches the sides, top and base of the box.

What fraction of the volume of the box is empty space?
You **must** show all your working.

$$\text{Volume of cylinder} = \pi r^2 \times 2r$$
$$= 2\pi r^3$$
$$\text{Volume of ball} = \frac{4}{3}\pi r^3$$
$$\text{Empty space} = 2\pi r^3 - \frac{4}{3}\pi r^3$$
$$= \frac{6\pi r^3}{3} - \frac{4\pi r^3}{3}$$
$$= \frac{2\pi r^3}{3}$$
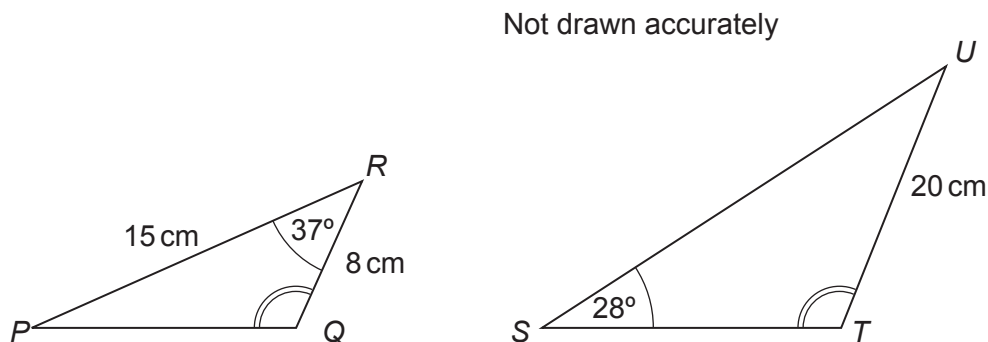$$\text{Fraction of empty space} = \frac{\text{empty space}}{\text{volume of cylinder}}$$
$$= \frac{2\pi r^3}{3} \div 2\pi r^3$$
$$= \frac{2\pi r^3}{3} \times \frac{1}{2\pi r^3}$$
$$= \frac{1}{3}$$

Answer $\dfrac{1}{3}$ ....   *(4 marks)*

3   Triangles *PQR* and *STU* are
similar. Angle *PQR* = angle *STU*.

Not drawn accurately

3 (a)   Work out the size of angle *STU*

$$\angle SUT = 37°$$

$$\angle STU = 180 - 37 - 28$$

$$= 115$$

Answer .....115... degrees   *(2 marks)*

3 (b)   Calculate the length of *SU*.

$$\text{Scale factor} = \frac{20}{8}$$

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

$$SU = 15 \times \frac{5}{2}$$

$$= 37\frac{1}{2}$$

Answer ....37.5... cm   *(3 marks)*

4   The diagram shows a regular octagon.
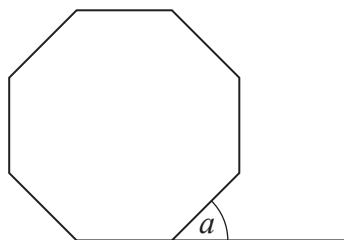
Not drawn accurately

4 (a)   Explain why the exterior angle of a regular octagon, marked a on the diagram, is 45°

The exterior angles add up to 360°

$360 \div 8 = 45$

(1 mark)

4 (b)   The diagram shows part of a regular polygon.
Each interior angle is 168°.
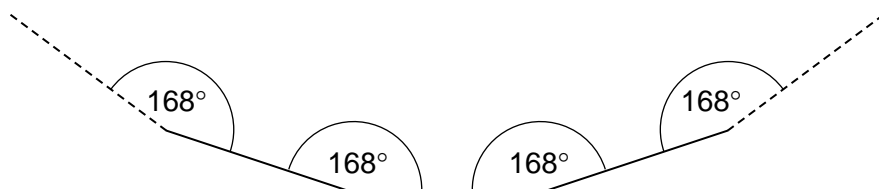
Not drawn
accurately

Calculate the number of sides of this regular polygon.

Exterior angle $= 180 - 168$

$= 12°$

Number of sides $= 360 \div 12$

$= 30$

Answer .....30..   *(3 marks)*

5   The table shows the profits of a shop during each quarter from March 2010 to June 2011. The March 2011 entry is missing from the table.

Date	Mar 10	June 10	Sept 10	Dec 10	Mar 11	June 11
Profits	38 000	29 000	25 000	34 000		21 000

5 (a)   Calculate the first four-point moving average.

$$\frac{38000 + 29000 + 25000 + 34000}{4}$$

$$= \frac{126000}{4}$$

$$= 31500$$

Answer £ ..31 500...   *(2 marks)*

5 (b)   The second four-point moving average is £28 000

Calculate the missing entry for March 2011.

$$28000 = \frac{29000 + 25000 + 34000 + x}{4}$$

$$4 \times 28000 = 29000 + 25000 + 34000 + x$$

$$112000 = 88000 + x$$

$$24000 = x$$

Answer £ ....24 000...   *(2 marks)*

6   This diagram shows the graph of $y = x^2 + px + q$

Not drawn accurately
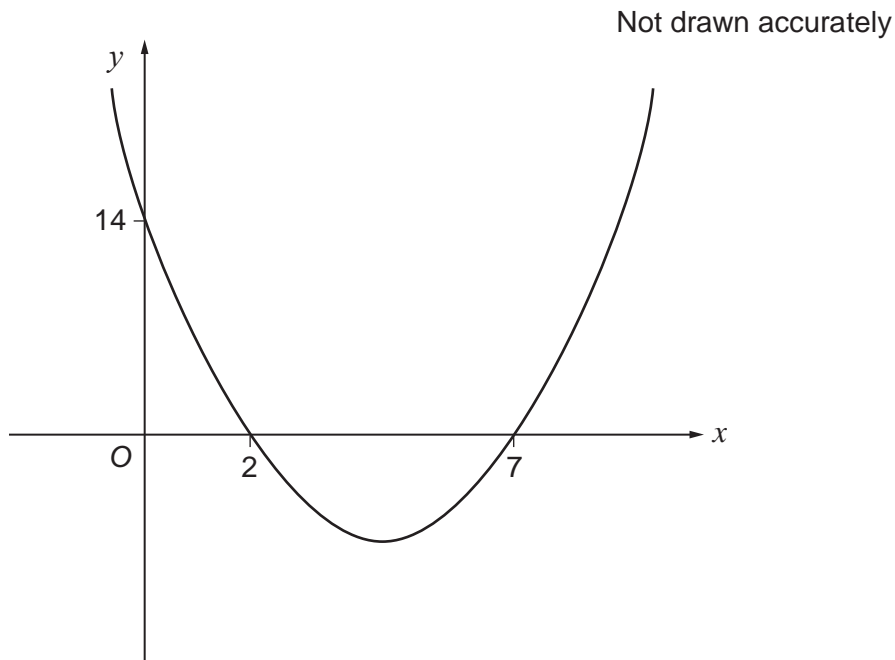
Find the values of p and q. You **must** show all your working.

When $y = 0$, $q = 14$

$x = 2$ or 7

subs $x = 2$

$0 = 2^2 + 2p + 14$

$0 = 4 + 2p + 14$

$-18 = 2p$

$-9 = p$

or

subs $x = 7$

$0 = 7^2 + 7p + 14$

$0 = 49 + 7p + 14$

$-63 = 7p$

$-9 = p$

Answer p = ...-9.............. , q = ...14........... *(3 marks)*

✱7 A coffee machine dispenses 130 millilitres of black coffee into cups with a capacity of 175 millilitres.

These values are accurate to 3 significant figures.

Milk is supplied in small cartons which contain 21 millilitres, accurate to the nearest millilitre.

David likes milky coffee and always puts 2 cartons of milk in his coffee.

Will David's cup ever overflow?

You **must** show your working.

Coffee largest amount: 130.5 ml

Cup capacity smallest amount: 174.5

Milk largest amount: 21.5 + 21.5 = 43 ml

130.5 + 43 = 173.5

The cup will not overflow.

(5 marks)

8 *PQRS* is a trapezium with *PS* parallel to *QR*.
   Triangle *PQR* is right-angled at *Q*.
   Triangle *PSR* is isosceles with *PS = PR*
   Angle *QPR = 2x*
   Angle *QRP = x*
   Angle *PSR = y*

Not drawn accurately
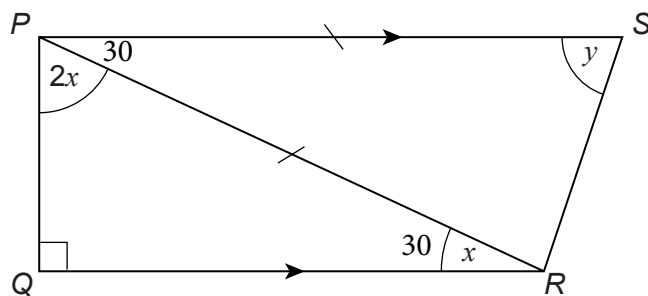
8 (a) Work out the size of angle x.

$$2x + x + 90 = 180$$
$$3x = 90$$
$$x = 30$$

Answer ....30.. degrees   *(2 marks)*

8 (b) Work out the size of angle y.

$$\angle RPS = 30° \text{ (Alternate angle)}$$
$$\triangle RPS \text{ is Isosceles}$$
$$\angle y = \frac{180 - 30}{2}$$
$$= 75°$$

Answer ....75.. degrees   *(3 marks)*

9 In the diagram, PQ is parallel to ST.
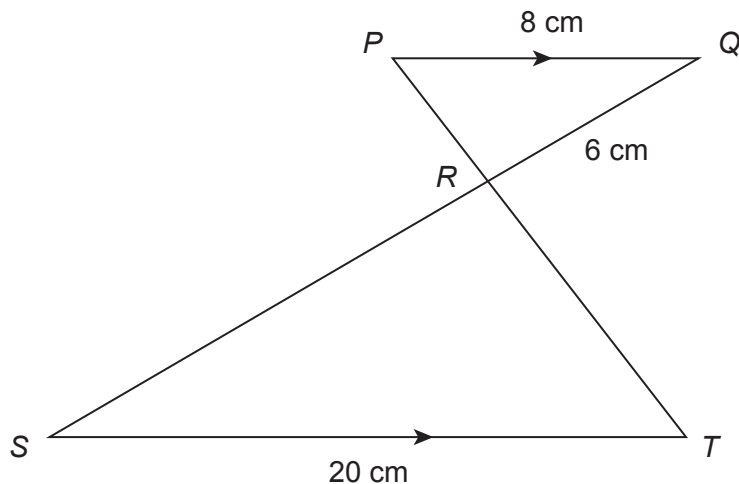$PQ = 8$ cm, $QR = 6$ cm and $ST = 20$ cm

8 cm
P Q

6 cm
R

Not drawn accurately

S T
20 cm

9 (a) Explain why triangles PQR and TSR are similar.
You **must** give reasons for any statements you make.

$\angle RTS = \angle QPR$ (Alternate angles)
$\angle RST = \angle PQR$ (Alternate angles)
$\angle SRT = \angle PRQ$ (Vertically opposite angles)
3 angles equal so triangles are similar.

(3 marks)

9 (b) Work out the length of SR.

Scale factor: $\dfrac{20}{8} = 2.5$

$SR = 6 \times 2.5$

$= 15$

Answer ......15.. cm   *(3 marks)*

10 The diagram shows two right-angled triangles *ABD* and *CBD*.
AD = 18 cm and *BC* = 8 cm
$\cos x = \tan y$

18 cm

Not drawn accurately

x y

A B C

8 cm
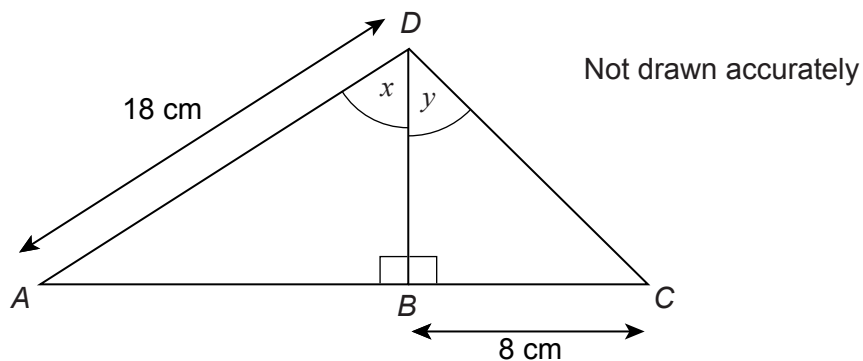
Work out the length of *BD*.

$$\cos x = \frac{BD}{18}$$

$$\tan y = \frac{8}{BD}$$

$$\cos x = \tan y$$

$$\frac{BD}{18} = \frac{8}{BD}$$

$$BD^2 = 18 \times 8$$

$$BD^2 = 144$$

$$BD = 12$$

Answer ...12.. cm   *(3 marks)*

11 Make x the subject of the formula $y = \dfrac{w+x}{x-2}$

$$(x-2)y = w+x$$

$$xy - 2y = w + x$$

$$xy - x = w + 2y$$

$$x(y-1) = w + 2y$$

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

Answer $x = \dfrac{w+2y}{y-1}$ .... *(4 marks)*

12   Convert $\dfrac{7}{11}$ to a recurring decimal.

$$0.6363$$
$$11\overline{)7.0000}$$

Answer ...0.6363..   *(2 marks)*

12   (b)   Prove that the recurring decimal 0.3939... can be written as $\dfrac{13}{33}$

$$x = 0.3939..$$
$$100x = 39.3939..$$
$$100x - x = 39$$
$$99x = 39$$
$$x = \frac{39}{99}$$
$$= \frac{13}{33}$$

(3 marks)

13 y is inversely proportional to x.
   z is directly proportional to the square root of y.
   When $x = 8$, $y = 9$
   When $y = 16$, $z = 20$

   Use this information to find the value of z when $x = 2$

$$y \propto \frac{1}{x}$$

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

$$9 = \frac{k}{8}$$

$$k = 72$$

$$y = \frac{72}{x}$$

$$z \propto \sqrt{y} \qquad z = 5\sqrt{y}$$

$$z = c\sqrt{y} \qquad = 5\sqrt{\frac{72}{x}}$$

$$20 = c\sqrt{16}$$

$$20 = 4c \qquad = 5\sqrt{\frac{72}{2}}$$

$$c = 5 \qquad = 5\sqrt{36}$$

$$= 30$$

Answer ....30... *(6 marks)*

14 This is the graph of $y = \sin x$ for $0° \leqslant x \leqslant 360°$
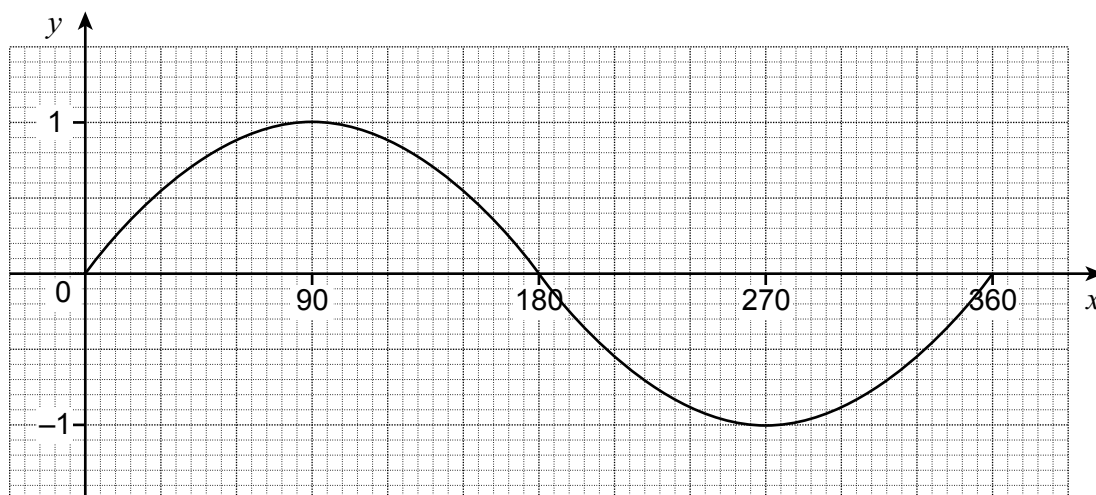
On the axes draw the following graphs for $0° \leqslant x \leqslant 360°$
The graph of $y = \sin x$ is shown dotted to help you.

14　　(a)　$y = \sin (x + 90)$
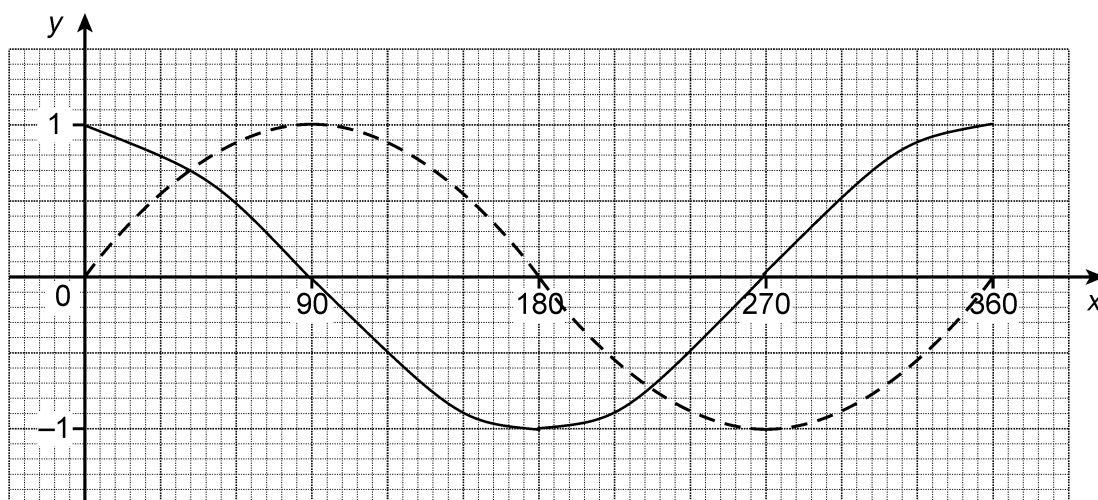
(1 mark)

14 (b) $y = \dfrac{1}{2} \sin x$
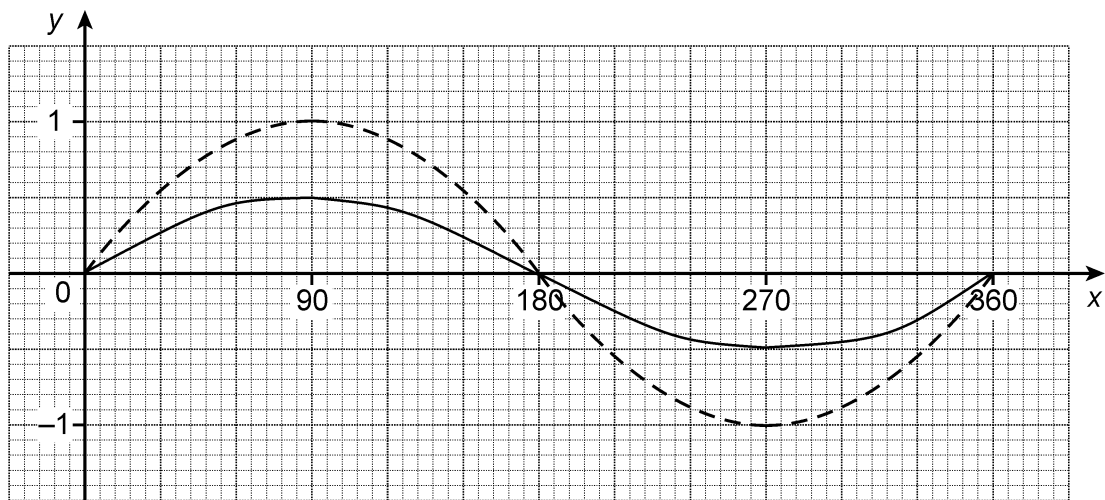
14   (c) $y = \sin \dfrac{x}{2}$
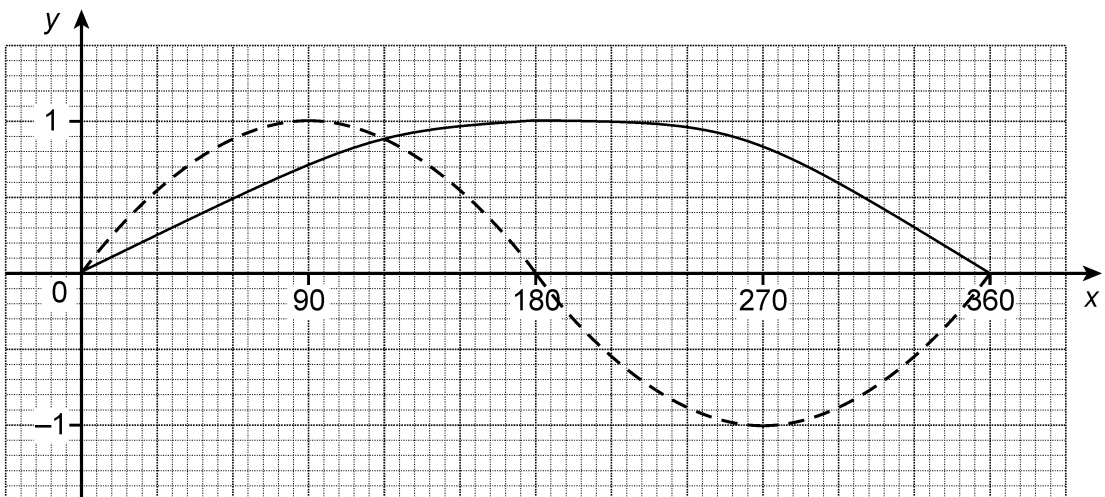
15 *ORS* is a triangle with *P* the mid-point of *OR* and *M* the mid-point of *RS*.

$\overrightarrow{OP}$ = **a**, $\overrightarrow{PR}$ = **a** and $\overrightarrow{OS}$ = 2**b**
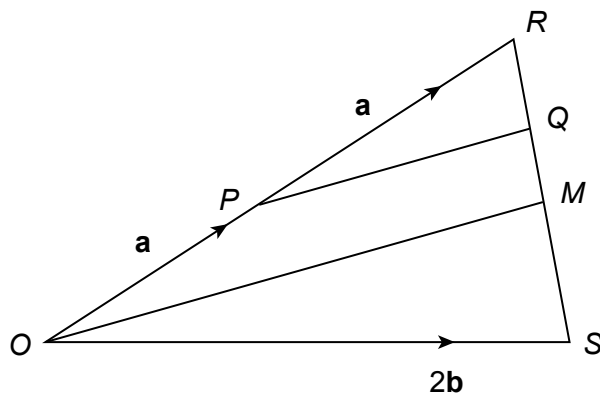
Not drawn accurately

15 (a) Write down an expression for *RS* in terms of **a** and **b**.

Answer ....-2**a** + 2**b**.. *(1 mark)*

15 (b) *Q* lies on *RS* such that $\overrightarrow{RQ} = \frac{1}{4} \ \overrightarrow{RS}$

Show that $\overrightarrow{PQ} = \frac{1}{2} \mathbf{a} + \frac{1}{2} \mathbf{b}$

Explain your answer.

$$\overrightarrow{PQ} = \mathbf{a} + \frac{1}{4}\left(-2\mathbf{a} + 2\mathbf{b}\right)$$

$$= \mathbf{a} - \frac{1}{2}\mathbf{a} + \frac{1}{2}\mathbf{b}$$

$$= \frac{1}{2}\mathbf{a} + \frac{1}{2}\mathbf{b}$$

(2 marks)

15 (c) Write down, and simplify, an expression for *OM* in terms of **a** and **b**.

$$\overrightarrow{OM} = \overrightarrow{OR} + \frac{1}{2}\overrightarrow{RS}$$

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

$$= 2a - a + b$$

$$= a + b$$

Answer ......**a + b**.. *(2 marks)*

(d) Explain why the answers for part (b) and part (c) show that *OPQM* is a trapezium.

PQ and *OM* are parallel as they have the same vector $\frac{1}{2}(a + b)$ and $a + b$.

The direction is the same but the magnitude differs. The two parallel sides make *OPQM* a trapezium.

(1 mark)

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1 *VWXY* are points on the circumference of a circle.
The line *XY* is extended to *Z*.
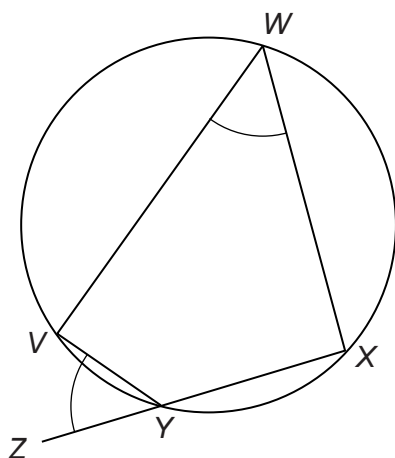
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Prove that ∠*VWX* = ∠*VYZ*

$\angle VYX = 180° - \angle VWX$ (Opposite angles in a cyclic quadrilateral add up to 180°)

$\angle VYZ = 180° - \angle VYX$ (Angles on a straight line add up to 180°)

$\therefore \angle VWX = \angle VYZ$

(3 marks)

2 (a) Sophie draws a line 6.0 cm long to the nearest mm.

Which of the following is the upper limit of the length of the line?
Circle the correct answer.

6.04 cm   (6.05 cm)   6.1 cm   6.5 cm

(1 mark)

2 (b) Sophie constructs the triangle *ABC* using a ruler and protractor.
She draws *AB* = 7.0 cm, to the nearest mm.
She draws *BC* = 8.0 cm, to the nearest mm.
She draws angle *ABC* = 62° to the nearest
degree.
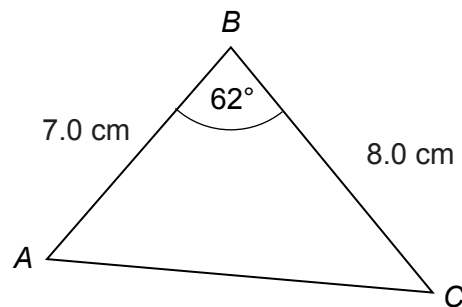
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accurately

Calculate the greatest possible area of the triangle.

Upper limits are:

$$AD = 7.05$$

$$BC = 8.05$$

$$\angle ABC = 62.5°$$

$$\text{Area} = \frac{1}{2}ac\ \sin B$$

$$= \frac{1}{2} \times 8.05 \times 7.05 \times \sin 62.5°$$

$$= 25.17004$$

Answer ....25.2... cm²   *(4 marks)*

3 A solution of $x^3 + 5x = 130$ is between 4 and 5

Use trial and improvement to find this solution.
Give your answer to one decimal place.

$$x^3 + 5x = 130$$

Try

4.1: $4.1^3 + (5 \times 4.1) = 89.421$ Too small

4.5: $4.5^3 + (5 \times 4.5) = 113.625$ Too small

4.6: $4.6^3 + (5 \times 4.6) = 120.336$ Too small

4.7: $4.7^3 + (5 \times 4.7) = 127.323$ Too small

4.8: $4.8^3 + (5 \times 4.8) = 134.592$ Too large

4.75: $4.75^3 + (5 \times 4.75) = 130.9219$ Too large

The answer is less than 4.75 so it is 4.7 when rounded to 1 dp.

Answer $x =$ ......4.7..   *(3 marks)*

4   *WXY* is a right-angled triangle.
          WX = 17 cm and *BC* = 6 cm.
          The line *XZ* bisects the angle *WXY*.

$$W$$

Not drawn
accurately

17 cm

$$Z$$

$$y$$

$$x$$

$$a$$

$$X$$ $$Y$$

$$z$$ 6 cm
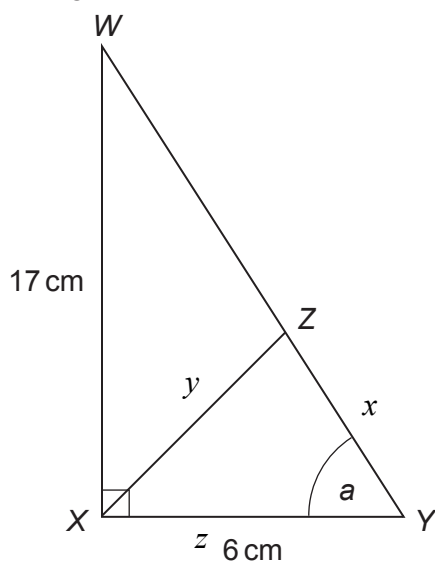
4 (a)   Write down the value of tan *a*.

          Answer $\dfrac{17}{6}$ or 2.833 ....   *(1 mark)*

4 (b)   Calculate the length *XZ*.

$$\angle a = 70.6$$

$$\angle ZXW = 45°$$

$$\angle XZW = 180 - 45 - 70.6$$

$$= 64.4°$$

Sine Rule:

$$\frac{y}{\sin Y} = \frac{z}{\sin Z}$$

$$\frac{y}{\sin 70.6} = \frac{6}{\sin 64.4}$$

$$y = \frac{6 \sin 70.6}{\sin 64.4}$$

$$= 6.275$$

          Answer ......6.28.. cm   *(5 marks)*

5   The diagram shows two circles, C_1 and C_2.

The centre of C_1 is at the origin, O.

The centre of C_2 is at E (12, 9).

The radius of C_2 is twice the radius of C_1.

The circles touch at the point D.

The circle C_2 crosses the x-axis at A and B.
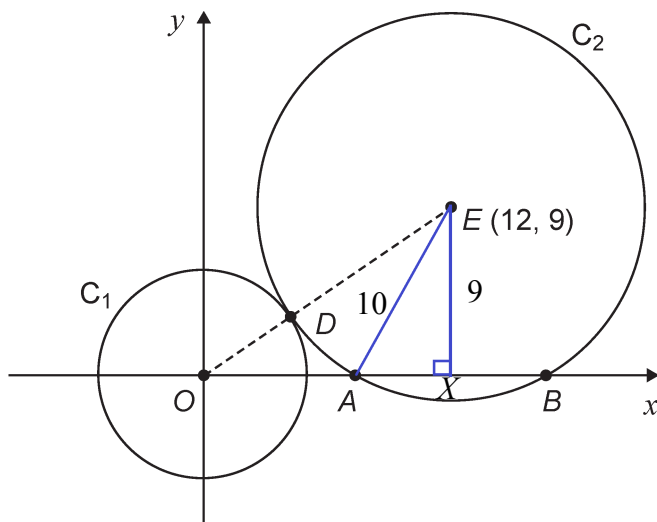
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Calculate the distance AB.

Pythagoras

$$OE^2 = 12^2 + 9^2$$
$$= 144 + 81$$
$$= 225$$
$$OE = \sqrt{225}$$
$$= 15$$

Radius C_2 is twice the radius of C_1

C_1 radius $= 5$

C_2 radius $= 10$

$$AX^2 = 10^2 - 9^2$$
$$= 100 - 81$$
$$= 19$$
$$AX = \sqrt{19}$$
$$AB = 2\sqrt{19}$$
$$= 8.7177 \quad \text{Answer} \quad \text{......8.72.......................................} \quad \text{cm} \quad \textit{(5 marks)}$$

6   Work out the value of y if $\dfrac{y\sqrt{2}}{5-\sqrt{3}} = 5+\sqrt{3}$

Give your answer in the form of $a\sqrt{b}$ where a and b are integers.

$$y\sqrt{2} = \left(5-\sqrt{3}\right)\left(5+\sqrt{3}\right)$$

$$= 25 + 5\sqrt{3} - 5\sqrt{3} - 3$$

$$= 22$$

$$y = \frac{22}{\sqrt{2}}$$

Rationalise the denominator

$$y = \frac{22}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$$

$$= \frac{22\sqrt{2}}{2}$$

$$= 11\sqrt{2}$$

Answer $x =$ $11\sqrt{2}$ .... *(4 marks)*

*6   The sum of the squares of two consecutive integers is one greater than twice the product of the integers.

For example $8^2 + 9^2 = 64 + 81$ and $2 \times 8 \times 9 = 144$
                                          $= 145$

Prove this result algebraically.

Let n be the integer

$$n^2 + \left(n+1\right)^2$$

$$= n^2 + \left(n+1\right)\left(n+1\right)$$

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

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

$$2n\left(n+1\right)$$

$$= 2n^2 + 2n$$

This is 1 less than $n^2 + \left(n+1\right)^2$

(5 marks)

7 The costs per mile, in pence, and the flight distance, in thousands of miles, are shown for 10 flights on Easyway airlines.

Flight	A	B	C	D	E	F	G	H	I	J
Distance (Thousands of miles)	0.3	0.5	0.8	1.0	1.2	1.4	1.7	2.6	3.3	3.9
Cost per mile (pence)	6.4	5.8	6.2	5.7	5.0	4.6	4.4	3.4	2.4	1.8

7 (a) Calculate the cost of the ticket for flight A.

$$0.3 \times 1000 = 300$$

$$300 \times 6.4 = 1920 \text{ pence}$$

$$= £19.20$$

Answer £ ...19.20.. *(2 marks)*

7 (b) The data for the first four flights has been plotted on the scatter diagram.

Plot the data for the remaining flights.

Distance (thousands of miles)
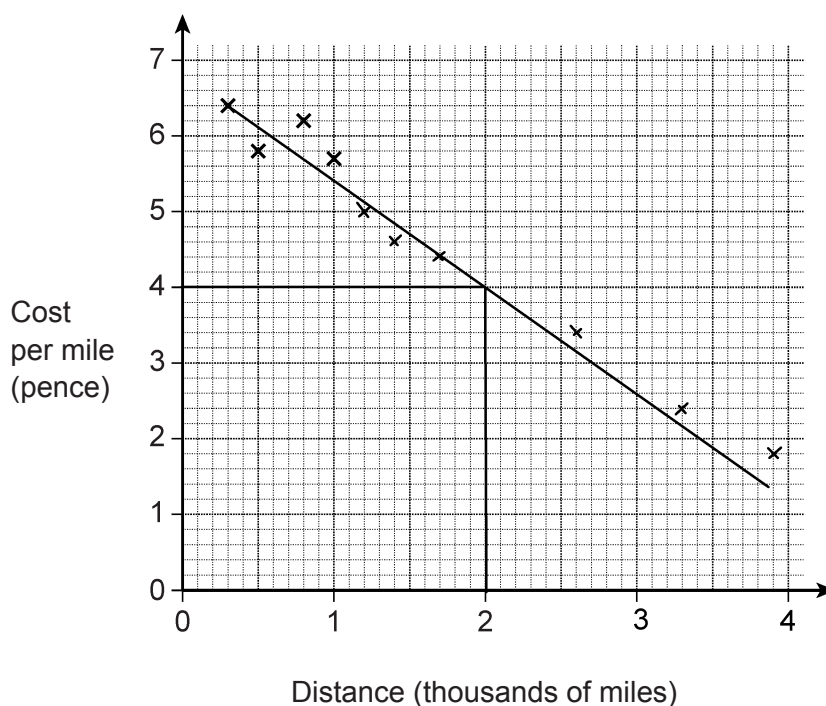
(2 marks)

7 (c)   Draw a line of best fit on the diagram.

7 (d)   Estimate the cost per mile, in pence, of a flight of 2000 miles.

Answer ....4... pence

7 (e)   The scatter diagram shows negative correlation.

Explain what this means for the relationship between the cost per mile and the distance of the flight.

The longer the flight is the lower the cost per mile.

8 The time, T, in seconds, that a pendulum takes to do a complete oscillation is given by the formula

$$T = 2\pi \sqrt{\frac{l}{g}}$$

where l is the length of the pendulum, in metres, and g is the acceleration due to gravity. Take the value of g to be 9.807 m/s^2.

In the Clock Tower of Big Ben in London there is a pendulum of length 4 m.

8 (a) (i) Calculate the value of T for this pendulum.
Give all the figures in your calculator display.
Give your answer as a decimal.

Answer .....4.012746978.............................. seconds   *(1 mark)*

8 (a) (ii) Give your answer to a suitable degree of accuracy.

Answer ......4.01... seconds   *(1 mark)*

8 (b) Calculate the length of a pendulum that will give a value of $T = 1$

$$T = 2\pi \sqrt{\frac{l}{g}}$$

$$T^2 = 4\pi^2 \frac{l}{g}$$

$$T^2 g = 4\pi^2 l$$

$$\frac{T^2 g}{4\pi^2} = l$$

Let $T^2 = 1$

$$l = \frac{1 \times 9.807}{4\pi^2}$$

$$l = 0.248414$$

Answer ......0.2484.. m   *(4 marks)*

9 *PQRS* is a quadrilateral.
PQ = 12 cm, *QR* = 11 cm, *RS* = 10 cm and *SP* = 9
cm ∠ *PQR* = 74° and ∠ *SPR* = 46°
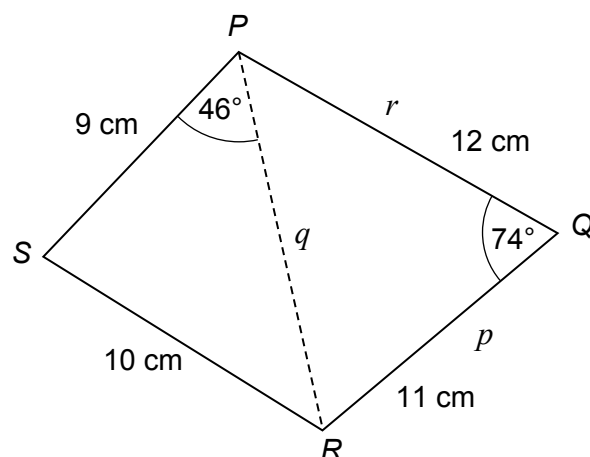
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accurately

9 (a)   Use the cosine rule to find *PR*.

$$q^2 = p^2 + r^2 - \left(2pr\cos 74°\right)$$
$$= 11^2 + 12^2 - \left(2 \times 11 \times 12\cos 74°\right)$$
$$= 121 + 144 - 72.768$$
$$= 192.232$$
$$q = \sqrt{192.23}$$
$$= 13.86$$

Answer ......13.86.. cm   *(3 marks)*

9 (b)   Use the sine rule to find the size of angle *PRS*.

$$\frac{\sin R}{9} = \frac{\sin 46°}{10}$$
$$\sin R = \frac{9\sin 46°}{10}$$
$$\sin R = 0.6474$$
$$R = 40.34$$

Answer ....40.34.................................... degrees   *(3 marks)*

10 Terry is sitting in his car at some traffic lights.
He knows that he is 1.2 miles from Arndale and 1.6 miles from Dale Street.
He knows his average speed is 10 miles per hour in city traffic.
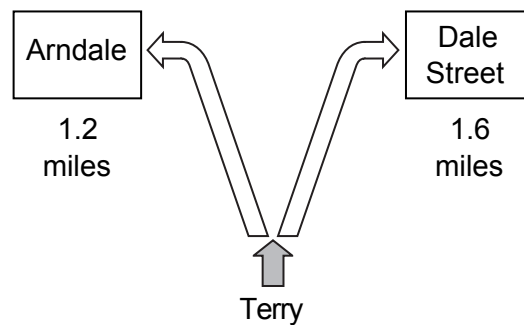
A sign on the traffic lights shows the number of spaces currently available in each

car park. Terry is sitting at the lights for one minute.

In that time the sign changes as shown below.

START

	SPACES
Arndale	510
Dale Street	700

1 MINUTE LATER

	SPACES
Arndale	450
Dale Street	630

10 (a) It will take Terry 7.2 minutes to drive to Arndale at 10 mph.

How long will it take Terry to drive to Dale Street at 10 mph?

$$1.6 \times \frac{60}{10}$$
$$= 9.6 \text{ minutes}$$

Answer ....9.6.................................. minutes   *(2 marks)*

10 (b) Which car park will give Terry the better chance of finding a space?
You **must** show your working.

Arndale spaces taken per minute:

$510 - 450 = 60$

$60 \times 7.2 = 432$ spaces gone

Spaces left:

$450 - 432 = 18$

Dale Street spaces taken per minute:

$700 - 630 = 70$

$70 \times 9.6 = 672$ so all spaces gone.

...................Arndale will give a better chance of finding a space..

(4 marks)

11 A regular octagon and a regular hexagon have sides of the same length.

Not drawn
accurately

h

o 45°
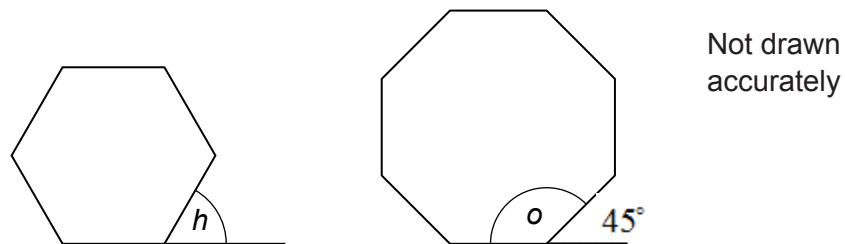
11 (a) Write down the size of the exterior angle, *h*, of the hexagon.

Sum of exterior angles of a polygon = 360°

There are 6 exterior angles.

$360 \div 6 = 60$

Answer ....60.. degrees   *(1 mark)*

11 (b) Work out the size of the interior angle, *o*, of the octagon.

Exterior angle:

$360 \div 8 = 45$

Interior angle:

$180 - 45 = 135$ Answer ....135.. degrees   *(2 marks)*

11 (c) The octagon and the hexagon are placed together as shown.

x

135 120

Not drawn
accurately
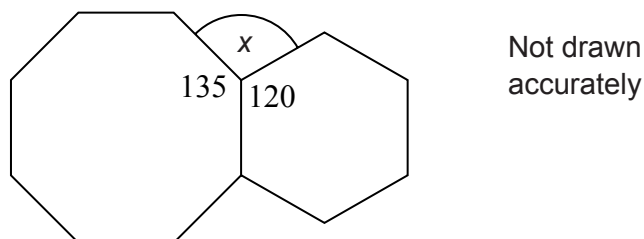
Work out the size of the angle marked *x*.

Interior angle of hexagon:

$180 - 60 = 120$

$\angle x = 360 - 135 - 120$

$\quad = 105$

Answer ....105... degrees   *(2 marks)*

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12 The circle $x^2 + y^2 = 16$ and the line $y = x + 2$ intersect at the points A and B.
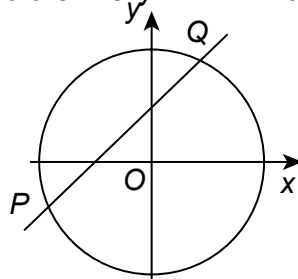
Not drawn accurately

12 (a) Show algebraically that the x-coordinates of points P and Q satisfy the equation

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

Subs $y = x + 2$ in $x^2 + y^2 = 16$

$$x^2 + (x+2)^2 = 16$$
$$x^2 + (x+2)(x+2) = 16$$
$$x^2 + x^2 + 2x + 2x + 4 = 16$$
$$2x^2 + 4x + 4 = 16$$
$$2x^2 + 4x + 4 - 16 = 0$$
$$2x^2 + 4x - 12 = 0$$
$$x^2 + 2x - 6 = 0$$

(3 marks)

12 (b) Write the equation $x^2 + 2x - 6 = 0$ in the form $(x + a)^2 - b = 0$

Completing the square:

$$(x+1)^2 - 6 - 1$$
$$(x+1)^2 - 7$$

Answer $(x+1)^2 - 7$ .... *(2 marks)*

12 (c) Hence, or otherwise, solve the equation $x^2 + 2x - 6 = 0$
Give your answers in surd form.

$$(x+1)^2 - 7 = 0$$
$$(x+1)^2 = 7$$
$$x + 1 = \pm\sqrt{7}$$
$$x = -1 \pm \sqrt{7}$$

Answer $x = -1 \pm \sqrt{7}$ .... *(2 marks)*

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13 Two squares with sides 8 cm overlap so that the corner of one square is at the centre of the other square, as shown in the first diagram.

8 cm

50°

P
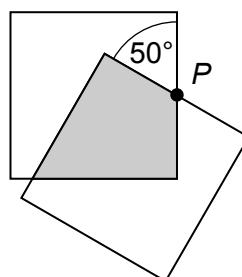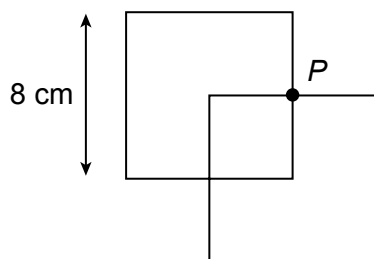
Not drawn accurately

The lower square is rotated about the point *P* until the angle between the sides is 50° as shown in the second diagram.
The shaded area is a kite.

Calculate the shaded area.

4

P

x

65
65

25
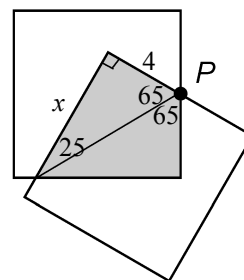
$$\tan 65° = \frac{x}{4}$$

$$x = 4 \tan 65°$$

$$= 8.578$$

Area of kite $= bh$

$$4 \times 8.578$$

$$= 34.312$$

Answer ....34.3.. cm² *(5 marks)*

14   Two points (5, 1) and (1, 5) on the graph of $y = \dfrac{5}{x}$ for $x > 0$ are plotted.
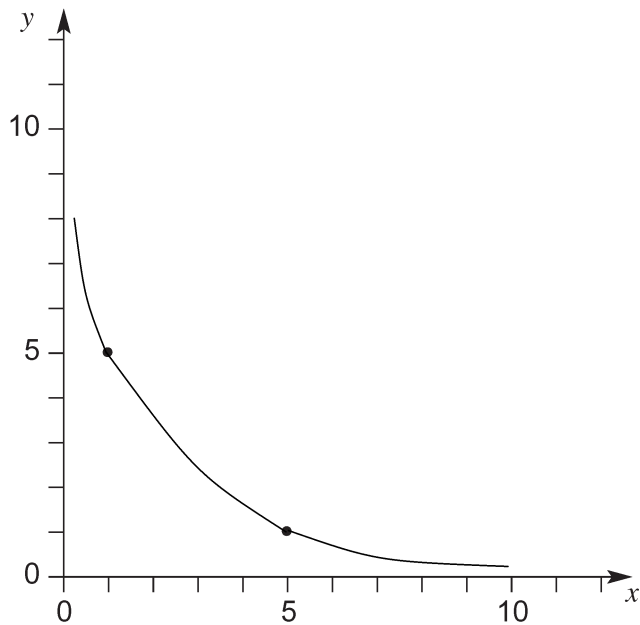
14 (a)   Complete a sketch of the graph of $y = \dfrac{5}{x}$ for $x > 0$

(2 marks)

14 (b)   Calculate the coordinates of the point where this curve intersects with the line $y = x$

....

....

Answer   (......................... , ...)   *(2 marks)*

15 This cylinder and sphere have the same volume.
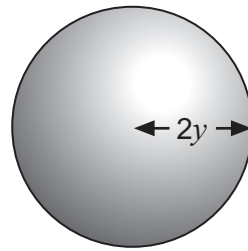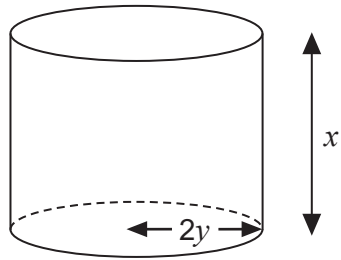
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This cone and sphere also have the same volume
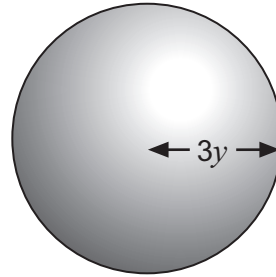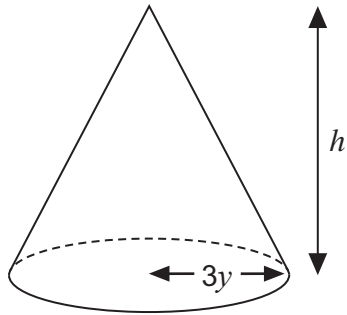
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Find h in terms of x

Volume of cylinder $= \pi (2y)^2 x$ Volume of cone $= \dfrac{1}{3} \pi (3y)^2 h$

Volume of sphere $= \dfrac{4}{3} \pi (2y)^3$

$\pi (2y)^2 x = \dfrac{4}{3} \pi (2y)^3$ $\dfrac{1}{3} \pi (3y)^2 h = \dfrac{4}{3} \pi (2y)^3$

Cancel: Cancel:

$$x = \dfrac{8y}{3}$$ $$\dfrac{h}{3} = \dfrac{12y}{3}$$

$$\therefore y = \dfrac{3x}{8}$$ $$h = 12y$$

           $$\therefore y = \dfrac{h}{12}$$

$$\dfrac{h}{12} = \dfrac{3x}{8}$$

$$h = \dfrac{36x}{8}$$

$$h = \dfrac{9x}{2}$$

Answer $. h = \dfrac{9x}{2}$ ....   *(5 marks)*

16 The diagram shows a line *PQRS*.
P is the point (400, 920).
Q is the point (250, 620).
The line cuts the *y*-axis at *R* and the *x*-axis at *S*.
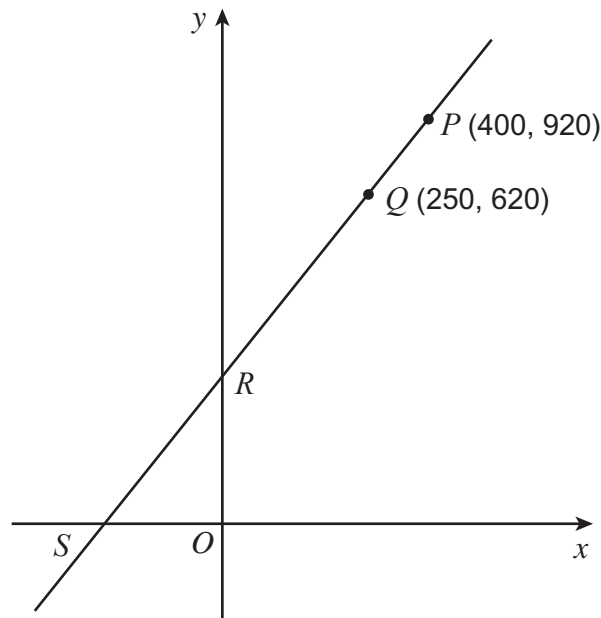
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Work out the coordinates of *R* and *S*.

$$m \text{ (gradient)} = \frac{\text{change in } y}{\text{change in } x}$$

$$= \frac{920 - 620}{400 - 250}$$

$$= \frac{300}{150}$$

$$m = 2$$

$y = mx + c$

To find c subs $x = 250$ and $y = 620$

$620 = (2 \times 250) + c$

$120 = c$

The equation is $y = 2x + 120$

$\therefore R$ coordinates are $(0, 120)$

To find S coordinates, subs $y = 0$ into the equation:

$$0 = 2x + 120$$

$$-120 = 2x$$

$$-60 = x$$

$\therefore S$ coordinates are $(-60, 0)$

Answer *R* (....0.............. , ...120......)

S (......-60............ , ...0........)   *(4 marks)*

Surname

Other Names

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General Certificate of Secondary Education
Foundation Tier

Mathematics   43602F

Past Paper Type Questions by Topic

Algebra
Model Answers

F

For this paper you must have:
- a calculator
- mathematical instruments.

Time allowed
- 1 hour

Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is.
- The quality of your written communication is specifically assessed in some questions. These questions are indicated with an asterisk (*)
- You may ask for more answer paper and graph paper. These must be tagged securely to this answer booklet.

Advice
- In all calculations, show clearly how you work out your answer.

1 (a) Solve $4(y + 5) = 28$

$$4y + 20 = 28$$
$$4y = 28 - 20$$
$$4y = 8$$
$$y = 2$$

Answer y = ...2..............................……………...…...……

(3 marks)

1 (b) Factorise $x^2 + 8x$

Answer ......$x(x + 8)$..............………….…...………

(1 mark)

2 You are given that 1 tonne = 1000 kilograms and 1 kilogram = 1000 grams

A skip contains half a tonne of magazines when full.
Each magazine weighs about 200 grams.

Approximately how many magazines would fill the skip?

Skip contains half a tonne
$$= 500 \text{ kg}$$
$$= 500\ 000 \text{ g}$$
$$= 5000 \div 2$$
$$= 2500$$

Answer ....2500 magazines…………..………....………

(4 marks)

3 (a) Work out the value of $3a + 4b$ when $a = 5$ and $b = \dfrac{1}{2}$

................................$15 + 2$...

....

Answer ......17... *(2 marks)*

3 (b) Solve $5x + 7 = x + 9$

$$5x - x = 9 - 7$$
$$4x = 2$$
$$x = \frac{2}{4}$$

Answer $x =$ ..$\dfrac{1}{2}$... *(3 marks)*

4 (a) Simplify $y^4 \times y^4$

To multiply, add the powers.

Answer ......y^8..............................…………..…………......………

(1 mark)

4 (b) Simplify $y^4 \div y^4$

To divide, subtract the powers. Any number to the power of 0 is 1.

$$y^0 = 1$$

Answer ......1..............................…………..…………......………

(1 mark)

5 (a)   Simplify $3x + 4x$

Answer ....7... *(1 mark)*

5 (b)   Simplify fully $\dfrac{12y}{6}$

Answer ....2y... *(1 mark)*

5 (c) $a = 5$ and $b = 4$

Work out the value $2a + 3b$

$$10 + 12$$

Answer ....22... *(2 marks)*

5 (d)   Solve $7x + 1 = 36$

$$7x = 36 - 1$$
$$7x = 35$$
$$x = 5$$

Answer $x =$ ..5... *(2 marks)*

6 (a)   Simplify 4x + 3x + 5x

Answer ....12x....................…………...…………....………

(1 mark)

6 (b)   Work out the value of $7a + 2b$ when a = 4 and b = 3

$$28 + 6$$

Answer .....34......................…………..…………....………

(2 marks)

7   Write 24 as the product of prime factors.

Give your answer in index form.

2)24
2)12
2)6
  3

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

$= 2^3 \times 3$

Answer ...$2^3 \times 3$.....................…………..…………....………

(3 marks)

8 (a)   Solve $7y > 2y + 20$

$7y - 2y \succ 20$

$5y \succ 20$

$y \succ 4$

Answer ...$y \succ 4$......................…………..…………....………

(2 marks)

8 (b) Circle the diagram that represents $1 \leq x < 3$

(1 mark)

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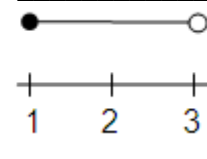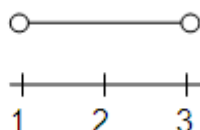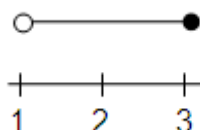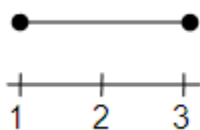
9   A bag contains blue, red and yellow balls.

