WJEC GCSE MATHEMATICS (LINEAR)

MATHS



EXAM QUESTION PACK

PAPER 1 HIGHER TIER 0185 PAPERS

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Surname	Centre Number	Candidate Number
Other Names		0

GCSE

185/09

MATHEMATICS

HIGHER TIER

PAPER 1

P.M. WEDNESDAY, 9 November 2011

2 hours

CALCULATORS ARE NOT TO BE USED FOR THIS PAPER

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

Take π as 3·14.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

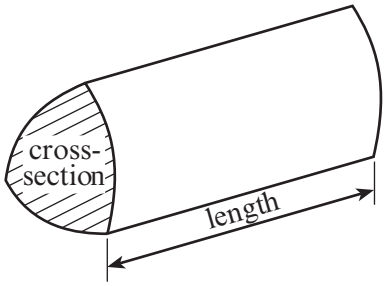
For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**5**	
2	**6**	
3	**10**	
4	**8**	
5	**7**	
6	**4**	
7	**7**	
8	**5**	
9	**10**	
10	**7**	
11	**5**	
12	**4**	
13	**7**	
14	**11**	
15	**4**	
TOTAL MARK		

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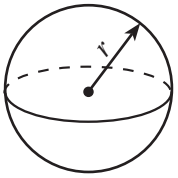
Formula List

Volume of prism = area of cross-section × length



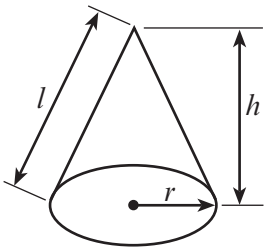
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

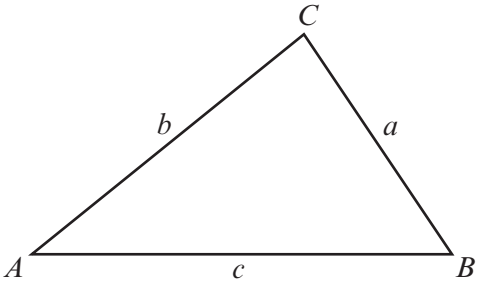


In any triangle ABC

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

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

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



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where $a \neq 0$ are given by

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

Standard Deviation

Standard deviation for a set of numbers

$x_1, x_2, \ldots, x_n$, having a mean of $\bar{x}$ is given by

$$s = \sqrt{\frac{\sum(x - \bar{x})^2}{n}} \text{ or } s = \sqrt{\frac{\sum x^2}{n} - \left\{\frac{\sum x}{n}\right\}^2}$$

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Examiner only

1. Tomas has one spin of the circular spinner shown below.
Two of the lines shown on the diagram are diameters of the circle.

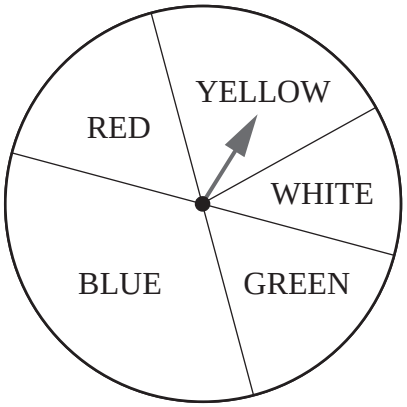


Diagram not drawn to scale

(a) The table below shows the probabilities of Tomas obtaining YELLOW, WHITE and GREEN with one spin of the spinner.
Complete the table.

Colour	YELLOW	WHITE	GREEN	RED	BLUE
Probability	0·2	0·12	0·18		

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[3]

(b) Find the probability of obtaining either WHITE or GREEN on the spinner.