The number of blue balls is x

The number of red balls is $x + 3$

The number of yellow balls is $2x$

9 (a)   Complete these sentences.

Choose from this list.

double   two more than   three more than   three times

10 (a)(i)   The number of red balls is ......three more than..... the number of blue balls.

(1 mark)

10 (a)(ii)   The number of yellow balls is ....double............... the number of blue balls.

(1 mark)

10 (b)   The total number of balls in the bag is 67.

Work out the number of red balls in the bag.

$$x + x + 3 + 2x = 67$$
$$4x + 3 = 67$$
$$4x = 67 - 3$$
$$4x = 64$$
$$x = 16$$

The number of red balls is $x + 3$

$$16 + 3 = 19$$

Answer ......19.........................…………..………....………

(4 marks)

11 Work out the value of $5x + 3y$ when $x = -2$ and $y = 6$

$$-10 + 18 = 8$$

Answer ......8...

(2 marks)

12 (a) Solve $a + 3 = 7$

$a = 7 - 3$

$a = 4$

Answer a = ...4.. (1 mark)

12 (b) Solve $2a + 5 = 1$

$2a = 1 - 5$

$2a = -4$

$a = -2$

Answer a = ...-2.. (2 marks)

13   There are 320 people on a train.

20% are children.

One-half are men.

The rest are women.

How many women are on the train?

20% are children

$$320 \times \frac{20}{100} = 64$$

One-half are men

$$320 \div 2 = 160$$

The rest are women

$$320 - 64 - 160 = 96$$

Answer   ....96..

(4 marks)

14   Here is a formula.

$$N = \frac{1}{4}xy$$

$x + y$ is less than 20.

Find **two** possible pairs of values of x and y when $N = 15$

$$15 = \frac{1}{4}xy$$

$$15 \times 4 = xy$$

$$60 = xy$$

$$4 \times 15 = 60$$

$$5 \times 12 = 60$$

$$6 \times 10 = 60$$

Answer $x =$ ...4...................……… $x =$....5..................   6

Answer $y =$ ...15...................…… $y =$...12................   10

(3 marks)

15 (a) The numbers in this sequence go down by the same amount each time.

74 …… 58 50 42 ……

What are the **two** missing numbers?

Answer ....66................. and ....34................ *(2 marks)*

15 (b) The numbers in this different sequence go down by the same amount each time.

26 …… …… …… 6

What are the **three** missing numbers?

$26 - 6 = 20$

There are 4 terms after 26

$20 \div 4 = 5$

The term to term rule is subtract 5

Answer .....21.......... , ...16.......... , ...11............ *(2 marks)*

16 (a) Solve $3x = 12$

Answer $x =$ ...4.. *(1 mark)*

16 (b) Solve $\dfrac{a}{5} = -6$

Answer $a =$ ...-30.. *(1 mark)*

16 (c) Solve $5b + 4 = 19$

$5b = 19 - 4$

$5b = 15$

$b = 3$

Answer $b =$ ..3.. *(2 marks)*

16 (d) Factorise fully $4c - 20$

(1 mark)

Answer .....$4(c - 5)$..

17 (a) Work out the value of $2x + 3y$ when $x = 5$ and $y = 8$

$10 + 24$

Answer ......34.. *(2 marks)*

17 (b) Expand and simplify $\quad 3(2a - 4) + 5(a + 2)$

$6a - 12 + 5a + 10$

Answer ......11a - 2.. *(2 marks)*

18 Peter thinks of a number. Two-thirds of the number is 60.

What is $1\frac{1}{2}$ times the number?

$\frac{1}{3}$ of the number is 30

The number is 3×30

$= 90$

$90 \times 1\frac{1}{2}$

$= \frac{90}{1} \times \frac{3}{2}$

Answer ......135.. *(3 marks)*

19 You are given that $\quad P = x^2 - y^2$

19 (a) Show that P is a prime number when $x = 4$ and $y = 3$

A prime number has two factors, 1 and itself.
$16 - 9 = 7$
7 is a prime number

(2 marks)

19 (b) Work out **two** other pairs of values for x and y so that P is a prime number.

$x = 6 \quad y = 5 \qquad x = 7 \quad y = 6$

$6^2 - 5^2 \qquad\qquad 7^2 - 6^2$

$= 36 - 25 \qquad\quad = 49 - 36$

$= 11 \text{ (prime)} \quad = 13 \text{ (prime)}$

Answer $x =$ ....6.............. and $y =$ ......5................

$x =$ ....7.............. and $y =$ ......6................ *(3 marks)*

*20 (a) (i)   Simplify the expression $y \times 5$

Answer .....$5y$..   *(1 mark)*

20 (a) (ii) Simplify fully $2x + 5y + 3x - 2y$

Answer ....$5x + 3y$..   *(2 marks)*

20 (b) z represents an even number.

Explain why $(z + 1)(z - 1)$ is always odd.

$z + 1$ is always odd.
$z - 1$ is always odd
An odd number multiplied by an odd number is always odd.

(2 marks)

21 (a)   Circle **all** the prime numbers in this list.

<u>3</u>   6   <u>7</u>   9   10   <u>13</u>   15   <u>17</u>

(2 marks)

21 (b) x is a positive whole number.
$6x - 1$ i s **not** a prime
number. Work out a possible
value for x.

$6 \times 6 = 36$

$36 - 1 = 35$ (not prime)

or

$6 \times 11 = 66$

$66 - 1 = 65$ (not prime)

Answer .....6 or 66...................................   *(2 marks)*

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Surname

Other Names

Candidate Signature

In the style of

AQA

General Certificate of Secondary Education
Higher Tier

Mathematics 43602H

Past Paper Type Questions by Topic
Algebra
Model Answers

H

For this paper you must have:
- a calculator
- mathematical instruments.

Time allowed
- 1 hour

Instructions
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Advice
- In all calculations, show clearly how you work out your answer.

1 Solve this equation

$$\frac{x+3}{2} - \frac{x-2}{3} = 3$$

$$\frac{6(x+3)}{2} - \frac{6(x-2)}{3} = 6 \times 3$$
$$3(x+3) - 2(x-2) = 18$$
$$3x + 9 - 2x + 4 = 18$$
$$x + 13 = 18$$
$$x = 18 - 13$$
$$x = 5$$

Answer $x =$ ...5... *(4 marks)*

2 Solve the equation $x^2 - 2x - 6 = 0$
Give your answers to three significant figures.

$$a = 1 \quad b = -2 \quad c = -6$$

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

$$x = \frac{2 \pm \sqrt{4 - (4 \times 1 \times (-6))}}{2 \times 1}$$

$$x = \frac{2 + \sqrt{28}}{2} \quad \text{or} \quad \frac{2 - \sqrt{28}}{2}$$

$$x = 3.64575 \quad \text{or} \quad -1.64575$$

Answer .....3.65..or..-.1.65.. *(3 marks)*

3 (a) Solve $7x = 15 - 3x$

$$7x + 3x = 15$$

$$10x = 15$$

$$x = \frac{15}{10}$$

$$x = 1.5$$

Answer $x =$ ...1.5.. *(2 marks)*

3 (b) $2(x + 16) + 4(x - 5)$ simplifies to $p(x + q)$

Work out the values of p and q.

$$2x + 32 + 4x - 20$$

$$= 6x + 12$$

$$= 6(x + 2)$$

Answer $p =$ ......6................. , $q =$ 2......................... *(3 marks)*

4 Solve the simultaneous equations

$$x = 3 + 2y \quad ....(1)$$

$$x^2 + 2y^2 = 27 \quad ....(2)$$

Do **not** use trial and improvement.
You **must** show your working.

Subs $x = 3 + 2y$ in (2)

$$(3 + 2y)^2 = 27$$

$$9 + 6y + 6y + 4y^2 + 2y^2 = 27$$

$$6y^2 + 12y - 18 = 0$$

$$y^2 + 2y - 3 = 0$$

$$(y - 1)(y + 3) = 0$$

$$y = 1 \text{ or } -3$$

Subs $y = -1$ in (1)

$$x = 3 + 2$$

$$x = 5$$

Subs $y = -3$ in (1)

$$x = -3$$

Answer $(5, 1)$ or $(-3, -3)$ .... *(6 marks)*

5 (a) Expand $\quad$ $3(2a - 4)$

Answer $6a - 12$ .... *(1 mark)*

5 (b) Factorise $\quad$ $b^2 - 3b$

Answer $b(b-3)$ .... *(1 mark)*

5 (c) Expand and simplify $\quad$ $3(c - 1) - 2(c + 4)$

$$3c - 3 - 2c - 8$$
$$= c - 11$$

Answer $c - 11$ .... *(2 marks)*

5 (d) Solve the equation $\quad$ $3(4d + 1) = 21$ $\quad$ $12d + 3 = 21$

$$12d = 21 - 3$$
$$12d = 18$$
$$d = \frac{18}{12}$$

Answer $d = 1\frac{1}{2}$ .... $\quad$ $d = 1\frac{1}{2}$ .... *(3 marks)*

6 A rectangle has sides of $(2s + 3)$ cm and $(s - 2)$ cm.
The perimeter is 32 cm.

$2s + 3$
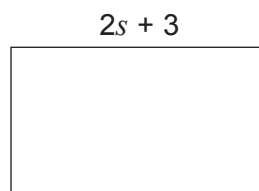
$s - 2$ $\qquad$ Not drawn accurately

Work out the value of s. $\quad$ $2s + 3 + s - 2 + 2s + 3 + s - 2 = 32$

$$6s + 2 = 32$$
$$6s = 32 - 2$$
$$6s = 30$$
$$s = 5$$

Answer $s =$ ....5... *(3 marks)*

7   Simplify fully $\dfrac{6y^2 + y - 1}{4y^2 - 1}$ ← Difference of two squares

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

$$\dfrac{(2y+1)(3y-1)}{(2y+1)(2y-1)}$$

$$= \dfrac{3y-1}{2y-1}$$

Answer ... $\dfrac{3y-1}{2y-1}$ ....   *(4 marks)*

8   Show that $7 + \dfrac{10}{y+2} = \dfrac{9}{y}$

simplifies to $y^2 + 15y - 18 = 0$

$$7(y+2) + \dfrac{10(y+2)}{(y+2)} = \dfrac{9(y+2)}{y}$$

$$7y + 14 + 10 = \dfrac{9y+18}{y}$$

$$7y + 24 = \dfrac{9y+18}{y}$$

$$7y^2 + 24y = 9y + 18$$

$$7y^2 + 24y - 9y - 18 = 0$$

$$7y^2 + 15y - 18 = 0$$

(3 marks)

9 (a) Simplify $a^3b^2 \times 4ab^5$

Add the powers to multiply

Answer $4a^4b^7$ .... *(2 marks)*

9 (b) Factorise fully $b^2 - 8\,ab$

Answer $b(b-8a)$ .... *(2 marks)*

9 (c) Make *x* the subject of $s = y + \dfrac{x}{r}$

$$s - y = \frac{x}{r}$$
$$r(s-y) = x$$

Answer $x = r(s-y)$ .... *(2 marks)*

9 (d) Work out the least common multiple (LCM) of $6ab^2$ and $3a^2b$

Answer $6a^2b^2$ .... *(2 marks)*

10 Solve the equations

10 (a) $3y - 8 = 7 - y$

$$3y + y = 7 + 8$$
$$4y = 15$$
$$y = \frac{15}{4}$$

Answer $y = $ .....$3\frac{3}{4}$............................. *(2 marks)*

10 (b) $\dfrac{y+4}{5} + \dfrac{y-2}{3} = 4$

$$\frac{3(y+4) + 5(y-2)}{15} = 4$$
$$\frac{3y + 12 + 5y - 10}{15} = 4$$
$$\frac{8y + 2}{15} = 4$$
$$8y + 2 = 60$$
$$8y = 58$$
$$y = \frac{58}{8}$$

Answer $y = 7\frac{1}{4}$ .... *(4 marks)*

11 (a) Show that the algebraic expression

$$\frac{2y-3}{y-3} - \frac{2y-1}{2y+1}$$

Can be written as

$$\frac{2y^2+3y-6}{(y-3)(2y+1)}$$

$$= \frac{(2y+1)(2y-3)-(y-3)(2y-1)}{(y-3)(2y+1)}$$

$$= \frac{4y^2-6y+2y-3-\left(2y^2-y-6y+3\right)}{2y^2+y-6y-3}$$

$$= \frac{4y^2-6y+2y-3-2y^2+y+6y-3}{2y^2+y-6y-3}$$

$$= \frac{2y^2+3y-6}{2y^2-5y-3}$$

$$= \frac{2y^2+3y-6}{(y-3)(2y+1)}$$

(4 marks)

11 (b) Hence, or otherwise, solve the equation

$$\frac{2y-3}{y-3} - \frac{2y-1}{2y+1} = 1$$

From part (a) $\dfrac{2y^2+3y-6}{(y-3)(2y+1)} = 1$

$$\frac{2y^2+3y-6}{2y^2-5y-3} = \frac{1}{1}$$

Cross multiply

$$2y^2+3y-6 = 2y^2-5y-3$$

$$3y+5y = -3+6$$

$$8y = 3$$

Answer $y = \dfrac{3}{8}$ .... *(3 marks)*

12 Solve the following equations.

12 (a) $3x - 7 = x + 5$

$$3x - x = 5 + 7$$
$$2x = 12$$

Answer $x = $ .6............................   *(2 marks)*

12 (b) $5(y - 3) = 3(y + 1)$

$$5y - 15 = 3y + 3$$
$$5y - 3y = 3 + 15$$
$$2y = 18$$

Answer $y = $ ...9..   *(3 marks)*

12 (c) $\dfrac{y+1}{2} - \dfrac{y-3}{5} = 2$

$$\frac{5(y+1) - 2(y-3)}{10} = 2$$
$$\frac{5y + 5 - 2y + 6}{10} = 2$$
$$\frac{3y + 11}{10} = 2$$
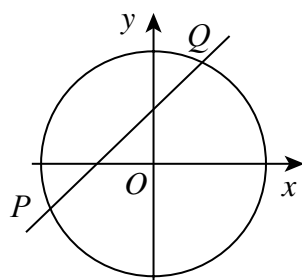$$3y + 11 = 20$$
$$3y = 20 - 11$$
$$3y = 9$$

Answer $y = $ ...3..   *(4 marks)*

13 The circle $x^2 + y^2 = 16$ and the line $y = x + 2$ intersect at the points P and Q.

Not drawn accurately

13 (a) Show algebraically that the x-coordinates of points P and Q satisfy the equation

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

$$x^2 + y^2 = 16$$
$$y = x + 2$$

Subs (2) in (1)

$$x^2 + (x+2)^2 = 16$$
$$x^2 + (x+2)(x+2) = 16$$
$$x^2 + x^2 + 2x + 2x + 4 - 16 = 0$$
$$2x^2 + 4x - 12 = 0$$
$$x^2 + 2x - 6 = 0$$

(3 marks)

13 (b) Write the equation $x^2 + 2x - 6 = 0$ in the form $(x + a)^2 - b = 0$

Completing the square

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

1 is half of 2 and gives $2x$ when $(x+1)^2$ is expanded.

Subtract 1^2 to cancel the 1 obtained.

$$(x+1)^2 - 6 - 1 = 0$$
$$(x+1)^2 - 7 = 0$$

Answer $(x+1)^2 - 7 = 0$ .... *(2 marks)*

13 (c) Hence, or otherwise, solve the equation $x^2 + 2x - 6 = 0$
Give your answers in surd form.

$$(x+1)^2 = 7$$
$$x + 1 = \pm\sqrt{7}$$
$$x = -1 \pm \sqrt{7}$$

Answer $x = -1 \pm \sqrt{7}$ .... *(2 marks)*

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14 (a) Factorise $y^2 + 7y$

Answer $y(y+7)$ .... *(1 mark)*

14 (b) Expand $5(3b + 8)$

Answer $15b + 40$ .... *(1 mark)*

14 (c) Expand and simplify $3(2b + 1) - 2(b - 3)$

$$= 6b + 3 - 2b + 6$$
$$= 4b + 9$$

Answer $4b + 9$ .... *(2 marks)*

15 Rearrange the formula $z = \dfrac{3x - 1}{2x + 5}$ to make x the subject.

$$z(2x + 5) = 3x - 1$$
$$2zx + 5z = 3x - 1$$
$$2zx - 3x = -5z - 1$$
$$x(2z - 3) = -5z - 1$$
$$x = \dfrac{-5z - 1}{2z - 3}$$

Answer $x = \dfrac{-5z - 1}{2z - 3}$ .... *(4 marks)*

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*16   Solve the equation $\dfrac{2y-3}{4} + \dfrac{y-1}{3} = 2$

Both Sides ×12

$$12\frac{(2y-3)}{4} + 12\frac{(y-1)}{3} = 24$$

$$3(2y-3) + 4(y-1) = 24$$

$$6y - 9 + 4y - 4 = 24$$

$$10y - 13 = 24$$

$$10y = 24 + 13$$

$$10y = 37$$

Answer y = 3.7 ....

(5 marks)

17 (a)   Factorise $x^2 + 7x + 6$

Answer $(x+1)(x+6)$ ....   *(2 marks)*

17 (b)   Hence, or otherwise, write 176 as the product of its prime factors.
Give your answer in index form.

$$\begin{array}{r} 2)\overline{176} \\ 2)\ \ 88 \\ 2)\ \ 44 \\ 2)\ \ 22 \\ 11 \end{array}$$

Answer 11×2^4 ....   *(3 marks)*

18   Solve the simultaneous equations

$$z^2 = 2x + 29 \quad ....(1)$$
$$z = x - 3 \quad ....(2)$$

You **must** show your working.

Subs (2) in (1)

$$(x - 3)^2 = 2x + 29$$
$$(x - 3)(x - 3) = 2x + 29$$
$$x^2 - 3x - 3x + 9 = 2x + 29$$
$$x^2 - 6x + 9 - 2x - 29 = 0$$
$$x^2 - 8x - 20 = 0$$
$$(x + 2)(x - 10) = 0$$

$x = -2$ or 10

Subs $x = -2$ in (2)

$z = -2 - 3$

$z = -5$

Subs $x = 10$ in (2)

$z = 10 - 3$

$z = 7$

Answer $(-2, \; -5)$ or $(10, \; 7)$ .... *(5 marks)*

∗19   Solve $\dfrac{10}{2y-1} - \dfrac{3}{y} = 3$

$$\frac{10y - 3(2y-1)}{y(2y-1)} = 3$$

$$\frac{10y - 6y + 3}{2y^2 - y} = 3$$

$$\frac{4y + 3}{2y^2 - y} = \frac{3}{1}$$

$$10y - 6y + 3 = 3(2y^2 - y)$$

$$10y - 6y + 3 = 6y^2 - 3y$$

$$10y - 6y + 3 - 6y^2 + 3y = 0$$

$$-6y^2 + 7y + 3 = 0$$

Both sides $\times \ -1$

$$6y^2 - 7y - 3 = 0$$

$$(2y - 3)(3y - 1) = 0$$

$$x = 1\frac{1}{2} \ \text{or} \ \frac{1}{3}$$

Answer $x = 1\dfrac{1}{2}$ or $\dfrac{1}{3}$ .... *(6 marks)*

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Surname	
Other Names	
Candidate Signature	

In the style of

AQA

General Certificate of Secondary Education
Foundation Tier

Mathematics 43601F

Past Paper Questions by Topic

Bearings
Model Answers

F

For this paper you must have:
- mathematical instruments.

You must **not** use a calculator.

Time allowed
- 1 hour 15 minutes

Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is.
- The quality of your written communication is specifically assessed in questions indicated with an asterisk (*)
- You may ask for more answer paper and graph paper. These must be tagged securely to this answer booklet.

Advice
- In all calculations, show clearly how you work out your answer.

∗1   Five roads meet at *M*.
        W is due South of *M*.

Measure bearings clockwise from
a North arrow. They have 3 digits.

Not drawn
accurately
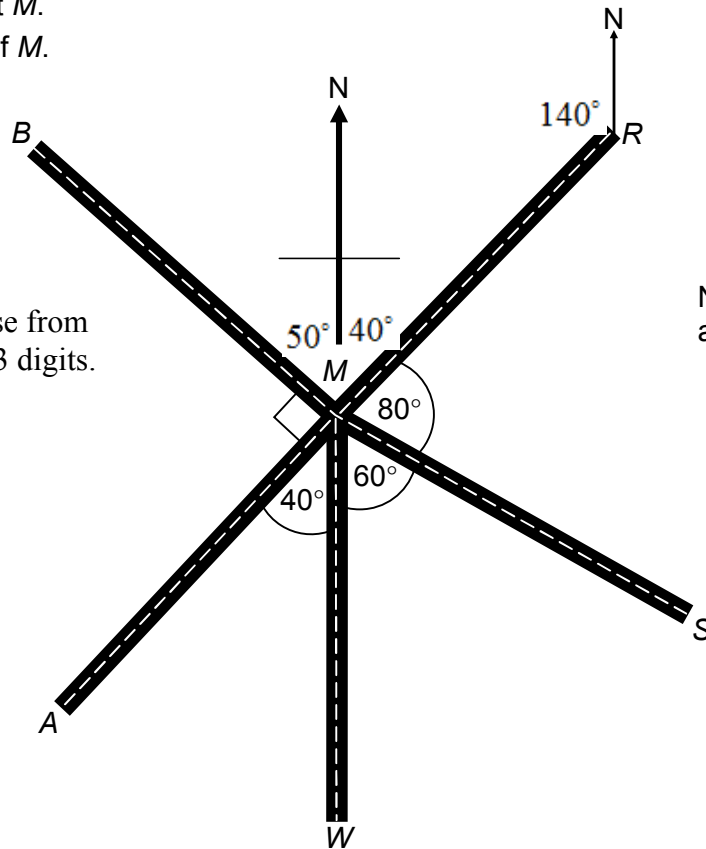
1 (a)   Is *AMR* a straight line?

Tick a box.

☑ Yes   ☐ No

Show how you decide.

$40° + 60° + 80° = 180°$ which is a straight line.

(1 mark)

1 (b)(i) What is the bearing of R from *M*?

Answer 040°... ° *(2 marks)*

1 (b)(ii) What is the bearing of *M* from *R*.

$360 - 140 = 220$

Answer 220° .... ° *(2 marks)*

& (a)   Measure the acute angle a.
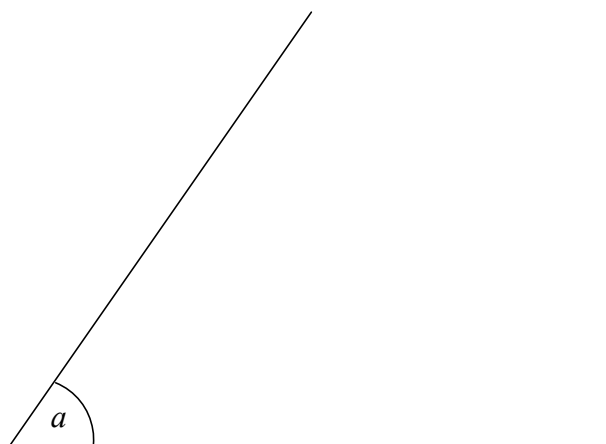
Answer   55° .... degrees   *(1 mark)*

& (b)   Use measurements to work out the size of angle b.

145°
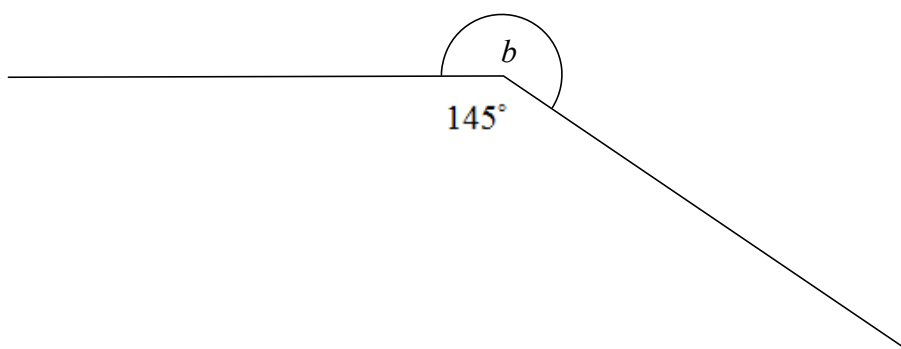
$360 - 145 = 215$

Answer   ....215... degrees   *(2 marks)*

&(c)   An acute angle and an obtuse angle fit together to make an angle of 200°

Work out two possible values for the angles

Answer ......50.............degrees and..........150.............. degrees *(2 marks)*
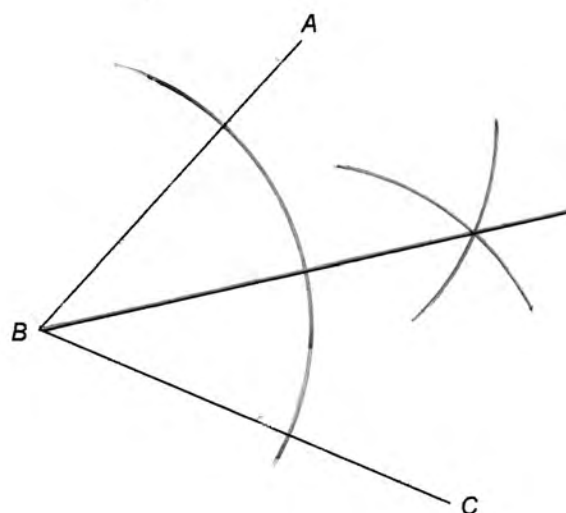
'   Use a ruler and compasses in this question.
          Remember to show all construction lines and arcs clearly.

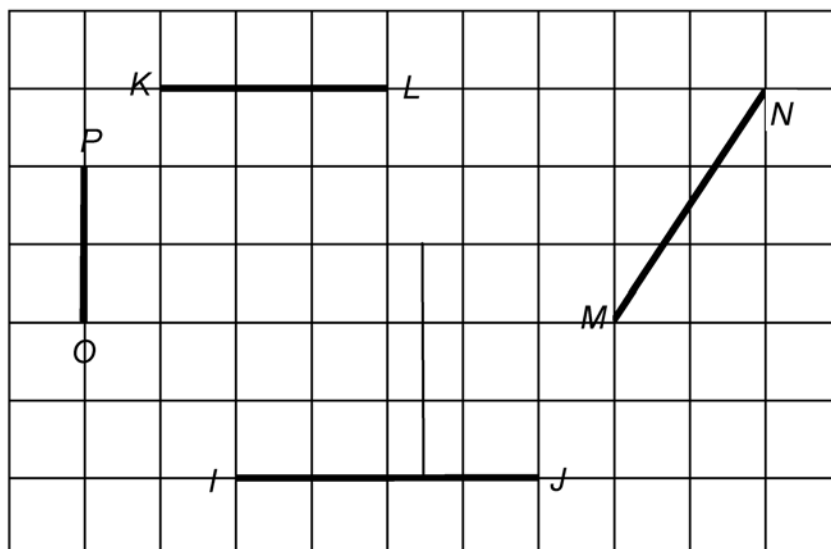**' (a)**   Construct the perpendicular bisector of *XY.*
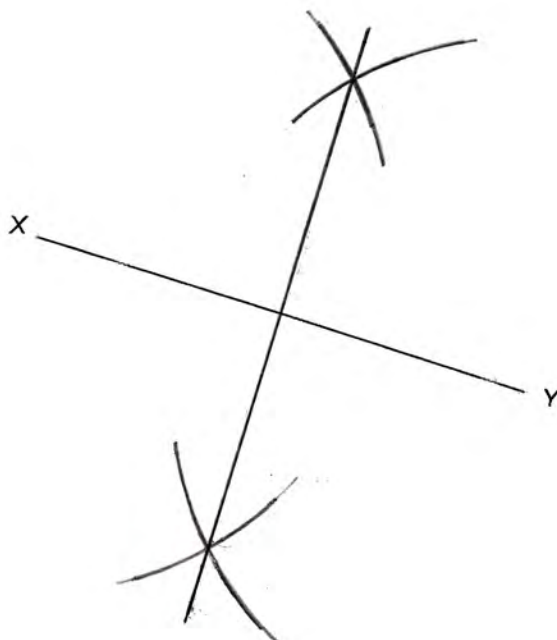
(2 marks)

' (b)   Construct the angle bisector of the angle *ABC*.

(2 marks)

4   Here are some lines drawn on a grid.

4 (a)   Measure the length of *MN*.

Answer ....3.6.................. cm (*1 mark*)

4 (b)   Which line is parallel to *KL.*

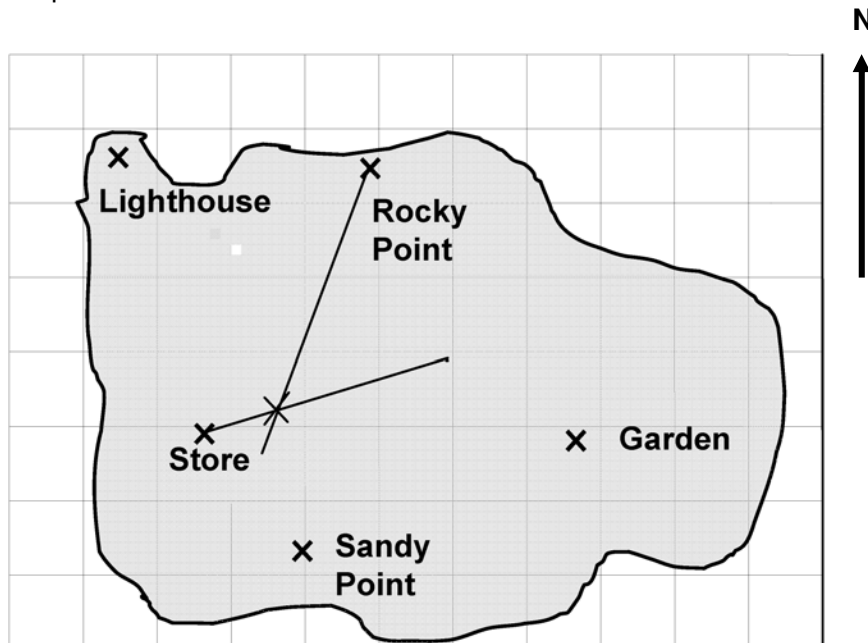Answer ....IJ........................ (*1 mark*)

4 (c)   Draw a line at right angles to *IJ.*

(*1 mark*)

`)   The diagram shows the map of an island drawn on a grid.

Each square represents 10 000 m².

N

`) **(a)**   Estimate the area of the island.

Give your answer in square metres.

$$50 \times 10\ 000 = 50\ 000$$

Answer .....50.000................. m² (*4 marks*)

) **(b)**   Measure the bearing of Sandy Point from Rocky Point.

Answer **190°** .... (*1 mark*)

) **(c)** A Football Stadium is on a bearing of 200° from Rocky Point and 070° from the Store
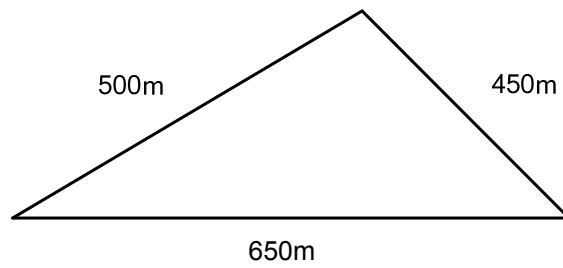
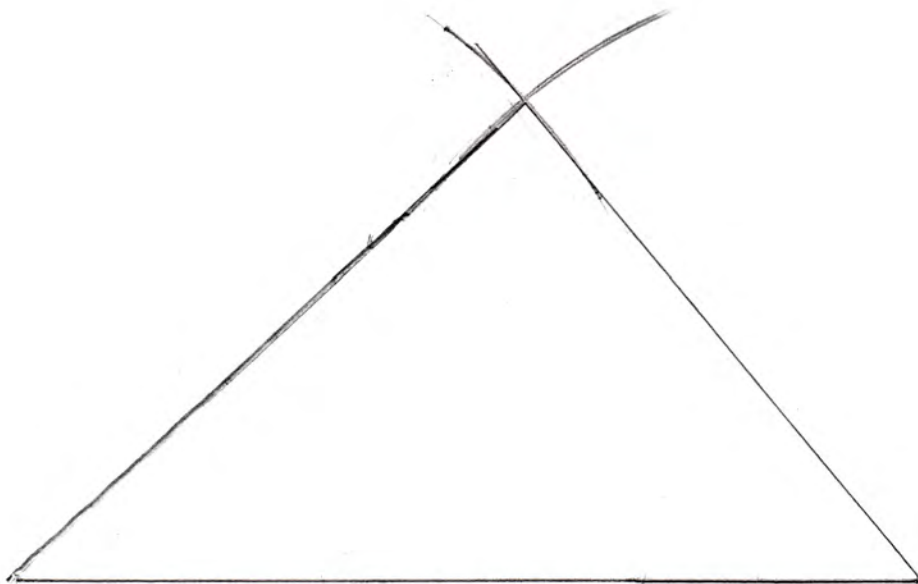Mark with a cross the position of the Football Stadium on the map.

(*3 marks*)

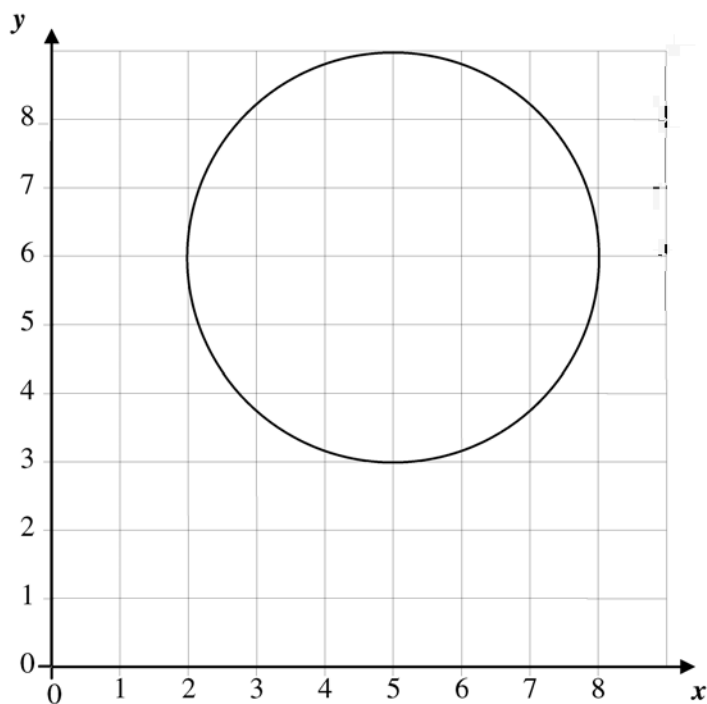*   Here is a triangle.

Not drawn
accurately

500m   450m

650m

Using ruler and compasses only, construct an accurate scale drawing of the triangle.

Use the scale 1 cm represents 50 m.

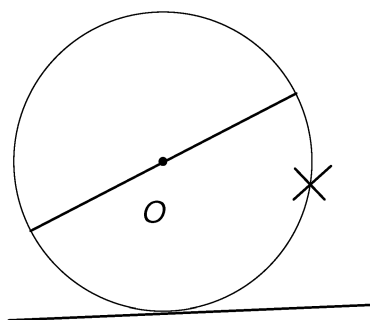(*3 marks*)

+   Here is a centimetre grid.

+ (a)   On the grid, draw a circle of radius 3 centimetres with centre (5, 6).

(2 marks)

+ (b)   Here is a circle, centre *O*.

+ (b)(i)   Mark with a cross a point on the circumference.
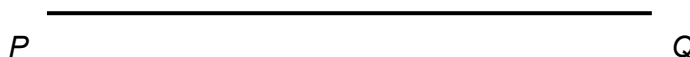
(*1 mark*)

+ (b)(ii)   Draw a diameter.

(*1 mark*)

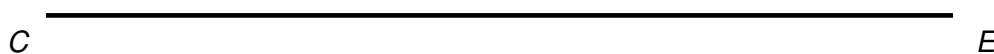**+ (b)(iii)**   Draw a tangent.   (*1 mark*)

, (a) Measure the length of line *PQ* in centimetres.

———————————————————
P   Q

Answer ....8............ cm (*1 mark*)

, (b) The length of line *CE* is 12 centimetres.

———————————————————————————
C   E

D is a point on *CE*.

CD is $\dfrac{1}{4}$ of *CE*.

Work out the length of *DE*.

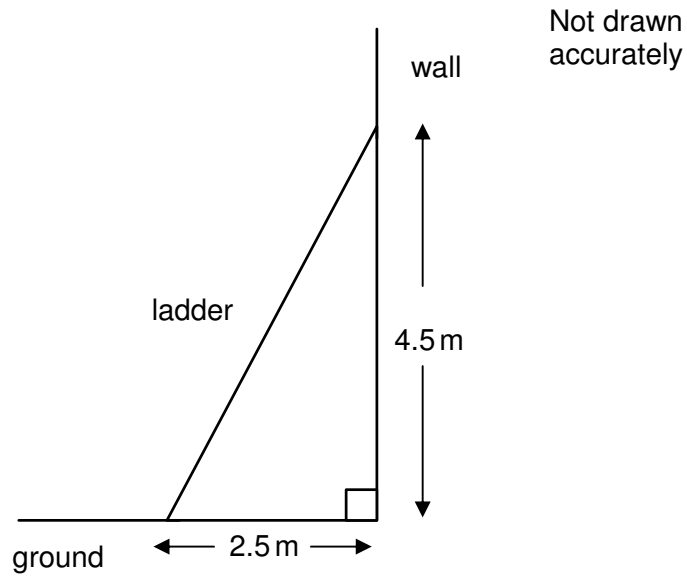CE :

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

$12 - 3 = 9$

Answer ......9................ cm (*3 marks*)

-       Sophie has put a ladder against a vertical wall.

The wall is at right angles to the ground.

wall   Not drawn
accurately

ladder

4.5 m

ground   2.5 m

- **(a)**   Make a scale drawing of this diagram.

The ground has been drawn for you.

Use a scale of 2 cm to represent 1 metre.
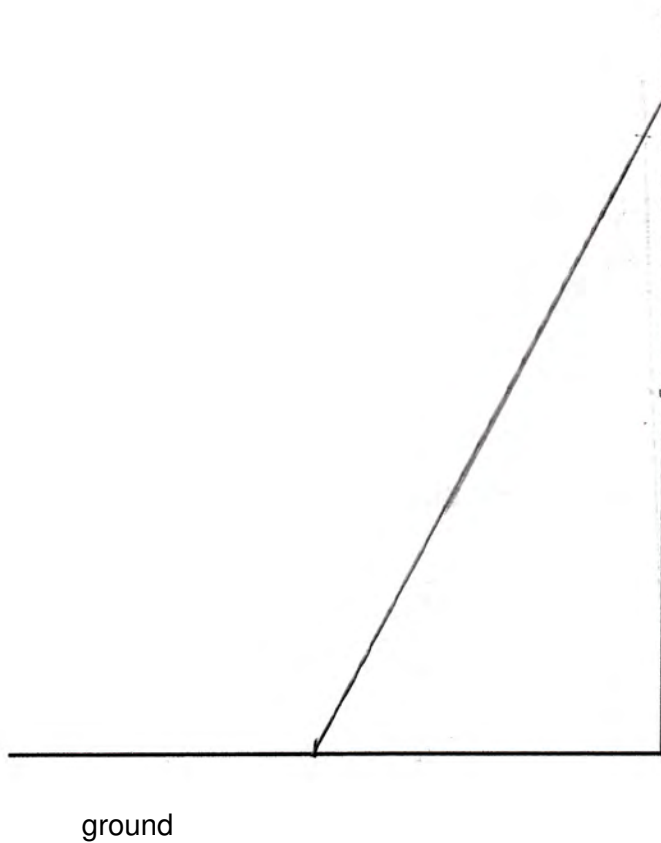
(*3 marks*)

ground

- **(b)** For the ladder to be safe to use, the angle between the ladder and the ground must be between 70° and 75°
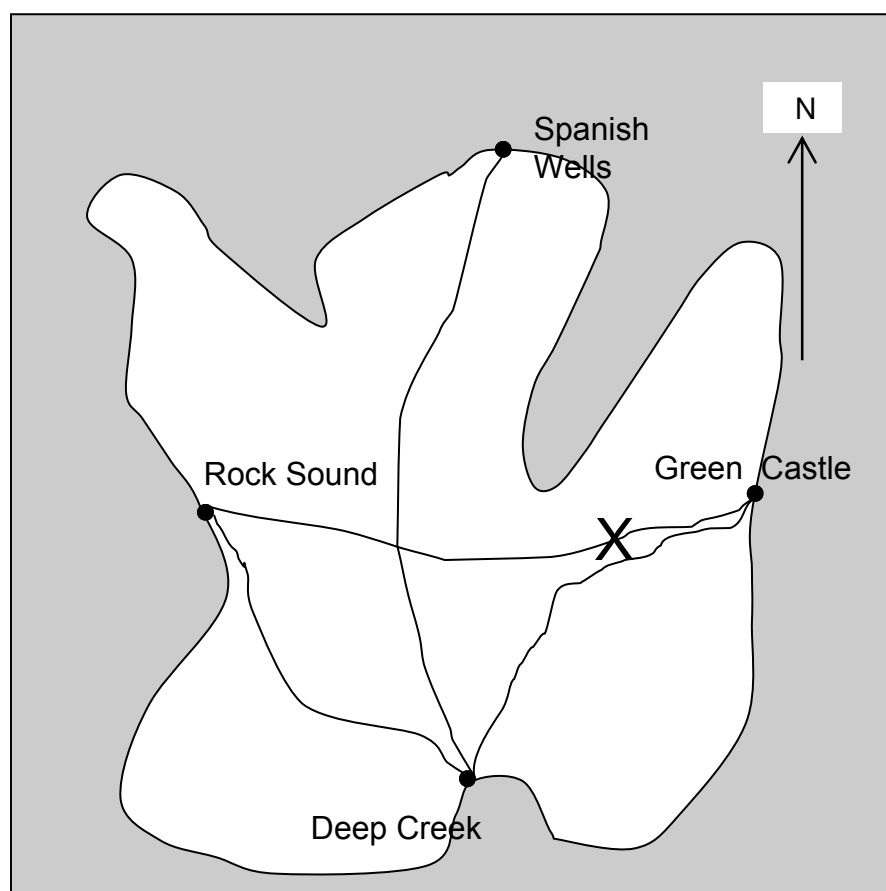
Is the ladder safe for Sophie to use?
Give a reason for your answer.

No. The angle of the ladder is 60˚.

(*1 mark*)

%$˙   The diagram shows a map of an island with roads joining four towns.

˙%$¨ (a) Choose the correct direction from the list to complete each sentence.

North	North-east	North-west	East
South	South-east	South-west	West

Green Castle is...........North-east.................... of Deep Creek.

Deep Creek is   ....South-east..................... of Rock Sound.

(*2 marks*)

¨ (b)   A ring is hidden on one of the roads.

Here are some clues to find it.

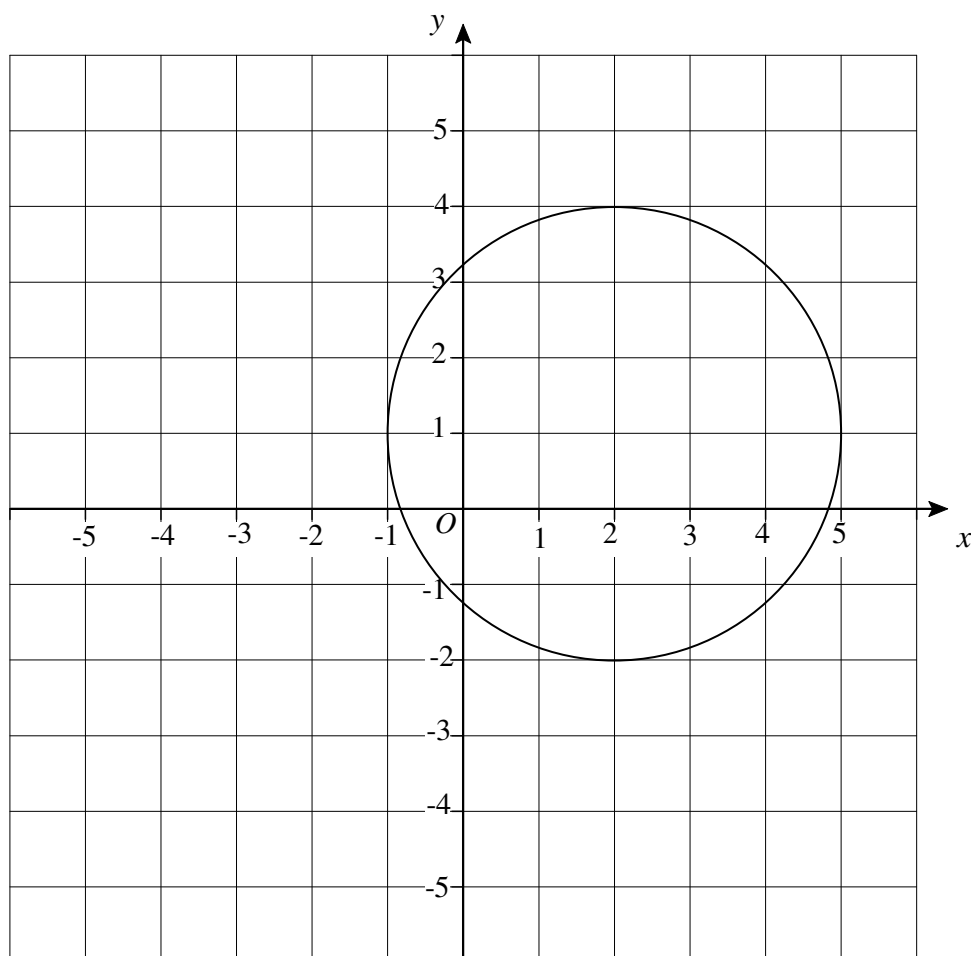The closest town to the ring is Green Castle.
The ring is twice as far from Rock Sound as from Deep Creek.

Mark with a cross, the approximate position of the ring on the map.

(*2 marks*)

11 The diagram shows a circle on a centimetre grid.

11(a) Write down the length of a diameter of the circle.

Answer ....6.................... cm (*1 mark*)

11 (b) Write down the coordinates of the centre of the circle.

Answer (....2........, ...1.......) (*2 marks*)

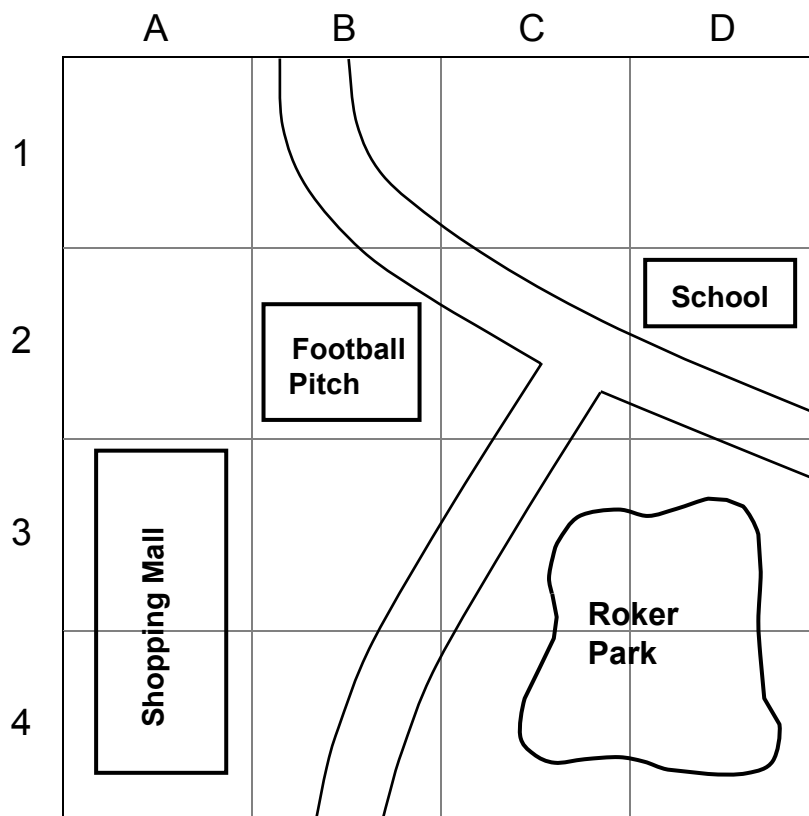**11 (c)** Draw a tangent to the circle.

(*1 mark*)

11 (d) State the units for the area of the circle.

Answer cm^2 .... (*1 mark*)

12   Part of a map is shown.

A location can be given by a letter and a number.

For example, the school is in D2.

12 (a)   In which square is the football pitch?

Answer ......2B... *(1 mark)*

12 (b)   Roker Park occupies several squares.

List all the squares.

Answer ...3C, 3D, 4C, 4D.. *(2 marks)*

12 (c)   The school is due East of the football pitch.

Complete this sentence.

The football pitch is due ....West........................... of the school.

(1 mark)

13 Louis has 6 rods.

3 cm

3 cm

4 cm

4 cm

8 cm

8 cm
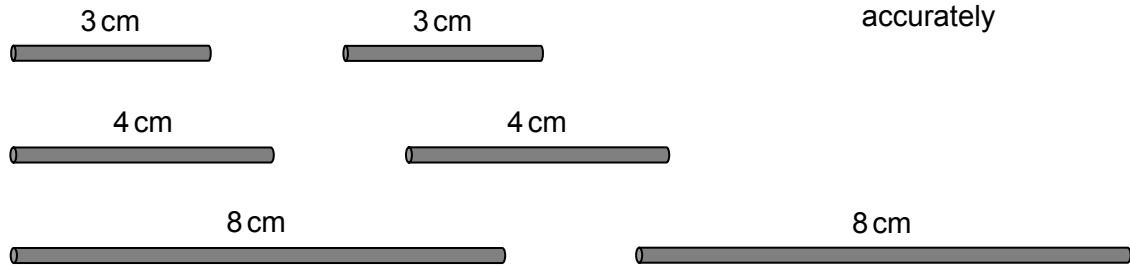
13 (a) He makes **two** isosceles triangles using all six of the rods.

Draw **two** different triangles that he can make using all of the rods.
Show the lengths on each side.

8cm   8cm

4cm

3cm   3cm

4cm
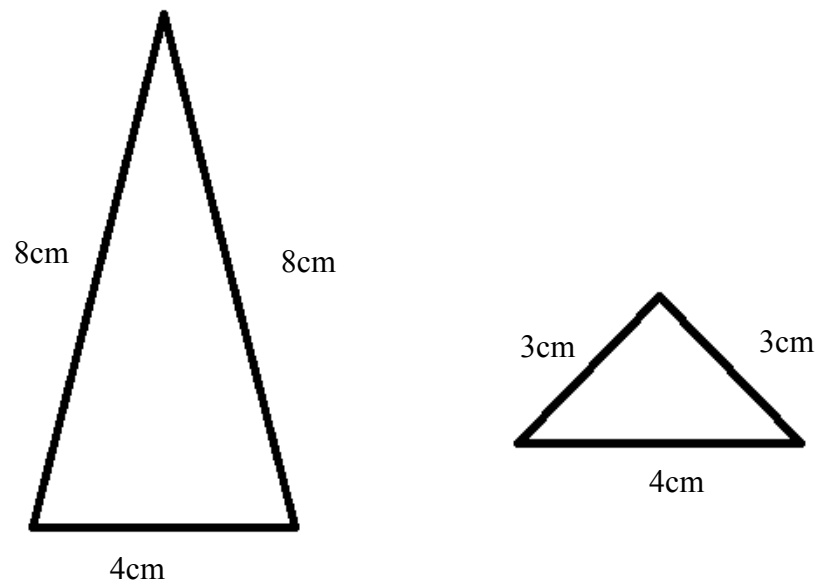
(2 marks)

13 (b) He tries to make a triangle using one rod of each length.
Explain why he **cannot** do this.

Answer ...The 4cm and 3cm would not meet if they were on the ends of the 8cm rod................. *(1 mark)*

13 (c)   Hassan says that it is impossible to have an isosceles triangle with a right angle.

Draw a fully labelled diagram to show that Hassan is wrong.
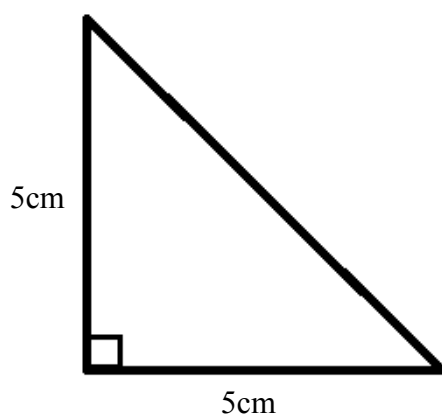
(2 marks)

14 A boat goes from *X* to *Y*.
The diagram shows the position of *X* and *Y*.
The diagram is drawn to scale.

Scale: 1 cm represents 50 km
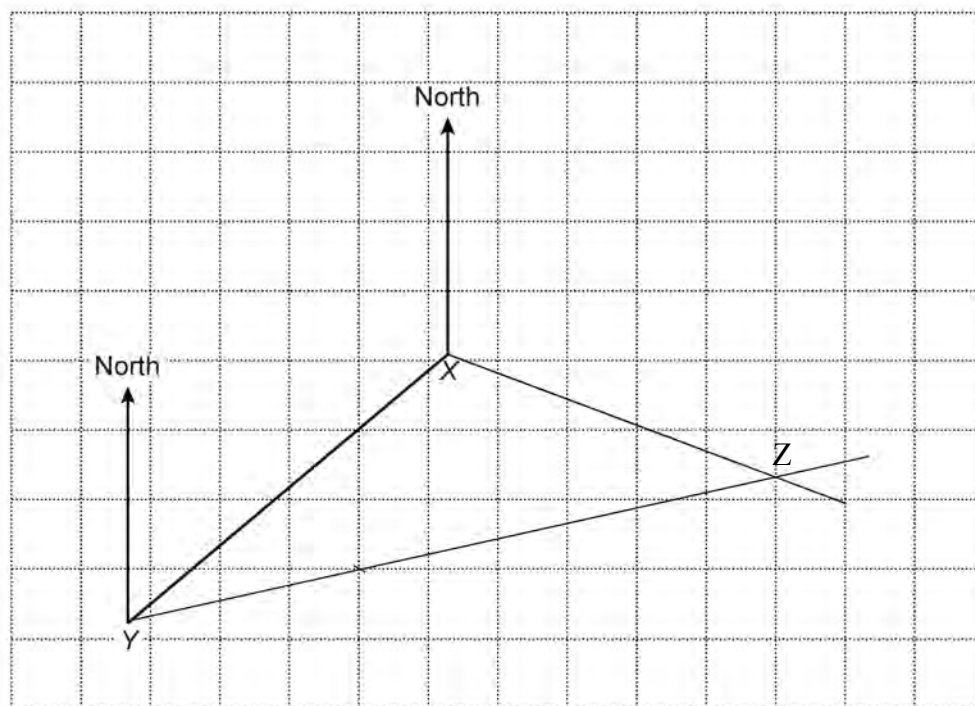
14 (a) (i) Use the diagram to find the actual distance from *X* to *Y*.

Answer ....300... km   *(1 mark)*

14 (a) (ii) Measure and write down the three figure bearing of *Y* from *X*.

Answer ....230... °   *(1 mark)*

14 (b) The boat then goes to *Z*.
The bearing of *Z* from *X* is 110°
The bearing of *Z* from *Y* is 080°

Mark the position of *Z* on the diagram.

(3 marks)

In the style of

AQA

General Certificate of Secondary Education
Higher Tier

Mathematics

Past Paper Type Questions by Topic

43602H

Circle Theorems
Model Answers

H

For this paper you must have:
- a calculator
- mathematical instruments.

Time allowed
- 1 hour

Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book.

Information
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- The maximum mark for this paper is.
- The quality of your written communication is specifically assessed in some questions. These questions are indicated with an asterisk (*)
- You may ask for more answer paper and graph paper. These must be tagged securely to this answer booklet.

Advice
- In all calculations, show clearly how you work out your answer.

by Peter Bland

1 (a) *WXYZ* are points on the circumference of a circle centre *O*.
   Angle *ZWY* = 37°
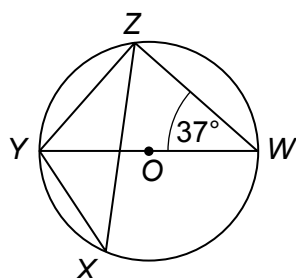
Not drawn
accurately

Write down the value of

1 (a) (i) Angle *ZXY*

Answer ....37... degrees   *(1 mark)*

$\angle YZW = 90°$

1 (a) (ii) Angle *WYZ*

$\angle WYZ = 180° - 90° - 37°$

Answer ....53... degrees   *(1 mark)*

1 (b)   In the diagram below *RST* and *RUV* are tangents to the circle centre *O*, radius 6 cm.

The distance *RS* = 14 cm.
W is the point where *RO* meets
the circumference.
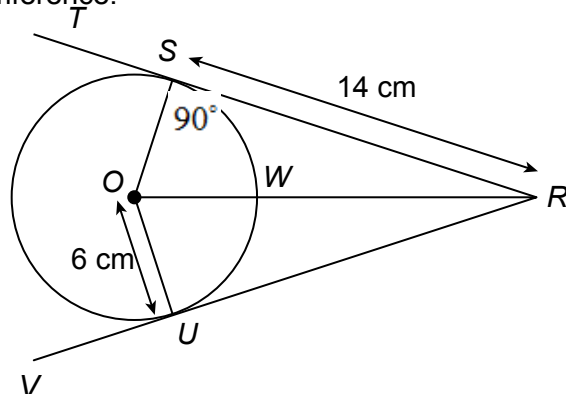
Not drawn
accurately

Work out the distance *RW*.

Pythagoras
$RO^2 = RS^2 + SO^2$

$= 14^2 + 6^2$

$= 196 + 36$

$= 232$

$RO = \sqrt{232}$

$= 15.2$

$RW = 15.2 - 6$

$= 9.2$

Answer ....9.2....................................... cm   *(4 marks)*

2 O is the centre of the circle. Angle $ACD = 134°$

Not drawn accurately
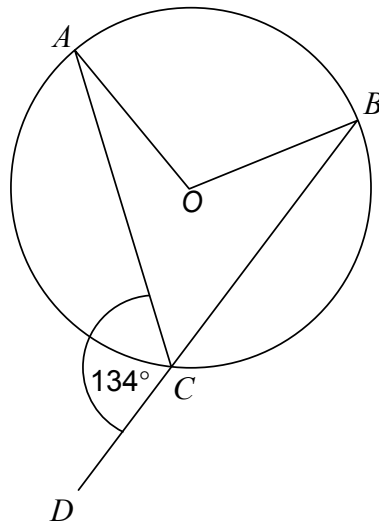
Work out the size of the reflex angle

AOB. You **must** show your working.

$$\angle ACB = 180 - 134 \text{ (The angle of a straight line is } 180°)$$
$$= 46$$
$$\angle AOB = 46 \times 2 \text{ (The angle subtended at the centre of a}$$
$$\text{circle is twice the angle subtended at}$$
$$\text{the circumference)}$$
$$= 92°$$

The reflex angle AOB is $360 - 92$

Answer ....268.. degrees *(3 marks)*

3   *WXYZ* is a cyclic quadrilateral within a circle centre *O*.

AB is the tangent to the circle at *W*.

YZZ is parallel to *XWX*.

Angle *XWZ* = 75°

Angle *YXZ* = 38°

Not drawn accurately

3 (a)   Give a reason why angle *XYZ* = 105°

The opposite angles in a cyclic quadrilateral add up to 180 degrees.

$180 - 75 = 105$

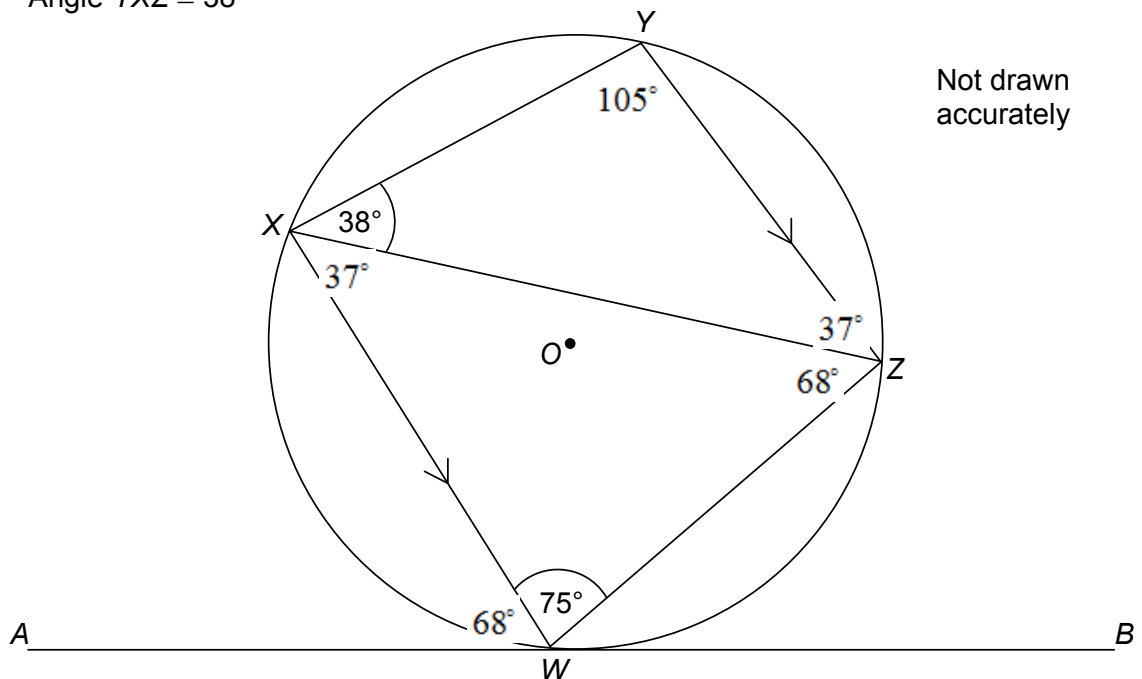*(1 mark)*

3 (b)   Work out the value of angle *XWA*

$\angle YZX = 180 - 38 - 105$ (Angles in a triangle add up to 180°)

$\qquad = 37°$

$\angle ZXW = 37°$ (Alternate angles)

$\angle XZW = 180 - 37 - 38 - 37$ (Opposite angles in a cyclic

$\qquad\qquad\qquad\qquad\qquad$ quadrilateral add up to 180°)

$\qquad = 68°$

$\angle XWA = 68°$ (The angle between a tangent and a chord

$\qquad\qquad$ through the point of contact is equal to

$\qquad\qquad$ the angle subtended by the chord in the

$\qquad\qquad$ alternate segment)

Answer ...68... degrees *(3 marks)*

4 (a) Here is a circle with centre *O*.
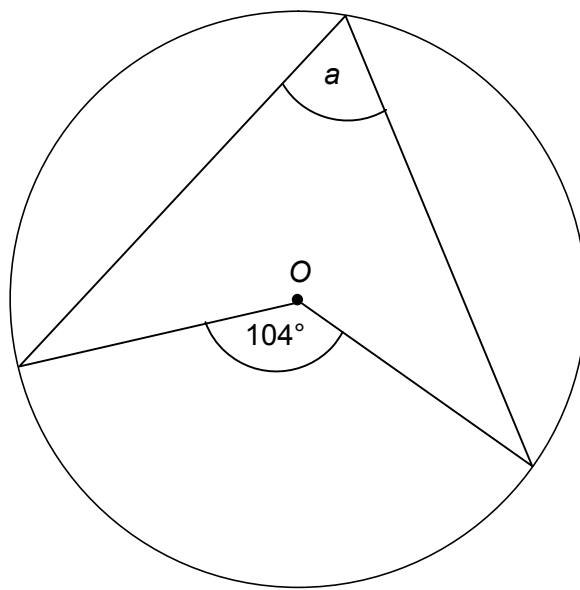
Not drawn
accurately

Write down the value of *a*.

$104 \div 2 = 52$

Answer ......52.. degrees *(1 mark)*

4 (b) Here is a different circle.
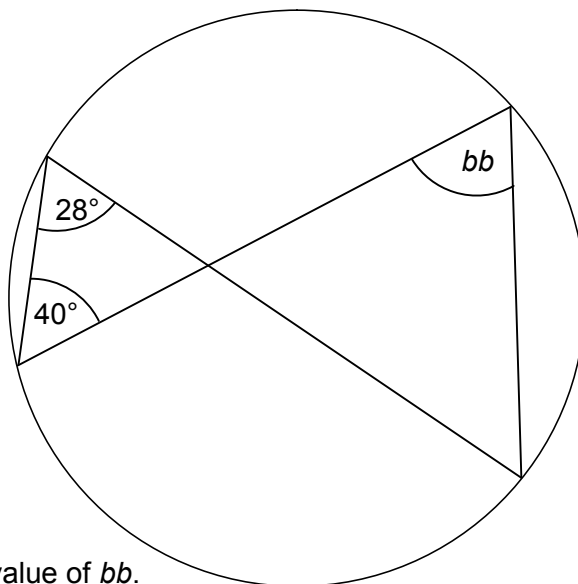
Not drawn
accurately

Write down the value of *bb*.

....

Answer ....28.. degrees *(1 mark)*

5   *WXYZ* is a cyclic quadrilateral within a circle centre *O*. *AB*
     is the tangent to the circle at *W*.
     Angle *AWX* = 58°
     Angle *XWZ* = 78°
     Angle *ZXY* = 34°
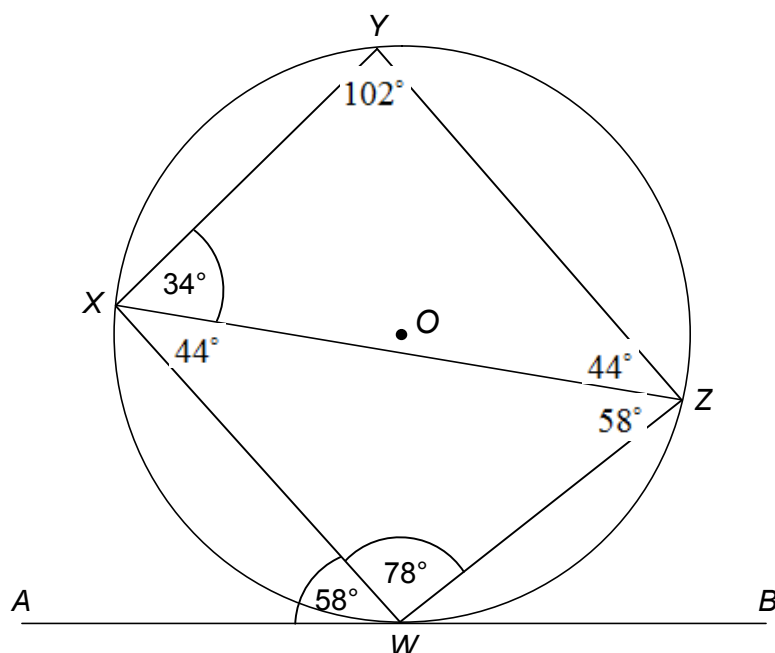
Not drawn
accurately

Prove that XW is parallel to *YZ*.

$\angle XYZ = 180 - 78$ (Opposite angles add up to 180°)

$\quad\quad = 102°$

$\angle YZX = 180 - 34 - 102$ (Angles in a triangle add up to 180°)

$\angle XZW = 58°$ (Alternate segment)

$\angle ZXW = 180 - 78 - 58$ (Angles in a triangle add up to 180°)

$\quad\quad = 44°$

$\angle YZX = \angle ZXW$ Alternate angles so *YZ* and *XW* are parallel

(5 marks)

6 *RSTU* are points on the circumference of a circle.
The line *TU* is extended to *V*.
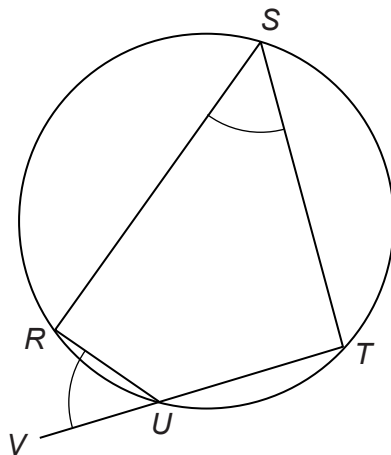
Not drawn
accurately

Prove that ∠*RST* = ∠*RUV*

$\angle RST + \angle RUT = 180°$

$\angle RST = 180° - \angle RUT$ (Opposite angles add up to $180°$)

$\angle RUV + \angle RUT = 180°$ (Angles on a straight line)

$\angle RUV = 180° - \angle RUT$

$\therefore \angle RUV = \angle RST$

(3 marks)

7 (a)   *A*, *B* and *C* are points on the circumference of a circle, centre *O*.
AC is a diameter of the circle.
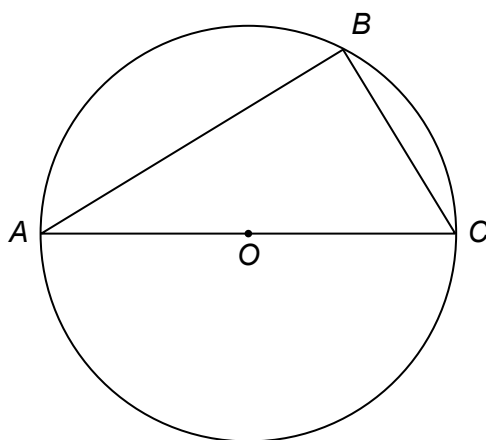
Not drawn accurately

Write down the size of angle *ABC*.

Answer ....90.. degrees   *(1 mark)*

7 (b)   *D* is also a point on the circumference of the circle in part (a).
Angle *BDC* = 27°
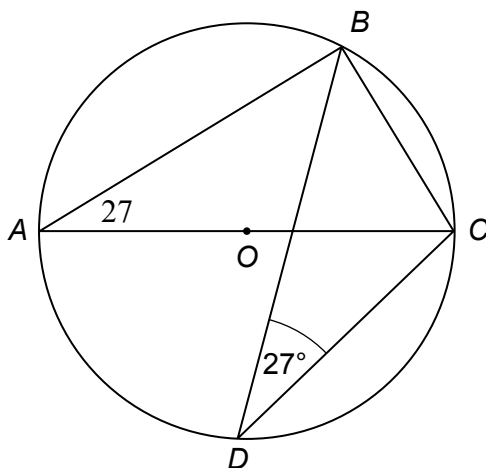
Not drawn accurately

7 (b)   (i)   Write down the size of angle *CAB*.

Answer ....27.................................... degrees   *(1 mark)*

7 (b)   (ii)   Work out the size of angle *ACB*.

$$180 - 27 - 90$$

Answer ....63.................................... degrees   *(1 mark)*

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7 (c) *D* is another point on the circumference of the circle in part (a).
BD is a diameter of the circle.
Angle *ACD* = 38°
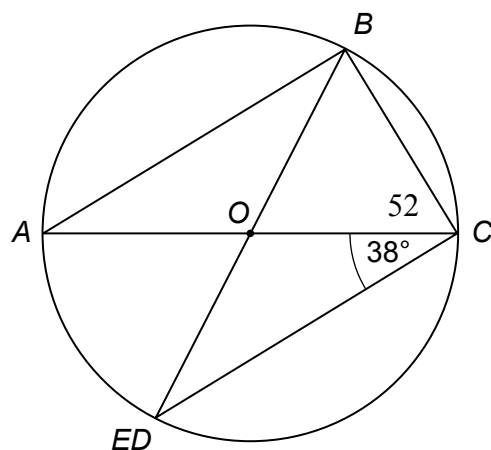
Not drawn accurately

Work out the size of angle *DBC*.

$$90 - 38$$

Answer ....52... degrees   *(1 mark)*

8 In the diagram, *RSTU* is a cyclic quadrilateral and *VRY* is a tangent to the circle at *R*.

Angle *UTS* = 105° and angle *SRY* = 63°.

V

T U

105° 63

75 R

63°

S

Y
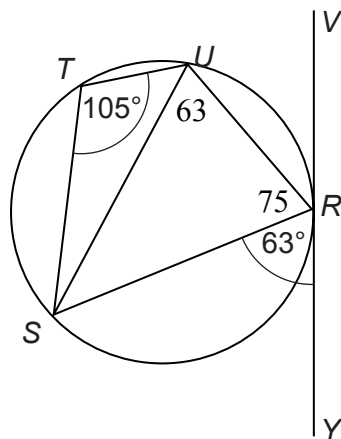
Not drawn accurately

8 (a) Work out the size of angle *URS*.
Give a reason for your answer.

$$180 - 105$$

Answer ....75.. degrees   *(1 mark)*

Reason ...Opposite.angles.add.up.to.180.degrees........   *(1 mark)*

8 (b) Work out the size of angle *RSU*.
You **must** show your working.

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.

Therefore angle *SUR* is 63°
$URS = 180 - 63 - 75$ (angles in a triangle add up to 180°)
   $= 42°$

Answer ....42°....................................... degrees   *(2 marks)*

9 The circle, with centre *P*, has a radius of 5 cm.
The circle, with centre *Q*, has a radius of 3 cm.
The circles touch externally.
The circles have a common tangent *CD*.
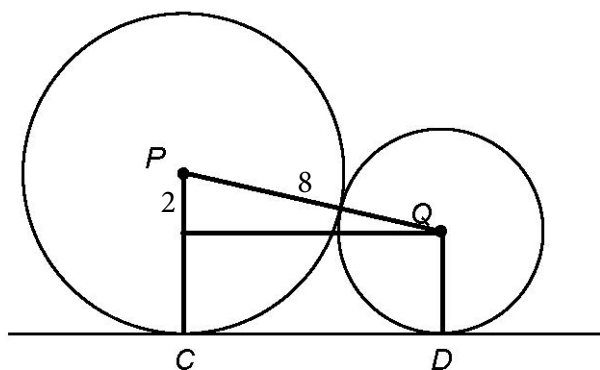
Not drawn
accurately

9 (a) Explain why *CDQP* is a trapezium.

A trapezium is a quadrilateral which has 2 parallel sides

(2 marks)

9 (b) Show that *CD* = 7.75 cm to 3 significant figures.

Pythagoras

$$CD^2 = 8^2 - 2^2$$
$$= 64 - 4$$
$$CD = \sqrt{60}$$
$$= 7.745967$$

7.75 to 3 significant figures

(3 marks)

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Surname

Other Names

Candidate Signature

In the style of

AQA

General Certificate of Secondary Education
Higher Tier

Mathematics   **43601H**

Past Paper Questions by Topic

H

Cumulative Frequency
Model Answers

For this paper you must have:
- mathematical instruments.

You must **not** use a calculator.

Time allowed
- 1 hour 15 minutes

Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is.
- The quality of your written communication is specifically assessed in questions indicated with an asterisk (*)
- You may ask for more answer paper and graph paper. These must be tagged securely to this answer booklet.

Advice
- In all calculations, show clearly how you work out your answer.

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

1 (a)   Group A start running.
              The graph shows information about their weight loss after one month.
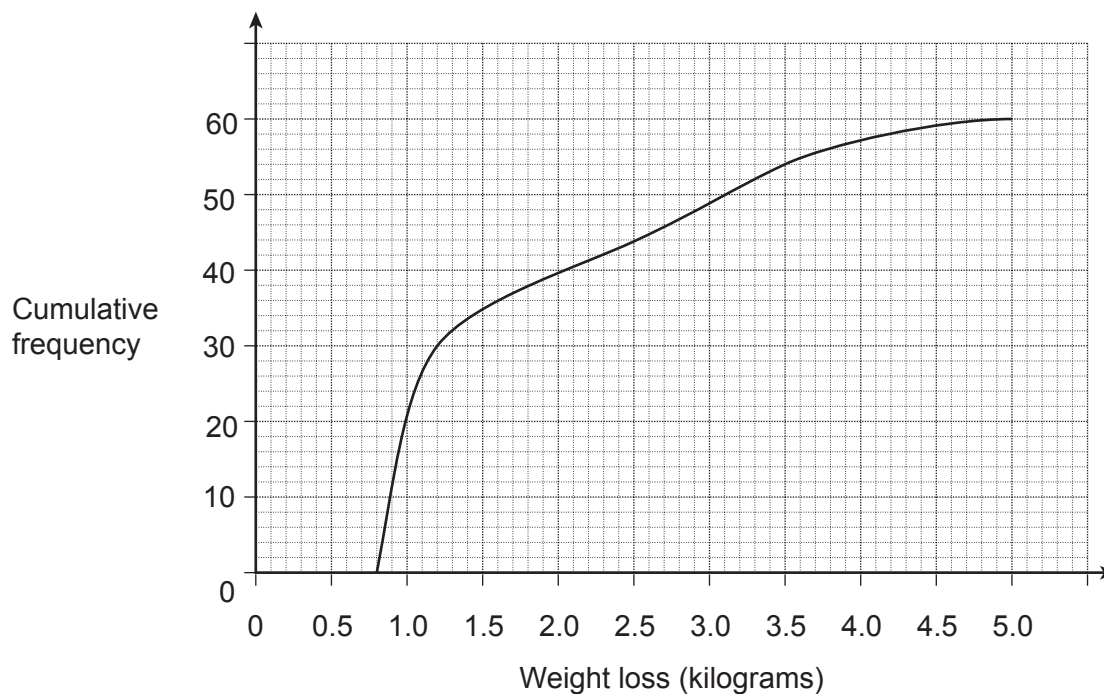
1 (a) (i)   How many people are in group A?

              Answer ....60...   *(1 mark)*

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

              Everyone loses weight. The graph shows the least weight loss as 0.8.

                                                                              (1 mark)

1 (b)   Group B start swimming.
The box plot shows information about their weight loss after one month.

Weight loss (kilograms)
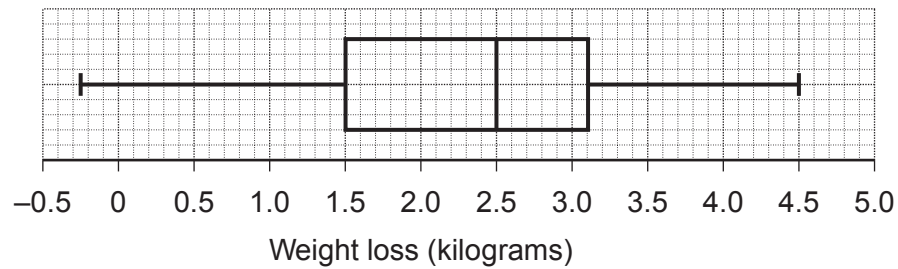
Does everyone in group B lose weight?
Write down how you decide.

No, the lowest weight loss shown as -0.25 is a weight gain.

(1 mark)

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

The median weight loss for group A was 1.2 and the median for group B was 2.5
so there was a difference of 1.3 so B has a greater success rate.

The interquartile range of group A is 1.65. The interquartile range for group B
is 1.6 so the two groups have almost the same spread of weight loss.

The range for group A is 4.2 and the range for group B is 4.75 so the results
are more variable.

(5 marks)

2   The table shows a summary of the scores of 120 children in an examination.

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

2 (a)   Three-quarters of the children pass the test.

Use a cumulative frequency graph to estimate the pass mark.

Cumulative frequency
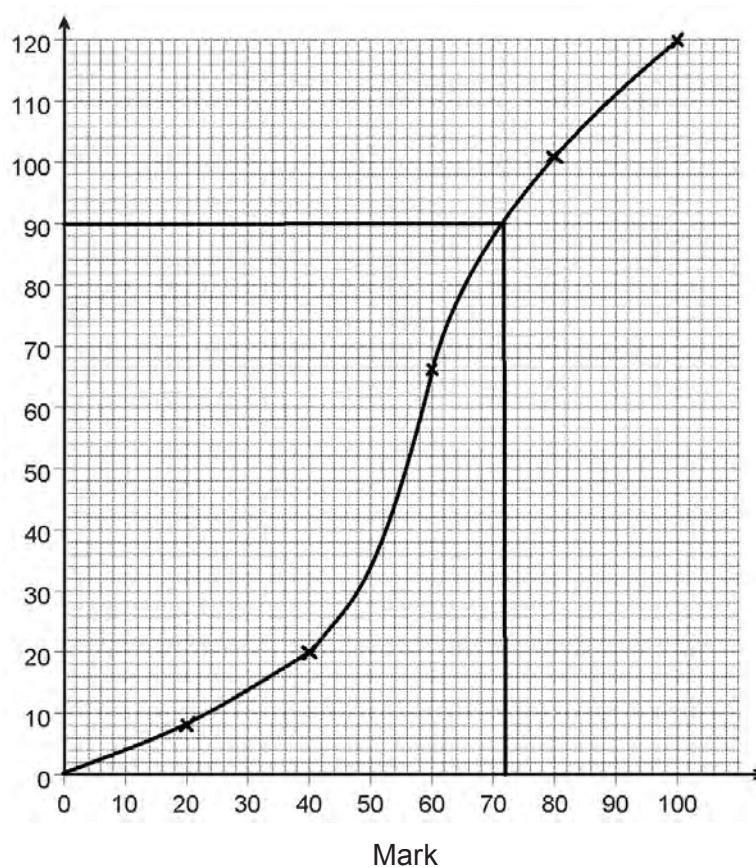
Mark

Answer ......72..   *(5 marks)*

2 (b)   Here is the table again.

Score	Frequency
$0 < $ mark $\leqslant 20$	8
$20 < $ mark $\leqslant 40$	12
$40 < $ mark $\leqslant 60$	46
$60 < $ mark $\leqslant 80$	35
$80 < $ mark $\leqslant 100$	19

Two of these 120 children are chosen at random.

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

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

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

$$p(\text{Both score over } 60) = \frac{54}{120} \times \frac{53}{119}$$

$$= \frac{477}{2380} \text{ or } 0.2004$$

Answer ....0.2004.. *(2 marks)*

2(b) (ii)   Work out the probability that one scored **over** 80 and the other scored 80 or **under**.

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

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

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

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

$$\left(\frac{19}{120} \times \frac{101}{119} \right) + \left(\frac{19}{119} \times \frac{101}{120} \right) = \frac{1919}{7140} \text{ or } 0.269$$

Answer ...0.269... *(3 marks)*

3 Helen bought 60 cucumber plants and split them into two identical batches of 30 plants.
The **first** batch of 30 plants was allowed to grow naturally.
Helen measured the increase in their heights six weeks later.
The results for the **first** batch are shown on this cumulative frequency
graph.
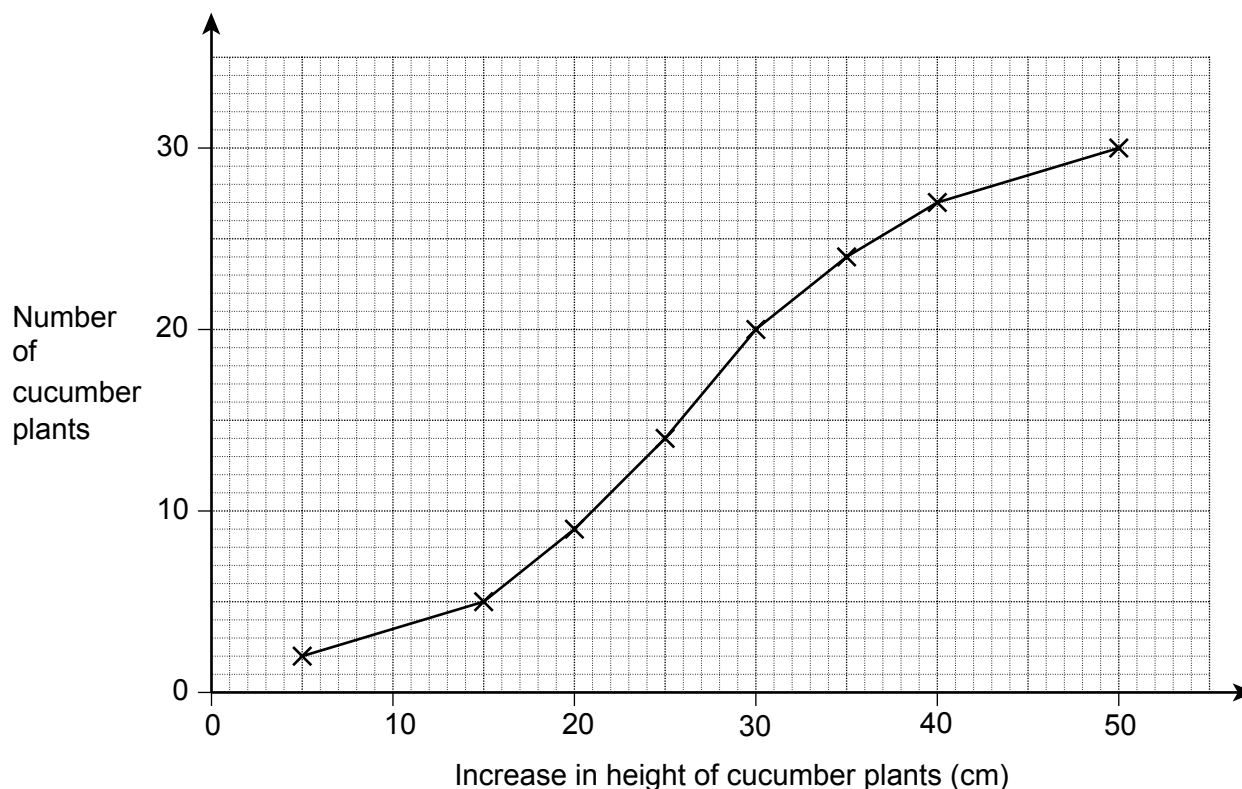
3 (a) How many cucumber plants from the **first** batch have increased in height by more
than 31 cm?

30 - 21

Answer ....9... *(2 marks)*

3 (b) The smallest increase in height was 5 cm.
On the graph paper at the top of the next page, draw a box plot from
the cumulative frequency diagram for the **first** batch of cucumber plants.
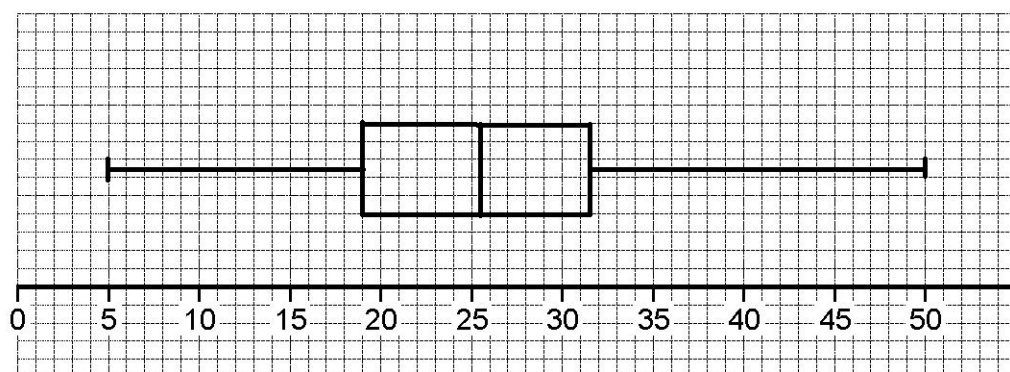
(3 marks)

The **second** batch of 30 cucumber plants was treated with *Speedygrow*.

This box plot shows the results of the **second** batch when Helen measured the increase in their heights six weeks later.
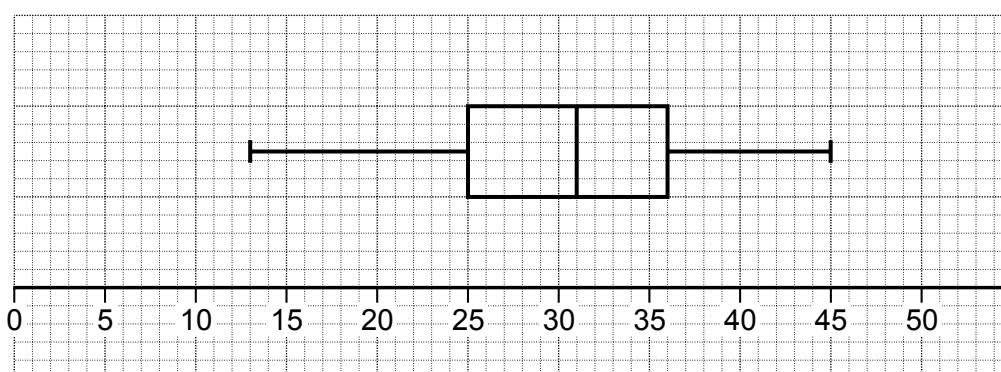
3 (c) The label on the packet of *Speedygrow* says

| Use *Speedygrow* for consistent results. Make your plants bigger. |

Give **two** reasons to support the claims on the packet.

Reason 1

In the first batch the median is 26 and the second batch has a median of 31.

Reason 2

The first batch has an interquartile range of 15 and the second batch has 11.
This shows less spread so more consistent results.

(2 marks)

4   In a factory two machines, A and B, fill bottles with juice.
Each bottle should contain 500 millilitres of juice.

4 (a)   Here is some information about the amount of juice contained in a sample of bottles from machine A.

Minimum	Lower quartile	Median	Upper quartile	Maximum
496 ml	502 ml	508 ml	510 ml	514 ml

4 (a) (i) Draw a box plot to represent this information.

Amount of juice (millilitres)
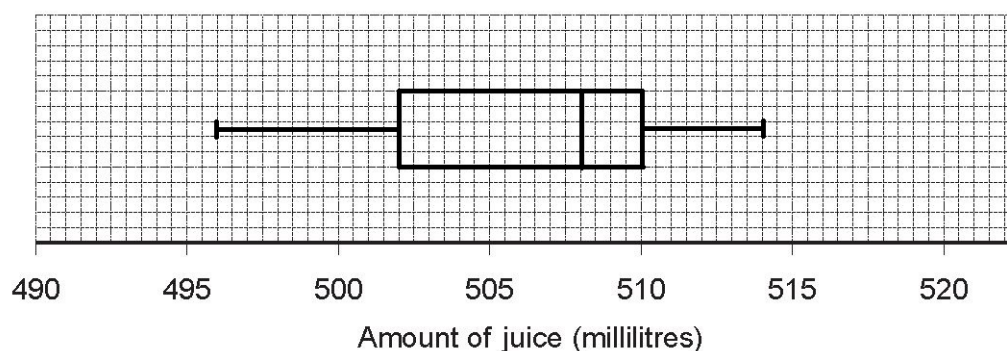
(2 marks)

4 (a) (ii) The box plot shows information about a sample of bottles from machine B.

Amount of juice (millilitres)

Derek wants to replace one of the machines. Which machine should he replace?
Tick a box   ☑ machine A   ☐ machine B

Give **two** reasons for your answer.

Reason 1

The median is 508 in machine A and it is 506in machine B. Machine A is using more juice.

Reason 2

The interquartile range for machine A is 8 and for machine B it is 4.5. Machine A produces a greater spread so is less consistant.

(2 marks)

4 (b) The contents of the sample bottles are given to the nearest millilitre.

Work out the greatest possible difference between the contents of two of the sample bottles from machine A.

maximum sample is 514.5
minimum sample is 495.5

Answer ....19... ml   *(2 marks)*

4 (c) The factory buys two more machines, C and D.
The four machines fill a total of 6000 bottles each day.

A sample, stratified by the number of bottles filled per day, is taken.
Some information about the sample is given in the table.

Machine	A	B	C	D
Number of bottles per day	1550	1200	1450	1800
Number in sample	31	24	29	36

Complete the table.

From A $1550 \div 31 = 50$
For B $24 \times 50 = 1200$
For C $6000 - 1550 - 1200 - 1800 = 1450$
$\qquad 1450 \div 50 = 29$
For D $1800 \div 50 = 36$

(4 marks)

5 The cumulative frequency diagram shows the waiting times for 120 learner drivers wanting to take their practical driving test.
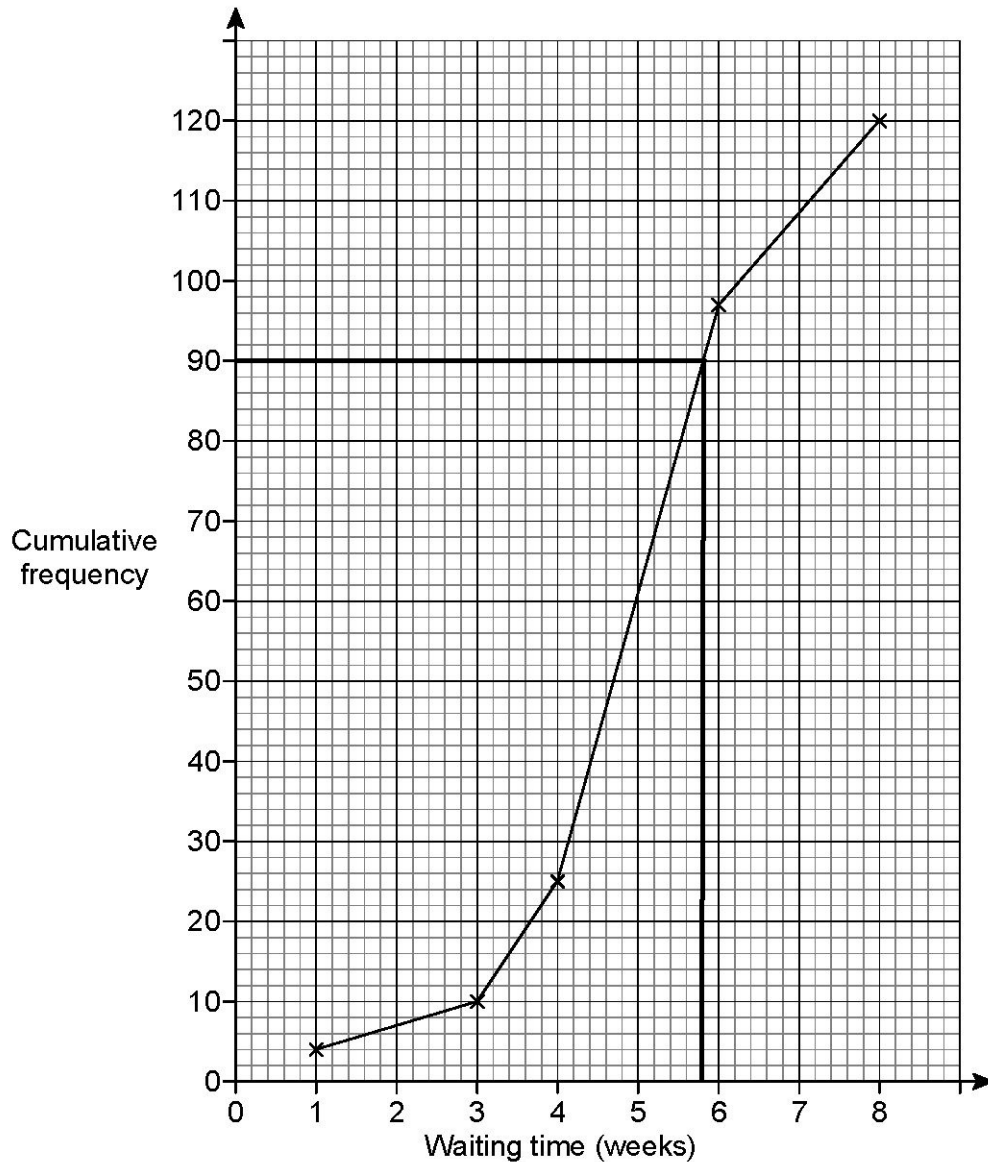
5 (a) The test centre claims that 75% of learners wait less than 40 days for the test.

Comment on this claim.

Each week is 7 days, so the first 5 weeks are 35 days.

On the last week each small square is $\dfrac{7}{5}$ days. There

are 4 small squares which are $4 \times \dfrac{7}{5} = 5.6$

$$35 + 5.6 = 40.6$$

The claim is false as they have to wait 40.6 days, which is over 40.

5 (b)   The least waiting time was 1 week.
The range of waiting times was 7 weeks.

Use this information and the cumulative frequency diagram to draw a box plot for the waiting times
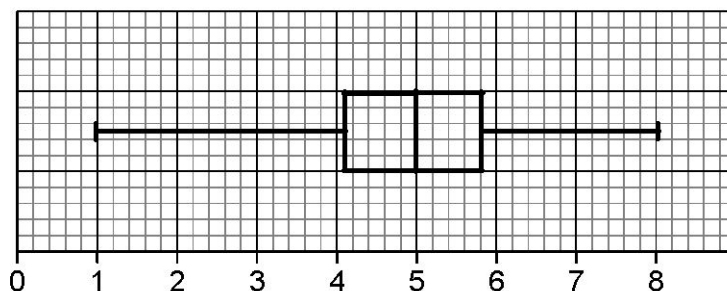
(3 marks)

5 (c)   At a different test centre 746 took the driving test. This table shows the age and gender of the patients.

	Age		
	Under 18	**18 – 65**	**Over 65**
Male	84	3	50
Female	39	1	37

Sheila wants the test centre to take a stratified sample of 80 patients.

Complete the table below to show how many people from each group should be sampled.

	Age		
	Under 18	**18 – 65**	**Over 65**
Male	9	37	5
Female	4	21	4

$80 \div 746$ multiplied by the values in the table.

(3 marks)

6 The box plot shows the number of fish caught by forty anglers in a fishing match.
Two anglers caught the lowest number of 3

Number of fish

Number of fish

Cumulative frequency
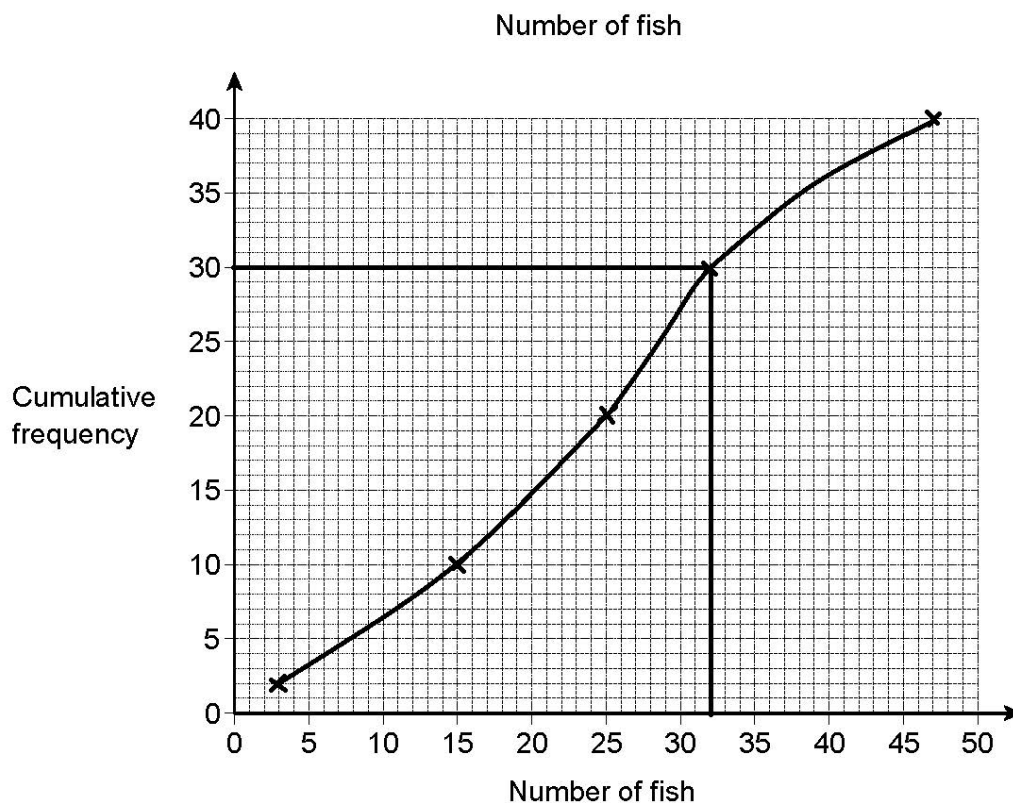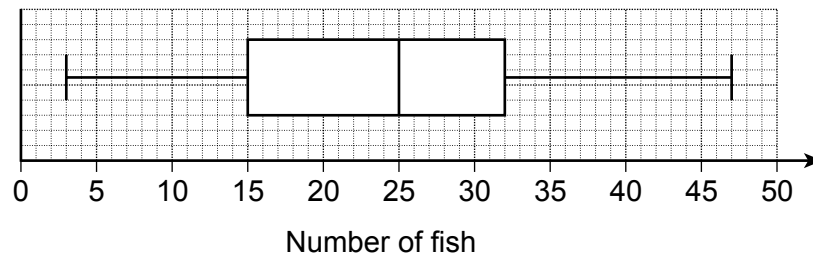
Number of fish

6 (a) Use the box plot to draw a cumulative frequency diagram for the numbers of fish the forty anglers caught.

(3 marks)

6 (b) What is the probability that an angler picked at random from the match caught more than 32 fish?

From 30 to 40 is $\frac{1}{4}$ of the values.

Answer ......0.25... *(1 mark)*

Surname

Other Names

Candidate Signature

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General Certificate of Secondary Education
Foundation Tier

Mathematics 43602F

Past Paper Type Questions by Topic

Fractions, Decimals and Percentages
Model Answers

F

For this paper you must have:
- a calculator
- mathematical instruments.

Time allowed
- 1 hour

Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is.
- The quality of your written communication is specifically assessed in some questions. These questions are indicated with an asterisk (*)
- You may ask for more answer paper and graph paper. These must be tagged securely to this answer booklet.

Advice
- In all calculations, show clearly how you work out your answer.

by Peter Bland

1. Terry owns a business that makes £3000 per month.

His profits rise by 6%.

Work out how much he now makes.

$$3000 \times 1.06 = 3180$$

Answer ....**£3180**..

(3)

2(a)   David wins a race.

His time is recorded as 50.36 seconds. Ron

comes second in the race.

His time is three-hundredths of a second

slower.

Work out Ron's time.

$50.36 + 0.03 = 50.39$

Answer   .....50.39 seconds.........................

(2 marks)

2(b)   Round David's time of 50.36 seconds to 1 decimal place.

Answer   ...50.4...seconds...........................

(1 mark)

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

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

....

(1 mark)

3 (b) $0.9 = \dfrac{\boxed{9}}{10}$

....

(1 mark)

3 (c) $\dfrac{1}{3} = \dfrac{\boxed{2}}{6}$

....

(1 mark)

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

....

(1 mark)

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

Lancashire Bank	**Cheshire Bank**
4% of the total that you invest For example: Invest £700 Interest = 4% of £700	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

Tara has £500 to invest for one year.

Work out which bank will pay her more interest. State how
much **extra** interest she will earn.

Lancashire Bank   **Cheshire Bank**
$500 \times 1.04 = 520$ $300 \times 1.01 = 303$
                                 $200 \times 1.06 = 212$
                                            Total 515

$$520 - 515 = 5$$

Bank Lancashire.....................

Extra Interest £5....................

(5 marks)

5   There are 160 people on
a plane. 20% are children.
One-half are men.
The rest are women.

How many women are on the plane?

Children

$160 \times 0.2 = 32$

Men

$160 \times 0.5 = 80$

Women

$160 - 32 - 80 = 48$

Answer   ...48..

(4 marks)

6 (a) Shade $\dfrac{7}{25}$ of this square grid.
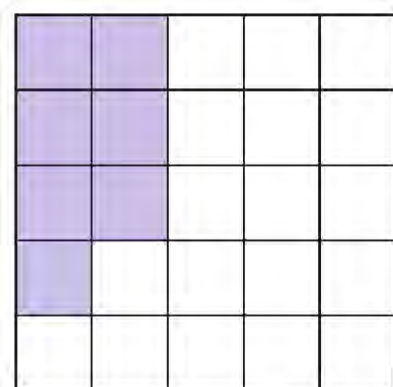
(1 mark)

6 (b) Shade $\dfrac{3}{5}$ of this square grid.
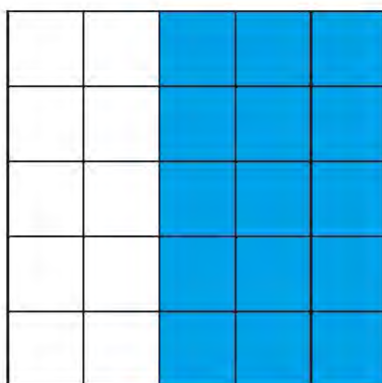
(1 mark)

6 (c) Use your answers to part (a) and part (b) to write down the answer to $\dfrac{3}{5} - \dfrac{7}{25}$

Answer ..... $\dfrac{8}{25}$ ....

(1 mark)

6 (d) Work out $\dfrac{2}{3}$ of 27

$$\frac{2}{3} \times \frac{27}{1} = 18$$

Answer......18.................................

(2 marks)

∗6 (a)   Here are five numbers.

$$3 \qquad 13 \qquad 20 \qquad 43 \qquad 81$$

Make a fraction with a value between 3 and 4.

Use one of the numbers for the numerator and one of the numbers for the denominator.

Answer ..... $\dfrac{43}{13}$ ....…………..………....………

(2 marks)

6 (b)   Which is bigger $\dfrac{13}{3}$ or $\dfrac{81}{20}$?

You **must** show your working.

$$3 \overline{\smash{\big)}\,13.00} \quad \overset{4.33}{} \qquad 20 \overline{\smash{\big)}\,81.00} \quad \overset{4.05}{}$$

Answer ..... $\dfrac{13}{3}$ ....…………..………....………

(3 marks)

7 (a)   Work out $\dfrac{1}{4} + \dfrac{1}{3}$

You may use this grid to help you.
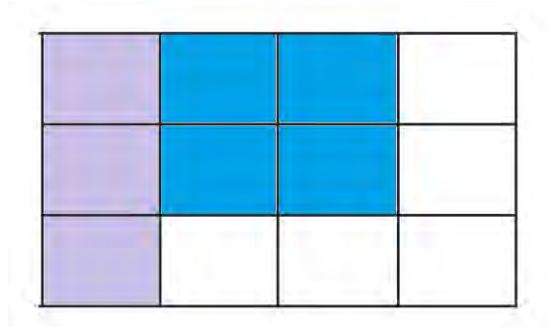
Answer .... $\dfrac{7}{12}$ ....………...………....………

(2 marks)

7 (b)   There are 24 people in a bus.

One-third of them are men who wear glasses.

One-quarter of them are women.

How many men do not wear glasses?

Men with glasses

$24 \div 3 = 8$

Women

$24 \div 4 = 6$

Men without glasses

$24 - 8 - 6 = 10$

Answer ......10...................………...………....………

(2 marks)

✳**8**   Helen is going on holiday to Spain.

8 (a)   She changes £2000 into Euros.
        The exchange rate is   £1 = 1.17 Euros

        How many Euros does she receive?

$$2000 \times 1.17 = 2340$$

            Answer   ......2340... Euros *(2 marks)*

8 (b)   In Spain, she changes an extra £100 into Euros.
        The exchange rate is 1 Euro = £0.80 How many

        Euros does she receive?

$$100 \div 0.80 = 125$$

            Answer   .....125... Euros *(2 marks)*

8 (c)   Helen is on holiday for one week.
        She wants to hire a car for **at least** 5 days.
        Three car hire firms advertise their charges.

	Fixed amount (Euros)	Additional cost per day (Euros)
Eurodrive	100	14
Coolcar	60	20
Zedcars	0	35

        Work out the cheapest firm for Helen for different numbers of days of car

        hire. Show full details of your working and conclusions.

Eurodrive   Coolcar   Zedcars

5 days $100 + (5 \times 14) = 170$ 5 days $60 + (5 \times 20) = 160$ 5 days $5 \times 35 = 175$

          6 days $170 + 14 = 184$ 6 days $160 + 20 = 180$ 6 days $175 + 35 = 210$

          7 days $184 + 14 = 198$ 7 days $180 + 20 = 200$ 7 days $210 + 35 = 245$

    Coolcar is cheapest for 5 and 6 days. Eurodrive is cheapest for 7 days.

                                                            (6 marks)

9 Work out $8^2 \div 4^3 = (8 \times 8) \div (4 \times 4 \times 4)$

$$= 64 \div 64$$

$$= 1$$

Answer ....1.. *(2 marks)*

10 You are given that $32.7 \times 26 = 850.2$

10 (a) Write down the value of 327×26

Answer ....8502.. *(1 mark)*

10 (b) Write down the value of $85.02 \div 26$

Answer ....3.27.. *(1 mark)*

10 (c) Work out the value of 32.7×27

$$850.2+$$
$$32.7$$
$$882.9$$

Answer ....882.9.. *(2 marks)*

11 Two adults and 18 children go to the circus.
The cost of a child ticket is half of the cost of an adult ticket. The total cost of the tickets is £132.

Work out the cost of one child ticket.

An adult ticket is equivalent to 2 child tickets.

2 adult tickets are like 4 child tickets.

$18 + 4 = 22$

$132 \div 22 = 6$

Answer £ ...6.. *(3 marks)*

12 What fraction is half way between $\frac{1}{4}$ and $\frac{1}{8}$?

Give your answer as a fraction in its simplest form.

$$\frac{1}{4} + \frac{1}{8} = \frac{2+1}{8}$$

$$= \frac{3}{8}$$

To find the half way position, divide by 2.

$$\frac{3}{8} \div \frac{2}{1} = \frac{3}{8} \times \frac{1}{2}$$

$$= \frac{3}{16}$$

Answer ... $\frac{3}{16}$ .... *(3 marks)*

13 Divide £600 in the ratio 9 : 6 : 5

$9 + 6 + 5 = 20$

There are 20 shares.

$600 \div 20 = 30$, so 1 share is £30

$9 \times 30 = 270$

$6 \times 30 = 180$

$5 \times 30 = 150$

Answer £ ...270............ : £ ...180............ : £ ...150............ *(3 marks)*

*14   Sophie sells jars of honey in her shop.
She has 80 jars to sell at £3 each.
She sells 50 jars and then reduces the price by 40%. Sophie
then sells the remaining jars at the reduced price.

It costs her £95 to get the jars of honey.
Her target is to make a profit of at least £100.

Does she meet her target?
You **must** show your working.

50 jars are sold at £3 each

$50 \times 3 = 150$

The price is reduced by 40% so the new price is 60% of the old one.

$3 \times 0.6 = 1.80$

The 30 jars left sell at £1.80.

$30 \times 1.8 = £54$

The takings

$150 + 54 = 204$

To find the profit, subtract the original cost of the honey.

$204 - 95 = 109$

Sophie does meet her target as she made more than £100 profit.

(5 marks)

15 (a) (i) Write $\frac{1}{4}$ as a percentage.

Answer ....25................................ % *(1 mark)*

15 (a) (ii) Write 30% as a decimal.

Answer ....0.3................................ *(1 mark)*

15 (a) (iii) Write $\frac{1}{4}$, 30% and 0.2 in order with the smallest first.

$$\frac{1}{4} = 25\%$$

$$0.2 = 20\%$$

Answer . 0.2, $\frac{1}{4}$, 30%............................ *(1 mark)*

15 (b) Complete the following.

15 (b) (i) $\frac{2}{3} = \frac{\boxed{12}}{18}$

(1 mark)

15 (b) (ii) $\frac{\boxed{3}}{4} = \frac{15}{20}$

(1 mark)

15 (c) Work out $\frac{3}{8}$ as a decimal.

$$\begin{array}{r} 0.375 \\ 8\,|\overline{3.000} \end{array}$$

Answer ....0.375................................ *(2 marks)*

16 (a) Work out the difference between

$$10\% \text{ of } 350 \quad \text{and} \quad \frac{1}{2} \text{ of } 76$$

$$35 \qquad\qquad\qquad 38$$

$$38 - 35 = 3$$

Answer ....3................……….....………....………

(3 marks)

16 (b) Write in order of size:

$$\frac{1}{4} \qquad 0.205 \qquad 0.2$$

Start with the smallest.

You **must** show your working.

$$4\,\overline{\smash{)}1.00}^{\,0.25} \qquad\qquad \frac{1}{4} = 0.25$$

Smallest .....0.2....................………....………....………

.....0.205...................................………....………

Largest .... $\frac{1}{4}$ ....………..………....………

(2 marks)

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

In the style of

AQA

General Certificate of Secondary Education
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Mathematics **43601F**

Past Paper Questions by Topic

Frequency
Model Answers

F

For this paper you must have:
- mathematical instruments.

You must **not** use a calculator.

Time allowed
- 1 hour 15 minutes

Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is.
- The quality of your written communication is specifically assessed in questions indicated with an asterisk (*)
- You may ask for more answer paper and graph paper. These must be tagged securely to this answer booklet.

Advice
- In all calculations, show clearly how you work out your answer.

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	IIII IIII II	12
Schoolmaster	IIII IIII	9
Total		28

(3)

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

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

(2)

.... $\frac{1}{7}$ ....

1 (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

He 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)

1 (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?

$$\frac{500\ 000}{8\ 000\ 000} = \frac{5}{80} = \frac{1}{16}$$

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

(3)

1(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 Louis saves in January, February and April 2012.
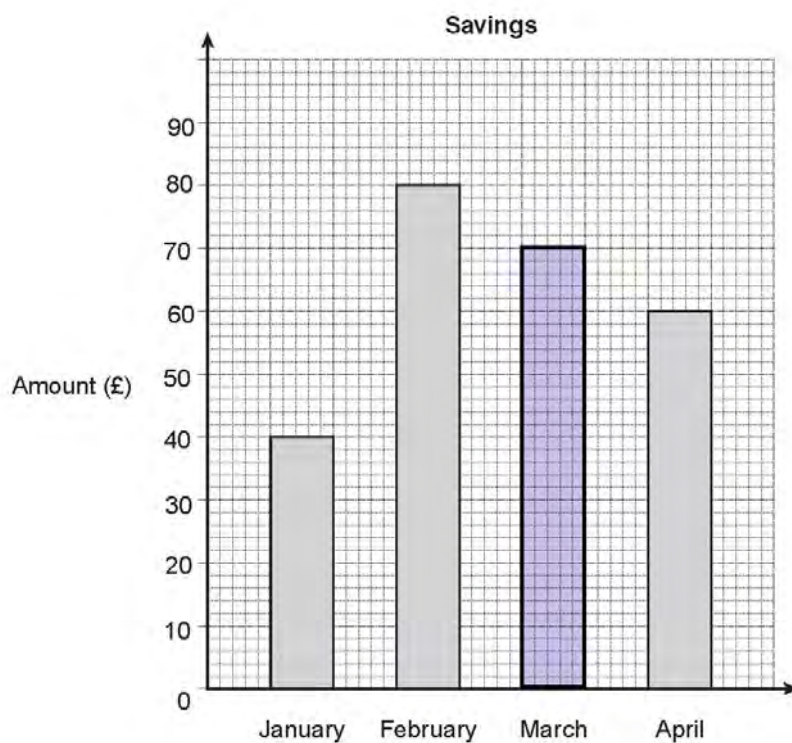
2 (a) (i)   How much does he save in January 2012?

Answer £ ......40..   *(1 mark)*

2 (a) (ii)   From January to April he saves £250 in total.

Complete the bar chart by drawing the bar for March.
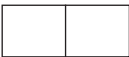
$$250 - 40 - 80 - 60 = 70$$

(3 marks)

2 (b)   The pictogram shows the amounts Louis saves in the next four months.

Key: ☐☐ represents £20

May	☐☐ ☐☐ ☐☐ ☐☐
June	☐☐ ☐☐ ☐
July	☐☐ ☐
August	☐☐ ☐☐ ☐☐ ☐

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

Range is highest value minus the lowest.
$80 - 30 = 50$

Answer £ ....50...   *(2 marks)*

2 (c) (i)   For the rest of 2012 Louis saves £50 each month.

How much does he save in 2012 in total?

From January to April he saved £250
From May to August he saved £230
From September to December he saved $4 \times 50 = £200$
Total for 2012 is $250 + 230 + 200 = 680$

Answer £ ....680...   *(3 marks)*

2 (c) (ii)   Louis spends 50% of these total savings to pay for a holiday.

How much does he pay for the holiday?

50% of 680

$= \dfrac{50}{100} \times 680$

$= 340$

Answer £ ..340...   *(2 marks)*

3   Is money discrete or continuous?
Tick a box.

☑ Discrete   ☐ Continuous

Give a reason for your answer.

Money is made up of individual number quantities that can be counted. Discrete data can be counted while continuous data is derived from measurement.

(1 mark)

*4   A company pays people to visit shops as a mystery shopper.

Peter works for this company.

His fees in September are shown.

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

4 (a)   Calculate his mean fee.

$$mean = \frac{\sum fx}{\sum f}$$

$$= \frac{424}{40}$$

Answer £ ...10.60...   *(3 marks)*

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

Give reasons and working to show how you decide.

Yes the mode is 10 as it occurs the most often. The median is the middle between the 20th and the 21st values, which is 10.

(2 marks)

4 (c) Sheila also works for this company.
Her fees in the same month are shown.
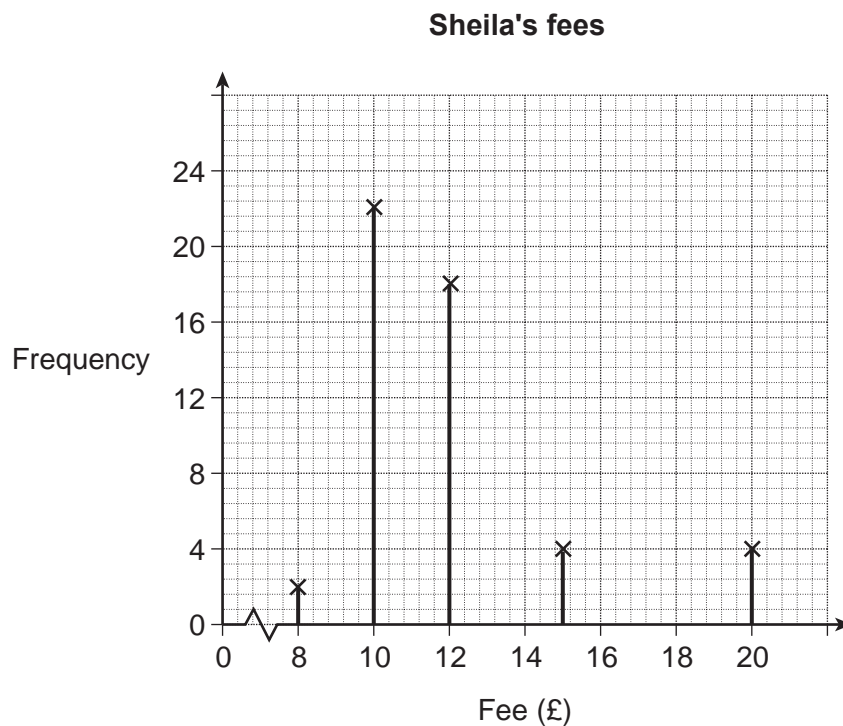
Sheila's fees

Give **one** similarity and **one** difference in the fees of Peter and Sheila.

Similarity
 They have the same range and the same mode.

Difference
 They have a different mean and a different median.

(2 marks)

5 Marie is collecting data to show how much protein and fat are in some food products. The table shows her results.

Product	Spaghetti	Potato Salad	Porridge	Creme Fraiche	Mayonnaise
Amount of protein per 100 g	1g	2g	9g	5g	1g
Amount of fat per 100 g	3g	5g	6g	1g	10g

The bar chart shows some of the information above.
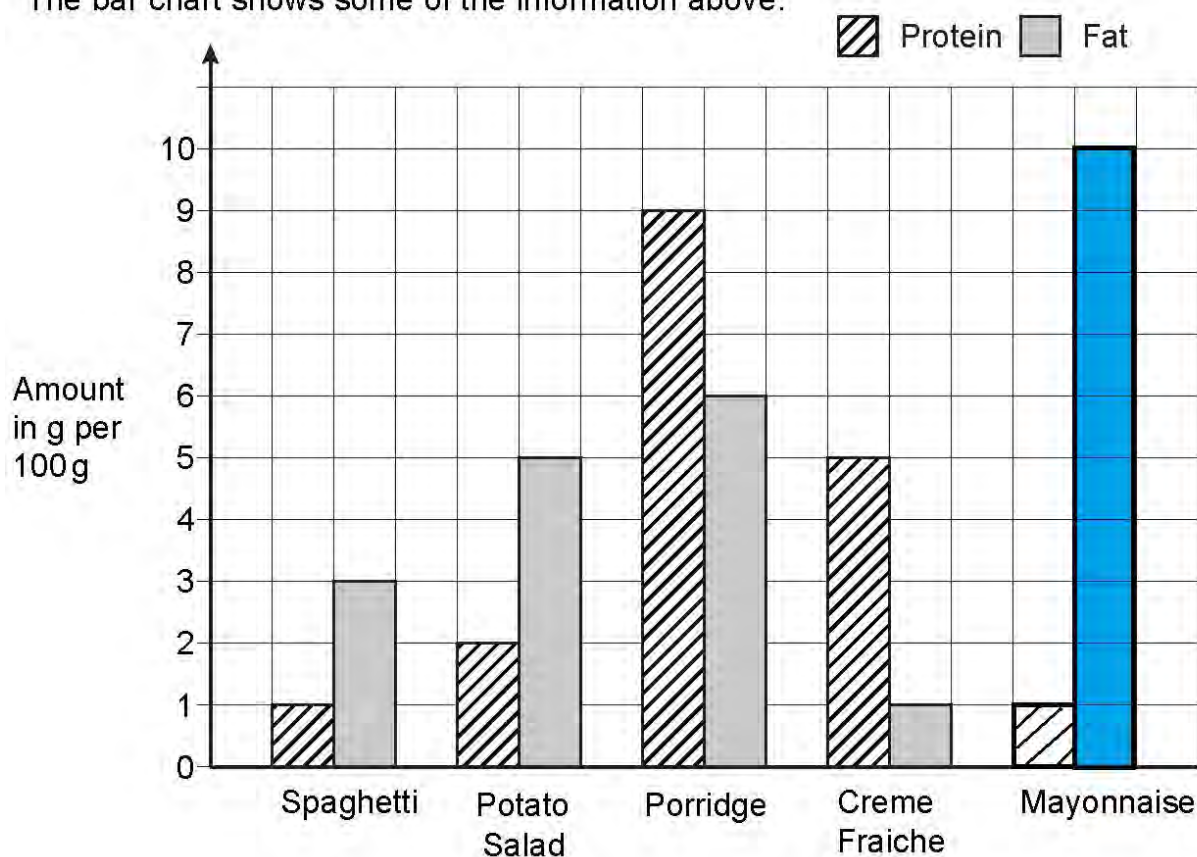
5 (a) Complete the bar chart for the Mayonnaise.

(2 marks)

5 (b) Which product has the most protein per 100 g?

Answer .....Porridge.. *(1 mark)*

5 (c) Which product has $2\frac{1}{2}$ times more fat than protein?
Explain your answer.

Potato Salad has 2 protein to 5 fat which is $1 : 2\frac{1}{2}$

(1 mark)

The table shows the weather in Birmingham each day for 40 days.

6 (a)

Weather	Tally	Frequency
Sun	ЖЖ ЖЖ	10
Rain	ЖЖ ЖЖ ЖЖ III	18
Snow	IIII	4
Fog	ЖЖ III	8
		Total = 40

Complete the table.

(2 marks)

6 (b)

What fraction of the 40 days are sunny?
Give your answer in its simplest form.

$$\frac{10}{40}$$

6 (c)

Answer ....$\frac{1}{4}$... *(2 marks)*

In Glasgow for the 40 days

- 16 days are sunny
- 50% of the days have rain
- there is no snow.

6 (c) (i) Complete the table for Glasgow.

Weather	Frequency
Sun	16
Rain	20
Snow	0
Fog	4
Total = 40	

(3 marks)

6 (c) (ii) One of the 40 days in Glasgow is chosen at random. Use a suitable probability **word** to complete the sentences.

The chance of choosing a day with snow is......very unlikely...................................

The chance of choosing a day with rain is ....evens.......................................

(2 marks)

* 7   David takes four Mathematics tests.
         The pictogram shows his scores.

Algebra	◯ ◯ ◯
Geometry	◯ ◯ ◗
Arithmetic	◯ ◯ ◯ ◯ ◗
Statistics	◯ ◯

7 (a)   David scores 60% in Algebra.

         Complete the key.   Key: ◯   represents …………20………%

                                                                  (1 mark)

7 (b)   In which subject is his highest score?

                         Answer …………… Arithmetic ……………………………   *(1 mark)*

7 (c)   Helen takes the same four tests.
         The bar chart shows her scores.

Score (%)

Algebra   Arithmetic
    Geometry   Statistics
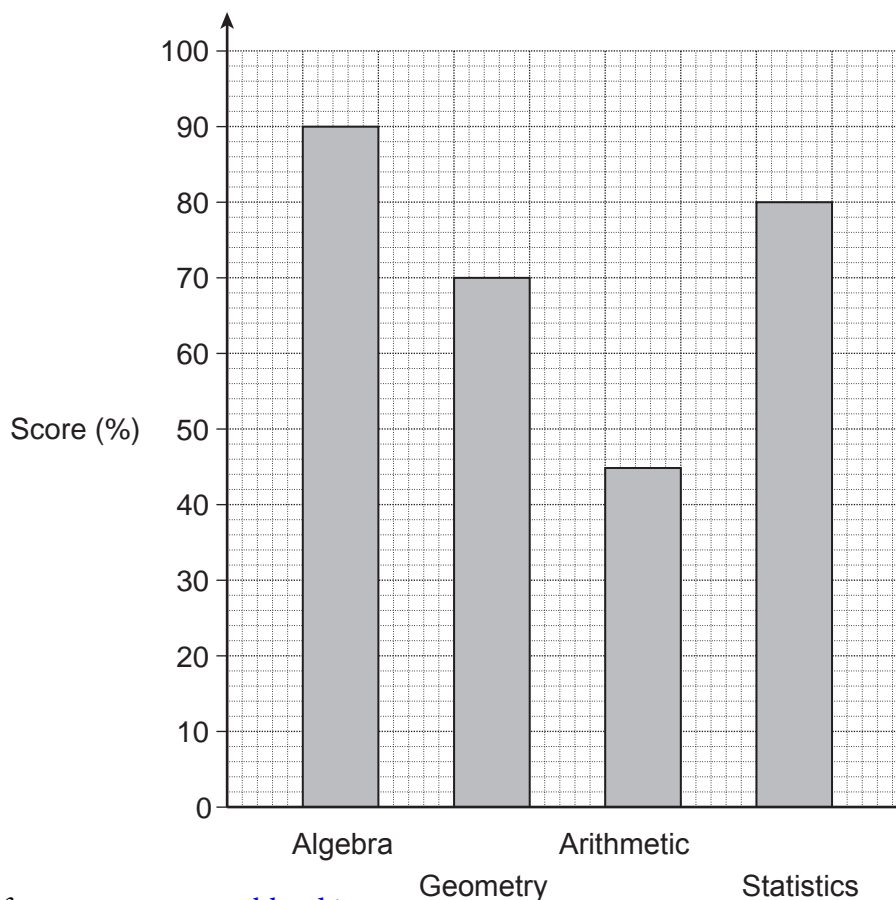
7 (c) (i) David wants to compare his scores with Helen's

scores. Draw a suitable diagram that he can use.

Algebra   Geometry   Arithmetic   Statistics   *(4 marks)*
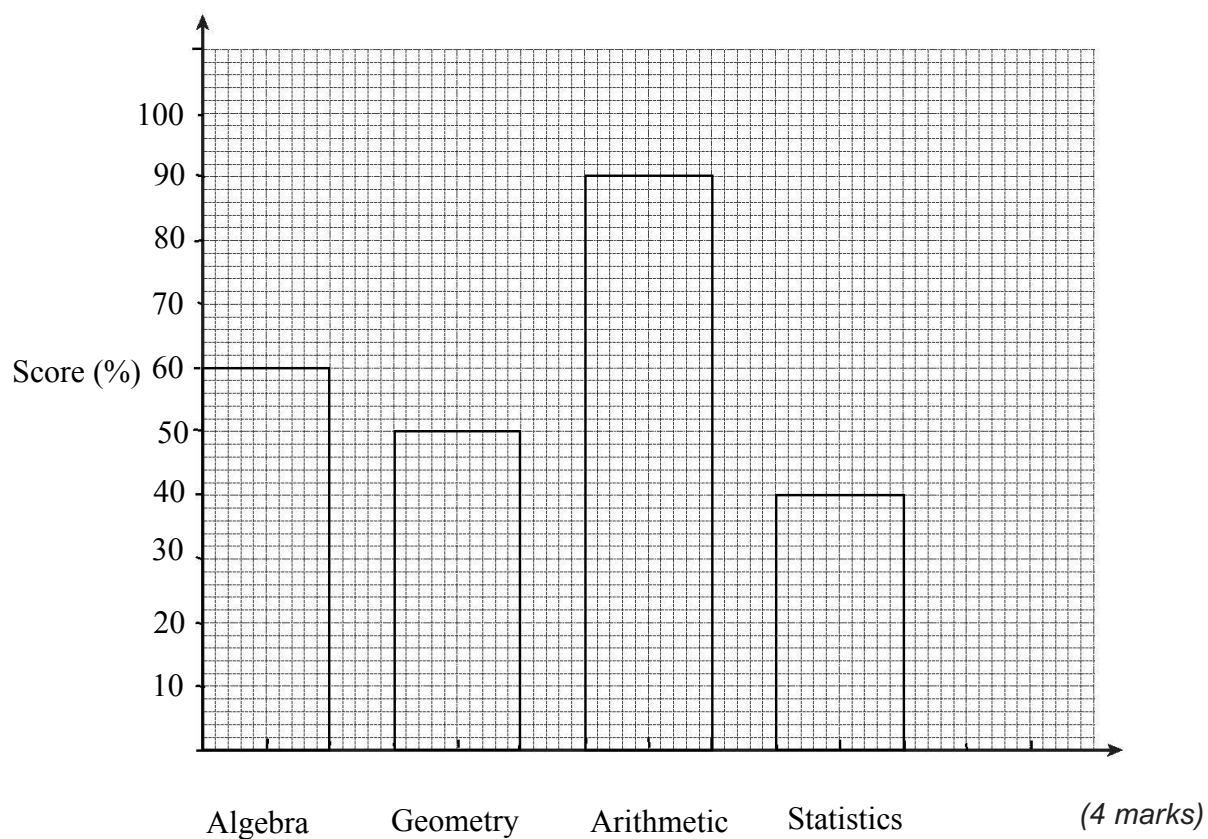
7 (c) (ii) Write down **three** facts comparing their scores.

Fact 1

Arithmetic was David's best score, but Helen's best score was in Algebra.

Fact 2

Statistics was David's lowest score, but Helen's lowest score was in Arithmetic.

Fact 3

The range of David's scores was 50, but the range of Helen's scores was 45.

(3 marks)

8   A company makes boxes of matches.

The company checks that the boxes contain 50 matches.

8 **(a)**   The number of matches in a sample of 11 boxes is

         51   50   51   51   52   43   50   50   51   51   50

8 **(a) (i)**   Write down the mode.

                          Answer ....51..   *(1 mark)*

8 **(a) (ii)**   Work out the median.
         You **must** show your working.

         43 50 50 50 50 <u>51</u> 51 51 51 51 52

                          Answer ....51..   *(2 marks)*

8 **(a) (iii)** Work out the mean.

$$51 + 50 + 51 + 51 + 52 + 43 + 50 + 50 = 51 + 51 + 50 = 550$$
$$550 \div 11 = 50$$

                          Answer ....50...   *(3 marks)*

8 **(b)**   The company claims there are 50 matches in a box.

8 **(b) (i)**   Give a reason why this claim seems fair.

         The mean, median and mode are all 50 or more.

                                                        (1 mark)

8 **(b) (ii)**   Give a reason why this claim seems unfair.

         The sample size is too small.
         One box contained 43 matches.

                                                        (1 mark)

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8 **(c)**   The company uses the first 11 boxes produced each Monday to check the

contents. State **two** ways this method of sampling can be improved.

1   The sample size should be bigger.

2   The sample should be spread over several days.

(2 marks)

9 The pie chart shows the activities of 60 students after school finished one day.
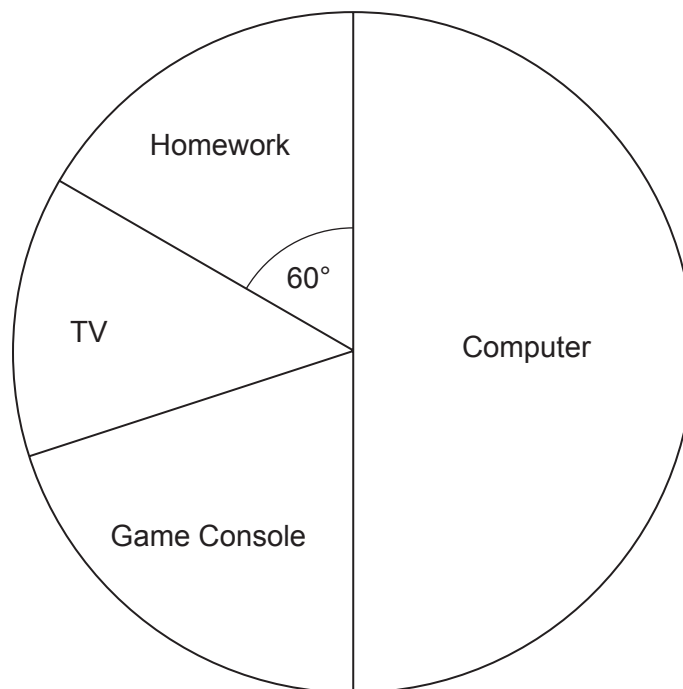
9 (a) How many students go on their computer?

Answer ....30.. *(1 mark)*

9 (b) How many students watch TV or play on their game console?

$$360 - 180 - 60 = 120$$

$$\frac{120}{360} \times 60 = 20$$

Answer ....20.. *(3 marks)*

10 The pictogram shows the amount of money that five friends raised for charity.

Andy   £ £ £ £

Barbara   £ £ £ £ £

Joan   £ £ £ £

Marie   £ £   Key: £ represents £10

Ron   £ £ £

10 (a)   Who raised the most money?

Answer ....Barbara...   *(1 mark)*

10 (b)   How much money did Ron raise?

Answer £ ...25...   *(1 mark)*

10 (c)   How much money did the five students raise altogether?

Answer £ ...170..   *(2 marks)*

10 (d) Sid raised £42 for the same charity.

Explain why it may be difficult to show his amount on the pictogram.

It would be difficult to represent the £2 as would be very small.

(1 mark)

11   Sophie asks 18 pupils to choose their favourite fruit from a list.
These are her results.

apples	bananas	apples	oranges	oranges	apples
apples	plums	apples	oranges	apples	oranges
oranges	bananas	oranges	oranges	oranges	bananas

Sophie decides to draw a pie chart to show these
results. The table shows some of his work.

Favourite vegetable	Tally	Frequency	Angle on pie chart
Bananas (B)	|||	3	60°
Apples (A)	⅃⅃⅂⊤ |	6	120°
Oranges (O)	⅃⅃⅂⊤ |||	8	160°
Plums (P)	|	1	20°
		Total = 18	Total = 360°

11 (a)   Complete the tally and frequency columns in the table.
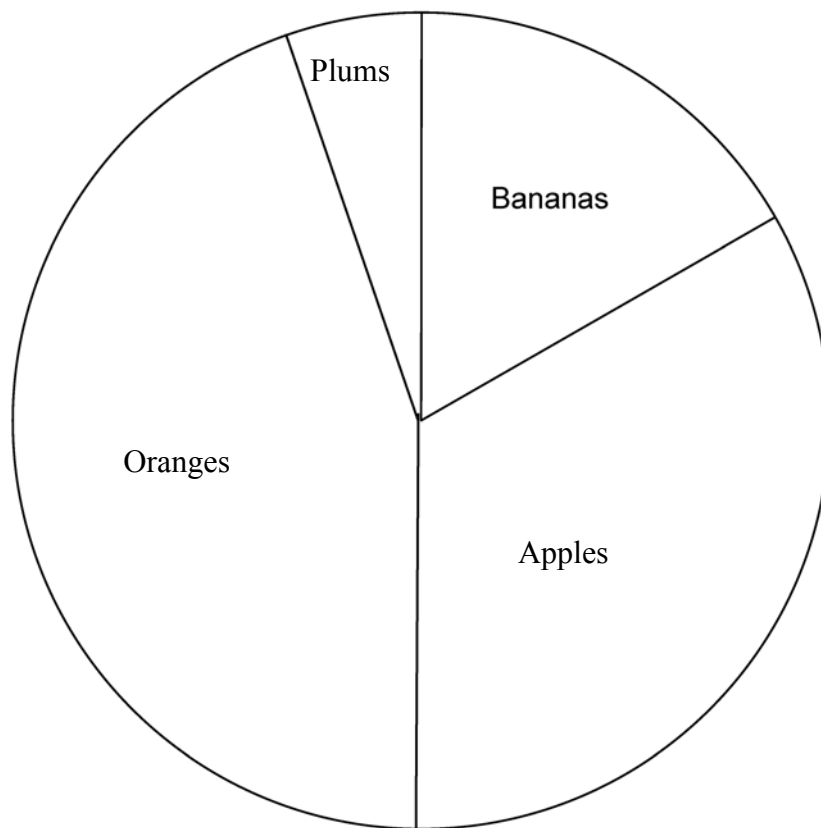
(2 marks)

11 (b) (i)   Complete the angle on the pie chart column in the table.

(2 marks)

11 (b) (ii) Complete the pie chart to represent this information.

(2 marks)

12(a) Hassan bought 90 tomato plants, 30 of which were a variety called Moneymaker. He measured and recorded their heights after 2 weeks.

Height (cm) x	Number of plants f	fx
3	0	0
4	4	16
5	6	30
6	9	54
7	8	56
8	3	24
	30	180

Calculate the mean height.

$$\text{mean} = \frac{\sum fx}{\sum f}$$

$$= \frac{180}{30}$$

Answer .....6... *(3 marks)*

12 (b) The varieties Shirley and Alicante were bought at the same time.

Their heights are shown in the table.

Height of Alicante (cm)

		1	2	3	4	5	6	Total	cumf
	1	0	0	0	0	0	0	0	0
	2	1	0	0	0	0	0	1	1
Height of Shirley (cm)	3	2	1	1	0	0	0	4	5
	4	0	3	4	1	0	0	8	13
	5	0	1	2	3	2	0	8	21
	6	0	0	3	3	2	1	9	30
	Total	3	5	1	7	4	1	30	

12 (b) (i) What is the median height for Shirley?

Show clearly how you obtain your answer.

Using the cumulative frequency (cumf) table the median value comes after 15. This puts the height at 5.

Answer ......5... *(2 marks)*

12 (b) (ii) Hassan claims that Shirley grows faster than Alicante.

How can you tell from the table that this is true?

There are lots of zeros on the top right hand side of the table. The numbers above zero are on or below the main diagonal.

(1 mark)

There are no questions printed on this page

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ANSWER IN THE SPACES PROVIDED

Surname

Other Names

Candidate Signature

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Mathematics **43601F**

Past Paper Questions by Topic

Geometry
Model Answers

F

For this paper you must have:
- mathematical instruments.

You must **not** use a calculator.

Time allowed
- 1 hour 15 minutes

Instructions
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- The maximum mark for this paper is.
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- You may ask for more answer paper and graph paper. These must be tagged securely to this answer booklet.

Advice
- In all calculations, show clearly how you work out your answer.

1   *ABCD* is a quadrilateral.
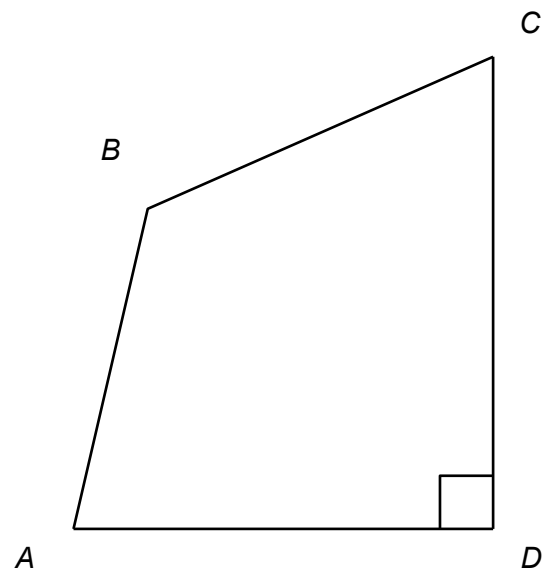
Complete each sentence using a letter.

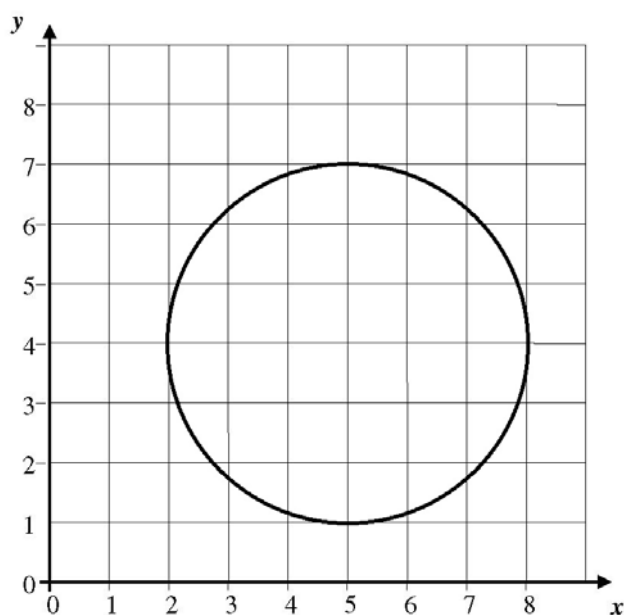Angle ...*ADC*.... is a right angle.

Angle ....*ABC*.... is an obtuse angle.

Angle ...*BCD*.... is an acute angle.
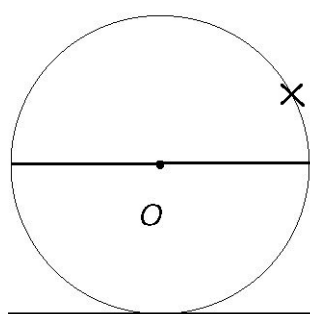
(*2 marks*)

2   Here is a centimetre grid.

2 (a)   On the grid, draw a circle of radius 3 centimetres with centre (5, 4).

(2 marks)

2 (b)   Here is a circle, centre *O*.

2 (b)(i)   Mark with a cross a point on the circumference.   (*1 mark*)

2 (b)(ii)   Draw a diameter.   (*1 mark*)

2 (b)(iii)   Draw a tangent.   (*1 mark*)

3 (a)   Measure the length of line *PQ* in centimetres.

_____

P   Q
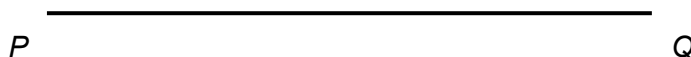
Answer ....8........ cm (*1 mark*)

3 (b)   The length of line *RS* is 12 centimetres.

_____

R   S
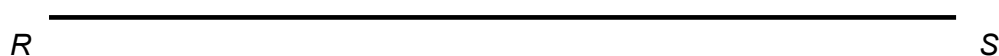
T is a point on *RS*

RT is $\frac{1}{4}$ of *RS*.

Work out the length of *RT*.

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

Answer ....3........... cm (*3 marks*)

4   The diagram shows a vertical flagpole. From 2 metres
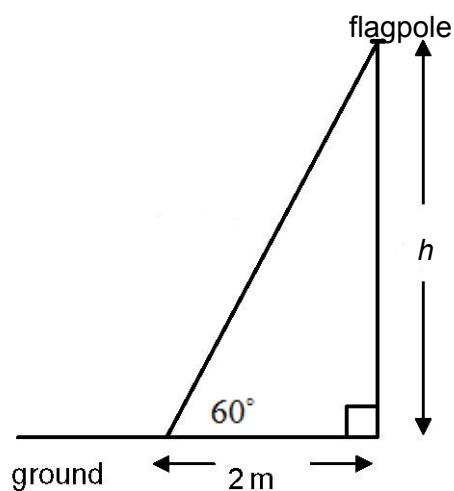away the top of the flagpole is $70°$ from the ground.

flagpole

Not drawn
accurately

h

60°

ground   2 m

Make a scale drawing of this diagram.

The ground has been drawn for you.

Use a scale of 2 cm to represent 1 metre.

What is the height h? Show your answer on your scale drawing.

3.5m
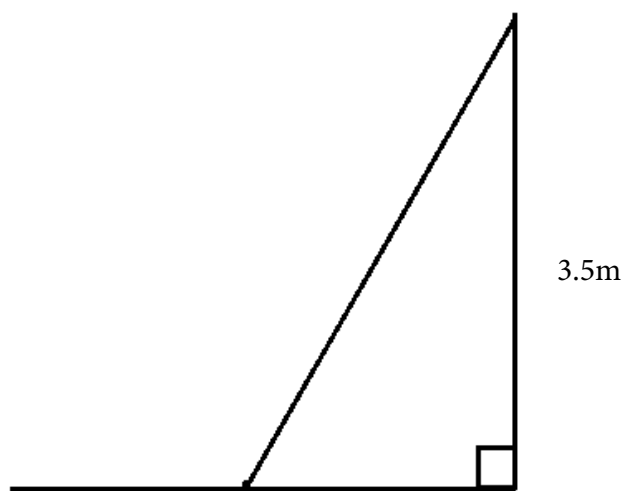
(*3 marks*)

5   The diagram shows parts of two regular polygons *P* and *Q*.

P has 12 sides and exterior angle $2x$.

Q has exterior angle $3x$.
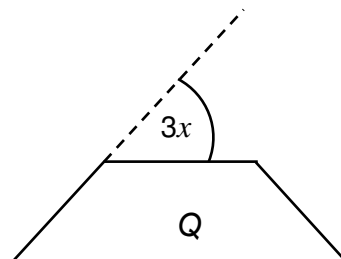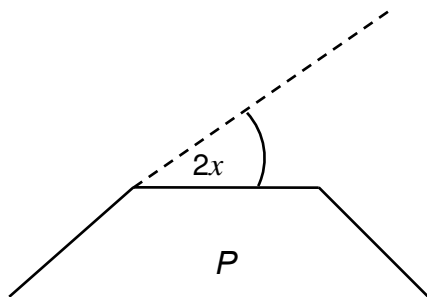
Not drawn
accurately

Work out the number of sides of regular polygon *Q*.

The exterior angles of a regular polygon add up to 360°

$2x \times 12 = 360$

$2x = \dfrac{360}{12}$

$2x = 30$

$x = 15$

The exterior angles in *Q* are $3x$

$3 \times 15 = 45$

The number of sides of *Q* are:

$\dfrac{360}{45} = 8$

Answer ....8................. (*5 marks*)

6(a)   Here are some shapes.
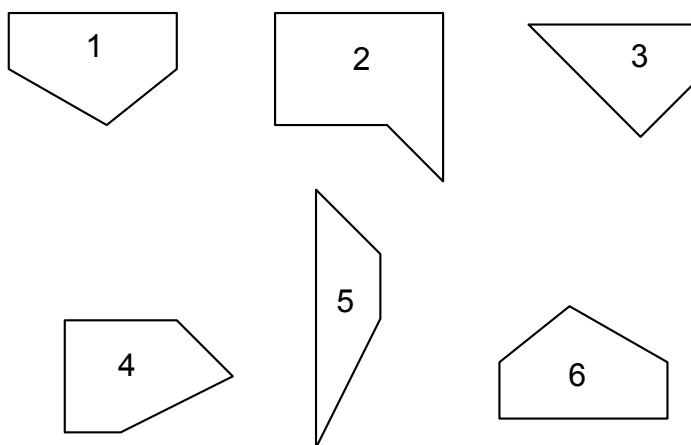
Which two shapes are congruent?

Answer.........1......... and ....6......... (*1 mark*)

6(b)   Tick whether each of the following statements is always true, sometimes true or never true.

Congruent shapes have the same perimeter.

[✓] Always true   [ ] Sometimes true   [ ] Never true

Congruent shapes have the same area.

[✓] Always true   [ ] Sometimes true   [ ] Never true

(*2 marks*)

7 (a)   Write down the mathematical name of each of the following.

..............kite...........................
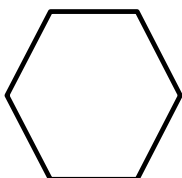
..............hexagon...................
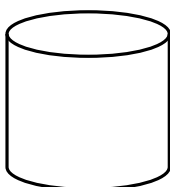
..............cylinder...................

(*3 marks*)

Here are two angles, *a* and *b.*
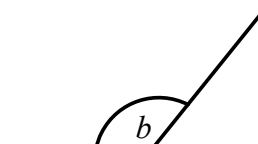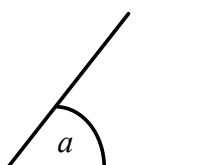
7 (b)   What type of angles are they?

Answer *a* is.......acute............................

b is ......obtuse.......................... (*2 marks*)

8   Here are some lines drawn on a grid.
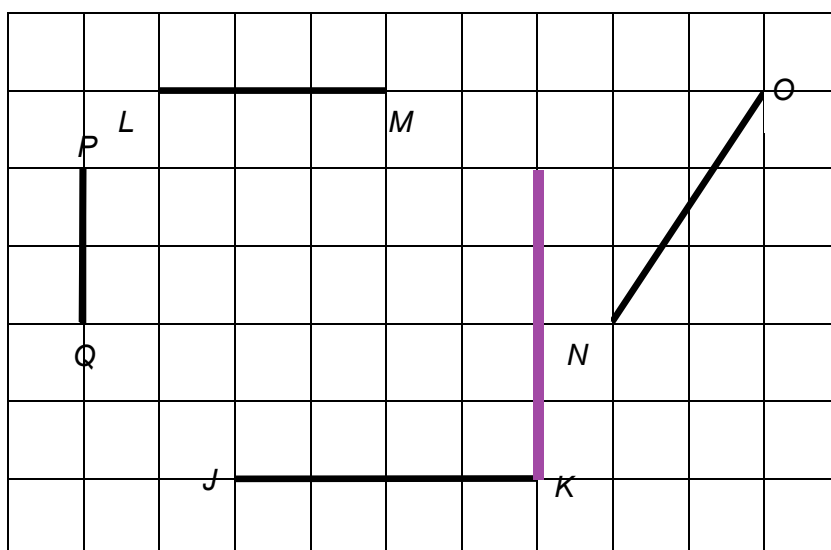
8(a)   Measure the length of *NO.*

Answer ....4............... cm (*1 mark*)

8(b)   Which line is parallel to *LM.*

Answer ....*JK*.................... (*1 mark*)

8(c)   Draw a line at right angles to *JK.*

(*1 mark*)

9   Points *R*, *S* and *T* are plotted on the grid.
They are three of the four corners of a quadrilateral.
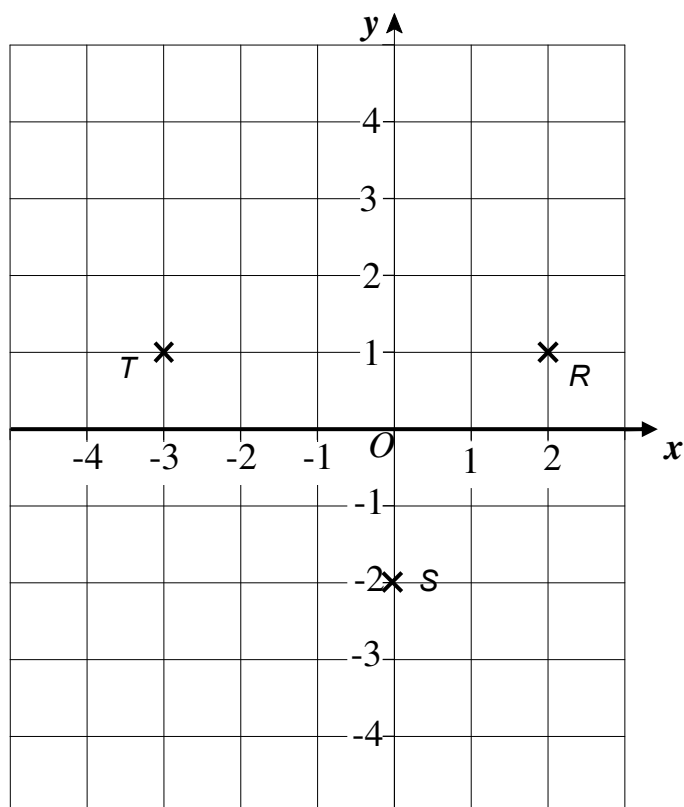
9(a)   Write down the coordinates of the point *T*.

Answer (......-3......., ...1........) (*1 mark*) Á

9(b)   Tick whether each of the following statements is true or false.

	True	False
It is possible to plot point *U* so that *RSTU* is a square.		✓
It is possible to plot point *U* so that *RSTU* is a rectangle.		✓
It is possible to plot point *U* so that *RSTU* is a parallelogram.	✓	

(2 marks)

10   Three straight lines meet at a point as shown.
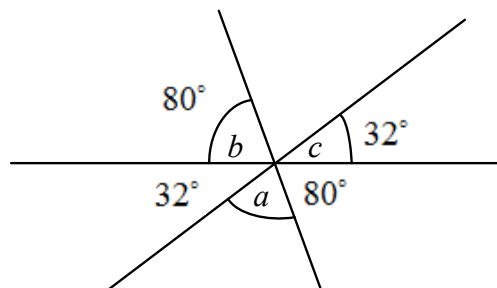
Not drawn
accurately

$b = 80°$

c is 40% of b.

Work out the size of a.

Angle c

$$80° \times \frac{40}{100} = 32°$$

$$a = 180 - 32 - 80$$

$$= 68°$$

Answer ....68................... degrees (*4 marks*)

11   The diagram shows the map of an island drawn on a grid.

Each square represents $10\,000\,\text{m}^2$.
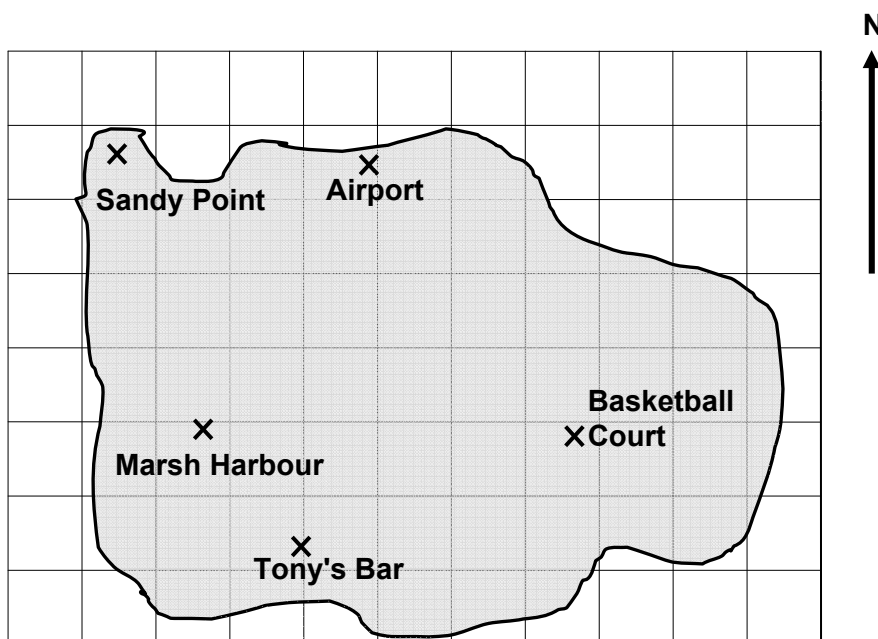
11 (a) Estimate the area of the island.

Give your answer in square metres.

50 squares are occupied.

Area:

$50 \times 10\,000 = 500\,000$

Answer ....500 000............ m² (*4 marks*)

11 (b) Measure the bearing of the Tony's Bar from the Airport.

Answer ….....190°..................... (*1 mark*)

11 (c) A Baseball Stadium is on a bearing of 200° from the Airport and 070° from Marsh Harbour

Mark with a cross the position of the Baseball Stadium on the map.   (*3 marks*)

12   Here is a triangle.
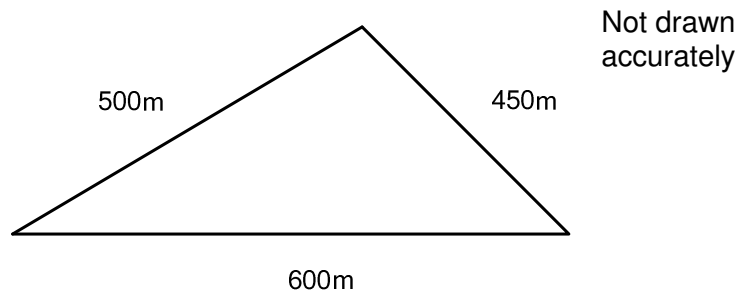
Not drawn accurately

500m

450m

600m

Using ruler and compasses only, construct an accurate scale drawing of the triangle.

Use the scale 1 cm represents 50 m.

(3 marks)

13 (a) Here is a formula for the perimeter, P, of a rectangle.

$$P = 2L + 2W$$

Work out L when $P = 30$ cm and $W = 4$ cm

$$30 = 2L + (2 \times 4)$$
$$30 = 2L + 8$$
$$30 - 8 = 2L$$
$$22 = 2L$$
$$11 = L$$

Answer ....11................ cm (*3 marks*)

13 (b) The diagram shows a semi-circle, radius r, and a rectangle.

Not drawn accurately

3 cm

r r
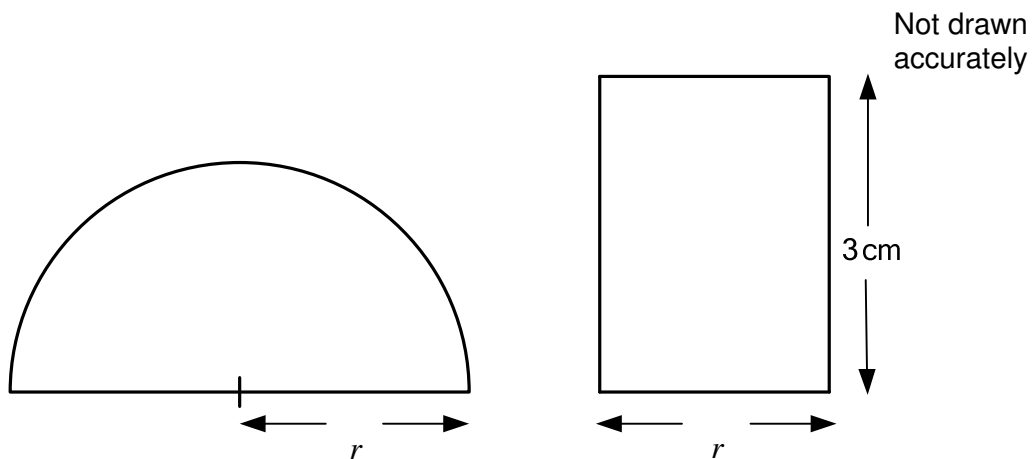
The perimeters are equal.

Work out the value of r.

Perimeter of rectangle:

$r + 3 + r + 3$

$= 2r + 6$

Perimeter of semicircle:

$r + r + \pi r$

$= 2r + \pi r$

The perimeters are equal

$2r + \pi r = 2r + 6$

$\pi r = 6$

$r = \dfrac{6}{\pi}$

$r = 1.9098$

Answer ....1.911................ cm (*4 marks*)

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14   The diagram shows a circle on a centimetre grid.
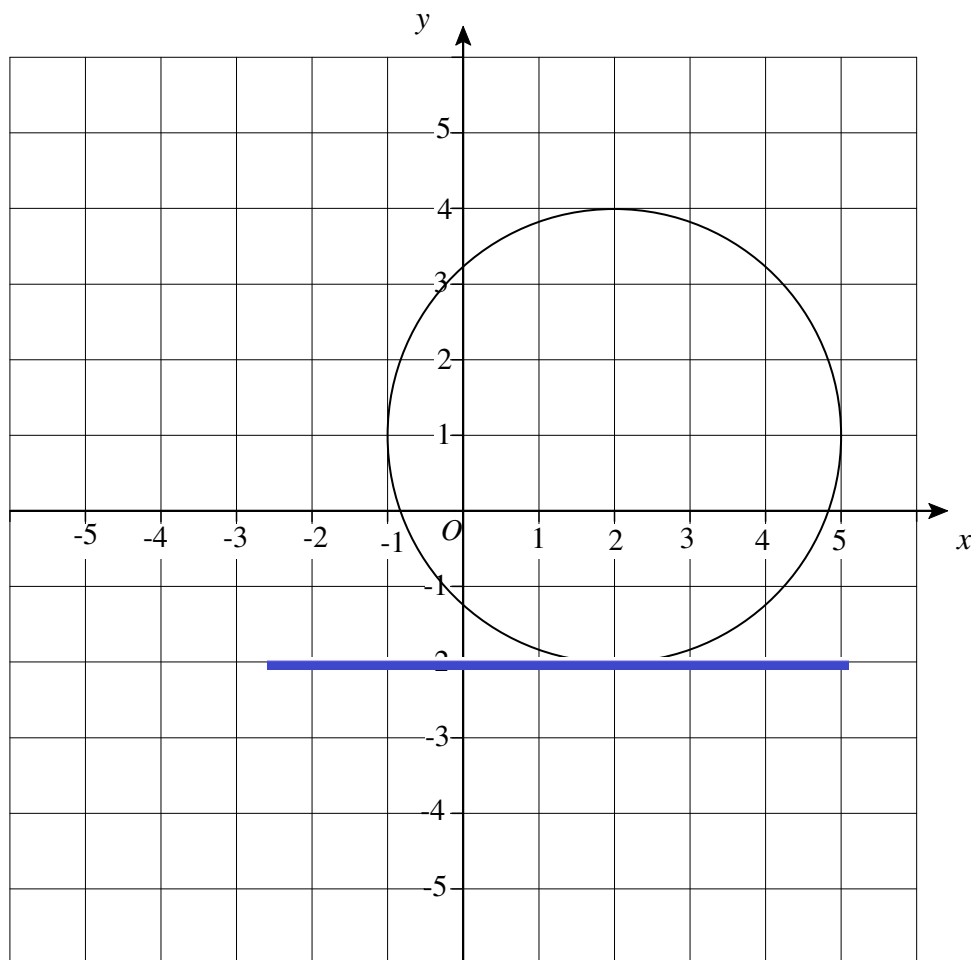
14(a)   What is the length of a diameter of the circle.

Answer ....6................. cm (*1 mark*)

14 (b)   What are the coordinates of the centre of the circle.

Answer (.......2......., ...1......) (*2 marks*)

14 (c)   Draw a tangent to the circle.

(*1 mark*)

14 (d)   State the units for the area of the circle.

Answer centimetres squared... (*1 mark*)

15   In the diagram *AB* is parallel to *CD*.

Not drawn accurately

15 (a)   Work out the value of r.

$r = 180 - 148$

$= 32$
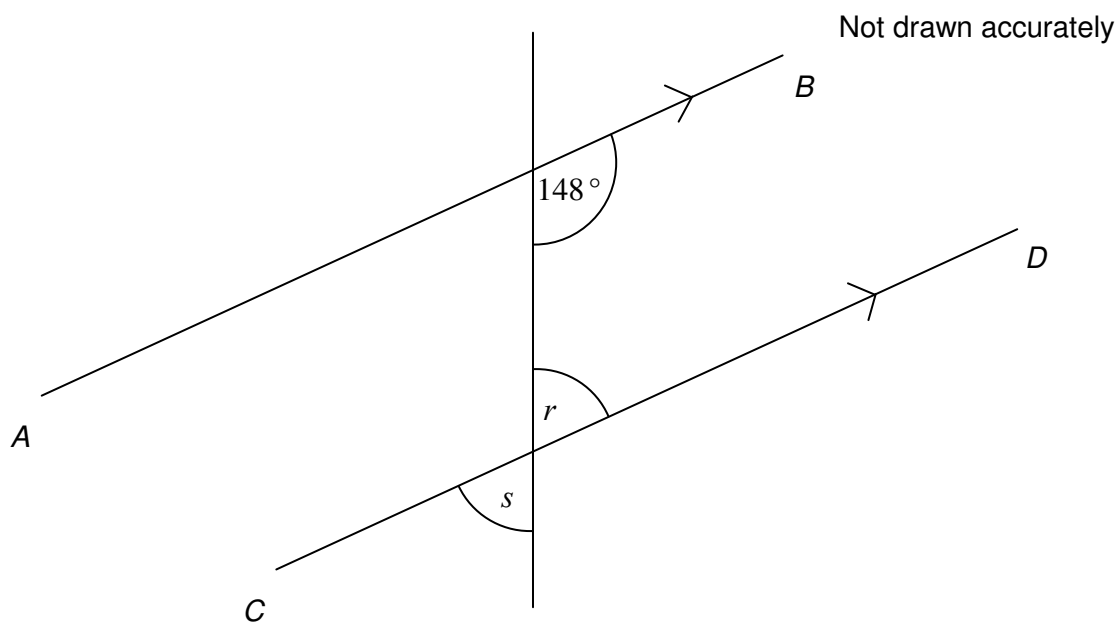
Answer ....32...................degrees (*2 marks*)

15 (b)(i) Write down the value of s.

Answer ....32...................degrees (*1 mark*)

15 (b)(ii) Give a reason for your answer.

The angles are vertically opposite and so are equal.

(*1 mark*)

16   The diagram shows a circle, centre *O*, with a tangent and a chord.
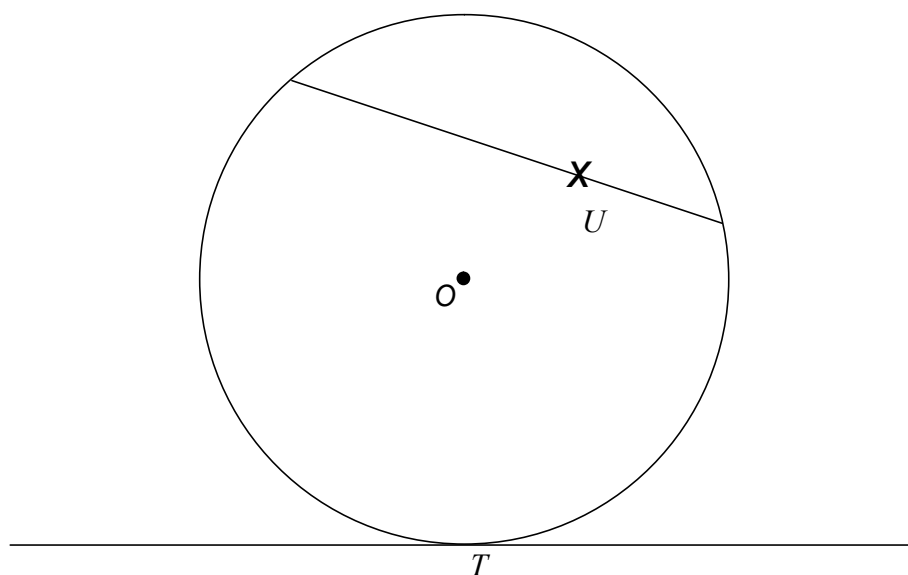
16 (a)   Measure the diameter of the circle.

Answer ....7.. cm *(1 mark)*

16 (b)   The tangent meets the circle at point *T*.

Mark point *T* on the diagram.   *(1 mark)*

16 (c)   Mark a point on the chord that is 2 cm from *O*.

Label it *U.*   *(1 mark)*

17 (a) Measure the acute angle a.
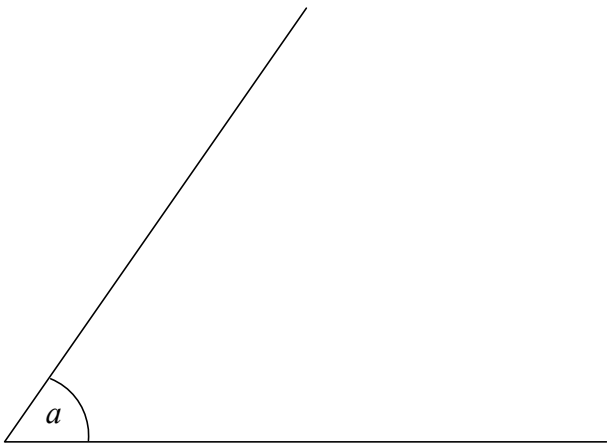
Answer .... degrees *(1 mark)*

17 (b) Use measurements to work out the size of angle b.

....………....………....……………………………………………………..

....………....………....……………………………………………………..
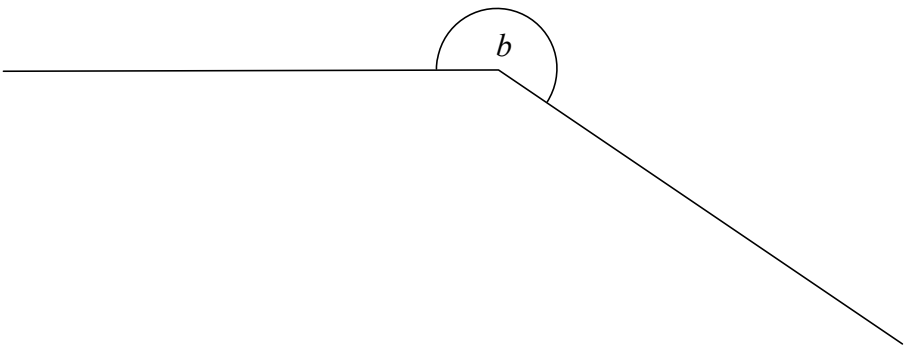
Answer .... degrees *(2 marks)*

17 (c)   An acute angle and an obtuse angle fit together to make an angle of 210°

Work out two possible values for the angles

Answer ....140..........degrees and...........70............... degrees   *(2 marks)*

18   A regular hexagon is divided into congruent right-angled triangles.
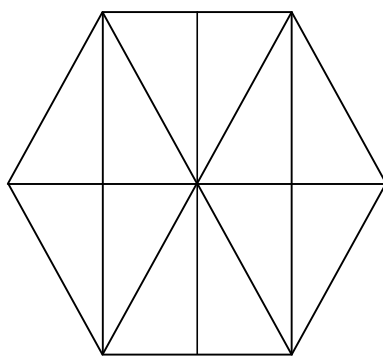
Here are the names of eight shapes:

Equilateral triangle   **Isosceles triangle**

Trapezium   **Rhombus**

Kite   **Rectangle**

Square   **Parallelogram**

In the diagrams below some of the right-angled triangles have been shaded.

Match the shaded shapes with the correct name from the list above.
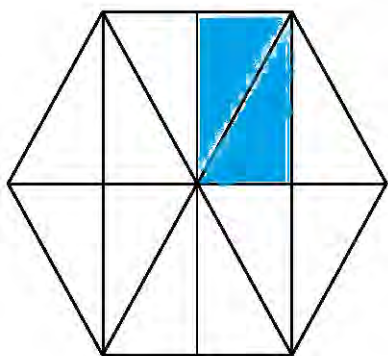
18(a)   Name ......Rectangle.. *(1 mark)*

18 (b)
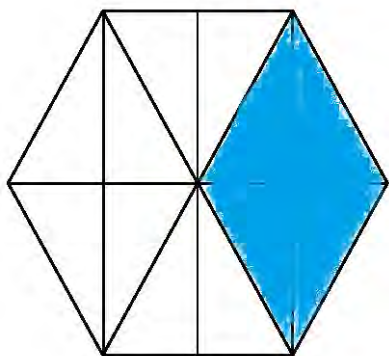
Name ....Rhombus................................. *(1 mark)*

18 (c)
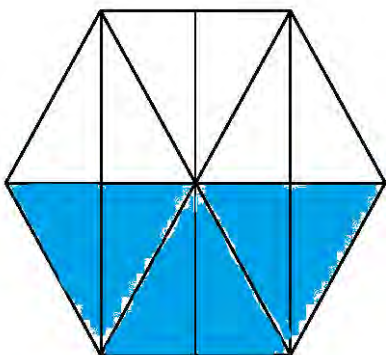
Name ....Trapezium................................. *(1 mark)*

19   Three triangles, *P, Q* and *R* are cut out of paper.

The angles are measured.

Not drawn
accurately

P

Q

R
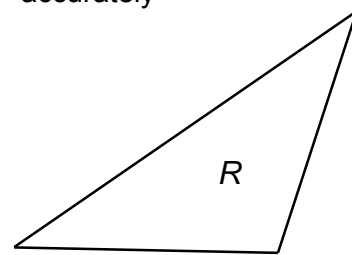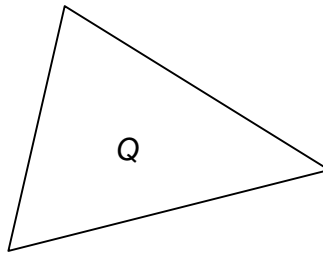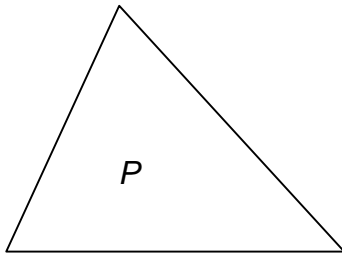
The corners are torn off each triangle and mixed up as shown.

65°   75°   80°

35°   45°   35°

40°   110°   55°
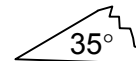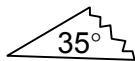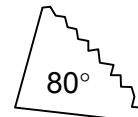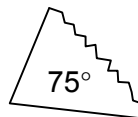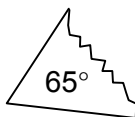
Identify three sets of angles that could go with each triangle.

Angles ....40.... and .....75.... and....65....

Angles ....80.... and .....45.... and....55....

Angles ....110.. and ....35.... and...35..... *(3 marks)*

20   In the diagram *AB* is parallel to *CD*.
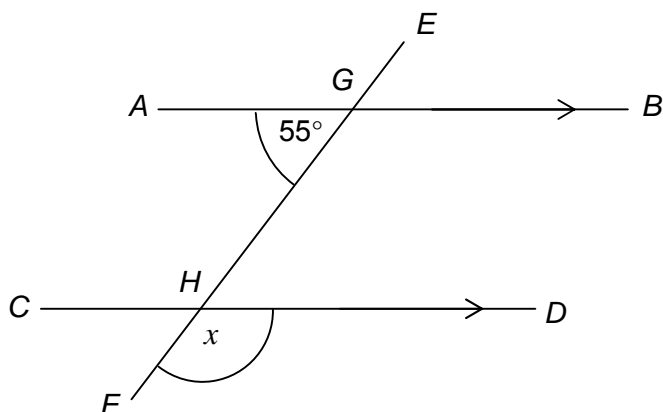
Not drawn
accurately

Work out the value of the angle marked x in the diagram.

Show clearly, giving reasons, how you work out your answer.

$\angle HGB = 125°$ (The angles on a straight line add up to $180°$)

$x = 125°$ (Corresponding angle to $\angle HGB$

Answer ....125...................degrees *(3 marks)*

There are no questions printed on this page

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ANSWER IN THE SPACES PROVIDED

In the style of

AQA

General Certificate of Secondary Education
Foundation Tier

Mathematics   43602F

Past Paper Type Questions by Topic

Graphs
Model Answers

F

For this paper you must have:
- a calculator
- mathematical instruments.

Time allowed
- 1 hour

Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book.

Information
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Advice
- In all calculations, show clearly how you work out your answer.

By Peter Bland

1   Georgina has 250 millilitres of milk in a glass.

She takes five seconds to drink some of the milk.

The graph shows this information.
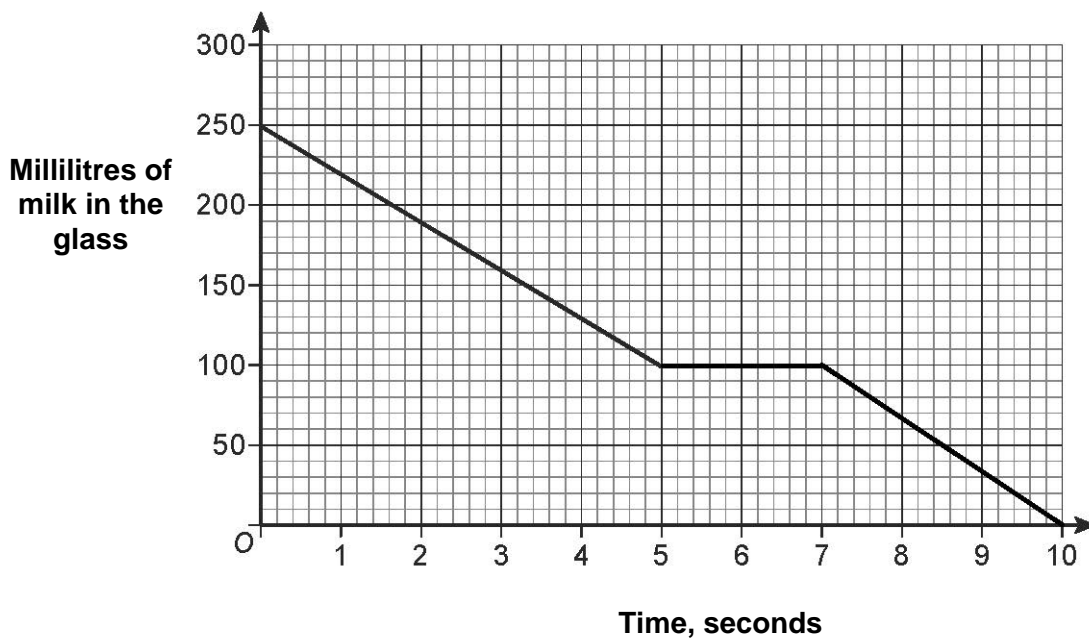
1 (a)   How many millilitres of milk did Georgina drink in five seconds?

Answer ....150 ml..........…………..………….....………

(1 mark)

1 (b)   Georgina does not drink any milk for the next two seconds.

She then drinks all the remaining milk in three seconds.

Show this information on the graph.

(2 marks)

2   Here is a mobile phone tariff.

<div align="center">

Plan 1

Monthly charge	£30
Free minutes of calls per month	400
Extra minutes charged at	20 pence per minute

</div>

Plan 2 is a different mobile phone tariff.

These graphs show the cost, in £, for each of the plans.
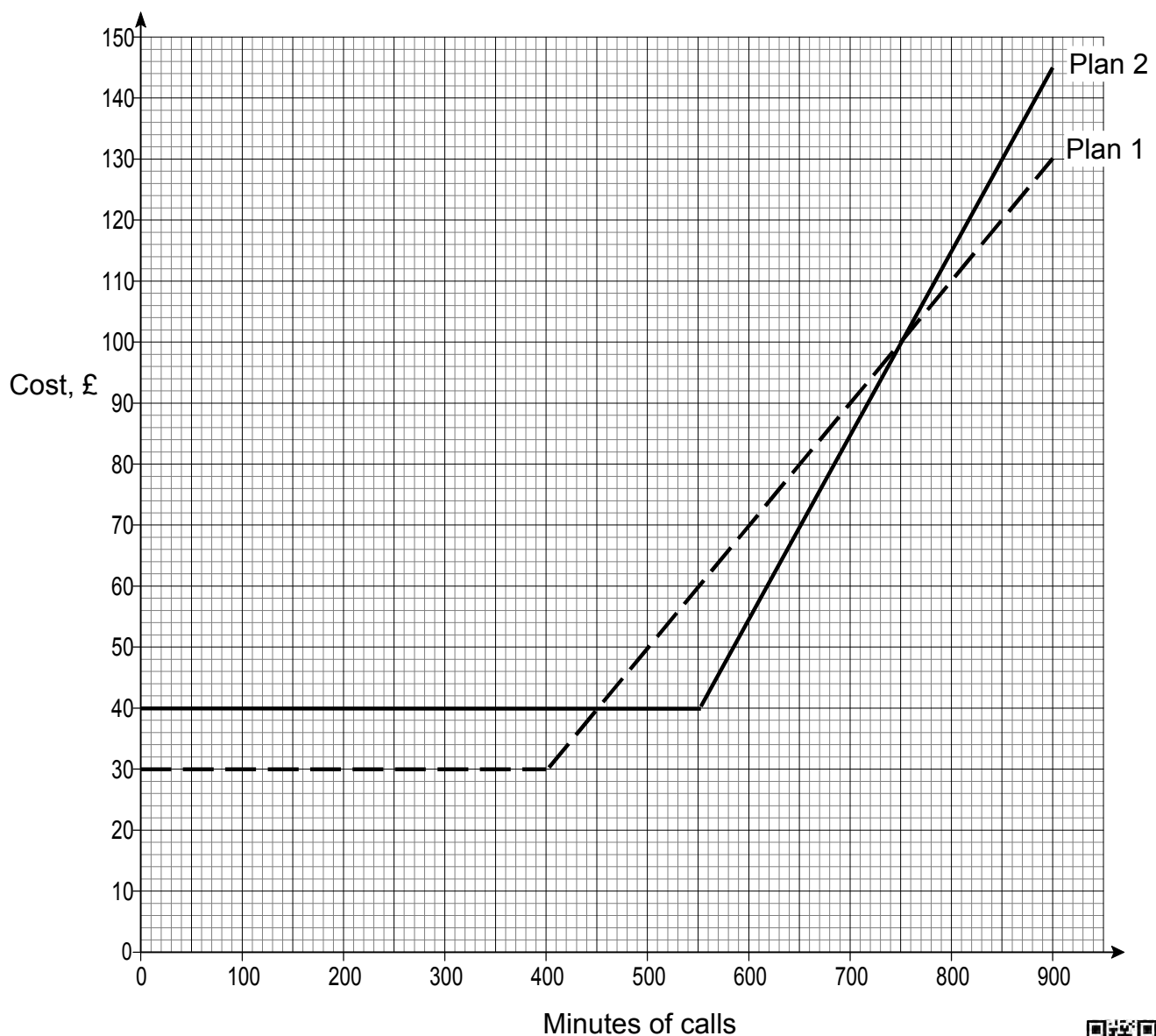
2 (a) Complete the mobile phone tariff for Plan 2.

From the graph, from 550 to 650 minutes cost £30
100 minutes cost £30.
1 minute costs 30p

Plan 2	
Monthly charge	£40
Free minutes of calls per month	550
Extra minutes charged at ….30….. pence per minute	

(4 marks)

2 (b) David is deciding whether to use Plan 1 or Plan 2.

Work out the number of minutes of calls for which Plan 2 is cheaper.

The graphs of Plan 1 and Plan 2 intersect at 750 minutes. Plan 2 is cheaper up to 750 minutes.

(2 marks)

3 (a) Line *A* is drawn on the grid.
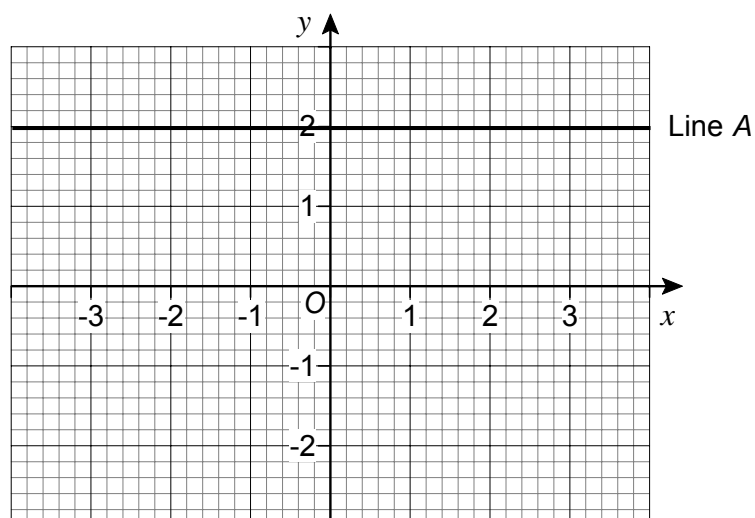
What is the equation of Line *A*?

Answer .....$y = 2$... *(1 mark)*

3 (b) Line *B* is drawn on the grid.
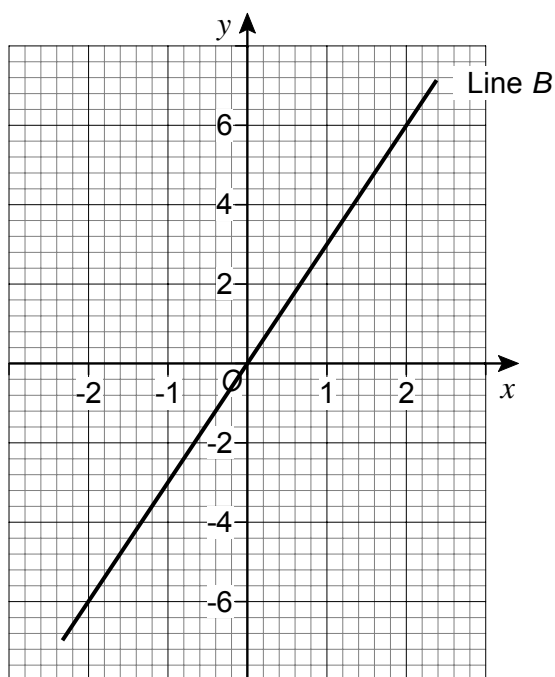
What is the gradient of Line *B*?

$$\text{gradient} = \frac{\text{difference in } y - \text{coordinates}}{\text{difference in } x - \text{coordinates}}$$

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

$$= 3$$

Answer ....3...*(1 mark)*

4   Points *R* and *S* are shown on the grid below.
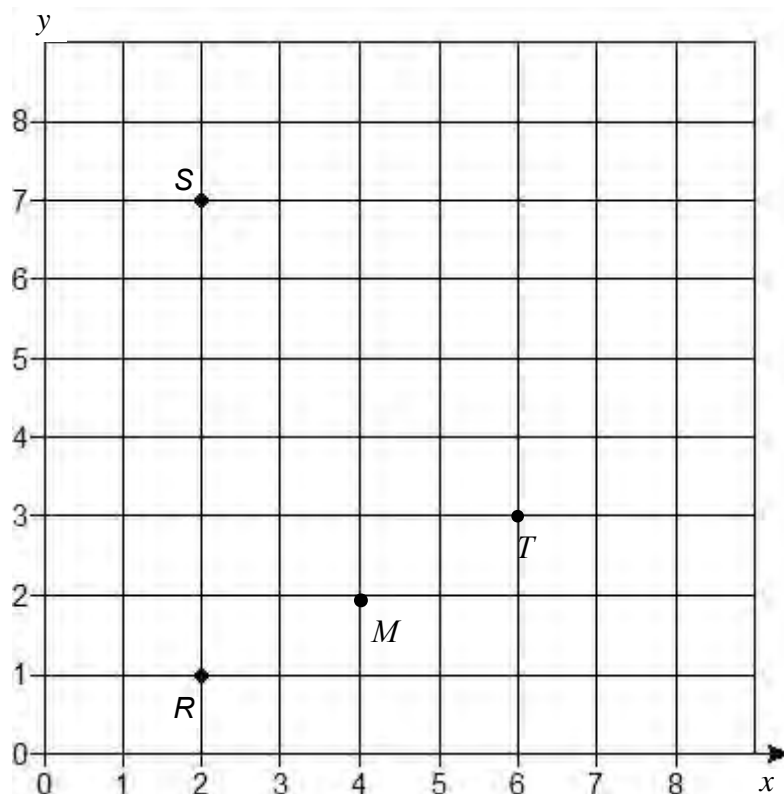
4 (a)   Write down the coordinates of *R*.

Answer (........2........, ...1.........) *(1 mark)*

4 (b)   Plot the point *M* (4, 2) on the grid.   *(1 mark)*

4 (c)   *M* is the midpoint of the line segment *RT*.

4 (c) (i)   Mark the position of *T* on the grid.   *(1 mark)*

4 (c) (ii)   Write down the coordinates of *T*.

Answer (.......6.........., ...3...........) *(1 mark)*

4 (d)   The points *R*, *S* and *U* are on a straight line. The point *U* is twice as far from *R* as point *S*. Write down the coordinates of *U*.

Answer (........2........., ...5............) *(2 marks)*

5   The graph shows the cost, C (£), of hiring a concrete mixer from Redwood Plant Hire for a number of days, d.

Cost, C (£)

Number of days, d
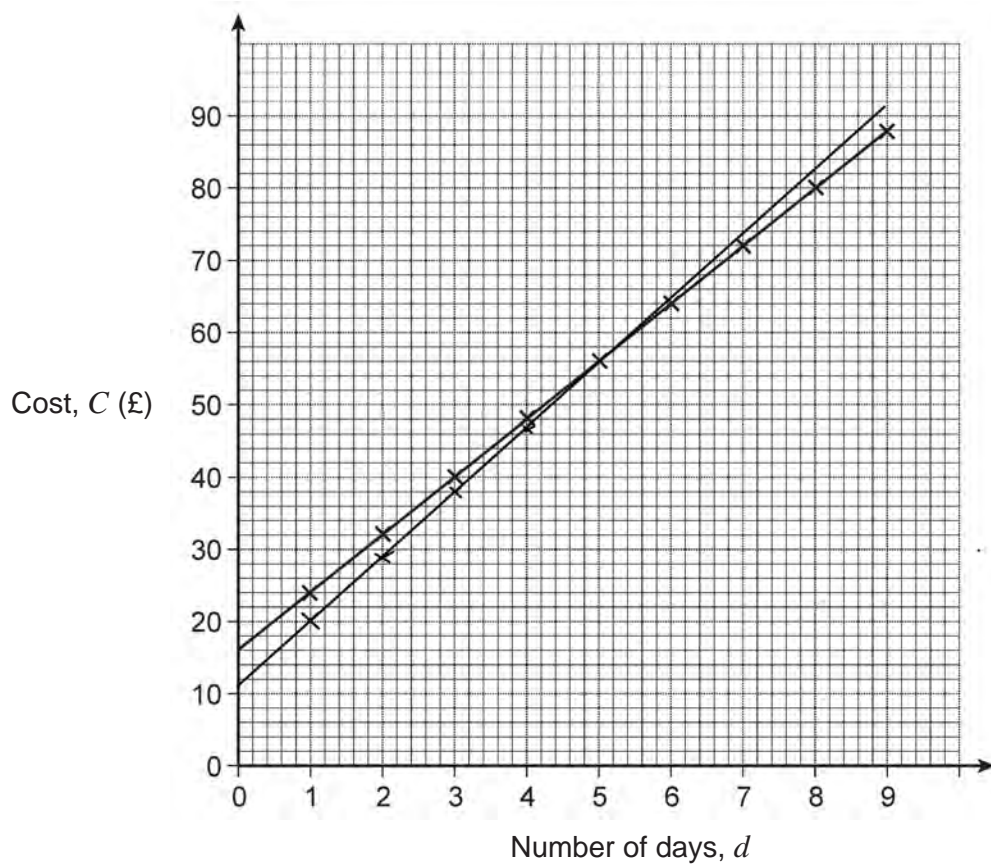
5 (a)   Circle the correct formula for the cost, C.

$C = 24d$ $C = 8d + 24$ $C = 16d + 8$ $C = 8d + 16$

(1 mark)

5 (b)   The cost of hiring a concrete mixer from Greens Plant Hire is given by the formula

$$C = 9d + 11$$

Helen thinks that Greens Plant Hire is always cheaper.

Is this true?
Tick a box.

Yes   ☐   No   ☑

Give reasons for your answer.

Plot $C = 9d + 11$ After 4 days Greens Plant Hire is not cheaper.

d	1	2	3	4
$9d$	9	18	27	36
	11	11	11	11
C	20	29	38	47

Substitute $d = 5$ in $C = 8d + 16$
$$C = 56$$
Substitute $d = 5$ in $C = 9d + 11$
$$C = 56$$

(3 marks)

6   The graph shows two training runs by Ian and Pete.
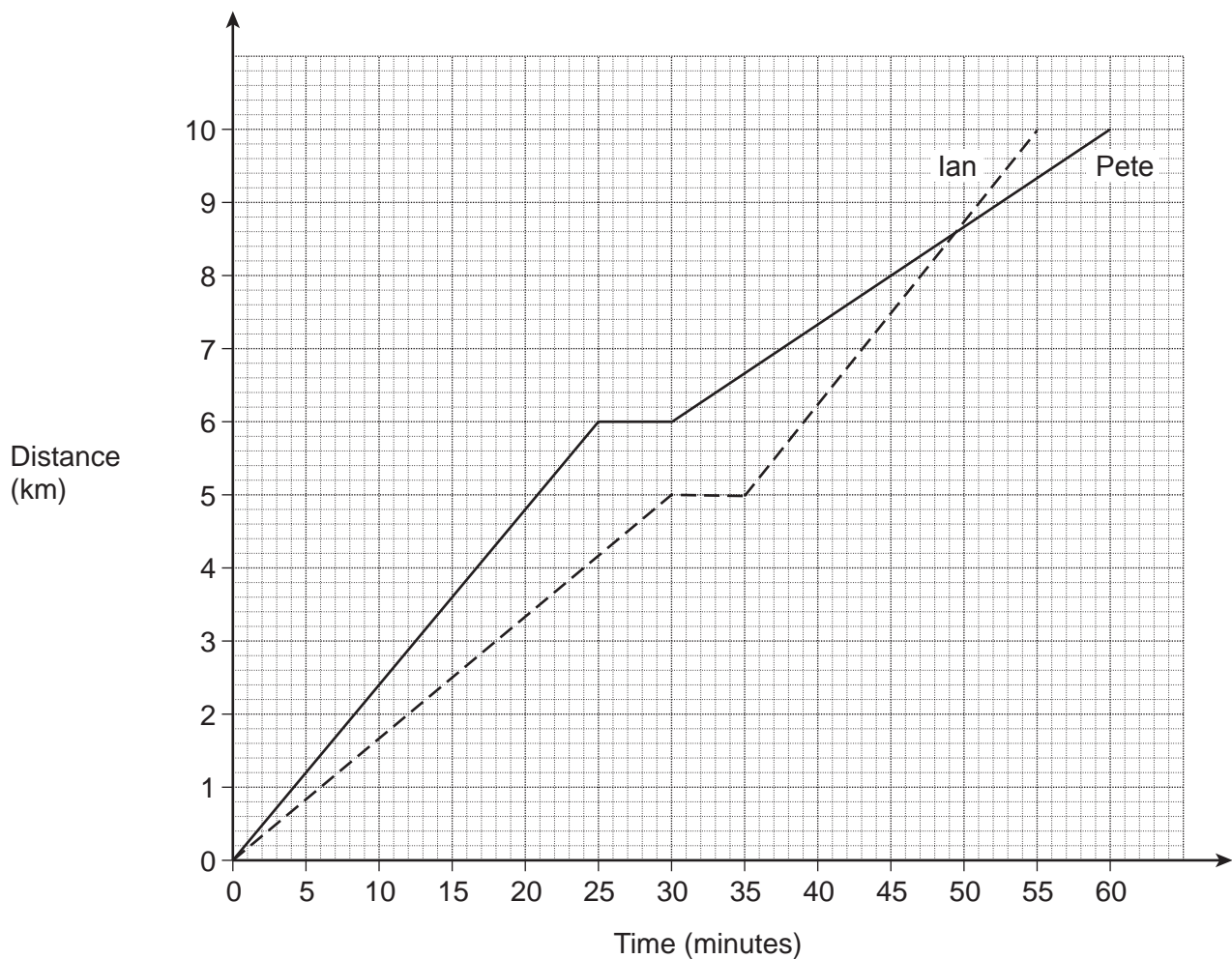
6 (a)   After how many minutes does Ian overtake Pete?

Answer ....49.................................. minutes   *(1 mark)*

6 (b)   How far ahead is Pete when Ian starts again after his rest?

Answer ....1.6.................................. km   *(2 marks)*

There are no questions printed on this page

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Surname	
Other Names	
Candidate Signature	

In the style of

AQA

General Certificate of Secondary Education
Higher Tier

Mathematics 43602H

Past Paper Type Questions by Topic

Histograms
Model Answers

H

For this paper you must have:
- a calculator
- mathematical instruments.

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- 1 hour

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Advice
- In all calculations, show clearly how you work out your answer.

1   The table shows information about the length of time that 180 children spent on facebook.

Mid value x

Time, t (minutes)	Frequency f	fx	Frequency Density
$60 < t \leqslant 150$	18		$18 \div 90 = 0.2$
$150 < t \leqslant 180$	66		$66 \div 30 = 2.2$
$180 < t \leqslant 240$	60	12600	$60 \div 60 = 1$
$240 < t \leqslant 360$	36	10800	$36 \div 120 = 0.3$

210
300

$$\sum f = 96 \qquad \sum fx \ \ 23400$$

1 (a)   Draw a suitable frequency diagram for the data.
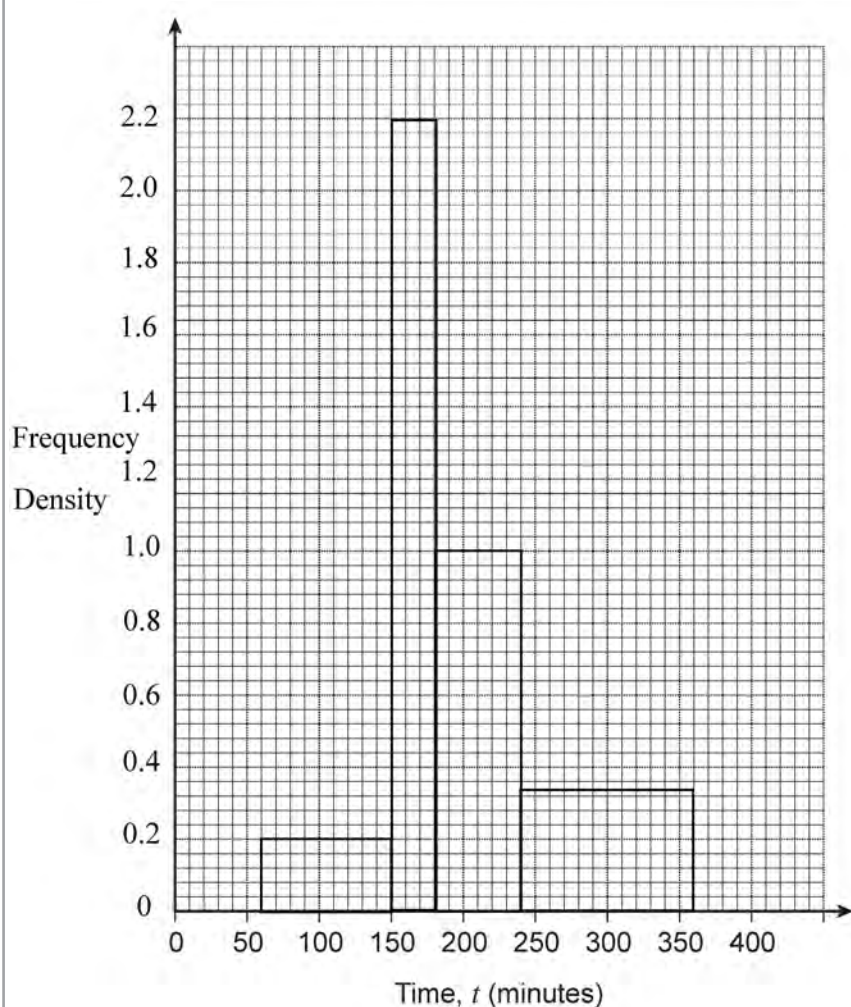
(3 marks)

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

$$\text{mean} = \frac{\sum fx}{\sum f}$$

$$= \frac{23400}{96}$$

$$= 243.75$$

Answer ......244.. minutes   *(2 marks)*

1 (c) Two children are chosen at random from the 180 children.

Estimate the probability that both are on facebook for less than two hours.
From the graph there are 45 squares between 60 and 150. This means
45 squares stand for 18 children, so 5 squares for 2 children. There
are 30 squares below 120 which is 12 children.

$$p\left(\text{First child on facebook}\right) = \frac{12}{180}$$

$$p\left(\text{Second child on facebook}\right) = \frac{11}{179}$$

$$p\left(\text{Both on facebook}\right) = \frac{12}{180} \times \frac{11}{179}$$

$$= \frac{11}{2685}$$

Answer .... $\frac{11}{2685}$ ....   *(3 marks)*

2 The table shows the cricket scores for a local club over a season.

Score, s	Frequency	Frequency Density
$75 < s \leqslant 125$	40	0.8
$125 < s \leqslant 150$	55	2.2
$150 < s \leqslant 175$	65	2.6
$175 < s \leqslant 225$	95	1.9
$225 < s \leqslant 300$	45	0.6
Total	300	

Draw a fully labelled histogram to illustrate the data.

Score, *s*

(3 marks)
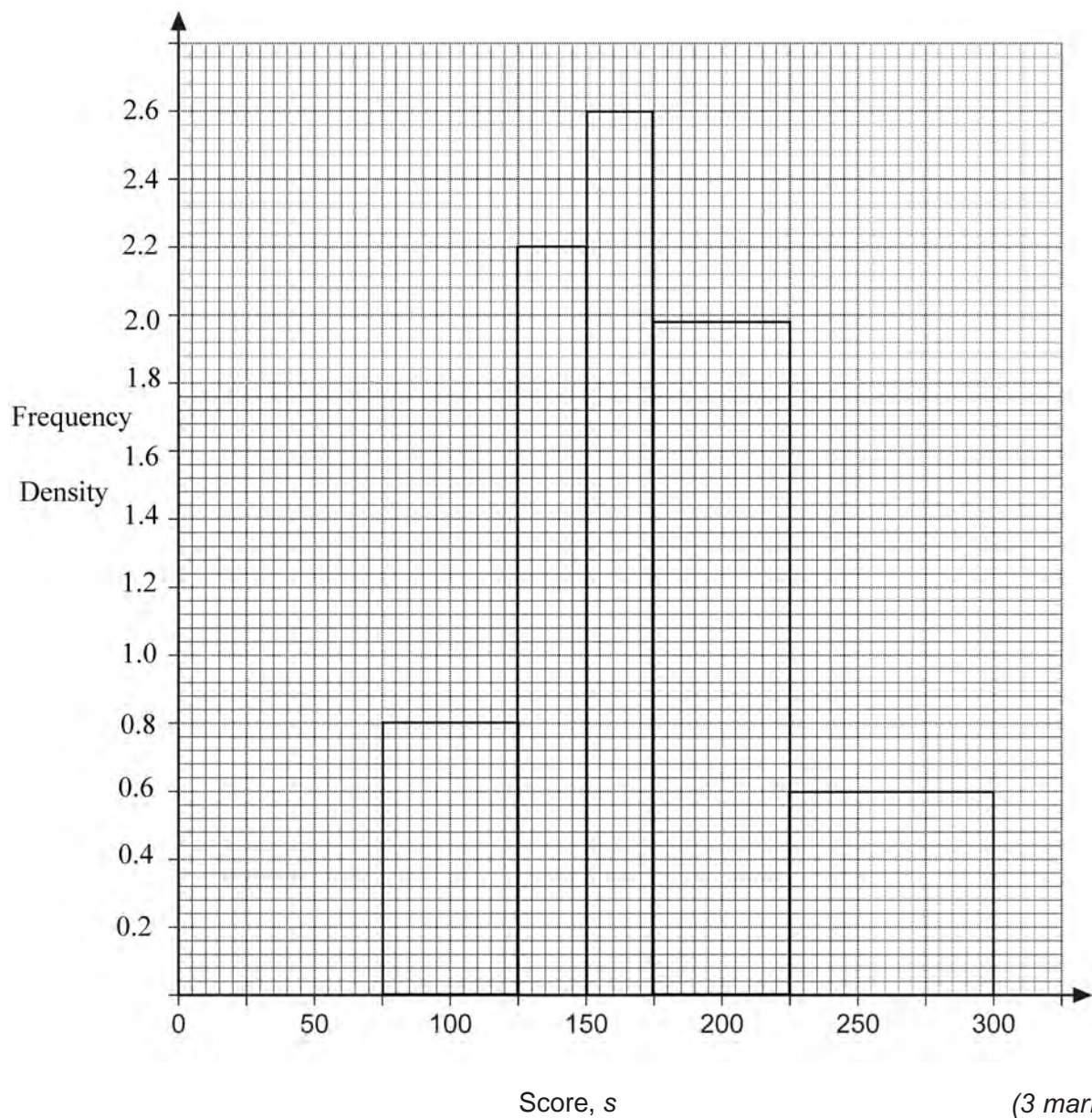
3 Four histograms for a variable *x* with values from 0 to 100 are shown below.

Four box plots for the same histograms are also

shown. Match each histogram to the correct box plot.
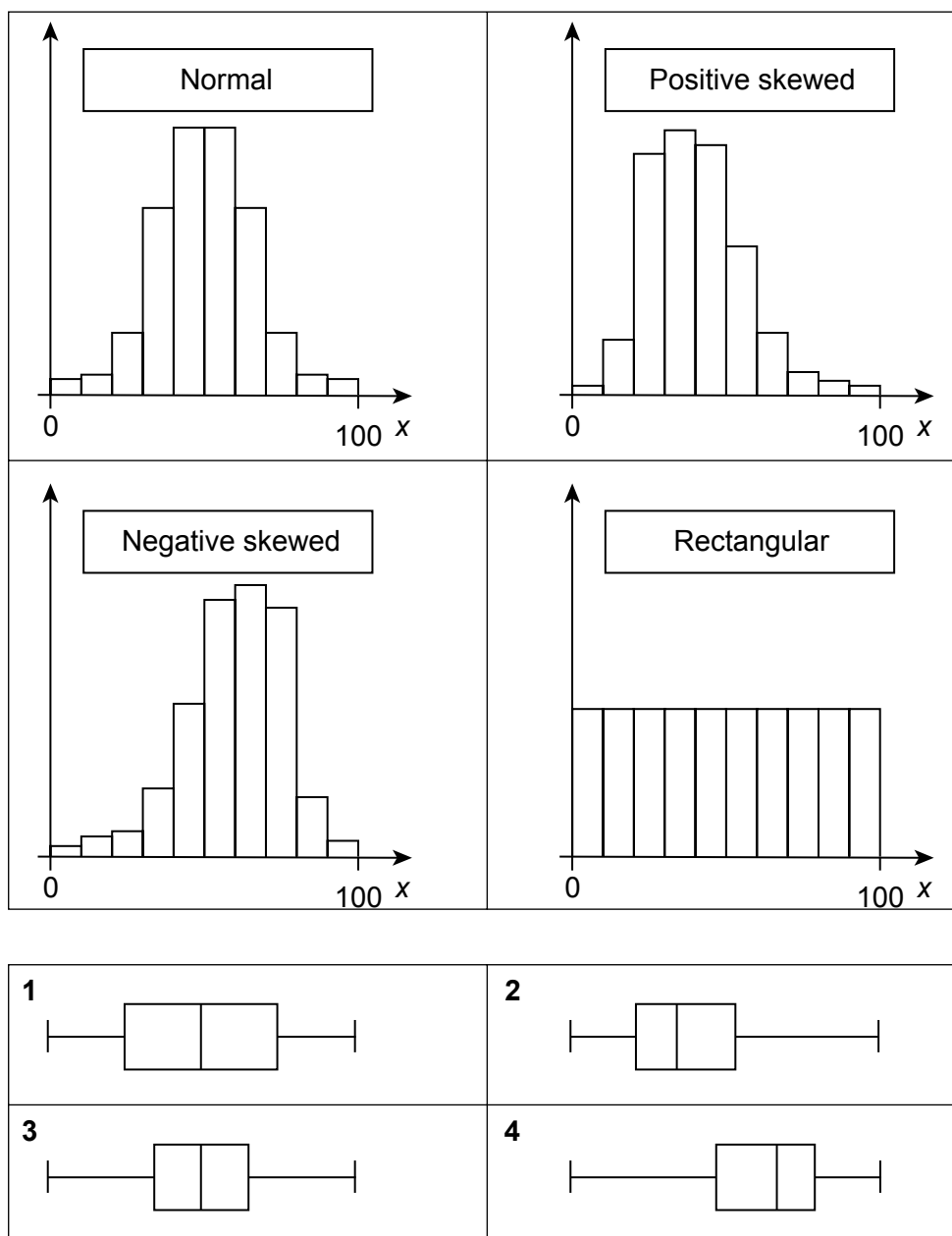
Normal histogram is shown by box plot ....3.........

Positive skewed histogram is shown by box plot .....2..........

Negative skewed histogram is shown by box plot ......4.........

Rectangular histogram is shown by box plot ......1.........

(3 marks)

4 The histogram shows the distribution of ages of 100 members of a bowling club.
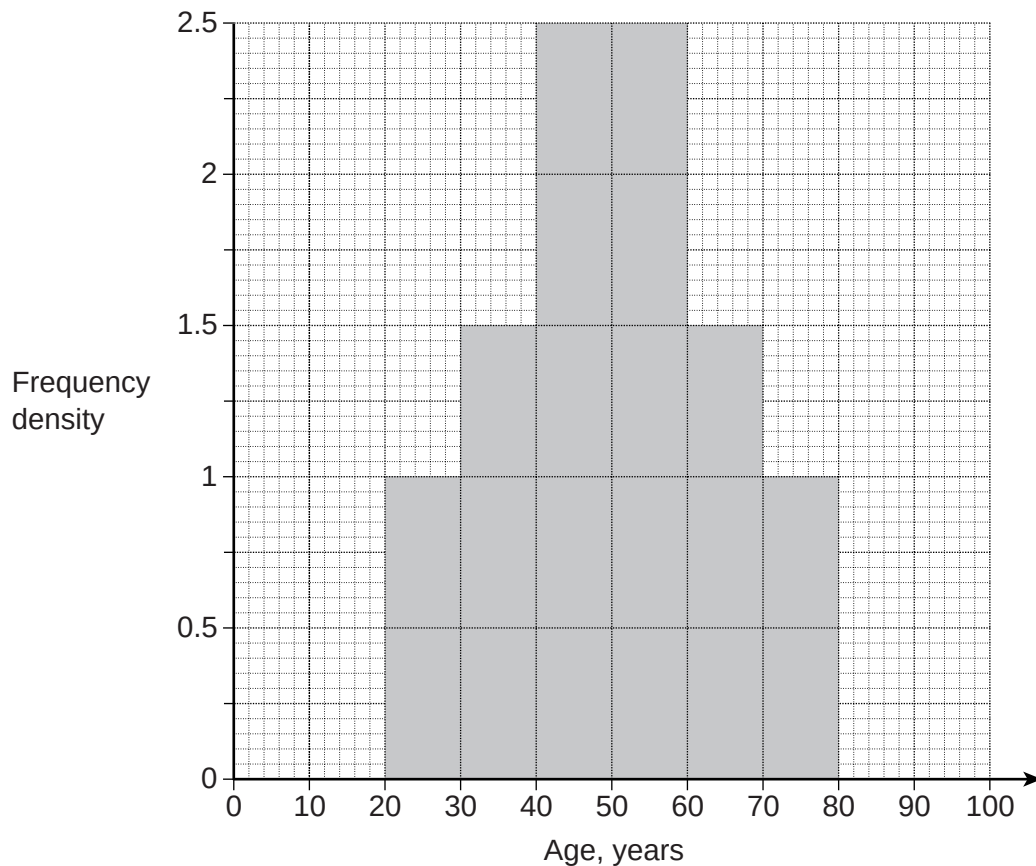
4 (a) How many members of the club were less than 40 years old?

The histogram has 20 boxes for 100 members so each box represents 5 members.

Answer ....25... *(1 mark)*

4 (b) How many members of the club are between 40 and 60 years old?

Answer ....50... *(1 mark)*

4 (c) Work out the inter-quartile range of the ages.

Lower quartile is 40. Upper quartile is 60.

Answer ....20.. years *(2 marks)*

5 The histogram shows the distribution of the masses of 100 mice.

Mass (grams)
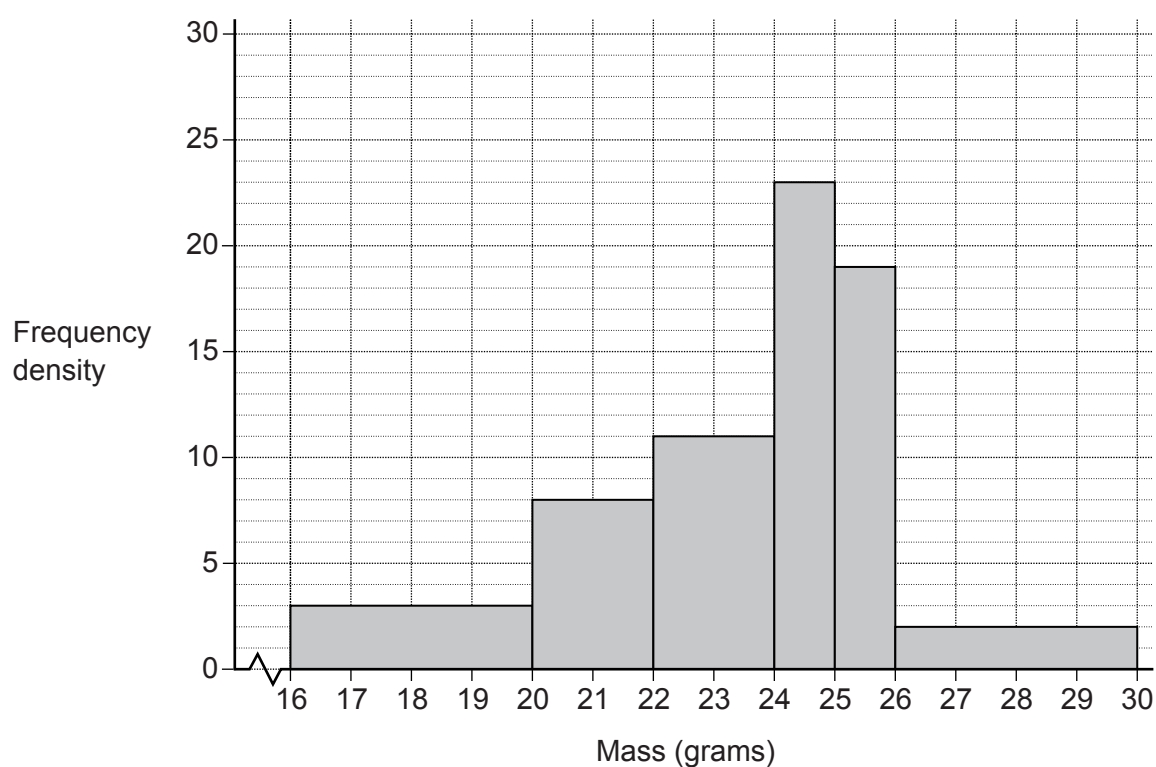
Calculate an estimate of the mean mass.

mid value x	frequency f	fx
18	12	216
21	16	336
23	22	506
24.5	23	563.5
25.5	19	484.5
28	8	224

$$\sum f = 100 \qquad \sum fx = 2330$$

$$\text{mean} = \frac{\sum fx}{\sum f}$$
$$= \frac{2330}{100}$$
$$= 23.3$$

Answer ....23.3...................................... grams   *(4 marks)*

6   The histogram and the frequency table show some information about how much time some people spent shopping.

Time (minutes)	Number of people
$0 < t \leq 20$	25
$20 < t \leq 50$	45
$50 < t \leq 100$	100
$100 < t \leq 120$	50
$120 < t \leq 180$	30
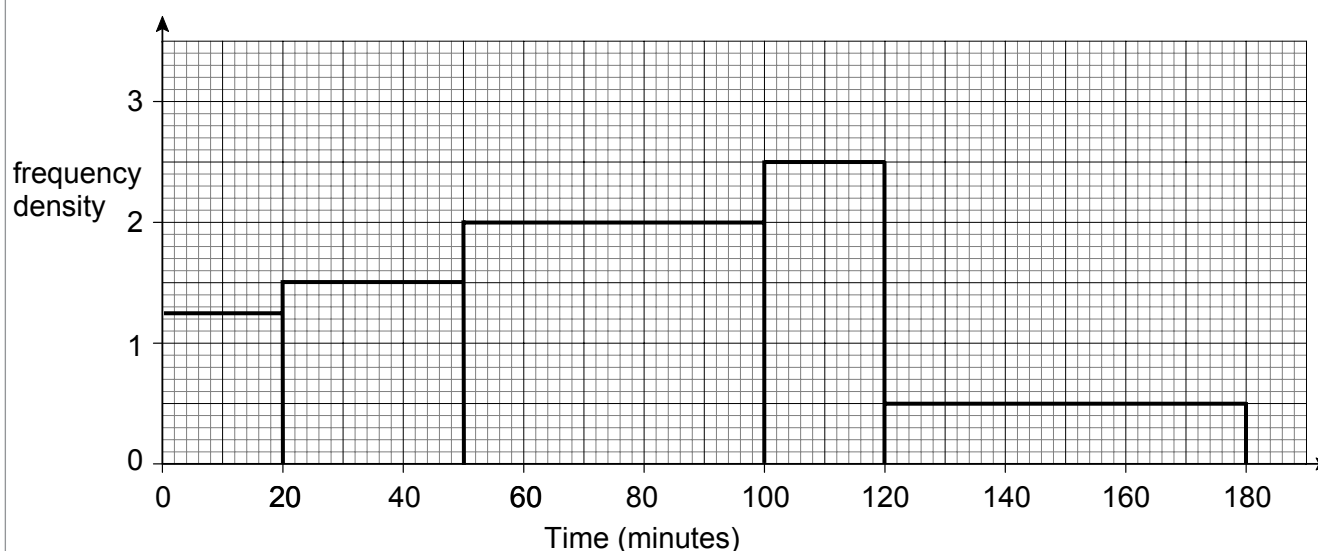
Fifty people were shopping for more than *T* minutes.

Calculate an estimate of the value of *T*.

$120 - 180$ has a frequency of 30 and an area of 6 cm^2

$\therefore$ 1cm^2 represents 5 people

In the $100 - 120$ part, each column of small squares is 1 cm^2 (5 people)

Counting backwards from the 120 (30 people) we reach 50 people at 112.

Answer ....112... minutes (3 marks)

7   The table shows the height of 100 hills in England.

Height, h (metres)	Frequency	Frequency Density
$0 < w \leq 500$	34	0.068
$500 < w \leq 1000$	28	0.056
$1000 < w \leq 2000$	22	0.022
$2000 < w \leq 4000$	16	0.008

7 (a)   Draw a fully labelled histogram to show the heights of the hills.

Heights of hills

(3 marks)
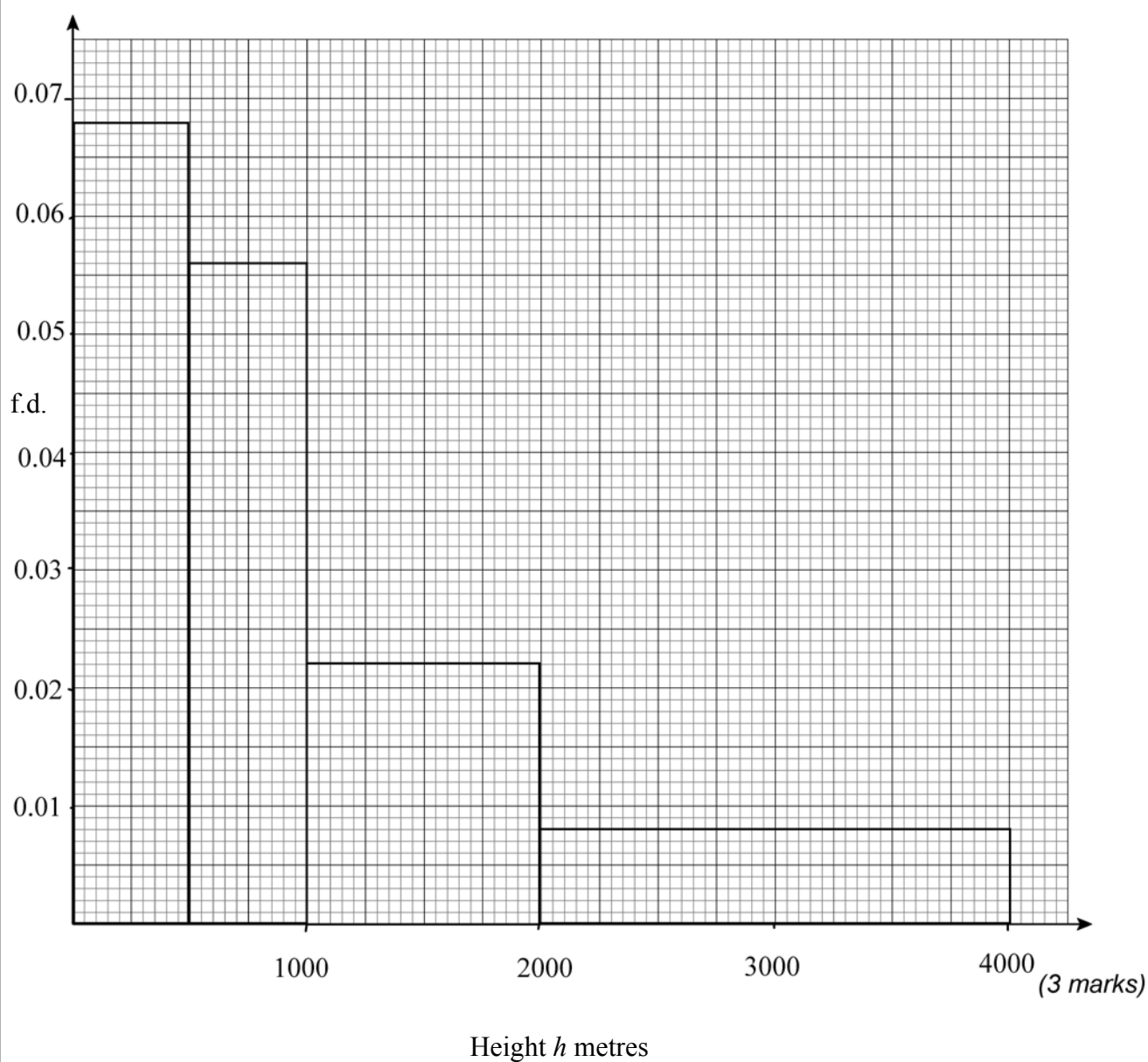
Height h metres

7 (b)   Estimate the probability that 2 hills picked at random were over 500 metres in height.

$$\text{Hills over 500 m} = 28 + 22 + 16$$
$$= 66$$
$$p(\text{1st hill over 500}) = \frac{66}{100}$$
$$p(\text{2nd hill over 500}) = \frac{65}{99}$$
$$p(\text{both over 500}) = \frac{66}{100} \times \frac{65}{99}$$
$$= \frac{13}{30}$$

Answer .... $\frac{13}{30}$ .... *(3 marks)*

8 The histogram and the frequency table show some information about how much time some people spent shopping.

Time (minutes)	Number of people	Frequency Density
$0 < t \leqslant 20$	25	
$20 < t \leqslant 50$	45	1.5
$50 < t \leqslant 100$	100	2
$100 < t \leqslant 120$	50	
$120 < t \leqslant 180$	30	

frequency density
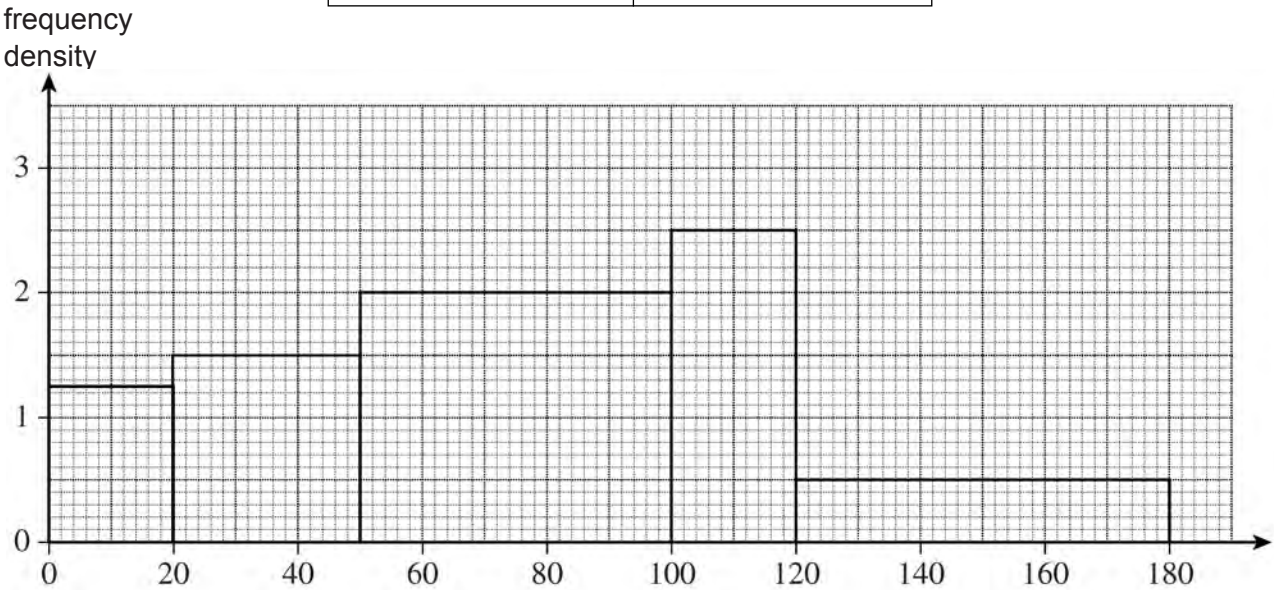
Complete the histogram and fill in the missing number in the frequency table.

(2 marks)

Surname	
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Mathematics   43601F

F

Past Paper Questions by Topic

Number
Model Answers

For this paper you must have:
- mathematical instruments.

You must **not** use a calculator.

Time allowed
- 1 hour 15 minutes

Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
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- You may ask for more answer paper and graph paper. These must be tagged securely to this answer booklet.

Advice
- In all calculations, show clearly how you work out your answer.

1 (a) Work out 7500 + 1500

Write your answer in words.

Answer ....nine thousand..………......………

(2 marks)

1 (b) Write 5758 to the nearest hundred.

Answer ......5800...................…………..………......………

(1 mark)

1 (c) What is the value of the digit 3 in the number 423 985?

Answer ....3000...................…………..………......………

(1 mark)

1 (d) Write down the positive square root of 100.

Answer ....10...................…………..………......………

(1 mark)

1 (e) Which of these is equal to one million?
Circle your answer.

10^3 10^4 10^5 10^6 10^7

(1 mark)

2   The heights of three mountains in England are shown.

Scafell Pike   978 metres
Helvellyn   950 metres
Skiddaw   931 metres

2 (a)   Write down the height of Scafell Pike to the nearest 10 metres.

Answer ……980………………………………… metres

(*1 mark*)

2 (b)   Write down the height of Skiddaw to the nearest 100 metres.

Answer ……900………………………………… metres

(*1 mark*)

2 (c)   Noah and Will do a sponsored run.

They both run up each of the three mountains. They

are each sponsored for 40p per metre of height. They

want to raise at least £2000 altogether.

Do they succeed?

Total height:

$978 + 950 + 931 = 2859$

Money raised:

$2859 \times 40 \times 2 = 228720$ pence

$= £2287.20$

They succeed.

(*4 marks*)

3   Use the numbers from this list to answer the questions.

5	12	13	25	28	30	42	49

3 (a)   Write down all the multiples of 4.

Answer ....12, 28.. *(2 marks)*

3 (b)   Write down all the factors of 100.

Answer ....5, 25.. *(2 marks)*

3 (c)   Write down a square number.

Answer ....25 (or 49)... *(1 mark)*

3 (d)   Write down three numbers that have a sum of 100.

Answer ......28........ and........30.......... and.........42........... *(1 mark)*

4   Here are two numbers.

                     fifty thousand   6500

Which number is bigger?

Give a reason for your answer.

Bigger number ....fifty thousand................

                  6500 is six thousand five hundred , so is not as big.

(2 marks)

5   *a, b* and *c* are three positive whole numbers.

a is one-fifth of *c*.

b is one-sixth of *c*.

c is less than 100.

What values could *c* take?

> *c* has to have both 5 and 6 as factors and be less
> than 100. The first one is 30. The other multiples of
> 30 are 60 and 90.

Answer ....30, 60, 90.........…………..…………....………

(5 marks)

6   The numbers 29 and 31 are consecutive prime numbers.

The number halfway between them is 30.

30 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 less than 30:
> 2, 3, 5, 7, 11, 13, 17, 19, 23, 29
> Square numbers less than 30:
> 1, 4, 9, 16, 25,

Answer ....3.................……and……....5.………...…

(also 7 and 11)   *(2 marks)*

7   Work out $8^2 \div 4^3$

$$= 64 \div 64$$
$$= 1$$

Answer ....1... (2 marks)

8   You are given that $31.7 \times 24 = 760.8$

8 (a)   Write down the value of 317×24

Answer ....7608.. (1 mark)

8 **(b)**   Write down the value of $76.08 \div 24$

Answer ....3.17... (1 mark)

8 (c)   Work out the value of 31.7×25

$$31.7 \times 24 = 760.8$$
$$31.7 \times 25 = 760.8 + 31.7$$
$$= 792.5$$

Answer ......792.5... (2 marks)

9 (a)   In the final of Britain's Got Talent there are 2 singers and 1 magician.

What fraction are singers?

Answer ...... $\dfrac{2}{3}$ .... *(1 mark)*

9 (b)   The number of votes that the winner receives is 2 827 273.

Write this number to the nearest million.

Answer ...... 3 000 000 .... *(1 mark)*

9 (c)   One in every five households watched the final on TV.

What percentage of households watched the final?

$$\dfrac{1}{5} \times 100 = 20\%$$

Answer .... 20 .... % *(2 marks)*

10 (a)   A century means 100 years

10 (a) (i)   How many years is half a century?

$$100 \div 2 = 50$$

Answer ....50... *(1 mark)*

10 (a) (ii) A house is 63 years old.

How many more years will it be before becomes a century old?

$$100 - 63 = 37$$

Answer ....37... *(1 mark)*

10 (b)   A race is run over a distance of fifteen hundred metres. Write this

distance in figures.

Answer ....1 500.. metres *(1 mark)*

10 (c) Write down the square root of 64.

$$8 \times 8 = 64$$

Answer ......8... *(1 mark)*

10 (d)   Two numbers have a difference of 40.
Each number is a factor of 100.

Work out the two numbers

Factors of 100:
1, 2, 4, 5, 10, 20, 25, 50, 100

Answer ....50................ and ....10................ *(2 marks)*

*11(a) (i)   Simplify the expression $n \times 5$

Answer ....5n..   *(1 mark)*

11 (a) (ii)   Simplify fully $2x + 5y + 3x - 2y$

Answer ....5x + 3y...   *(2 marks)*

11 (b) m represents an even number.

Explain why $(m + 1)(m - 1)$ is always odd.

$m + 1$ will always be odd. Also $m - 1$ will always be odd. An odd number multiplied by an odd number gives an odd answer.

(2 marks)

12 (a)   Circle **all** the prime numbers in this list.

③   6   ⑦   9   10   ⑬   15

(2 marks)

12 (b) x is a positive whole number. $6x - 1$ is not a prime number.
Work out a possible value for x.

Answer ....11 (or 21, 31, 41, 51....)........................   *(2 marks)*

13 (a) (i) Write down a multiple of 6 that is greater than 20.

Answer ....24 (or 30, 36, 42 ...).......................... *(1 mark)*

13 (a) (ii) Write down a factor of 20 that is less than 6.

Answer ....5 (or 1, 2, 4)... *(1 mark)*

13 (b) Use these mathematical terms to complete the statements below.

cube   cube root   square   square root

10 is the ………………square root.. of 100

144 is the ……………square................................. of 12

5 is the ..………………cube root.. of 125

(3 marks)

13 (c) This is Hassan's working for the calculation $12 + 4 \times 10$

$$12 + 4 = 16$$
$$16 \times 10 = 160$$
$$\text{Answer} = 160$$

Hassan is wrong.

Work out the correct answer for the calculation.

$$4 \times 10 = 40$$
$$12 + 40 = 52$$

Answer ....52... *(1 mark)*

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Past Paper Questions by Topic

Pie Charts
Model Answers

F

For this paper you must have:
- mathematical instruments.

You must **not** use a calculator.

Time allowed
- 1 hour 15 minutes

Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
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Advice
- In all calculations, show clearly how you work out your answer.

1   A car park is open from 9 am to 6 pm.

1 (a) (i)   80 cars enter between 9 am and 10 am.
One-quarter of these cars are white.

How many white cars enter between 9 am and 10 am?

$$80 \div 4 = 20$$

Answer ....20...   *(1 mark)*

1 (a) (ii)   115 cars enter between 10 am and 11 am.
Tara says, "Exactly one-quarter of these cars are

white." Show that she is wrong.

$$115 \div 4 \text{ does not give a whole number.}$$ *(1 mark)*

1 (b)   A data logging machine counts cars entering and leaving the car park.

Hour ending at	Cars entering	Cars leaving
10 am	80	5
11 am	115	25
12 noon	75	40
1 pm	35	35
2 pm	50	50
3 pm	40	45
4 pm	20	65
5 pm	10	115
6 pm	5	30

1 (b) (i) The car park is empty at 9 am.

How many cars are in the car park at 10 am?

$$80 - 5 = 75$$

Answer ....75...   *(1 mark)*

1 (b) (ii) Traffic lights stop cars entering when the car park is full.
The car park is full at 12 noon.

How many cars are in the car park when it is full?

$$80 + 115 + 75 - 5 - 25 - 40 = 200$$

Answer ....200...   *(3 marks)*

1 **(c)**   The pie chart shows information about the colours of the cars in the car park one day.
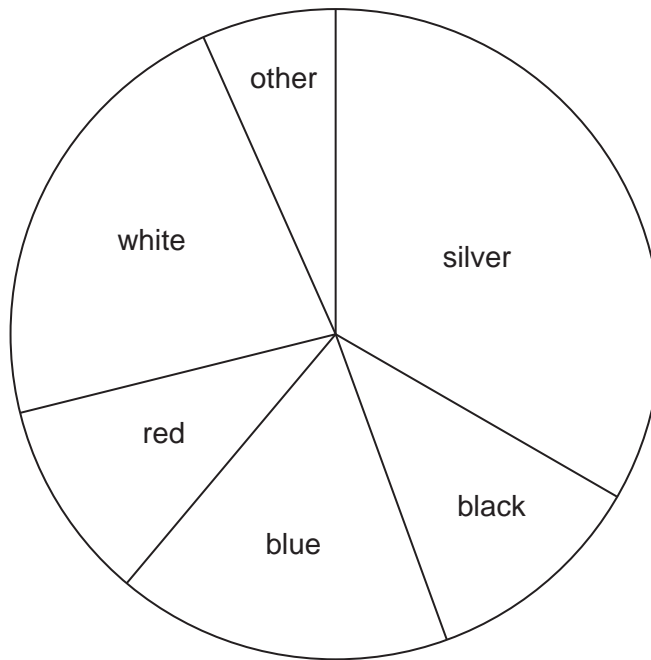
Complete the sentences.

1 **(c) (i)** There are twice as many ......white...................... cars as black cars.

(1 mark)

1 **(c) (ii)** $\frac{1}{3}$ of the cars are ....silver..................

(1 mark)

1 **(d)**   Are there any pink cars in the car park on that day?
Tick a box.

☐ Yes   ☐ No   ☑ Cannot tell

Give a reason for your answer.

There may be some pink cars in the 'other' category.

(1 mark)

2 **(a)** The pie chart shows the destinations of 300 students from Year 11 in 1979.
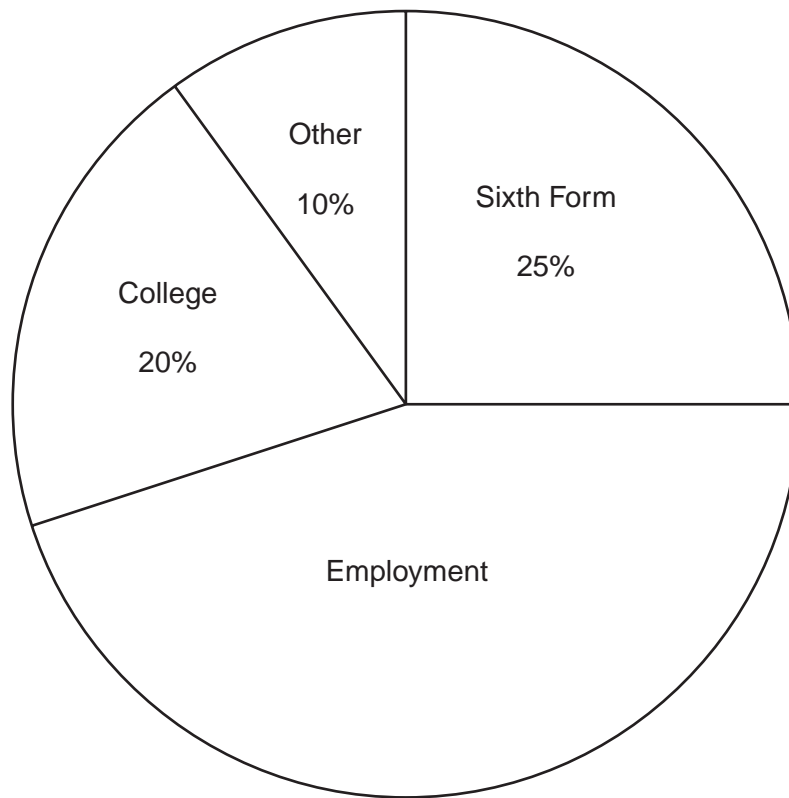
2 **(a) (i)** Work out the percentage of the students who went into Employment.

$$100 - 20 - 10 - 25 = 45$$

Answer ......45.. %   *(2 marks)*

2 **(a) (ii)** Work out the number of students who went to College.

$$300 \times \frac{20}{100} = 60$$

Answer ......60..   *(2 marks)*

3 **(b)**   The pie chart shows the destinations of 300 students from Year 11 in 2009.
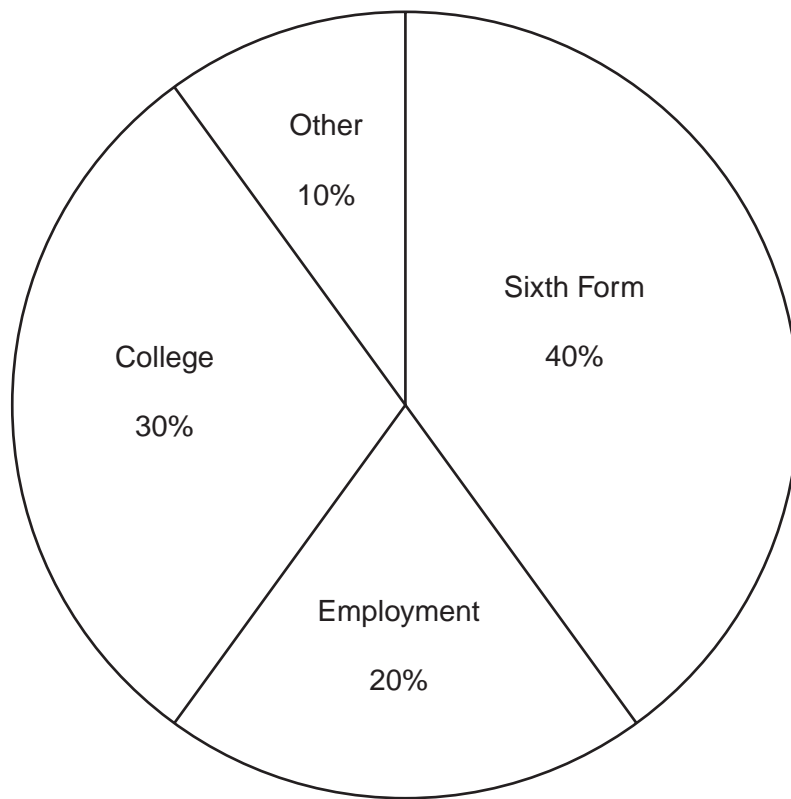
3 **(b)**   What was the most popular destination in 2009?

Answer ......Sixth Form..   *(1 mark)*

3 **(c)**   The pie charts show changes in the destinations of the students.

Write down **two** changes that have happened by 2009.

Change 1   More go to sixth form.

Change 2   Less go to employment.

(2 marks)

4   The pie chart shows information about how year 9 students travel to a school.
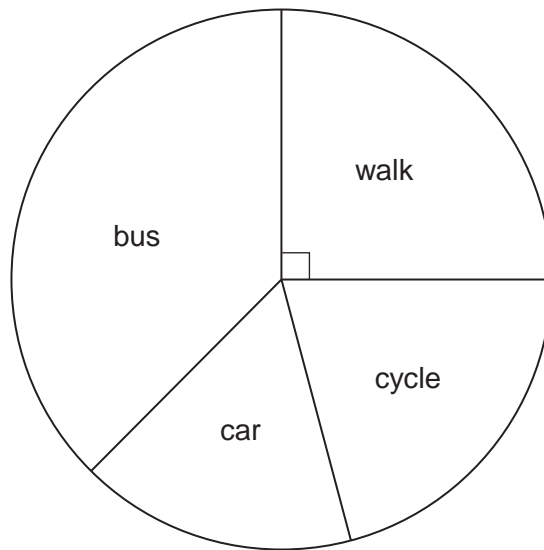
4 (a) A student from year 9 is chosen at random.

Mark, with the letter, the probabilities of each of the following on the scale below.

The first one has been done for you.

A: The student walks to school.

B: The student does **not** walk to school.

C: The student travels to school by train.
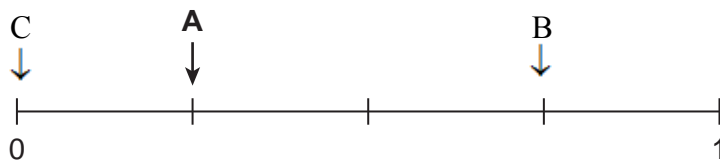
(2 marks)

4 (b)   40 students travel to school by car.

How many year 9 students are there?

The angle for 'car' measures 60°

$$\frac{360}{60} \times 40 = 240$$

Answer .....240...   *(3 marks)*

4 (c)   There are 252 students in year 10.

The same proportion of students walk to school as in year 9.

Work out the number of year 10 students that walk to school.

$$\frac{90}{360} \times 252 = 63$$

Answer ....63...   *(2 marks)*

5   The table shows the types of shell that Chris collects.

Type of shell	Number	Degrees
Mussel	18	162
Winkle	10	90
Whelk	8	72
Razor	4	36
	40	360

5 (a)   Draw and label a pie chart to represent the data.

$$\frac{360}{40} = 9$$

$$18 \times 9 = 162$$
$$10 \times 9 = 90$$
$$8 \times 9 = 72$$
$$4 \times 9 = 36$$
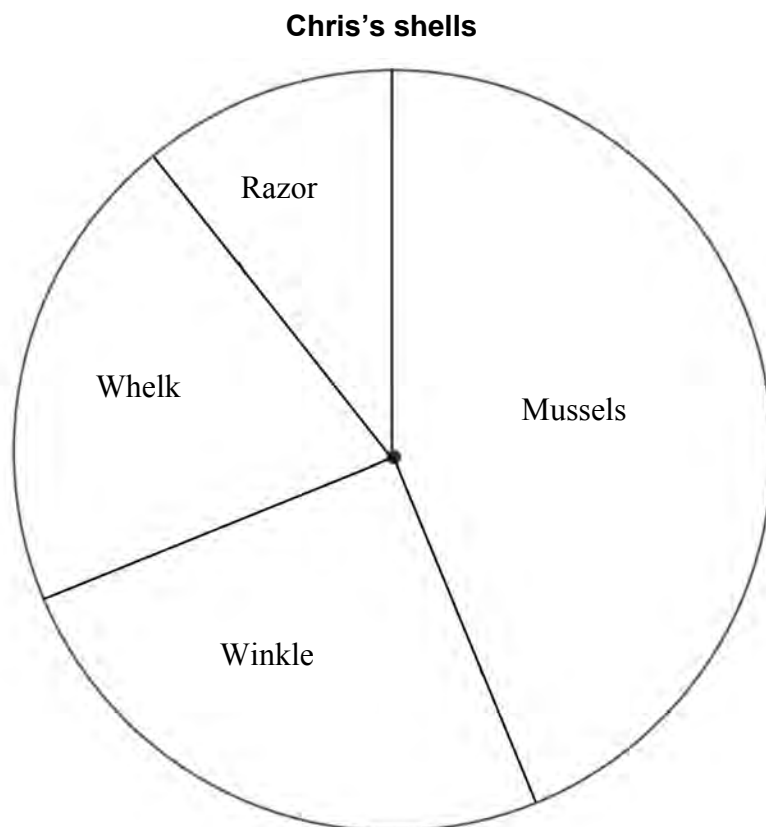
Chris's shells

(4 marks)

5 (b)   Sophie collects the same proportion of winkle shells as Chris.

She collects 15 winkle shells.

Work out the number of shells that Sophie collects.

A quarter of the shells are winkle.

Total number of shells:

$15 \times 4 = 60$

Answer ....60..

(3 marks)

6 The pie chart shows the sports played by 60 students during their games lesson.
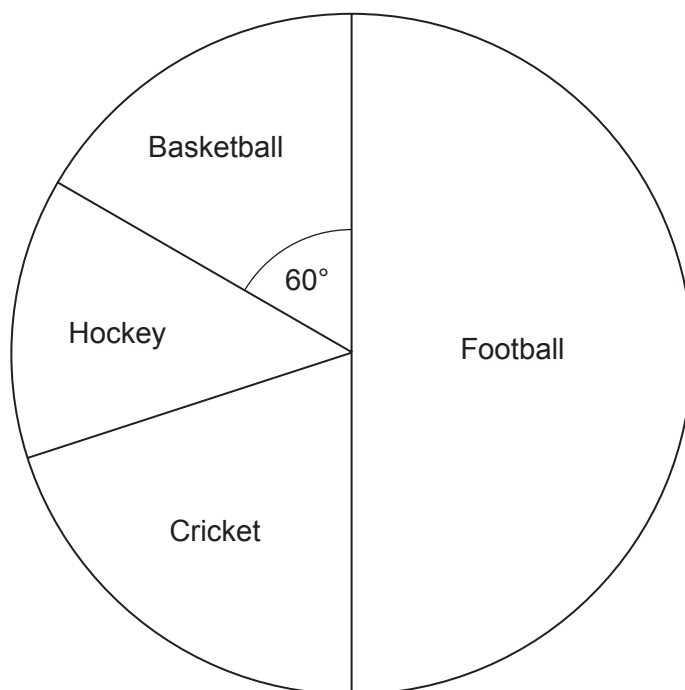
6 (a) How many students play football?

Answer .....30.. *(1 mark)*

6 (b) How many students play hockey or cricket?

Angle for hockey and cricket:

$360 = 180 - 60$

$ = 120$

Number of players:

$\dfrac{120}{360} \times 60$

$\phantom{\dfrac{120}{360}} = 20$

Answer .....20.. *(3 marks)*

7 The pie chart shows how a council spends money on transport.
Only some of the percentages are given.
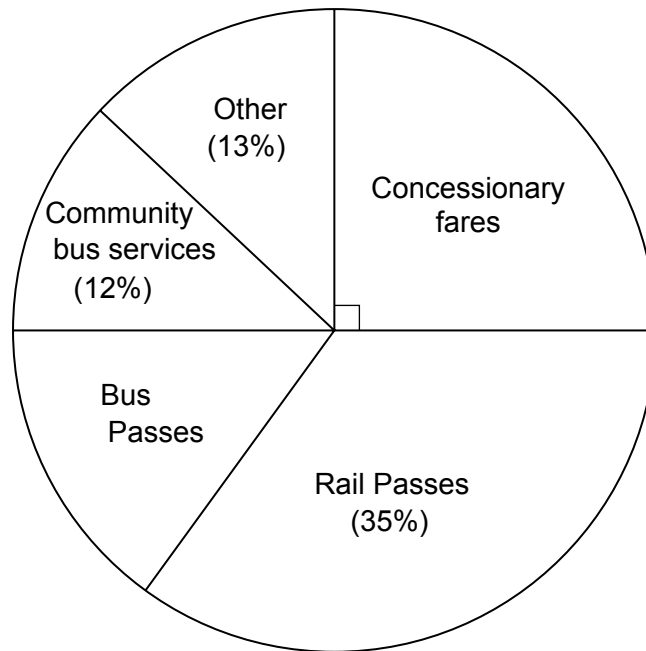
7 (a) 25% of the money is spent on Concessionary fares.

Explain how the pie chart shows this.

The angle is marked as a right angle and this is 25% of the circle.

(1 mark)

7 (b) What percentage of the money is spent on Bus Passes?

$$100 - 12 - 13 - 25 - 35 = 15$$

Answer ....15... % *(2 marks)*

7 (c) The council spends £200 million on transport in total.

Work out 12% of £200 million to find how much the council spends on Community bus services.

$$200 \times \frac{12}{100}$$

$$= 24$$

Answer £ ....24.. million *(2 marks)*

8   Misba asks 18 pupils to choose their favourite vegetable from a list.
These are her results.

peas	broccoli	peas	**carrots**	carrots	broccoli
peas	broccoli	sprouts	carrots	**peas**	carrots
carrots	peas	carrots	**carrots**	carrots	broccoli

Misba decides to draw a pie chart to show these
results. The table shows some of her work.

Favourite vegetable	Tally	Frequency	Angle on pie chart
Broccoli (B)	III	3	60°
Peas (P)	ЖГ	5	100°
Carrots (C)	ЖГ III	8	160°
Sprouts (S)	I	1	20°
		Total = 18	Total = 360°

8 (a)   Complete the tally and frequency columns in the table.

(2 marks)

8 (b) (i)   Complete the angle on the pie chart column in the table.

$$\frac{360}{18} = 20$$

$5 \times 20 = 100$

$8 \times 20 = 160$

$1 \times 20 = 20$

(2 marks)

8 (b) (ii) Complete the pie chart to represent this information.

(2 marks)

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Mathematics 43601F

Past Paper Questions by Topic

Probability
Model Answers

F

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- mathematical instruments.

You must **not** use a calculator.

Time allowed
- 1 hour 15 minutes

Instructions
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Advice
- In all calculations, show clearly how you work out your answer.

1(a) Fair spinner A has eight equal sections.
The sections are either *one* (1), *two* (2), *three* (3) or *four* (4).

Spinner A

1 (a) (i) The spinner is spun.

On which number is it least likely to land?

Answer ....4... *(1 mark)*

1 (a) (ii) Write down the probability that the spinner lands on *three*.
Give your answer in its simplest form.

$$\frac{2}{4}$$

Answer .... $\frac{1}{2}$ .... *(2 marks)*

1 (b) Fair spinner B has three equal sections.

It is certain to land on *one* (1).

Label spinner B.

Spinner B

(1 mark)

1 (c)   Fair spinner C has 10 equal sections.

Label spinner C so that

it has the same four numbers as spinner A
four is less likely than on spinner A
four and *three* are equally likely on spinner C
one and *two* are equally likely on spinner C.

Spinner C

(2 marks)

2   There are three drinks.

Cola   C

Orange   O

Water   W

They come in three sizes.

Small   S

Medium   M

Large   L

2 (a)   List **all** possible combinations of drink and size. The first
one has been done for you.

CS   CM   CL

OS   OM   OL

WS   WM   WL

(3 marks)

2 (b)   A drink is chosen at random.

What is the probability that a small cola is chosen?

Answer ..... $\dfrac{1}{9}$ ....   *(1 mark)*

3 (a)   A bag contains 3 red, 5 white and 8 blue balls.

One ball is chosen at random.

What is the probability of choosing a blue ball?

$$p(\text{blue ball}) = \frac{8}{16}$$

Answer ... $\frac{1}{2}$ ....   *(2 marks)*

3 (b)   A different bag contains only black balls, pink balls and white balls. When one

ball is chosen at random, each colour is equally likely.

Write down **two** possible values for the total number of balls in this bag.

Any multiple of 3

Answer   ....3.............. and ....6................   *(2 marks)*

3 (c)   Another bag contains only green balls and yellow balls. There are
more than 10 balls in the bag.
When one ball is chosen at random, the probability of choosing a
green ball is $\frac{3}{4}$

Write down **two** possible values for the total number of balls in this bag.

Any multiple of 4 that is above 10.

Answer   ....12.......... and ....16..............   *(2 marks)*

4   The scale shows the probability that three events A, B and C will happen.

X   Y   Z

0   1

Choose the correct word to complete each statement.

(Unlikely)   (Impossible)   (Very likely)

(Certain)   (Very unlikely)   (Likely)

It is ....Very unlikely............... that event X will happen.

It is ....Likely......................... that event Y will happen.

It is ....Certain....................... that event Z will happen.

(3 marks)

5   At the school fayre, Hamira plays a game 20 times.
Each go costs 50p.
Each time she wins she receives £1.50
The probability of winning is 0.2.

How much money does she expect to lose?

Cost of games:

$20 \times 50p = £10$

Expected number of wins:

$20 \times 0.2 = 4$

Expected winnings:

$4 \times £1.50 = £6$

Expected loss:

$£10 - £6$

Answer £ .4...   *(3 marks)*

6   Tara has a box of 1000 coloured bands.
The bands are Red, Blue, Green and Yellow.
The table shows some of the probabilities of choosing a colour.

Colour	Red	Blue	Green	Yellow
Probability	0.6	0.1		0.1

6 (a)   Which coloured band is the most common?

Answer ......Red... *(1 mark)*

6 (b)   Tara chooses a band at random from the box.

6 (b) (i)   Work out the probability that she chooses a Green band.

$$1 - 0.6 - 0.1 - 0.1$$

Answer ....0.2... *(2 marks)*

6 (b) (ii)   Write down the probability that she chooses a White band.

Answer ....0... *(1 mark)*

6 (c)   Tara says: 'There must be 600 Red bands in the box.'

Is Tara correct?

Tick the correct box.

☑   ☐

Yes   No

Give a reason for your answer.

Reason $0.6 \times 1000 = 600$

(2 marks)

7   The pie chart shows information about how workers travel to a factory.

7 (a)   A worker is chosen at random.

Mark, with the letter, the probabilities of each of the following on the scale below.

The first one has been done for you.

   A: The worker walks to the factory.

   B: The worker does **not** walk to the factory.

   C: The worker travels to the factory by train.

(2 marks)

7 (b)   40 workers travel to the factory by car.

How many workers are there?

From the pie chart the angle for car is 60°

$$\frac{60}{360} = \frac{1}{6}$$

$$40 \times 6 = 240$$

Answer ......240..   *(3 marks)*

7 (c) There are 252 workers in the warehouse.

The same proportion of workers walk to the warehouse as in the factory

Work out the number of workers that walk to the warehouse.

$$\frac{90}{360} \times 252 = 63$$

Answer .....63... *(2 marks)*

8 A box only contains red and black balls.

It contains 24 red balls.

A ball is chosen at random from the box.

The probability of choosing a black ball is $\frac{1}{4}$.

How many balls are in the box?

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

$\frac{3}{4}$ of the balls are red

$$24 \times \frac{4}{3} = 32$$

Answer ....32.. *(3 marks)*

9 Terry throws two fair dice and adds their scores together.
   The table shows some of the possible total scores.

+	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	1 0	11	12

9 (a)   Complete the table.

(2 marks)

9 (b)   What is the probability of scoring a total of 8?

Answer .... $\dfrac{5}{36}$ ....   *(1 mark)*

9 (c)   What is the probability of scoring a total of 10 or more?

$$\frac{6}{36} = \frac{1}{6}$$

Answer .. $\dfrac{1}{6}$ ....   *(2 marks)*

10   Alex is x years old.
   David is 3 years younger than Alex.
   Will is twice as old as Alex.
   The total of their ages is 25

10 (a)   Write an expression for David's age in terms of x.

Answer $x - 3$ ....   *(1 mark)*

10 (b)   Write an expression for Will's age in terms of x.

Answer $2x$ ....   *(1 mark)*

10 (c)   Form an equation in x and use it to work out Alex's age.

$$x + x - 3 + 2x = 25$$
$$4x = 25 + 3$$
$$4x = 28$$
$$x = 7$$

Answer ....7..   *(2 marks)*

11 Justin has 3 red counters and 7 blue counters.
Terry has 10 red counters.
Chris has only blue counters.

11 (a) Justin puts his counters into a bag.

What is the probability of choosing a red counter from the bag?

Answer $\dfrac{3}{10}$ .... *(1 mark)*

11 (b) Terry adds his counters to the bag.

What is the probability of choosing a red counter now?

Answer $\dfrac{13}{20}$ .... *(2 marks)*

11 (c) Chris adds her counters to the bag.
The probability of choosing a red counter now is $\dfrac{1}{2}$

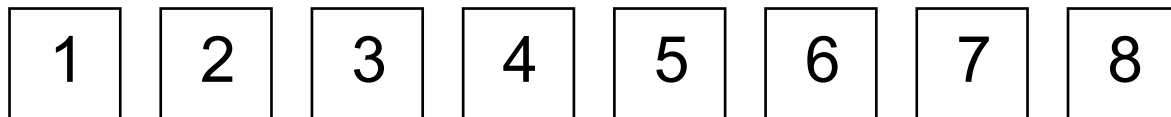How many blue counters did Chris have?

There are 7 blue and 13 red

Chris added 6 blue to make the blue up to 13 and $p\left(\text{blue}\right) = \dfrac{1}{2}$

Answer $\dfrac{1}{2}$ .... *(2 marks)*

12 Here are some number cards.

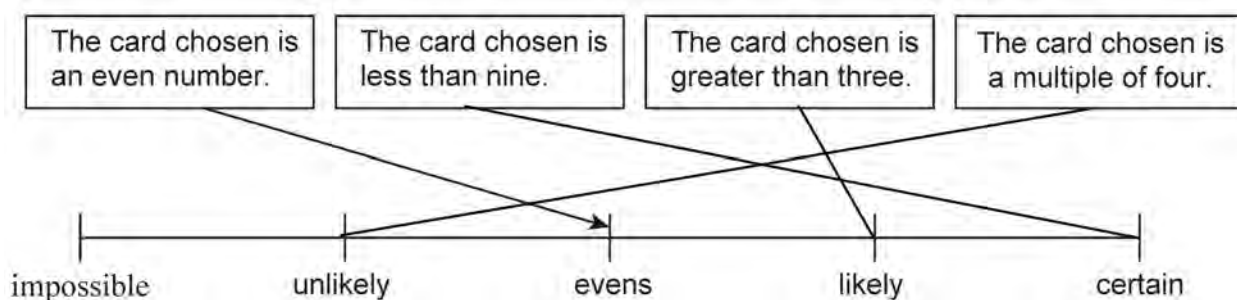| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |

A card is chosen at random.

Match each statement to the correct position on the probability

scale. The first one has been done for you.

| The card chosen is an even number. | The card chosen is less than nine. | The card chosen is greater than three. | The card chosen is a multiple of four. |

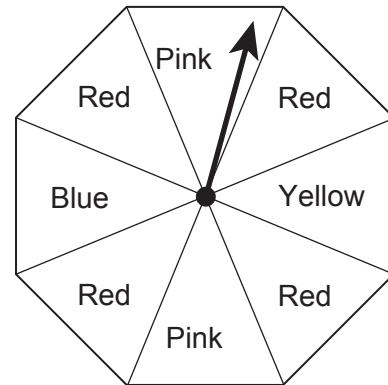impossible   unlikely   evens   likely   certain

(3 marks)

13 (a) Ron has a spinner with eight sections.
Four of the sections are Red, two are Pink, one is Blue and one is Yellow. He spins the spinner 200 times.
His results are shown in the table.

Colour	Red	Pink	Blue	Yellow
Frequency	105	48	22	25

13 (a) (i) Explain why the relative frequency of Pink is 0.24

$$\text{Relative frequency of Pink} = \frac{48}{200}$$
$$= 0.24$$

(1 mark)

13 (a) (ii) Do the results suggest that the spinner is fair?
Explain your answer.

Yes. The sample is close to the theoretical probabilities

Theoretical probabilities:

Red: $\frac{4}{8} \times 200 = 100$ Blue: $\frac{1}{8} \times 200 = 25$

Pink: $\frac{2}{8} \times 200 = 50$ Yellow: $\frac{1}{8} \times 200 = 25$

(2 marks)

13 (b) Sheila has a spinner with six sections.
Three of the sections are Green, two are White and one is Black. She spins the spinner 10 times.
Her results are shown in a table.

Colour	Green	White	Black
Frequency	2	5	3

She says her spinner is **not** fair.

Explain why Sheila could be wrong.

There were not enough trials.

(1 mark)

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Centre Number					Candidate Number				

Surname	
Other Names	
Candidate Signature	

Mathematics 43601H

Past Paper Questions by Topic

Probability
Model Answers

H

For this paper you must have:
- mathematical instruments.

You must **not** use a calculator.

Time allowed
- 1 hour 15 minutes

Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book.

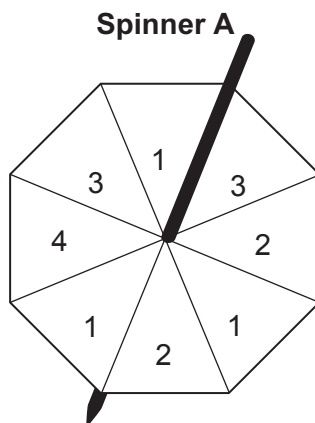**Information**
- The marks for questions are shown in brackets.
- The maximum mark for this paper is.
- The quality of your written communication is specifically assessed in questions indicated with an asterisk (*)
- You may ask for more answer paper and graph paper. These must be tagged securely to this answer booklet.

Advice
- In all calculations, show clearly how you work out your answer.

1(a)   Fair spinner A has eight equal sections.
The sections are either *one* (1), *two* (2), *three* (3) or *four* (4).

Spinner A

1 (a) (i)   The spinner is spun.

On which number is it least likely to land?

Answer ....4...   *(1 mark)*
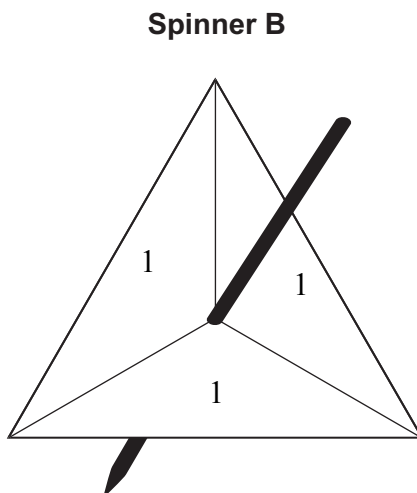
1 (a) (ii) Write down the probability that the spinner lands on *three*.
Give your answer in its simplest form.

$$\frac{2}{4}$$

Answer ....$\frac{1}{2}$...   *(2 marks)*

1 (b)   Fair spinner B has three equal sections.

It is certain to land on *one* (1).

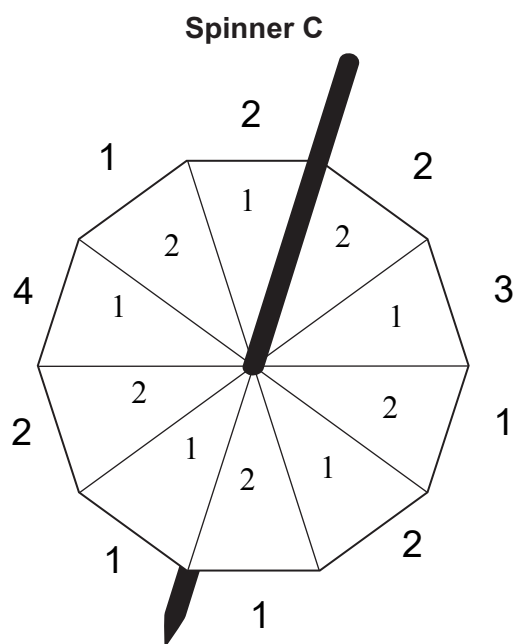Label spinner B.

Spinner B

(1 mark)

1 (c)   Fair spinner C has 10 equal sections.

Label spinner C so that

  it has the same four numbers as spinner A
  four is less likely than on spinner A
  four and *three* are equally likely on spinner C
  one and *two* are equally likely on spinner C.

Spinner C

(2 marks)

2   There are three drinks.

Cola   C

Orange   O

Water   W

They come in three sizes.

Small   S

Medium   M

Large   L

2 (a)   List **all** possible combinations of drink and size. The first
one has been done for you.

CS   CM   CL

OS   OM   OL

WS   WM   WL

(3 marks)

2 (b)   A drink is chosen at random.

What is the probability that a small cola is chosen?

Answer ..... $\dfrac{1}{9}$ .... *(1 mark)*

3 (a)   A bag contains 3 red, 5 white and 8 blue balls.

One ball is chosen at random.

What is the probability of choosing a blue ball?

$$p(\text{blue ball}) = \frac{8}{16}$$

Answer ... $\frac{1}{2}$ ....   *(2 marks)*

3 (b)   A different bag contains only black balls, pink balls and white balls. When one

ball is chosen at random, each colour is equally likely.

Write down **two** possible values for the total number of balls in this bag.

Any multiple of 3

Answer   ....3.............. and ....6................   *(2 marks)*

3 (c)   Another bag contains only green balls and yellow balls. There are
more than 10 balls in the bag.
When one ball is chosen at random, the probability of choosing a
green ball is $\frac{3}{4}$

Write down **two** possible values for the total number of balls in this bag.
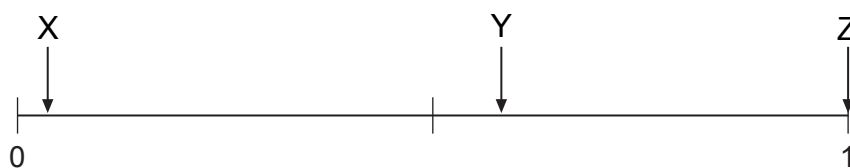
Any multiple of 4 that is above 10.

Answer   ....12.......... and ....16.............   *(2 marks)*

4   The scale shows the probability that three events A, B and C will happen.

X   Y   Z
↓   ↓   ↓
├─────────────────────────────┼────────────────────────────┤
0   1

Choose the correct word to complete each statement.

(Unlikely)   (Impossible)   (Very likely)

(Certain)   (Very unlikely)   (Likely)

It is ....Very unlikely............... that event X will happen.

It is ....Likely......................... that event Y will happen.

It is ....Certain........................ that event Z will happen.

(3 marks)

5   At the school fayre, Hamira plays a game 20 times.
Each go costs 50p.
Each time she wins she receives £1.50
The probability of winning is 0.2.

How much money does she expect to lose?

Cost of games:

$20 \times 50p = £10$

Expected number of wins:

$20 \times 0.2 = 4$

Expected winnings:

$4 \times £1.50 = £6$

Expected loss:

$£10 - £6$

Answer £ .4...   *(3 marks)*

6   Tara has a box of 1000 coloured bands.
The bands are Red, Blue, Green and Yellow.
The table shows some of the probabilities of choosing a colour.

Colour	Red	Blue	Green	Yellow
Probability	0.6	0.1		0.1

6 (a)   Which coloured band is the most common?

Answer ......Red..   *(1 mark)*

6 (b)   Tara chooses a band at random from the box.

6 (b) (i)   Work out the probability that she chooses a Green band.

$$1-0.6-0.1-0.1$$

Answer ....0.2...   *(2 marks)*

6 (b) (ii)   Write down the probability that she chooses a White band.

Answer ....0...   *(1 mark)*

6 (c)   Tara says: 'There must be 600 Red bands in the box.'

Is Tara correct?

Tick the correct box.

☑   ☐

Yes   No

Give a reason for your answer.
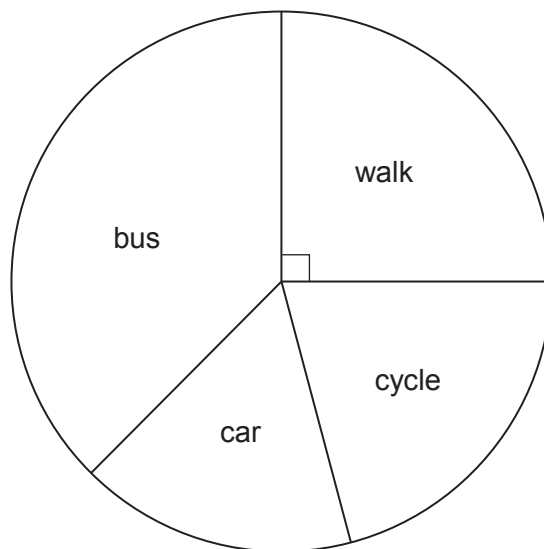
Reason $0.6 \times 1000 = 600$

(2 marks)

7　The pie chart shows information about how workers travel to a factory.

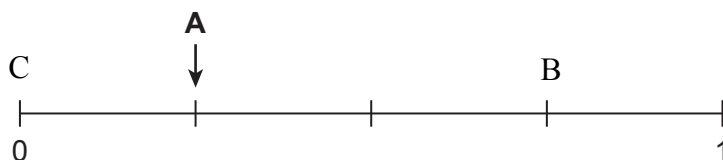**7 (a)**　A worker is chosen at random.

Mark, with the letter, the probabilities of each of the following on the scale below.

The first one has been done for you.

　A: The worker walks to the factory.

　B: The worker does **not** walk to the factory.

　C: The worker travels to the factory by train.

(2 marks)

7 (b)　40 workers travel to the factory by car.

How many workers are there?

From the pie chart the angle for car is 60°

$$\frac{60}{360} = \frac{1}{6}$$

$$40 \times 6 = 240$$

Answer .....240.. *(3 marks)*

7 (c)   There are 252 workers in the warehouse.

The same proportion of workers walk to the warehouse as in the factory

Work out the number of workers that walk to the warehouse.

$$\frac{90}{360} \times 252 = 63$$

Answer .....63...   *(2 marks)*

8   A box only contains red and black balls.

It contains 24 red balls.

A ball is chosen at random from the box.

The probability of choosing a black ball is $\frac{1}{4}$.

How many balls are in the box?

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

$\frac{3}{4}$ of the balls are red

$$24 \times \frac{4}{3} = 32$$

Answer ....32...   *(3 marks)*

9 Terry throws two fair dice and adds their scores together.
The table shows some of the possible total scores.

+	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

9 (a)   Complete the table.

(2 marks)

9 (b)   What is the probability of scoring a total of 8?

Answer .... $\dfrac{5}{36}$ ....   *(1 mark)*

9 (c)   What is the probability of scoring a total of 10 or more?

$$\dfrac{6}{36} = \dfrac{1}{6}$$

Answer .. $\dfrac{1}{6}$ ....   *(2 marks)*

10   Alex is x years old.
David is 3 years younger than Alex.
Will is twice as old as Alex.
The total of their ages is 25

10 (a)   Write an expression for David's age in terms of x.

Answer $x - 3$ ....   *(1 mark)*

10 (b)   Write an expression for Will's age in terms of x.

Answer $2x$ ....   *(1 mark)*

10 (c)   Form an equation in x and use it to work out Alex's age.

$$x + x - 3 + 2x = 25$$
$$4x = 25 + 3$$
$$4x = 28$$
$$x = 7$$

Answer ....7..   *(2 marks)*

11 Justin has 3 red counters and 7 blue counters.
Terry has 10 red counters.
Chris has only blue counters.

11 (a) Justin puts his counters into a bag.

What is the probability of choosing a red counter from the bag?

Answer ...$\frac{3}{7}$.. *(1 mark)*

11 (b) Terry adds his counters to the bag.

What is the probability of choosing a red counter now?

Answer $\frac{13}{20}$... *(2 marks)*

11 (c) Chris adds her counters to the bag.
The probability of choosing a red counter now is $\frac{1}{2}$

How many blue counters did Chris have?

There are 7 blue and 13 red
Chris added 6 blue to make the blue up to 13 so $p(\text{blue}) = \frac{13}{26}$ $= \frac{1}{2}$
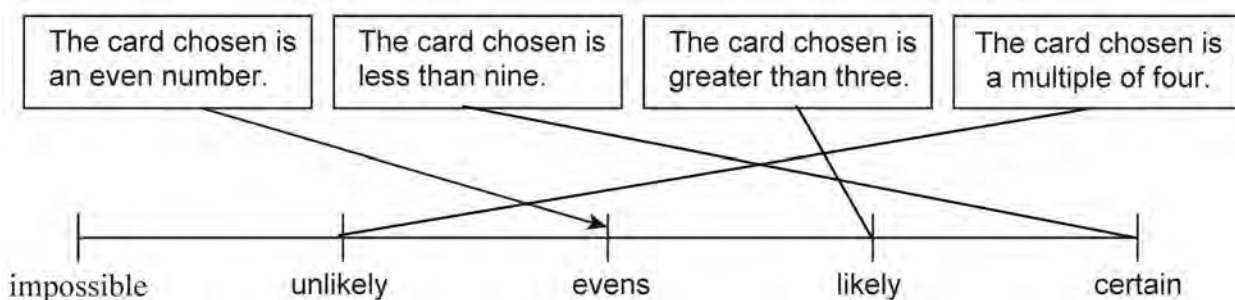
Answer ...6 counters.. *(2 marks)*

12 Here are some number cards.

$$\boxed{1} \quad \boxed{2} \quad \boxed{3} \quad \boxed{4} \quad \boxed{5} \quad \boxed{6} \quad \boxed{7} \quad \boxed{8}$$

A card is chosen at random.

Match each statement to the correct position on the probability
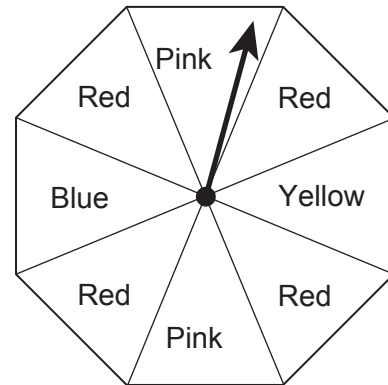
scale. The first one has been done for you.

The card chosen is an even number.	The card chosen is less than nine.	The card chosen is greater than three.	The card chosen is a multiple of four.

impossible   unlikely   evens   likely   certain

(3 marks)

13 (a) Ron has a spinner with eight sections.
Four of the sections are Red, two are Pink, one is Blue and one is Yellow. He spins the spinner 200 times.
His results are shown in the table.

Colour	Red	Pink	Blue	Yellow
Frequency	105	48	22	25

13 (a) (i) Explain why the relative frequency of Pink is 0.24

$$\text{Relative frequency of Pink} = \frac{48}{200}$$
$$= 0.24$$

(1 mark)

13 (a) (ii) Do the results suggest that the spinner is fair?
Explain your answer.

Yes. The sample is close to the theoretical probabilities

Theoretical probabilities:

Red: $\frac{4}{8} \times 200 = 100$ Blue: $\frac{1}{8} \times 200 = 25$

Pink: $\frac{2}{8} \times 200 = 50$ Yellow: $\frac{1}{8} \times 200 = 25$

(2 marks)

13 (b) Sheila has a spinner with six sections.
Three of the sections are Green, two are White and one is Black. She spins the spinner 10 times.
Her results are shown in a table.

Colour	Green	White	Black
Frequency	2	5	3

She says her spinner is **not** fair.

Explain why Sheila could be wrong.

There were not enough trials.

(1 mark)

14 A box only contains black balls and red balls. A ball is chosen from the box at random and replaced. Another ball is then chosen from the box at random. The probability of choosing two black balls is 0.36

14 (a) Show that the probability of choosing a black ball each time is 0.6

$$\sqrt{0.36} = 0.6$$

(1 mark)

14 (b) Work out the probability of choosing two red balls.

$$p(\text{red}) = 1 - 0.6$$
$$= 0.4$$
$$p(\text{red, red}) = 0.4 \times 0.4$$
$$= 0.16$$

Answer ....0.16.. *(2 marks)*

14 (c) Work out the probability of choosing at least one red ball.

$$p(\text{red, red}) = 0.4 \times 0.4$$
$$= 0.16$$
$$p(\text{red, black}) = 0.4 \times 0.6$$
$$= 0.24$$
$$p(\text{black, red}) = 0.6 \times 0.4$$
$$= 0.24$$

$$p(\text{at least one red}) = 0.16 + 0.24 + 0.24$$
$$= 0.64$$

Answer ...0.64.. *(2 marks)*

15 Chris picks a sweet at random from a box.
All the sweets in the box are identically wrapped.
The probability that she picks a caramel is $\frac{5}{8}$

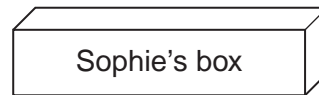Sophie picks a sweet at random from a different box. All
the chocolates in Sophie's box are identically wrapped.
The probability that she picks a caramel is denoted by p.

The probability that **both** Chris and Sophie pick a caramel is $\frac{1}{4}$

| Chris's box | Sophie's box |
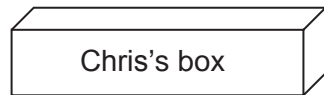
P (Chris picks a caramel) = $\frac{5}{8}$ P (Sophie picks a caramel) = p

15 (a) Work out the value of p.

$$\frac{5}{8} \times p = \frac{1}{4}$$

$$p = \frac{1}{4} \times \frac{8}{5}$$

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

Answer ... $\frac{2}{5}$ .... *(2 marks)*

15 (b) Calculate the probability that **neither** Chris **nor** Sophie picks a caramel.

$$p\left(\text{Chris no caramel}\right) = 1 - \frac{5}{8}$$

$$= \frac{3}{8}$$

$$p\left(\text{Sophie no caramel}\right) = 1 - \frac{2}{5}$$

$$= \frac{3}{5}$$

$$p\left(\text{both no caramel}\right) = \frac{3}{8} \times \frac{3}{5}$$

$$= \frac{9}{40}$$

(2 marks)

Answer .. $\frac{9}{40}$ ....

16 Tom and Harry go fishing together.

The probability that Tom catches a fish is 0.7
The probability that Harry catches a fish is 0.4

They go fishing again.

What is the probability that **exactly one** of them
catches a fish? You **must** show your working.

$$p(\text{Tom fish}) = 0.7$$

$$p(\text{Harry no fish}) = 1 - 0.4$$

$$= 0.6$$

$$p(\text{Tom fish, Harry no fish}) = 0.7 \times 0.6$$

$$= 0.42$$

$$p(\text{Tom no fish}) = 1 - 0.7$$

$$= 0.3$$

$$p(\text{Tom no fish, Harry fish}) = 0.3 \times 0.4$$

$$= 0.12$$

$$p(\text{exactly one fish}) = 0.42 + 0.12$$

$$= 0.54$$

Answer ......0.54.. *(4 marks)*

17 After a course of driving lessons candidates must take a test to get a driving licence.
The probability of passing the test at the first attempt is 0.8
Those who fail can re-take the test.
The probability of passing the re-sit is 0.5

17(a) (i) Complete the tree diagram, which shows all the possible outcomes.

First attempt   Second attempt

Pass

0.8

Pass

0.5

.....0.2..... Fail

.....0.5..... Fail
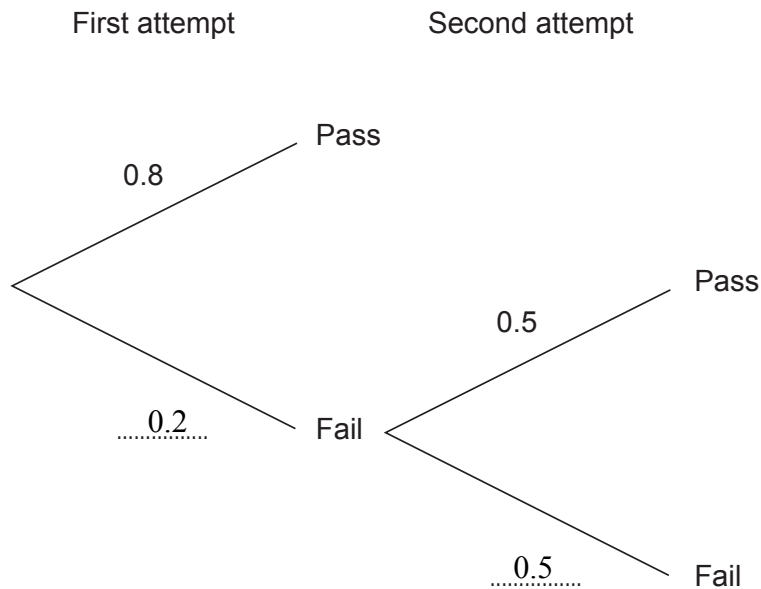
(1 mark)

17 (a) (ii) What is the probability that a candidate fails both attempts?

$$0.2 \times 0.5 = 0.1$$

Answer .....0.1... *(2 marks)*

17 (b) What is the probability that a candidate passes the course?

$$1 - 0.1 = 0.9$$

Answer .....0.9... *(1 mark)*

17 (c) Hassan and Shagufta both take the driving lessons course.

What is the probability that one of them passes and one of them fails?

$$(0.9 \times 0.1) + (0.1 \times 0.9)$$
$$= 0.09 + 0.09$$
$$= 0.18$$

Answer ....0.18... *(3 marks)*

18 Nikki buys a pack of ten eggs.

Seven of the eggs are brown, three are white. An egg is taken at random.
A second egg is taken at random.

Calculate the probability that the two eggs will be **at least one** white egg.
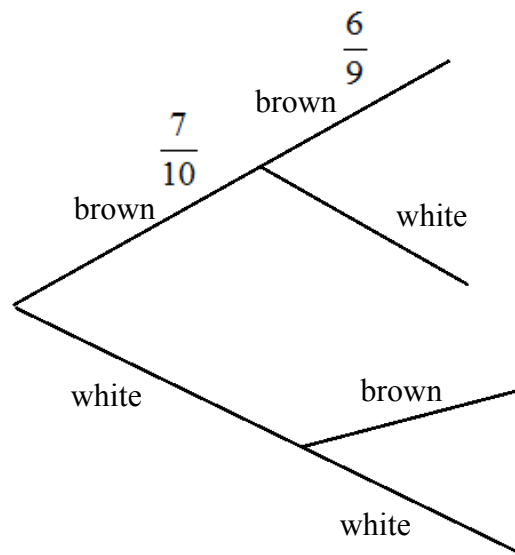
$$p(\text{brown, brown}) = \frac{7}{10} \times \frac{6}{9}$$

$$= \frac{42}{90}$$

$$p(\text{at least one white}) = 1 - \frac{42}{90}$$

$$= \frac{90}{90} - \frac{42}{90}$$

$$= \frac{48}{90}$$

Answer .. $\frac{48}{90}$ .... *(3 marks)*

19*   In a game, players try to win a coloured card. There
are six possible colours.
The table shows the probability of winning each colour.

Colour of Card	Probability
Yellow	0.04
Green	0.07
Brown	0.09
Blue	0.10
Pink	0.13
Black	0.14

19 (a)   Which colour is twice as likely to be won as green?

Answer ....Black...   *(1 mark)*

19 (b)   Work out the probability of winning yellow or brown.

$$p(\text{yellow or brown}) = 0.04 + 0.09$$
$$= 0.13$$

Answer ....0.13..   *(2 marks)*

19 (c)   Haziq plays the game 160 times.

Estimate the number of times that he does **not** win.

$$0.04 + 0.07 + 0.09 + 0.10 + 0.13 + 0.14 = 0.57$$
$$p(\text{lose}) = 1 - 0.57$$
$$= 0.43$$

Number of times he loses:
$$160 \times 0.43 = 68.8$$

Answer ......69...   *(4 marks)*

20 The town of Knutsford had an election.
The probability a vote was given to a particular party is shown.
One value is missing.

Party	Probability
Conservative	0.41
Labour	0.24
Liberals	0.22
UKIP	0.09
BNP	0.04

20 (a) Complete the table.

$$0.41 + 0.24 + 0.22 + 0.04 = 0.91$$
$$p(\text{UKIP win}) = 1 - 0.91$$
$$= 0.09$$

(2 marks)

20 (b) Write Labour votes to Liberals votes as a ratio. Give

your answer in its simplest form.

$$0.24 : 0.22$$
$$= 24 : 22$$
$$= 12 : 11$$

Answer ....12............................. : ....11............................. *(2 marks)*

20 (c) There are 15 000 people in the town.
8000 voted.

How many people in the town did **not** vote Conservative?

$$8000 \times 0.41 = 3280 \text{ voted Conservative}$$
$$15000 - 3280 = 11720$$

Answer .... *(3 marks)*

21 A bag contains 5 black and 3 white counters.

A counter is taken from the bag at random and replaced.

Another counter is then taken from the bag at random.

21 (a) Complete the tree diagram.

first counter　　　　　　　**second counter**

$$\frac{5}{8}$$ black
$$\frac{5}{8}$$ black
.... $$\frac{3}{8}$$ .... white

... $$\frac{3}{8}$$ .....

... $$\frac{5}{8}$$ ..... black
white
.... $$\frac{3}{8}$$ .... white

(1 mark)
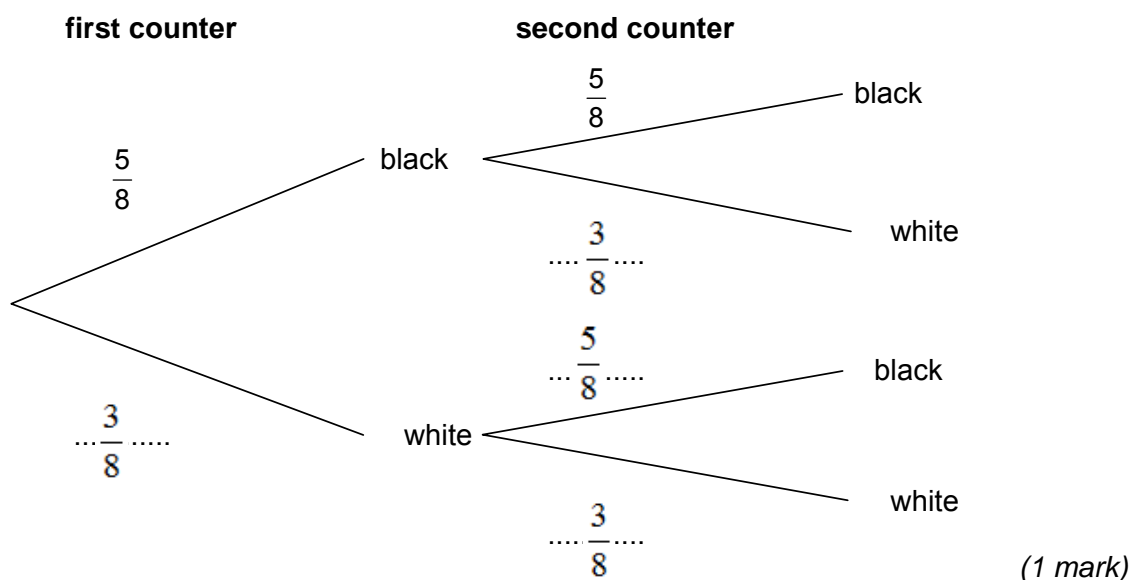
21 (b) What is the probability that both counters are white?

$$p\left(\text{white, white}\right) = \frac{3}{8} \times \frac{3}{8}$$

$$= \frac{9}{64}$$

Answer $$\frac{9}{64}$$ .... *(2 marks)*

21 (c) Some more black counters are added to the 5 black and 3 white counters in the bag.

A counter is taken from the bag at random and replaced.

Another counter is then taken from the bag at random.

The probability that both counters are white is now $$\frac{1}{25}$$.

How many black balls were added to the bag?

$$p\,(\text{white, white}) = \frac{1}{25}$$

$$p\,(\text{white}) = \frac{1}{\sqrt{25}}$$

$$= \frac{1}{5} \text{ or } \frac{3}{15}$$

7 black balls were added to bring the number of balls to 15.

Answer ....7.. *(3 marks)*

22 Altrincham has the same number of people as Bury.

In Altrincham there are 95 males for every 100 females.
In Bury there are 105 males for every 100 females.

22 (a) Work out the ratio of males in Altrincham to females in Altrincham.

Give your answer in its simplest form.

Answer ....95 : 100.. *(2 marks)*

22 (b) Which town has more females?

Show how you decide.

Altrincham, because it has more that are females.

(1 mark)

23 Mizba tossed a coin 100 times.
Heads appears 61 times.

23 (a) The same coin is tossed once more.

23 (a) (i) If the coin is fair, write down the probability that it lands on heads.

Answer ....$\dfrac{1}{2}$.. *(1 mark)*

23 (a) (ii) If the coin is biased, estimate the probability that the coin lands on heads.

Answer ......$\dfrac{61}{100}$.. *(1 mark)*

23 (b) Do you think the coin is fair?

Tick a box.

☐ Yes   ☑ Don't know   ☐ No

Give a reason for your answer.

It is not clear from the evidence because the sample is too small.

(2 marks)

There are no questions printed on this page

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General Certificate of Secondary Education
Foundation Tier

Mathematics   43602F

Past Paper Type Questions by Topic

Sequences
Model Answers

F

For Examiner's Use	
Examiner's Initials	

Pages	Mark
2 – 3	
4 – 5	
6 – 7	
8 – 9	
10 – 11	
12 – 13	
TOTAL	

For this paper you must have:
● a calculator
● mathematical instruments.

Time allowed
● 1 hour

Instructions
● Use black ink or black ball-point pen. Draw diagrams in pencil.
● Fill in the boxes at the top of this page.
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● You may ask for more answer paper and graph paper. These must be tagged securely to this answer booklet.

Advice
● In all calculations, show clearly how you work out your answer.

1   Write down the next term in each sequence.

1 (a)(i)   5   8   11   14   ....

...................................17……...…......…...…........

(1 mark)

1 (a)(ii)   6   4   2   0   ....

................................-2……...…......…...…........

(1 mark)

1 (a)(iii)   2   4   8   16   ....

...............................32……...…......…..…........

(1 mark)

1 (b)   The numbers in this sequence increase by the same amount each time.

<div align="center">

11   35

</div>

What are the missing numbers? $35 - 11 = 24$

$$24 \div 3 = 8$$

$$11 + 8 = 19 \quad 19 + 8 = 27$$

Answer…….19………and………27………….

(2 marks)

2   The *n*th term of a sequence is 100 – 3*n*.

2 (a)   Work out the first three terms.

n	$-3n$	$+100$
1	-3	97
2	-6	94
3	-9	91

Answer ....97........,............94.....,.......91......

(2 marks)

2 (b)   Work out the first term of the sequence that is a minus number.

$$100 - 3n = 0$$

$$-3n = -100$$

$$3n = 100$$

$$n = \frac{100}{3}$$

$n = 33.33$ The next whole number after this.

Answer ......34..   *(2 marks)*

3 (a) Here are the first three terms of a sequence.

20   12   8   .6.

The term to term 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.

8, 6, 5, 4.5

Answer ......4.5.................…………..………....………

(2 marks)

3 (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.

Reverse the rule to get the previous term. Multiply by 2 and then subtract 4.

$9 \times 2 = 18$

$18 - 4 = 14$

$14 \times 2 = 28$

$28 - 4 = 24$

Answer ....24,...14...........…………..………....……… *(3 marks)*

4 (a)   Write down the next term in each of these sequences.

4 (a) (i)   3   8   13   18   ....

.................................……….....…….....………………………23…………….....…..

(1 mark)

4 (a) (ii)   5.1   5.3   5.5   5.7   ....

.................................……….....…….....…………………………5.9…………….....…..

(1 mark)

4 (a) (iii)   2   −1   −4   −7   ....

.................................……….....…….....………………………-10…………….....…..

(1 mark)

4 (b)   Here is another 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.

Reverse the rule to get the previous term. Add four and half it.

$$20 + 4 = 24 \qquad 12 + 4 = 16$$
$$24 \div 2 = 12 \qquad 16 \div 2 = 8$$

Answer ......8...12.. *(2 marks)*

5 (a) The numbers in this sequence go down by the same amount each time.

74   ……   58   50   42   ……

Work out the **two** missing numbers.

Answer ....66................. and ....34............... *(2 marks)*

5 (b) The numbers in this different sequence go down by the same amount each time.

26   ……   ……   ……   6

What are the **three** missing numbers?

$26 - 6 = 20$

$20 \div 4 = 5$

There are 4 numbers after 26

The term to term rule is subtract 5

$26 - 5 = 21 \quad 21 - 5 = 16 \quad 16 - 5 = 11$

Answer ....21........ , ...16........ , ...11.......... *(2 marks)*

6 (a)   Here are the first two terms of a sequence.

5   4   ……   ……   ……

The term to term 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.

$$4 \times 2 = 8 \qquad 2 \times 2 = 4$$
$$8 - 6 = 2 \qquad 4 - 6 = -2$$

Answer ...-2.. *(2 marks)*

6 (b)   Here are the first three terms of another sequence.

1   4   7   ……   ……   ……

Which of the following is the nth term for this sequence?
Circle the correct answer.

n	$3n$	-2
1	3	-2
2	6	-2
3	9	-2

$n + 3$ $3n + 1$ $\boxed{3n - 2}$ $3n + 2$

(1 mark)

7 (a)   A sequence starts

                49   46   43   40

7 (a) (i)   Write down the next two terms.

                          Answer ....37................ and ....34.............. ....   *(2 marks)*

7 (a) (ii) What is the rule for continuing the sequence?

                          Answer ...Subtract 3 from the previous term.............   *(1 mark)*

7 (b)   Another sequence starts

                57   50   43   36

             This sequence is continued.

             What is the first negative number in this sequence?

              36, 29, 22, 15, 8, 1, -6

                          Answer ....-6...   *(1 mark)*

7 (c)   The first sequence is also continued.
             The two sequences have the number 43 in common.

             What is the next number that the two sequences have in common?

                 37, 34, 31, 28, 25, 22, 19, 16, 13, 10, 7, 4, 1

                          Answer ....1...   *(2 marks)*

8 (a)   Here are the first two terms of a sequence.

   5   4   ……   ……

The term to term 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.

   5, 4, 2, -2

   Answer ......-2... *(2 marks)*

8 (b)   Here are the first three terms of another sequence.

   4   7   10   ……   ……

Which of the following is the nth term for this sequence?

Circle the correct answer.

n	$3n$	$3n + 1$
1	3	4
2	6	7
3	9	10

   $n + 3$ ⟨$3n + 1$⟩ $3n - 2$ $3n + 2$ *(1 mark)*

There are no questions printed on this page

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**

In the style of

AQA

General Certificate of Secondary Education
Higher Tier

Mathematics   **43602H**

Past Paper Type Questions by Topic

Sequences
Model Answers

H

For this paper you must have:
- a calculator
- mathematical instruments.

Time allowed
- 1 hour

Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is.
- The quality of your written communication is specifically assessed in some questions. These questions are indicated with an asterisk (*)
- You may ask for more answer paper and graph paper. These must be tagged securely to this answer booklet.

Advice
- In all calculations, show clearly how you work out your answer.

1   Write down the next term in each sequence.

1 (a)(i)   5   8   11   14   ....

...............................17...........….......…......…………………………………….......…

(1 mark)

1 (a)(ii)   6   4   2   0   ....

.............................−2…...…...…......…………………………………......…

(1 mark)

1 (a)(iii)   2   4   8   16   ....

...............................32…….....…......…………………………………….......…

(1 mark)

1 (b)   The numbers in this sequence increase by the same amount each time.

11   35

What are the missing numbers? $35 - 11 = 24$

$24 \div 3 = 8$

$11 + 8 = 19$ $19 + 8 = 27$

Answer…….19………and………27…………..

(2 marks)

2   The *n*th term of a sequence is 100 – 3*n*.

2 (a)   Work out the first three terms.

n	$-3n$	$+100$
1	-3	97
2	-6	94
3	-9	91

Answer ....97.........,..............94......,........91.......

(2 marks)

2 (b)   Work out the first term of the sequence that is a minus number.

$$100 - 3n = 0$$
$$-3n = -100$$
$$3n = 100$$
$$n = \frac{100}{3}$$
$$n = 33.33 \qquad \text{The next whole number after this.}$$

Answer ......34...   *(2 marks)*

3 (a)   Here are the first three terms of a sequence.

$$20 \qquad 12 \qquad 8 \qquad \underset{\cdots}{6}$$

The term to term 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.

$$8, \ 6, \ 5, \ 4.5$$

Answer ......4.5..................………...………......………

(2 marks)

3 (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.

$$\ldots \qquad \ldots \qquad 9 \qquad \ldots$$

Work out the first term.

Reverse the rule to get the previous term. Multiply by 2 and then subtract 4.

$$9 \times 2 = 18$$
$$18 - 4 = 14$$

$$14 \times 2 = 28$$
$$28 - 4 = 24$$

Answer ....24,...14...........………...………......………   *(3 marks)*

4 (a)   Write down the next term in each of these sequences.

4 (a) (i)   3   8   13   18   ....

....23..........................
(1 mark)

4 (a) (ii)   5.1   5.3   5.5   5.7   ....

....5.9..........................
(1 mark)

4 (a) (iii)   2   −1   −4   −7   ....

....-10..........................
(1 mark)

4 (b)   Here is another 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.

Reverse the rule to get the previous term. Add four and half it.

$$20 + 4 = 24 \qquad 12 + 4 = 16$$
$$24 \div 2 = 12 \qquad 16 \div 2 = 8$$

Answer ......8, 12.. *(2 marks)*

5 (a) The numbers in this sequence go down by the same amount each time.

74   ……   58   50   42   ……

Work out the **two** missing numbers.

Answer ....66................. and ....34............... *(2 marks)*

5 (b) The numbers in this different sequence go down by the same amount each time.

26   ……   ……   ……   6

What are the **three** missing numbers?

$26 - 6 = 20$

$20 \div 4 = 5$

There are 4 numbers after 26

The term to term rule is subtract 5

$26 - 5 = 21$ $21 - 5 = 16$ $16 - 5 = 11$

Answer ....21........ , ...16........ , ...11......... *(2 marks)*

6 (a)   Here are the first two terms of a sequence.

    5   4   ……   ……   ……

The term to term 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.

$$4 \times 2 = 8 \qquad 2 \times 2 = 4$$
$$8 - 6 = 2 \qquad 4 - 6 = -2$$

Answer ...-2...   *(2 marks)*

6 (b)   Here are the first three terms of another sequence.

    1   4   7   ……   ……   ……

Which of the following is the nth term for this sequence?
Circle the correct answer.

n	$3n$	-2
1	3	-2
2	6	-2
3	9	-2

$n + 3$ $3n + 1$ $3n - 2$ $3n + 2$

(1 mark)

7 (a)   A sequence starts

49   46   43   40

7 (a) (i)   Write down the next two terms.

Answer ....37................. and ....34............. ....   *(2 marks)*

7 (a) (ii)   What is the rule for continuing the sequence?

Answer ....Subtract 3 from the previous term.............   *(1 mark)*

7 (b)   Another sequence starts

57   50   43   36

This sequence is continued.

What is the first negative number in this sequence?

36, 29, 22, 15, 8, 1, -6

Answer ....-6...   *(1 mark)*

7 (c)   The first sequence is also continued.
The two sequences have the number 43 in common.

What is the next number that the two sequences have in common?

37, 34, 31, 28, 25, 22, 19, 16, 13, 10, 7, 4, 1

Answer ....1...   *(2 marks)*

8 (a) Here are the first two terms of a sequence.

$$5 \qquad 4 \qquad \ldots\ldots \qquad \ldots\ldots$$

The term to term 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.

5, 4, 2, -2

Answer ......-2.. *(2 marks)*

8 (b) Here are the first three terms of another sequence.

$$4 \qquad 7 \qquad 10 \qquad \ldots\ldots \qquad \ldots\ldots$$

Which of the following is the nth term for this sequence?

Circle the correct answer.

n	$3n$	$3n + 1$
1	3	4
2	6	7
3	9	10

$n + 3$ (3n + 1)   3n − 2   3n + 2   *(1 mark)*

*9   The rule for finding the next term in a sequence is

Subtract x and then multiply by 4

The second term is 12.
The third term is 52.

.…   12   52   .…

Work out the first term of the sequence.

$$4(12 - x) = 52$$
$$48 - 4x = 52$$
$$-4x = 52 - 48$$
$$-4x = 4$$
$$x = -1$$

Reverse the rule to find the first term.
Divide by 4 and then add x.

$$12 \div 4 = 3$$
$$3 - 1 = 2$$

Answer ……..2…………………………………………………………   *(4 marks)*

10   The nth term of a sequence is $n^2 + 50$

10 (a)   Work out the first three terms of the sequence.

n	n^2	$+50$
1	1	51
2	4	54
3	9	59

Answer 1st term ......51.......... 2nd term ......54.......... 3rd term ....59......... *(2 marks)*

10 (b)   How many terms in the sequence are less than 100?

$$n^2 + 50 \prec 100$$
$$n^2 \prec 100 - 50$$
$$n^2 \prec 50$$
$$n^2 = 49$$
$$n = 7$$

Answer .....7.. *(2 marks)*

*11   The first three terms of a sequence are

x   y   z   ……..

The term-to-term rule of the sequence is

Multiply by 2 and subtract 4

Show that $z = 4(x - 3)$

$$y = 2x - 4$$
$$z = 2(2x - 4) - 4$$
$$= 4x - 8 - 4$$
$$= 4x - 12$$
$$= 4(x - 3)$$

(4 marks)

Surname

Other Names

Candidate Signature

In the style of

AQA

General Certificate of Secondary Education
Foundation Tier

Mathematics   43601F

Past Paper Questions by Topic

Shapes
Model Answers

F

For this paper you must have:
- mathematical instruments.

You must **not** use a calculator.

Time allowed
- 1 hour 15 minutes

Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
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Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is.
- The quality of your written communication is specifically assessed in questions indicated with an asterisk (*)
- You may ask for more answer paper and graph paper. These must be tagged securely to this answer booklet.

Advice
- In all calculations, show clearly how you work out your answer.

1 (a) Here are four 3D shapes.
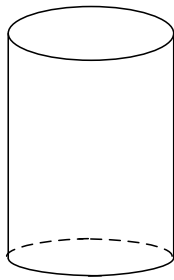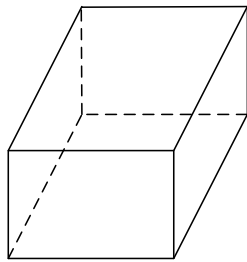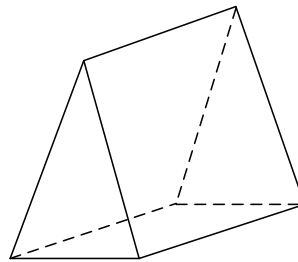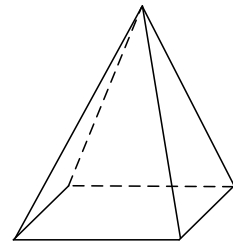
W   X   Y   Z

The shaded area is a net for one of them.
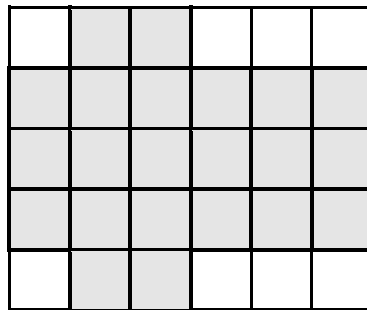
Which shape is it?

Answer ....**X**........................ (*1 mark*)

1 (b) Write down the mathematical name of each of the following.

........................Kite.............................
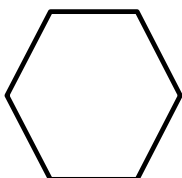
........................Hexagon........................
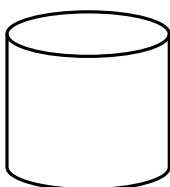
........................Cylinder........................

(*3 marks*)

2 Here are two angles, *a* and *b*.
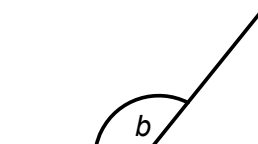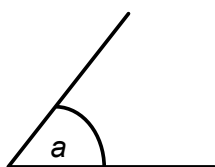
What type of angles are they?

Answer *a* is.......acute.............................

b is ...obtuse............................. (*2 marks*)

3   Here is a centimetre cube.
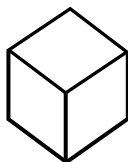
30 of these cubes are used to make a cuboid.

Draw a possible cuboid on the grid below.
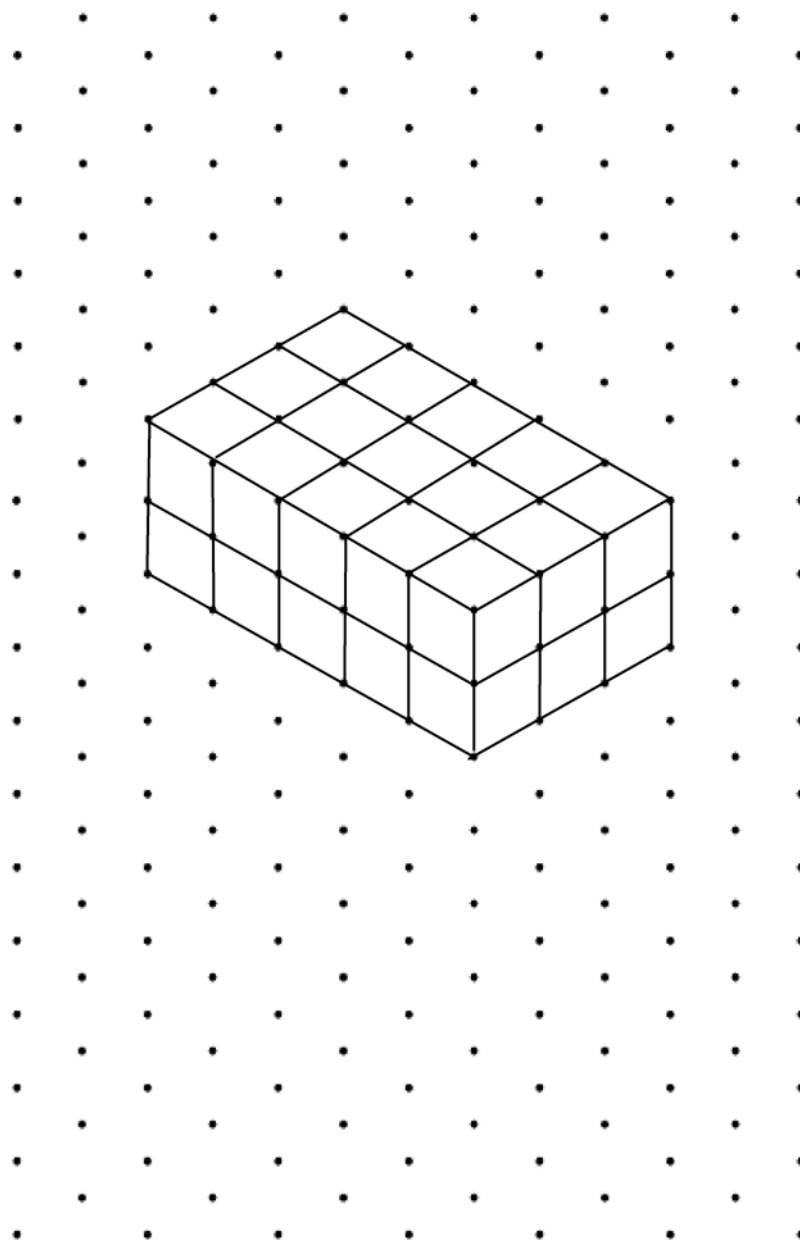
(3 marks)

4   Rebecca wants to put three equal-sized pictures on a wall as shown.

Not drawn
accurately
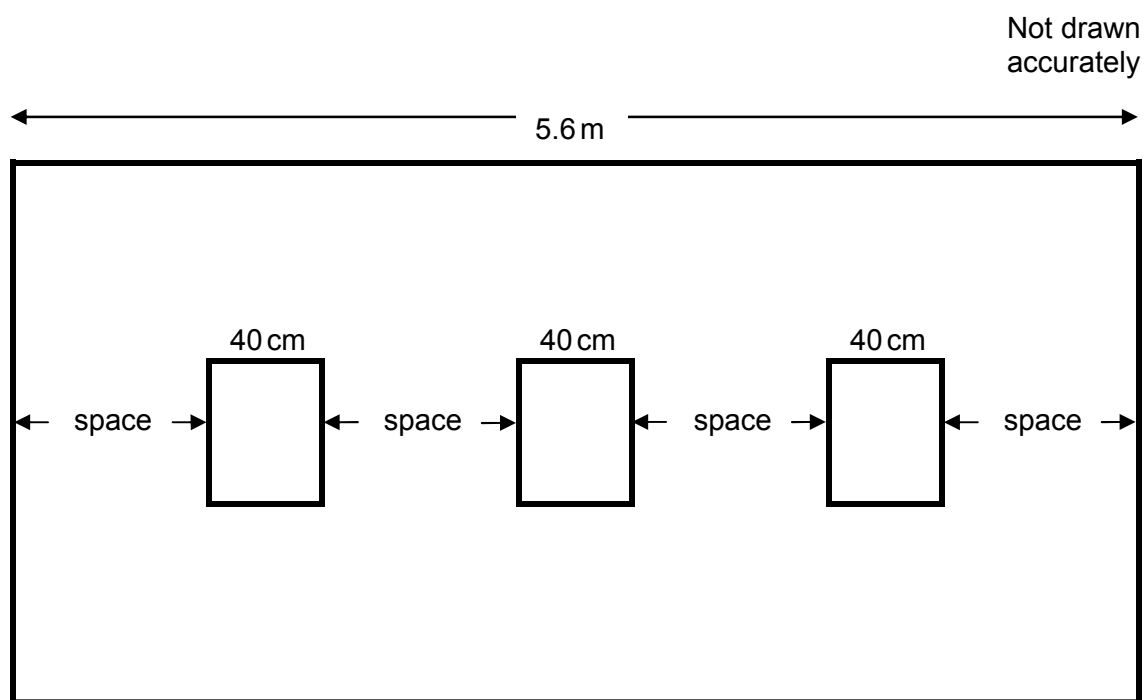
Each space is the same width.

How wide is each space?

State the units of your answer.

$$5.6 \text{ m} = 560 \text{ cm}$$
$$560 - 40 - 40 - 40 = 440$$
$$440 \div 4 = 110$$

Answer ......110 cm................ (*6 marks*)

5 ABCD is a square of side length 14 cm.

M is the midpoint of AB.

Two squares are drawn inside ABCD that overlap to form square X.

The area of the shaded rectangle is $\frac{1}{7}$ of the area of ABCD

Not drawn accurately

7cm   M   7 cm   B

A

7 cm

4 cm

X   3 cm

D

C
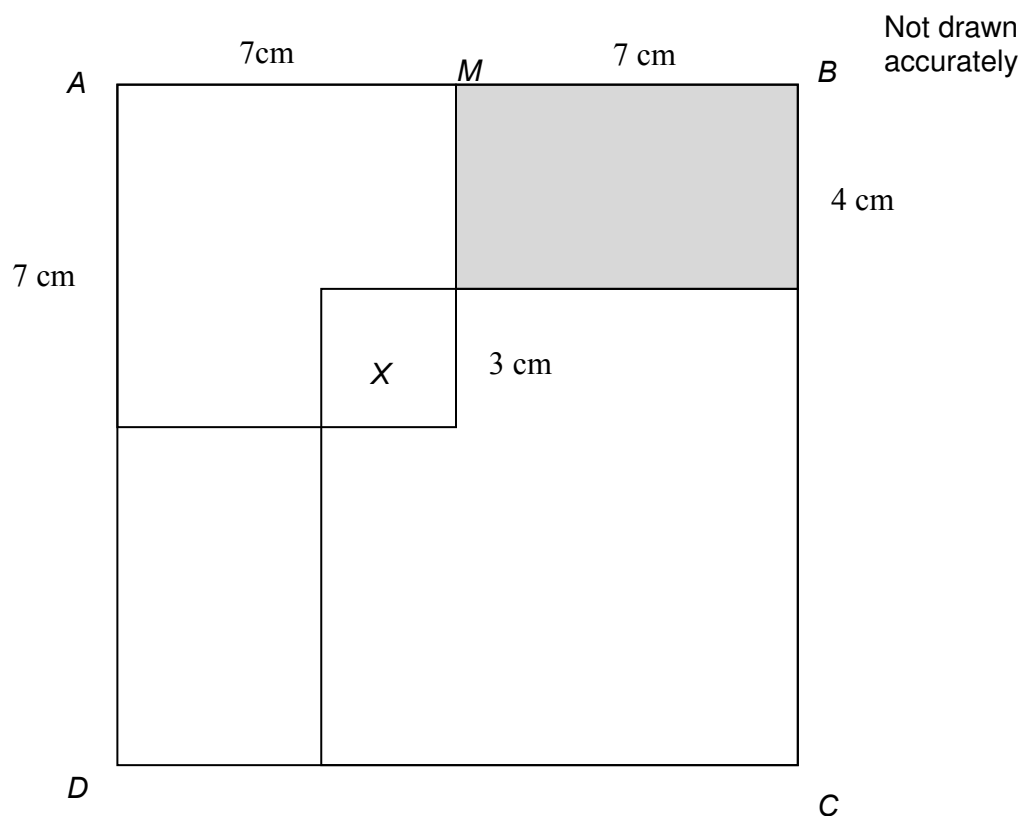
Work out the area of square X.

Area of $ABCD = 14 \times 14$

$= 196$

Area of shaded rectangle is $\frac{1}{7}$ of $ABCD$

$196 \times \frac{1}{7} = 28$

Length of other side of shaded rectangle:

$28 \div 7 = 4$

Length of square X

$7 - 4 = 3$

Area of square X

$3 \times 3 = 9$

Answer ....9.......... cm² (5 marks)

6   Tara is packing her centimetre cubes into the box.

Not drawn accurately
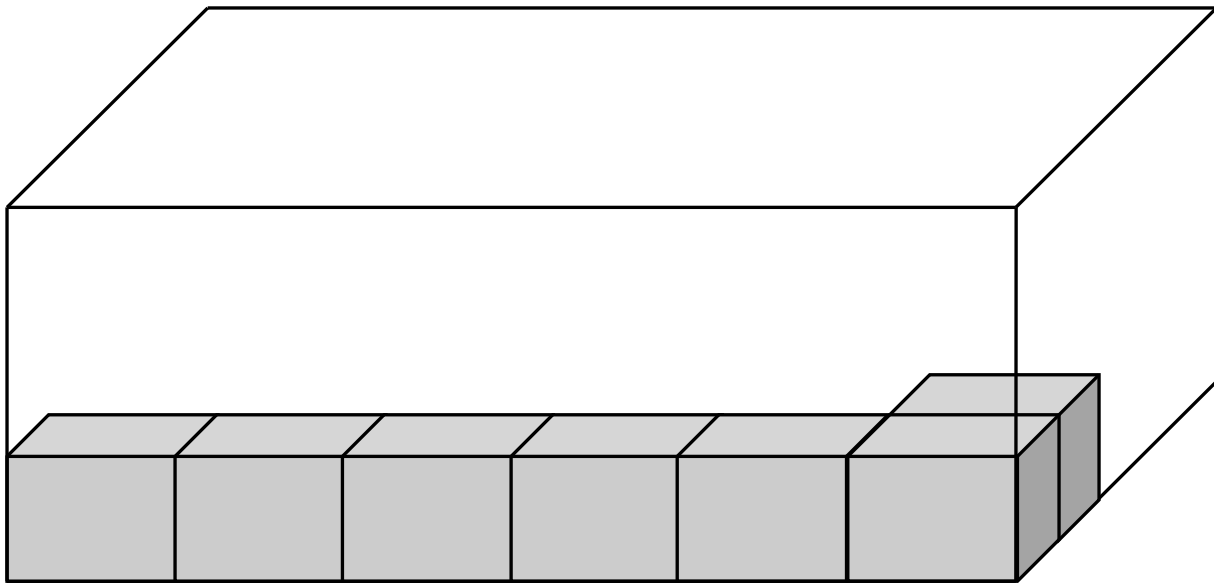
Each layer of cubes is 6 cubes long and 5 cubes wide.
There are 3 layers in the box.

Tara fills the box.
How many cubes does she have?

$6 \times 5 \times 3 = 90$

Answer ....90.................... (*1 mark*)

7   The diagram shows Ron's field.

Not drawn accurately

160 metres
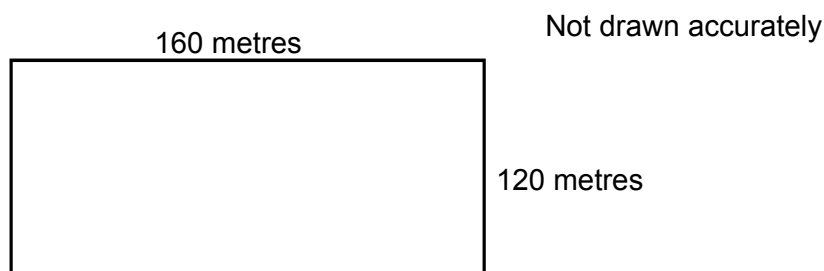
120 metres

The field is to be divided into three rectangular areas. One-quarter of the field is for Wheat.

7 (a)   Work out the length and width of a rectangle he could use for wheat.

Area of field:

$160 \times 120 = 19200$

Area of wheat:

$19200 \times \dfrac{1}{4} = 4800$

A convenient size would be:

120×40

Length........120..............metres

Width..........40................metres (*2 marks*)

7 (b)   Two-fifths of the field is for potatoes.
The rest is **not** used.

What fraction of the field is **not** used for wheat or potatoes?

Area not used for wheat or potatoes:

$1 - \left(\dfrac{2}{5} + \dfrac{1}{4} \right)$

$= 1 - \dfrac{8 + 5}{20}$

$= 1 - \dfrac{13}{20}$

$= \dfrac{7}{20}$

Answer $\dfrac{7}{20}$.......................... (*3 marks*)

8 (a) On the circles, draw

a diameter
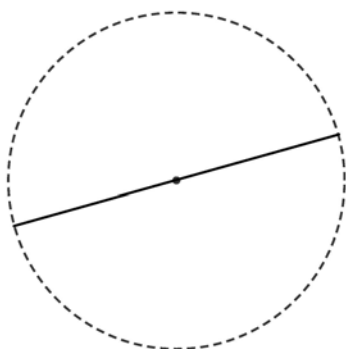
an arc
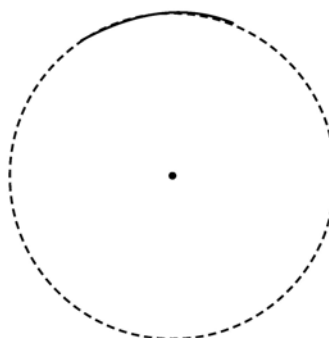
(2 marks)

8 (b) Complete the sentences.
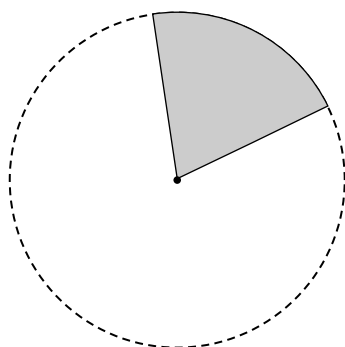
The shaded area is a ...sector...................
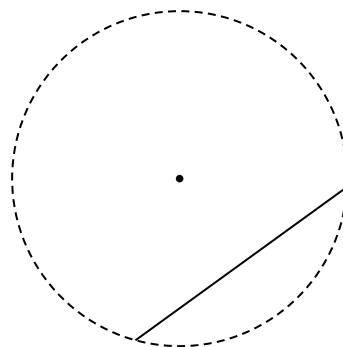
The straight line is a ......chord...................

(2 marks)

9 (a)   The diagram shows a regular hexagon.

2 cm
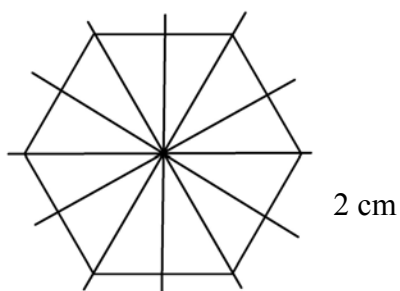
9 (a) (i)   By measuring the length of one side, work out the perimeter.

$2 \times 6 = 12$

Answer ....12... cm   *(2 marks)*

9 (a) (ii)   On the diagram above draw in all the lines of symmetry.

(2 marks)

9 (b)   Three regular hexagons are joined together as shown.
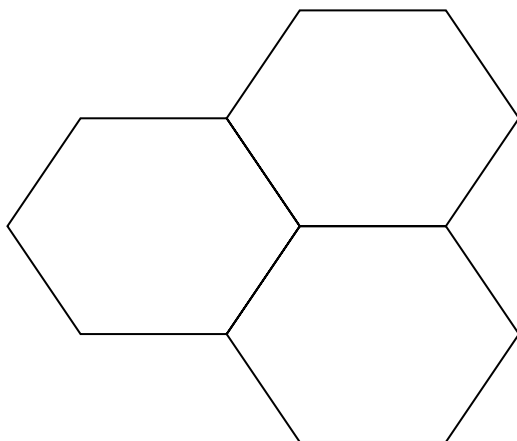
Not drawn accurately

Work out the size of an interior angle of a regular hexagon.
You must show your working.

At the centre 3 interior angles cover 360°

$360 \div 3 = 120$

Answer ....120...................................... degrees   *(2 marks)*

10   The shape is a drawing of a dolls house.

8 cm

3 cm

Not drawn
accurately

6 cm

12 cm
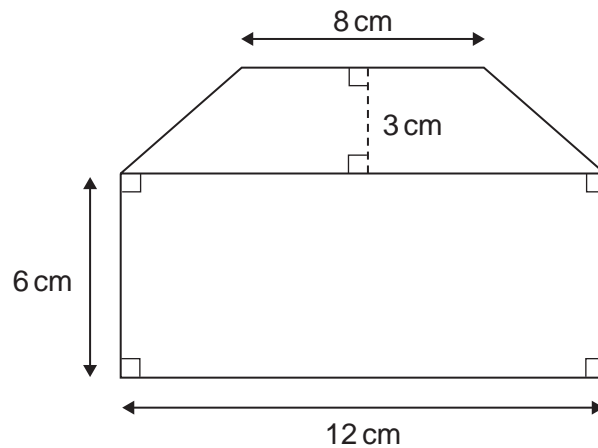
Work out the area of this shape.
State the units of your answer.

$$\text{Area of rectangle} = 12 \times 6$$
$$= 72$$

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

$$= \frac{1}{2}(8+12)\,3$$

$$= \frac{1}{2} \times 20 \times 3$$

$$= 30$$

$$\text{Total Area} = 72 + 30$$

$$= 102$$

Answer 102 cm^2 ....   *(4 marks)*

11   *W*, *X*, *Y* and *Z* are four points on a circle centre *O*.
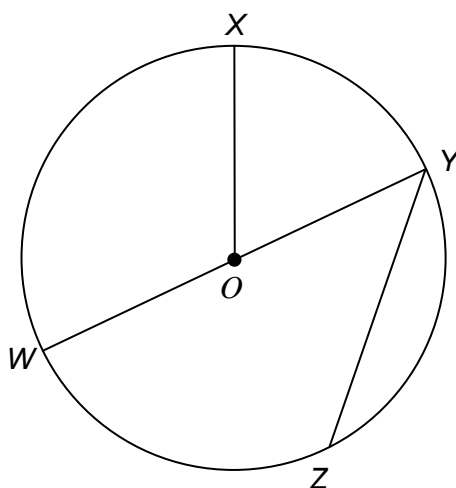
11 (a)   Here are five words that are used with circles.

circumference   radius   chord   diameter   sector

Use **one** of these words to complete the following sentences.

11 (a) (i) The straight line *WY* is a ......diameter.. of the circle.

(1 mark)

11 (a) (ii) The straight line *YZ* is a ....chord.. of the circle.

(1 mark)

11 (a) (iii) The straight line *OX* is a ....radius.. of the circle.

(1 mark)

11 (b)   On the diagram below draw a tangent to the circle at point *W*.
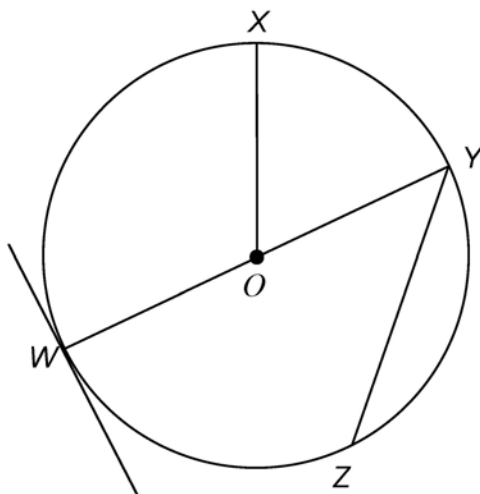
(1 mark)

12＊Joe is sorting shapes.
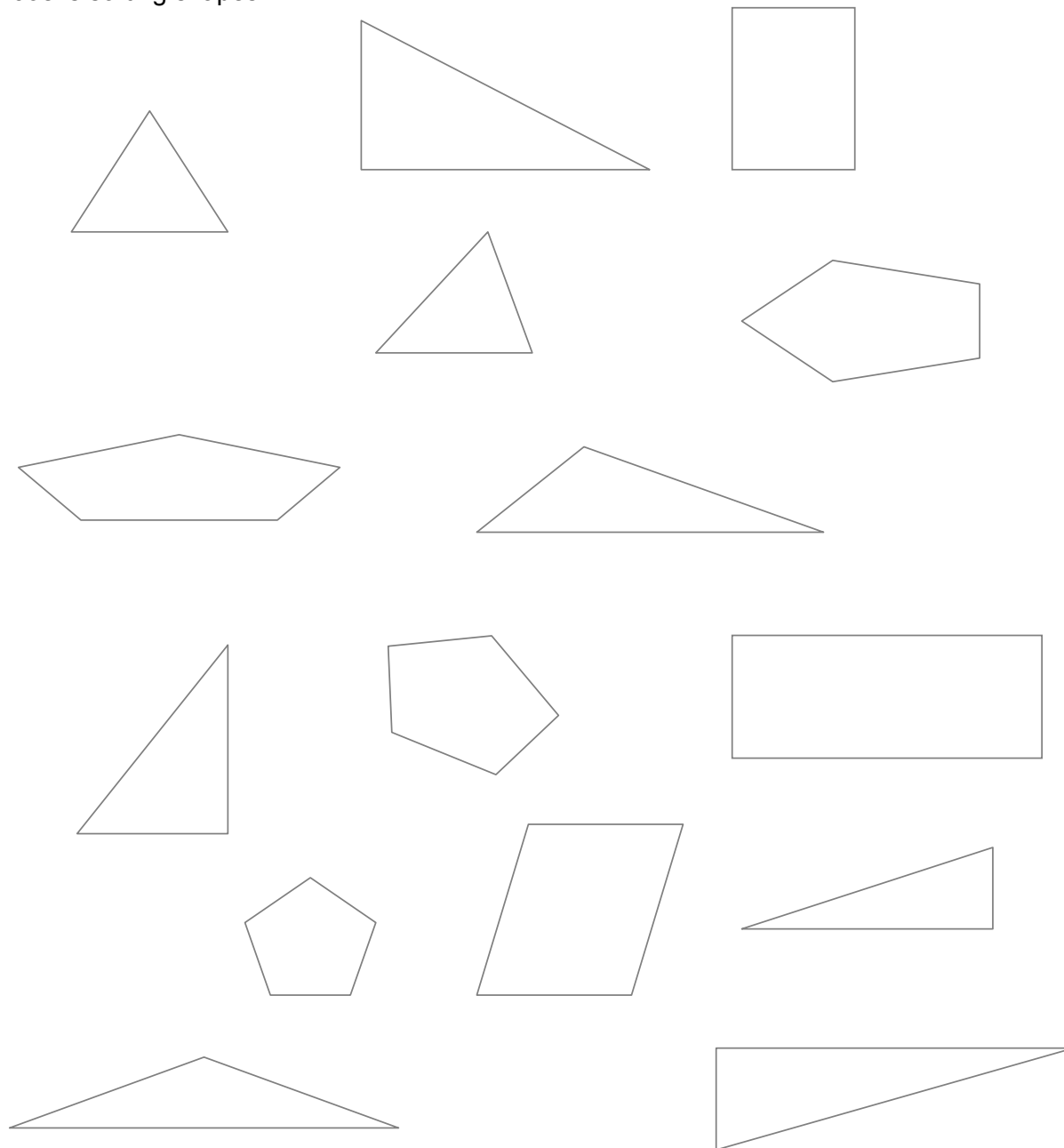
12 (a) Complete the tally table.

	Tally	Frequency
Triangles	ⲎⲎ |||	8
Quadrilaterals	|||	3
Pentagons	||||	4

(3 marks)

12 (b)   On the grid draw a suitable diagram to show this information.
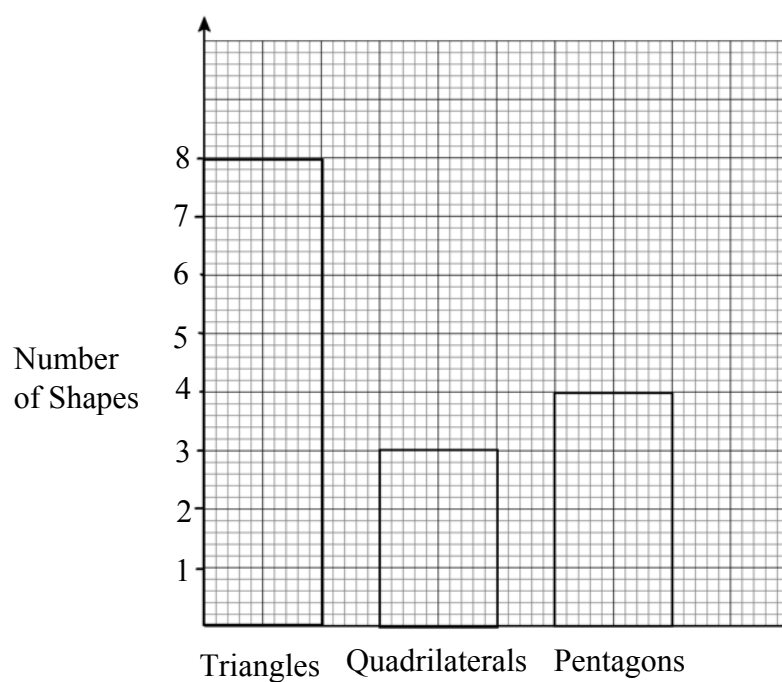
(3 marks)

13   A regular octagon is split into triangles *1*, *2*, *3*, *4*, *5* and *6*.
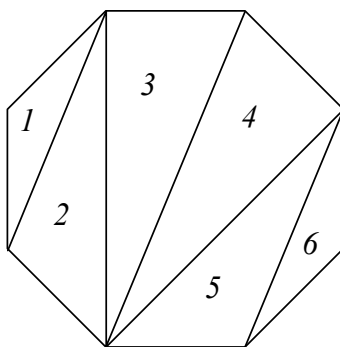
13 (a)   Complete this list of pairs of congruent triangles.

3   and   *4*

2   and   *5*........

1   and   *6*........

(2 marks)

13 (b) Triangles *1* and *2* make a trapezium as shown.
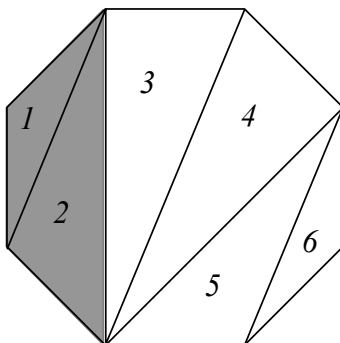
Which of the following triangles also make a trapezium?
Circle your answers.

2 and 3   3 and 4   ⬭ 4 and 5 ⬭   5 and 6

(2 marks)

13 (c)   Shade **two** triangles in this diagram to make a kite.
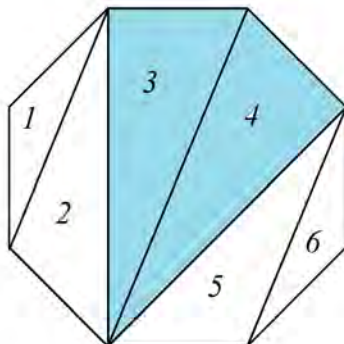
(1 mark)

14 John's garden is a rectangle measuring 9 metres by 6 metres.
He decides to make one-third of the area into a vegetable plot and the rest into a lawn.

14 (a) On the grid draw accurately a possible design for John's garden.

Use the scale 1 centimetre represents 1 metre.

Label your design.

1 cm represents 1 m

Vegetable Plot
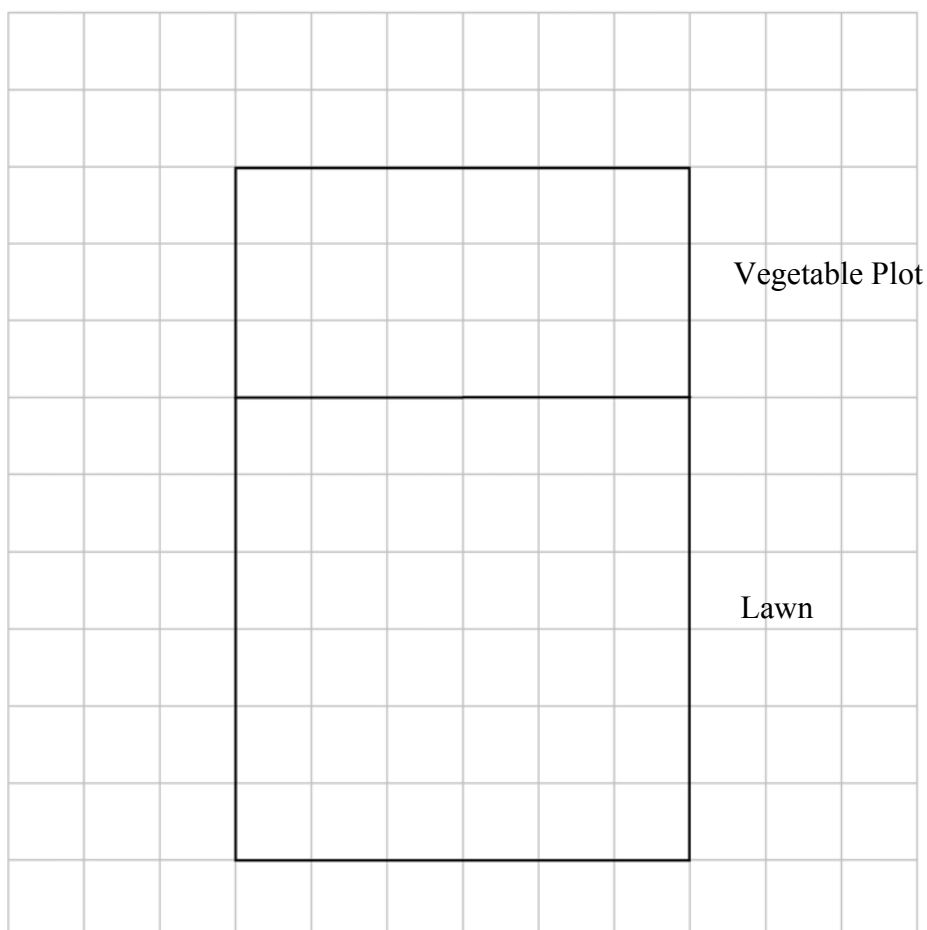
Lawn

(4 marks)

14 (b) Lawn turf (grass) costs £2.50 per square metre.
How much will it cost John to turf his new lawn?

$$\text{Lawn area} = 6 \times 6$$
$$= 36 \text{ m}^2$$
$$\text{Turf costs £2.50 per m}^2$$
$$36 \times 2.50 = 90$$

Answer £ .....90.. *(3 marks)*

15 (a)   Draw a 3-D sketch of a square based pyramid.
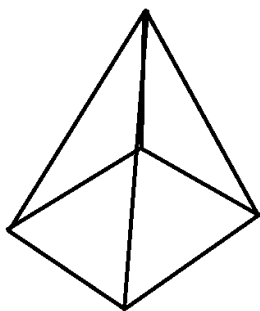
(1 mark)

15 (b)   Give the mathematical name of these solid shapes.
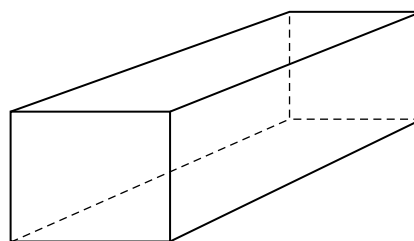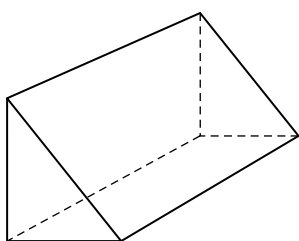
Answer ....Prism.............................   ....Cuboid.........................

(2 marks)

16   A pattern is formed from squares.

Pattern 1   Pattern 2   Pattern 3   Pattern 4
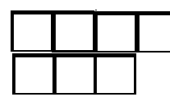
1   3   5   7   *(1 mark)*

16 (a)   Draw Pattern 4 in the space above.

16 (b)   Find the number of squares in Pattern 6.

1, 3, 5, 7, 9, 11

Answer ....11... *(1 mark)*

17 (a)   How many faces does a cuboid have?

Answer ....6.. *(1 mark)*

17 (b) This cuboid is made from centimetre cubes.
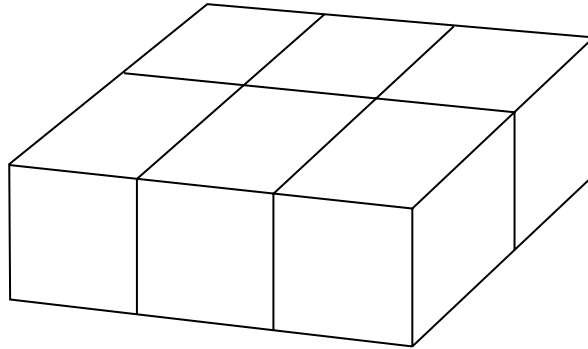
Find the total surface area of the cuboid.

$$6 + 6 + 3 + 3 + 2 + 2 = 22$$

Answer ....22.. cm^2 *(2 marks)*

18 Below is a regular octagon.

Not drawn accurately

a
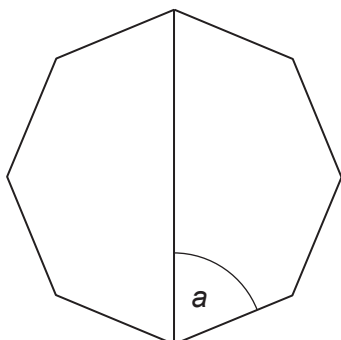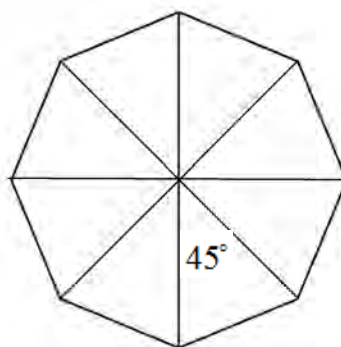
Work out the value of *a*.

The angles at the centre add up to 360°

Each angle is $45°(360 \div 8)$ and forms an isosceles triangle.

$180 - 45 = 135$

$135 \div 2 = 67.5$

Answer ....67.5... degrees   *(3 marks)*

19 **Here are** the standard quadrilaterals

Square   **Rectangle**   **Parallelogram**

Kite   **Rhombus**   **Trapezium**

19 (a)   Three different quadrilaterals have these two properties.

Both pairs of opposite sides are equal.
Rotational symmetry order 2

Name the **three** quadrilaterals.

Answer   Rectangle
                Parallelogram
                Rhombus

(2 marks)

19 (b) Two of the quadrilaterals in part (a) also have this property

Diagonals do not cross at right

angles. Name the **two** quadrilaterals.

Answer   Rectangle
                Parallelogram

(1 mark)

19 (c) For one of the quadrilaterals in part (b), write down an extra property that will distinguish it from the other.

Quadrilateral chosen   Rectangle

Property   A rectangle has angles which are all 90°

(1 mark)

Surname	
Other Names	
Candidate Signature	

In the style of

AQA

General Certificate of Secondary Education
Higher Tier

Mathematics 43602H

Past Paper Type Questions by Topic

Surds and Indices
Model Answers

H

For this paper you must have:
● a calculator
● mathematical instruments.

Time allowed
● 1 hour

Instructions
● Use black ink or black ball-point pen. Draw diagrams in pencil.
● Fill in the boxes at the top of this page.
● Answer **all** questions.
● You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
● Do all rough work in this book.

Information
● The marks for questions are shown in brackets.
● The maximum mark for this paper is.
● The quality of your written communication is specifically assessed in some questions. These questions are indicated with an asterisk (*)
● You may ask for more answer paper and graph paper. These must be tagged securely to this answer booklet.

Advice
● In all calculations, show clearly how you work out your answer.

1 **(a)** Write as single powers of a

1 **(a)** **(i)** $a^6 \times a^{-2}$

Answer a^4 .... *(1 mark)*

1 **(a)** **(ii)** $a^8 \div a^{-4}$

Answer a^{12} .... *(1 mark)*

1 **(b)** Simplify the expression $(3a^2b)^3$

Answer $27a^6b^3$ .... *(2 marks)*

2 Expand and simplify fully $(\sqrt{10} + \sqrt{2})(\sqrt{15} - \sqrt{3})$

Give your answer in the form $a\sqrt{b}$, where a and b are integers.

$$\left(\sqrt{10} + \sqrt{2}\right)\left(\sqrt{15} - \sqrt{3}\right)$$
$$= \sqrt{10}\sqrt{15} - \sqrt{10}\sqrt{3} + \sqrt{2}\sqrt{15} - \sqrt{2}\sqrt{3}$$
$$= \sqrt{10}\sqrt{15} - \sqrt{30} + \sqrt{30} - \sqrt{2}\sqrt{3}$$
$$= \sqrt{10}\sqrt{15} - \sqrt{2}\sqrt{3}$$
$$= \sqrt{2}\sqrt{5}\sqrt{5}\sqrt{3} - \sqrt{6}$$
$$= \sqrt{5}\sqrt{5}\sqrt{6} - \sqrt{6}$$
$$= 5\sqrt{6} - \sqrt{6}$$
$$= 4\sqrt{6}$$

Answer $4\sqrt{6}$ .... *(4 marks)*

3 (a)   Simplify $a^3b^2 \times 4ab^5$

Answer $4a^4b^7$ ....   *(2 marks)*

3 (b)   Factorise fully $a^2 - 8\,ab$

Answer $a(a-8b)$ ....   *(2 marks)*

3 (c)   Make x the subject of $w = y + \frac{x}{r}$
$$rw = ry + x$$
$$rw - ry = x$$

Answer $x = rw - ry$ ....   *(2 marks)*

3 (d)   Work out the least common multiple (LCM) of $6xy^2$ and $3x^2y$

Answer $6x^2y^2$ ....   *(2 marks)*

4 (a) Work out the value of $9^{-\frac{3}{2}}$

$$= \frac{1}{\sqrt{9^3}}$$

$$= \frac{1}{\sqrt{729}}$$

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

Answer $\dfrac{1}{27}$ .... *(3 marks)*

4 (b) Work out **all** solutions of the equation

$$8^n = 2^{n^2}$$

$$2^{3n} = 2^{n^2} \quad \left(8 \text{ is } 2 \times 2 \times 2 \text{ or } 2^3\right)$$

$$3n = n^2$$

$$n^2 - 3n = 0$$

$$n(n-3) = 0$$

$$n = 0 \text{ or } 3$$

Answer ....0.or.3.. *(3 marks)*

5 (a) Write the number 5.28×10^{-3} as an ordinary decimal number.

Answer .....0.00528.. *(1 mark)*

5 (b) Work out $(7 \times 10^3)^2$
Give your answer in standard form.

$$= 49 \times 10^6$$
$$= 4.9 \times 10^7$$

Answer 4.9×10^7 .... *(2 marks)*

6 These statistics are about the United States.

- There are 2.5×10^8 passenger vehicles in the United States.
- On average 2×10^7 barrels of fuel are used by these vehicles each day.
- One barrel contains 42 gallons.
- On average each passenger vehicle travels 18 miles on one gallon of fuel.

6 (a) Work out how many gallons of fuel are used each day?

$$2 \times 10^7 \times 42$$
$$= 84 \times 10^7$$
$$= 8.4 \times 10^8$$

Answer 8.4×10^8 ....gallons *(2 marks)*

6 (b) What is the average distance each passenger vehicle travels each day.

Fuel per vehicle:

$$\frac{8.4 \times 10^8}{2.5 \times 10^8}$$
$$= \frac{8.4}{2.5}$$

Average distance:

$$\frac{8.4}{2.5} \times 18$$
$$= 60.48$$

Answer ....60.48..miles *(2 marks)*

7 (a) Simplify $x^4 \times x^7$

Answer x^{11} .... *(1 mark)*

7 (b) Simplify $y^{12} \div y^4$

Answer y^8 .... *(1 mark)*

7 (c) Rearrange $y = 3a + 2$ to make a the subject.

$$y - 2 = 3a$$
$$\frac{y-2}{3} = a$$

Answer $a = \dfrac{y-2}{3}$ .... *(2 marks)*

8 Here is a formula $r = \sqrt{(x^2 - y^2)}$

Work out the value of r when $x = 9\sqrt{2}$ and $y = 5\sqrt{6}$

WMP/Nov11/43602H

Give your answer in the form $a\sqrt{b}$ where a and b are integers greater than 1.

$$r = \sqrt{\left(x^2 - y^2\right)}$$
$$= \sqrt{(9\sqrt{2})^2 - (5\sqrt{6})^2}$$
$$= \sqrt{(81 \times 2) - (25 \times 6)}$$
$$= \sqrt{162 - 150}$$
$$= \sqrt{12}$$
$$= \sqrt{4} \times \sqrt{3}$$
$$= 2\sqrt{3}$$

Answer $2\sqrt{3}$ .... *(3 marks)*

9   *XYZ* is a right-angled triangle.

$XY = (4 - \sqrt{2})$ cm, $YZ = (4 + \sqrt{2})$ cm

Not drawn accurately
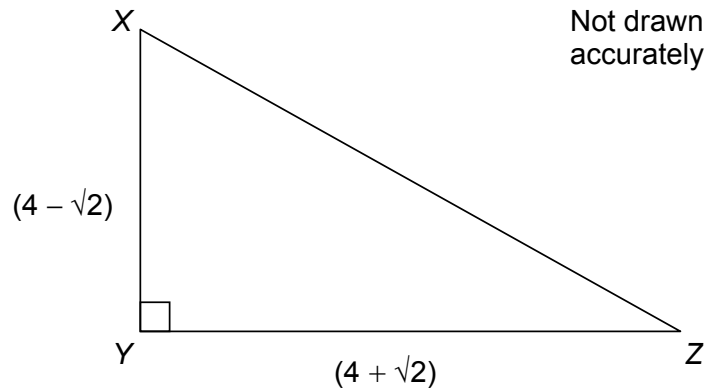
Show that the perimeter of the triangle is 14 cm.

Pythagoras:

$$XY^2 = \left(4 - \sqrt{2}\right)^2 + \left(4 + \sqrt{2}\right)^2$$
$$= 16 + 2 + 16 + 2$$
$$= 36$$
$$XY = \sqrt{36}$$
$$XY = 6$$

Perimeter:

$$4 - \sqrt{2} + 4 + \sqrt{2} + 6 = 14$$

(5 marks)

10   Lauren is using the quadratic formula to solve a quadratic equation. After correctly substituting the values, she writes

$$x = \frac{7 \pm \sqrt{49 - 72}}{4}$$

10 (a)   What is the quadratic equation Lauren is trying to solve?

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

For: $ax^2 + bx + c = 0$

$a = 2$

$b = -7$

$c = 9$

Answer $2x^2 - 7x + 9 = 0$ .... *(3 marks)*

10 (b)   Explain why Lauren will **not** be able to find any solutions to the equation.

From the values put into the formula, there is no square root for a negative number.

(1 mark)

11 (a) Simplify $n^3 \times n^5$

Answer n^8 .... *(1 mark)*

11 (b) Simplify $\dfrac{n^4}{n^6}$

Answer n^{-2} .... *(1 mark)*

11 (c) Simplify fully $\sqrt{\dfrac{\pi b^3}{4\pi b}}$

$$= \sqrt{\dfrac{b^2}{4}}$$

Answer $\dfrac{b}{2}$ .... *(2 marks)*

12 (a) Write $\sqrt{28} + \sqrt{63}$ in the form $p\sqrt{7}$, where p is an integer.

$$\left(\sqrt{4} \times \sqrt{7}\right) + \left(\sqrt{9} \times \sqrt{7}\right)$$
$$= 2\sqrt{7} + 3\sqrt{7}$$
$$= 5\sqrt{7}$$

Answer $5\sqrt{7}$ .... *(2 marks)*

12 . (b) Simplify $\dfrac{30}{\sqrt{5}}$ by rationalising the denominator.

$$\dfrac{30\sqrt{5}}{\sqrt{5}\sqrt{5}}$$
$$= \dfrac{30\sqrt{5}}{5}$$
$$= 6\sqrt{5}$$

Answer $6\sqrt{5}$ .... *(2 marks)*

Surname

Other Names

Candidate Signature

In the style of

AQA

General Certificate of Secondary Education
Foundation Tier

Mathematics   **43601F**

Past Paper Questions by Topic

Transformations
Model Answers

F

For this paper you must have:
- mathematical instruments.

You must **not** use a calculator.

Time allowed
- 1 hour 15 minutes

Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
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Information
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- You may ask for more answer paper and graph paper. These must be tagged securely to this answer booklet.

Advice
- In all calculations, show clearly how you work out your answer.

By Peter Bland

1 Here are some patterns of circles.

1 (a) Shade **four** more circles to give this pattern symmetry in the mirror line.
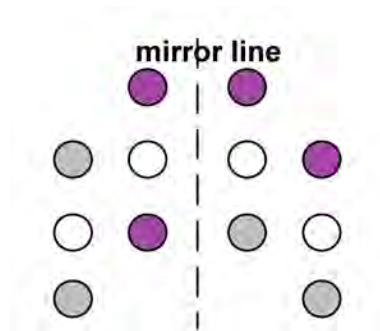
(*2 marks*)

1 (b) Shade **two** more circles to give this pattern symmetry in both mirror lines.
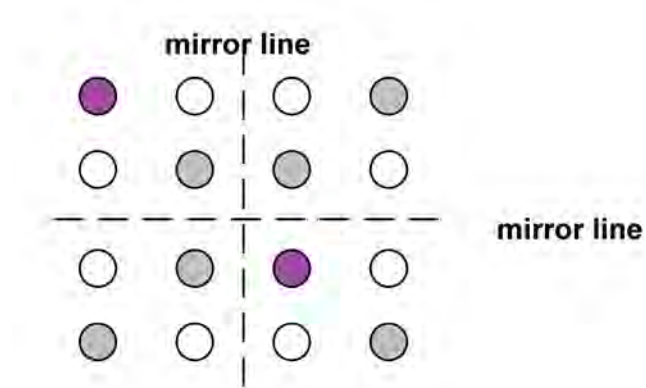
(*2 marks*)

1 (c) Shade **two** more circles to give this pattern symmetry in the mirror line.
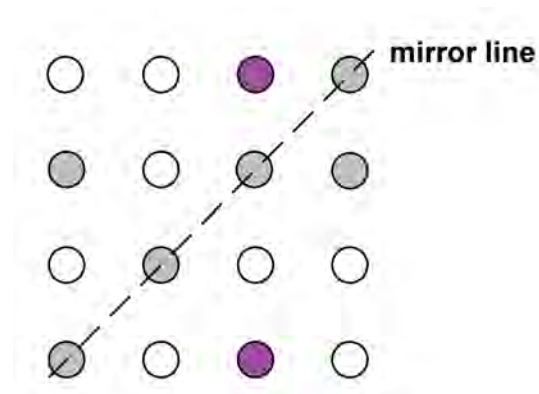
(*2 marks*)

2   The shape *ABCD* is drawn on a grid.
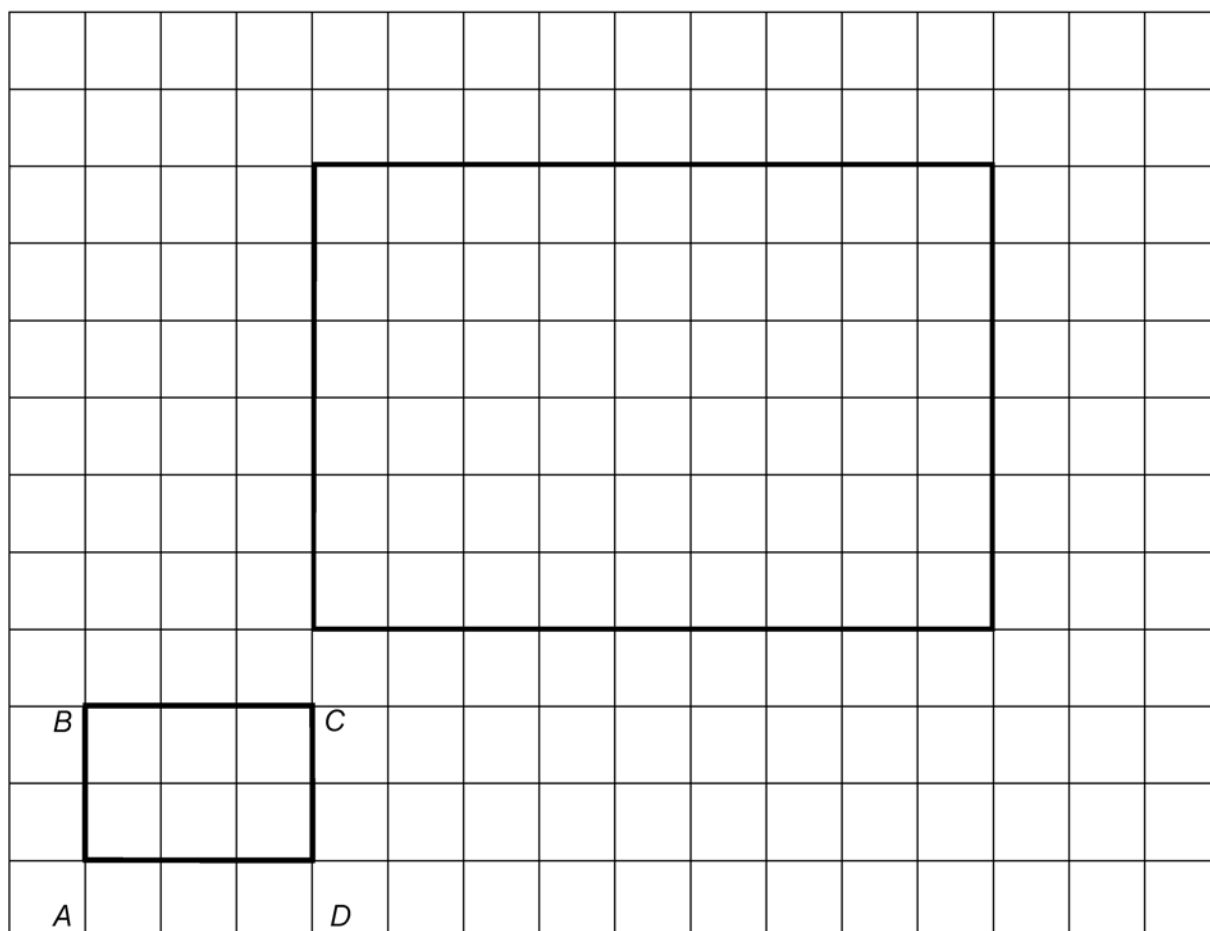
2 (a) Enlarge *ABCD* by scale factor 3.

(*2 marks*)

2 (b) How many times bigger is the area of the enlarged shape than the area of *ABCD*?

$$3 \times 3 = 9$$

Answer ....9................. (*2 marks*)

3   The number 71 is shaded on the grid.
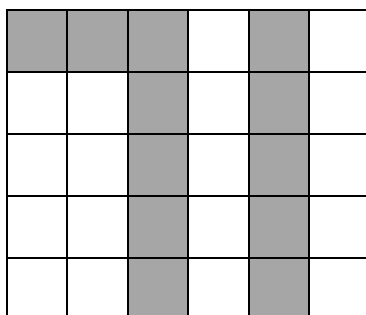
3 (a)   What fraction of the grid is shaded?

Give your answer in its simplest form.

$$\frac{12}{30} = \frac{2}{5}$$

Answer $\frac{2}{5}$ .... (*3 marks*)

3 (b)   The letter S is shaded on this grid.
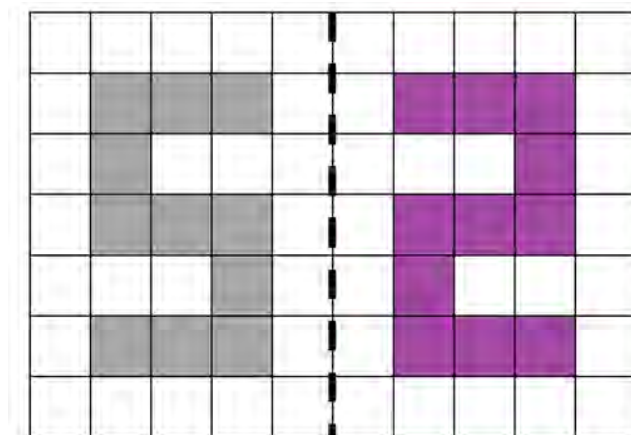
mirror line

Draw the reflection of the letter S in the mirror line.

(*2 marks*)

3 (c)   The number eight is drawn.
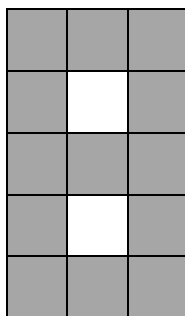
Write down the order of rotational symmetry.

Answer ....2........................ (*1 mark*)

4   Triangle *T* is shown on the grid.
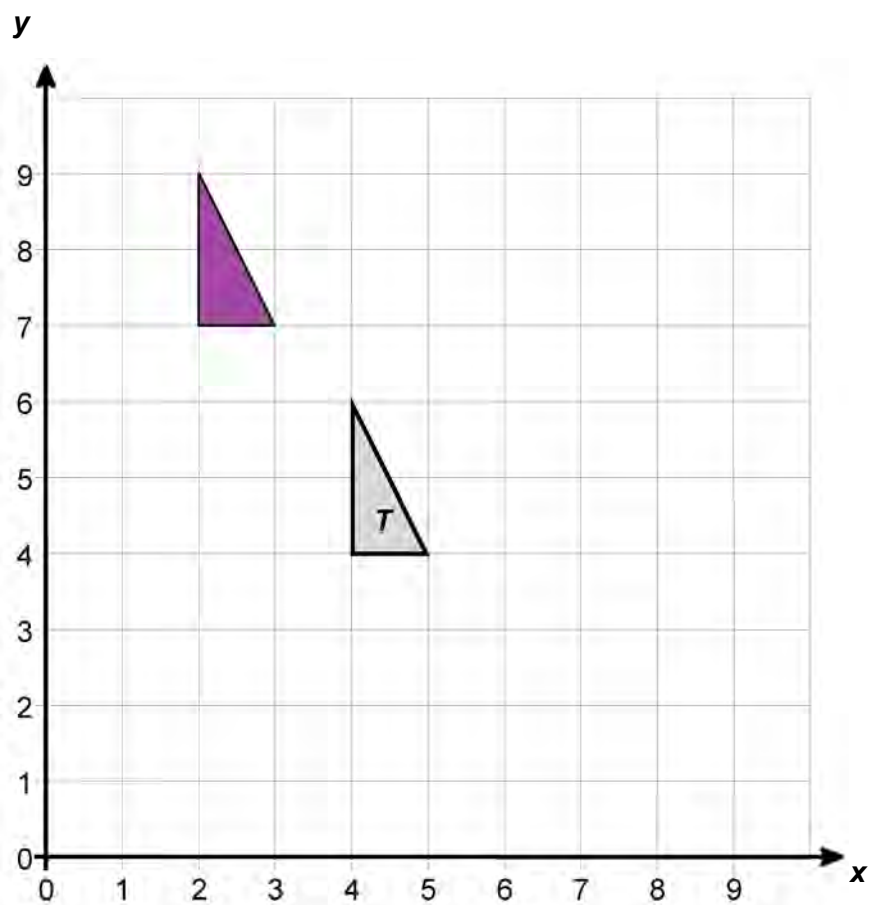
Translate triangle *T* by vector $\begin{pmatrix} -2 \\ 3 \end{pmatrix}$

(*2 marks*)

5 (a) The diagram shows shape *C*.
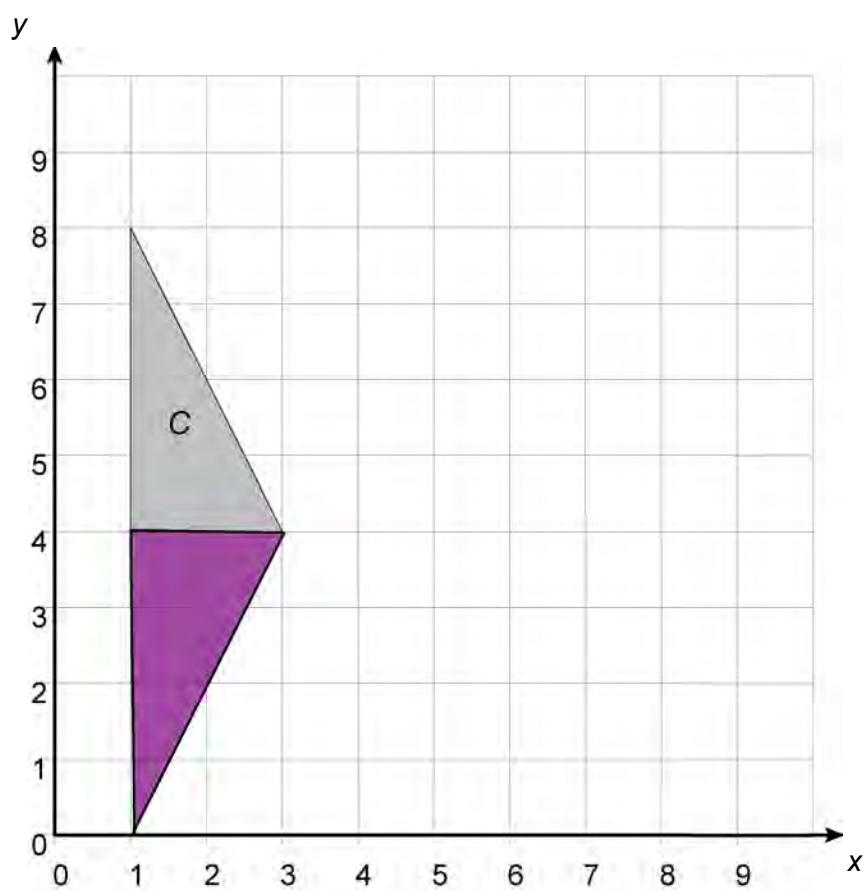
Reflect shape *C* in the line *y* = 4

(2 marks)

5 (b) The diagram shows two shapes *D* and *E*.
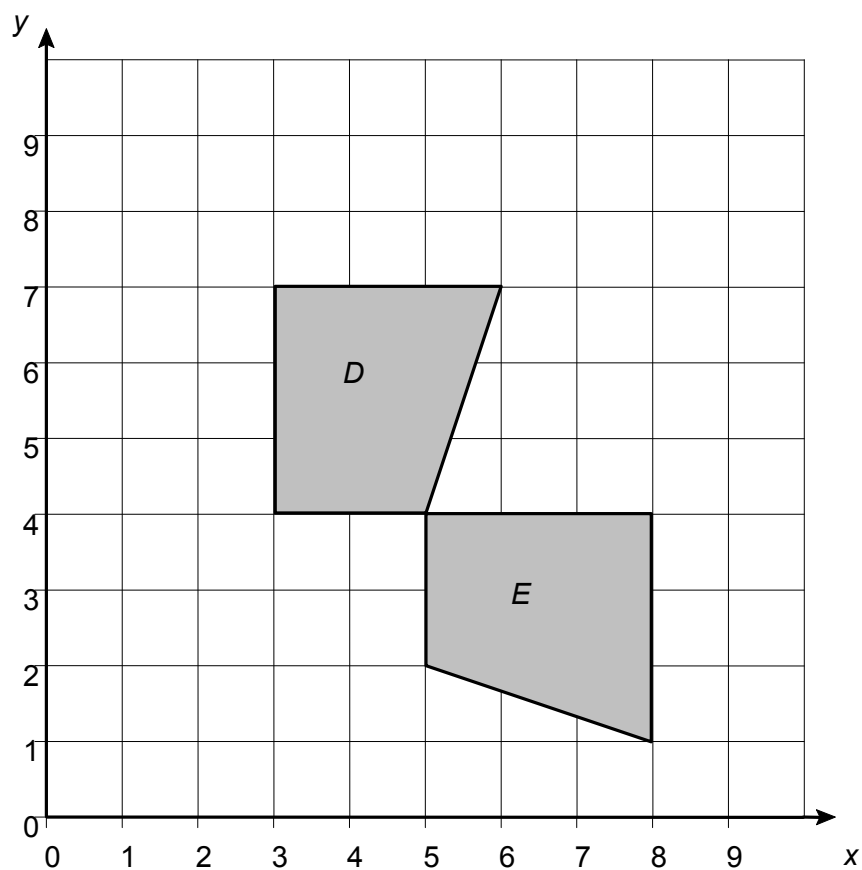
Describe fully the **single** transformation which takes shape *D* to shape *E*.

Shape E is the image of D rotated 90 degrees clockwise about the point 4, 3.

(3 marks)

6 (a)   Shape *L* has an area of $5\,\text{cm}^2$.
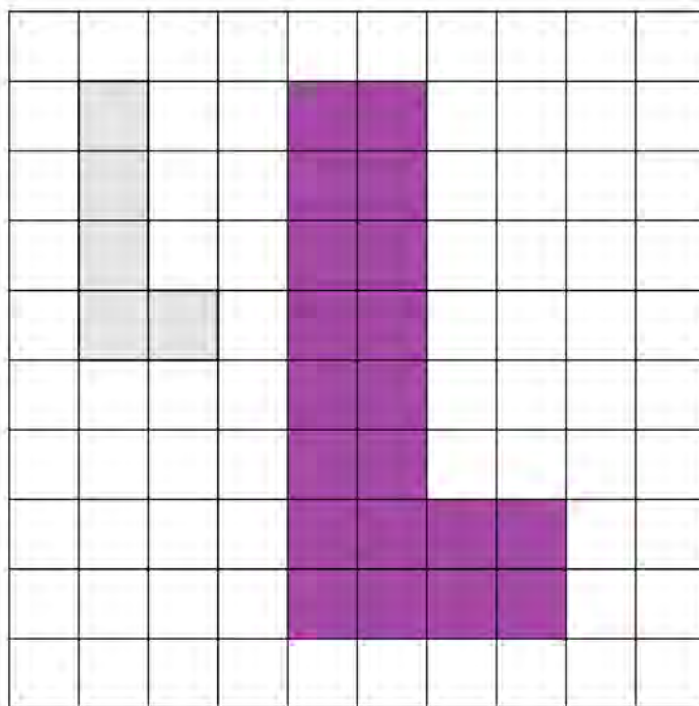
Work out the area of the shape after an enlargement of scale factor 2

$$5 \times 2^2 = 20$$

Answer ......20.. cm^2 *(2 marks)*

6 (b) Rotate the shape clockwise by a quarter of a turn.
Mark with a cross your centre of rotation.
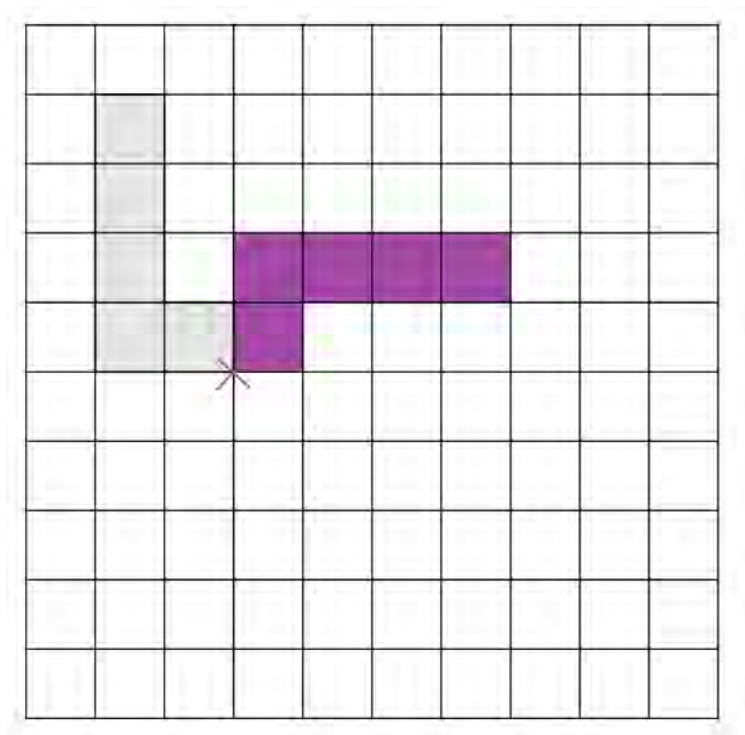
(3 marks)

7 Here are six shapes made from centimetre squares.
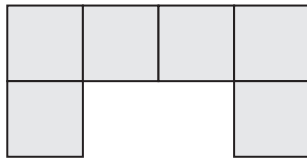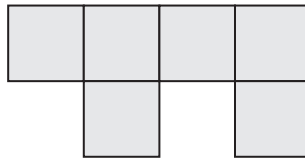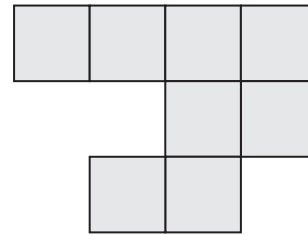
1   *2*   *3*
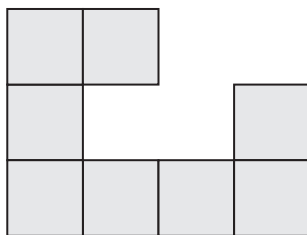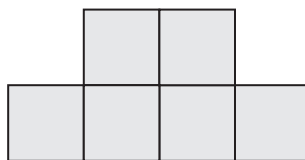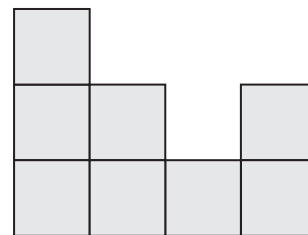
4   *5*   *6*

7 (a) Which **two** shapes fit together to make a rectangle?

Answer ....*1*............... and ....*5*................. *(1 mark)*

7 (b) Which **two** shapes fit together to make a square?

Answer ....*3*............... and ....*4*................. *(1 mark)*

7 (c) Work out the area of shape *D*. State the units of your answer.

Answer ... 8cm^2 .... *(2 marks)*

8 Triangles *R*, *S* and *T* are shown on the grid.
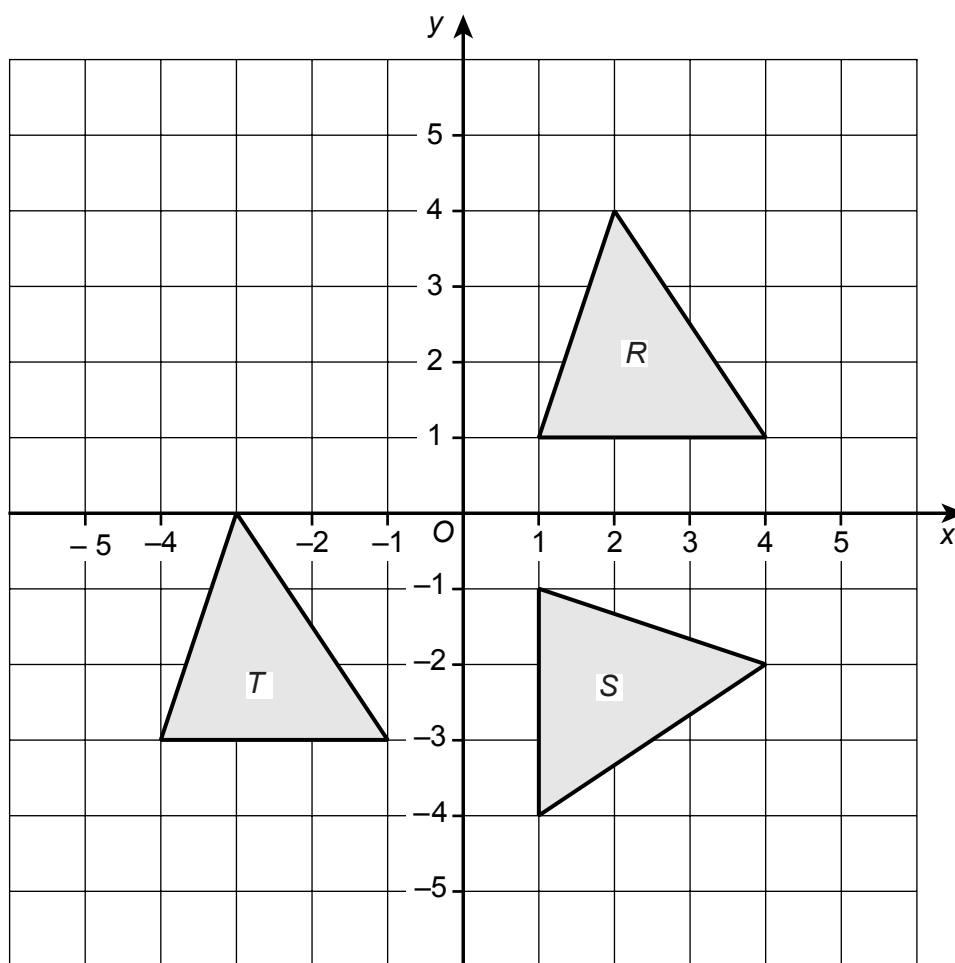
8 (a) Describe fully the **single** transformation that maps triangle *R* onto triangle *S*.

S is the image *R* rotated clockwise by 90 degrees about the point 1, 0.

(3 marks)

8 (b) Write down the vector which describes the translation of triangle *R* onto triangle *T*.

Answer $\begin{pmatrix} -5 \\ -4 \end{pmatrix}$ *(1 mark)*

9 Rectangle *D* is an enlargement of rectangle *C*.
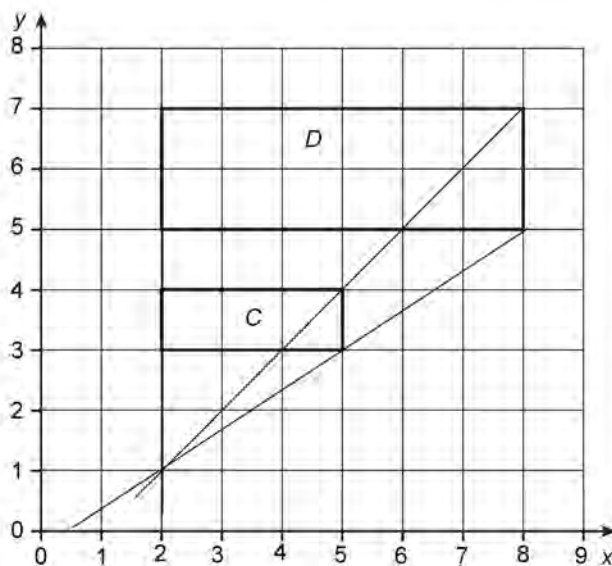
9 (a)   Write down the scale factor of the enlargement.

Answer ....2..   *(1 mark)*

9 (b)   Write down the coordinates of the centre of the enlargement.

Answer (........2................ , ...1..............)   *(1 mark)*

10   The diagram shows a triangle *L*, with vertices at (–4, 3), (–2, 3) and (–2, 4).
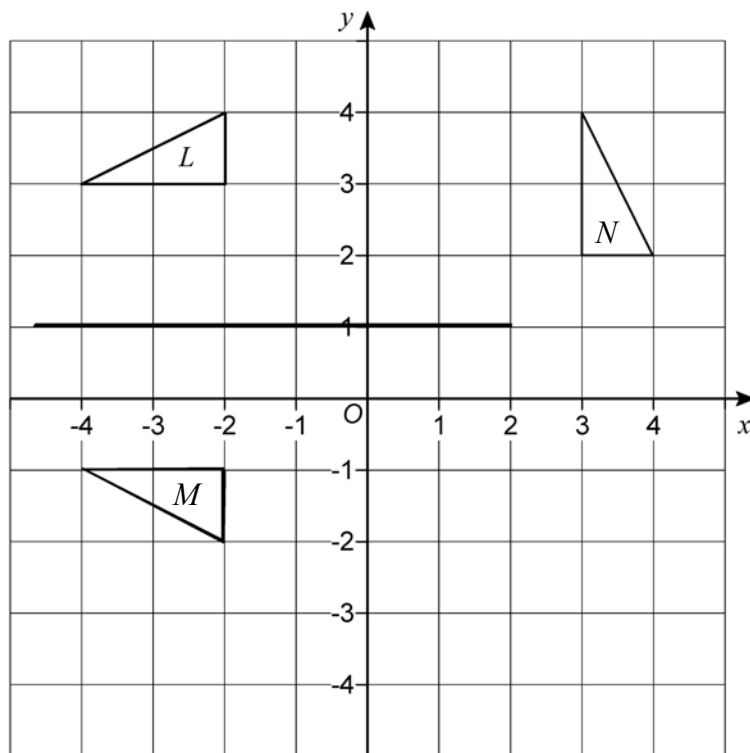
10 (a)   Draw an image of triangle *L* when it is reflected in the line $y = 1$

Label your image *M*.

(2 marks)

10 (b)   Draw an image of triangle *L* when it is rotated 90° clockwise about the origin.
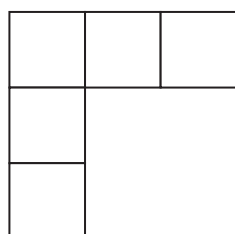
Label your image *N*.

(3 marks)
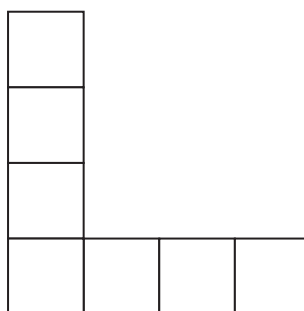
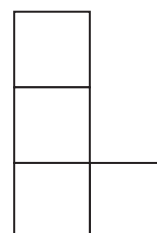**11** Shapes *W*, *X*, *Y* and *Z* are made from squares of sides 1 cm.
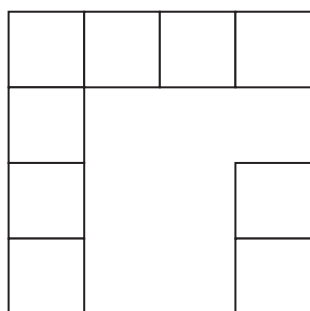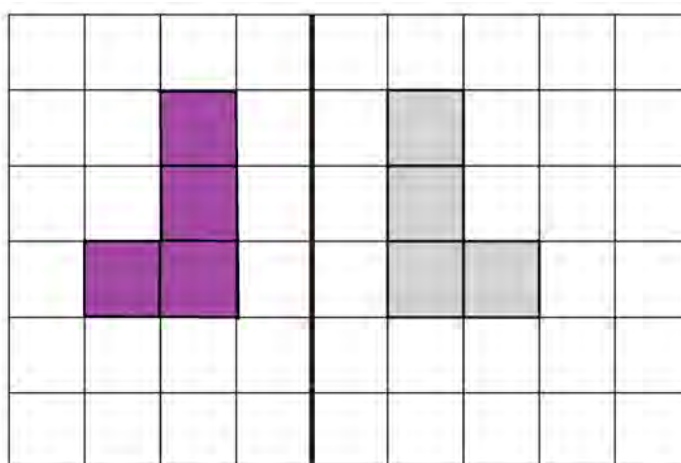

W   X   Y   Z

11 (a) Which **two** shapes are congruent?

Answer   Shape ....*W*.......................... and Shape ....*Y*................................

(1 mark)

11 (b) Shape *L* is drawn on the grid.
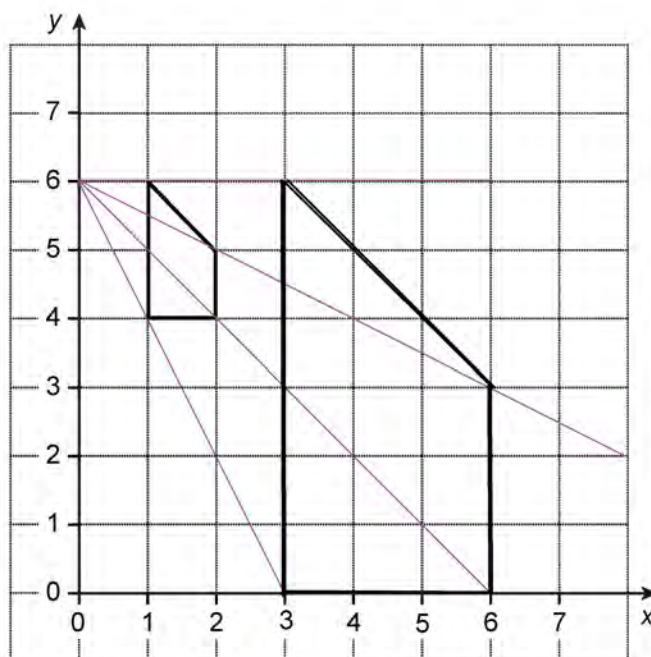
Reflect shape *L* in the mirror line.

Mirror line

(2 marks)

12 Enlarge the shape in the diagram by a scale factor 3, centre (0, 6).

(2 marks)