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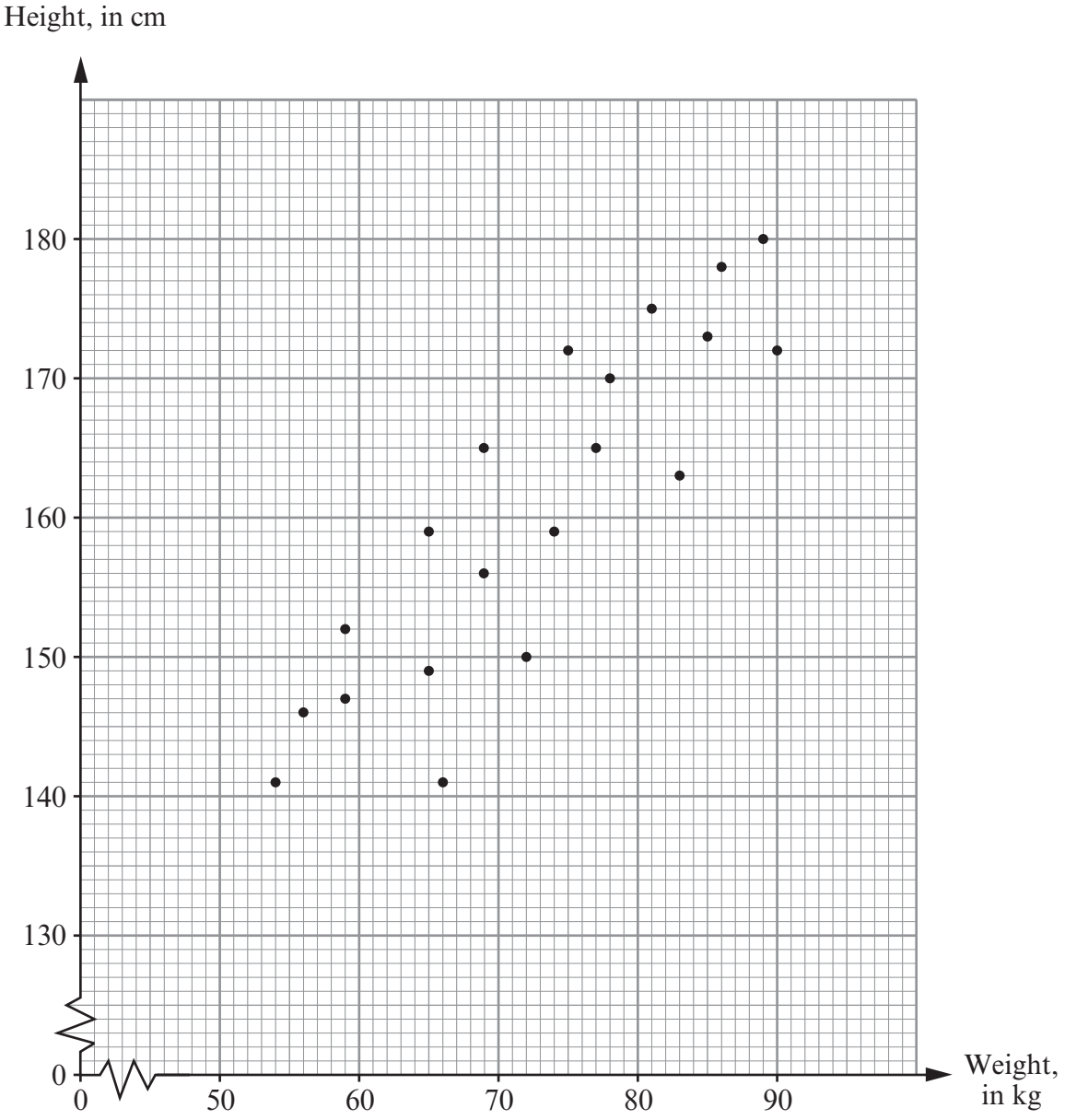
[2]

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2. The scatter diagram shows the height, in cm, and the weight, in kg, for each of 20 members of a sports club.



(a) Write down the height and weight of the **heaviest** of the 20 members of the sports club.

Weight ..... kg

Height ..... cm
[2]

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(b) Write down the type of correlation shown by the scatter diagram.

.....

[1]

(c) Draw, by eye, a line of best fit on the scatter diagram.

[1]

(d) Estimate the weight of a person of height 155 cm.

.....

[1]

(e) Is it possible to estimate the weight of a person with a height of 210 cm from the scatter diagram? You must give a reason for your answer.

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[1]

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3. *(a)*

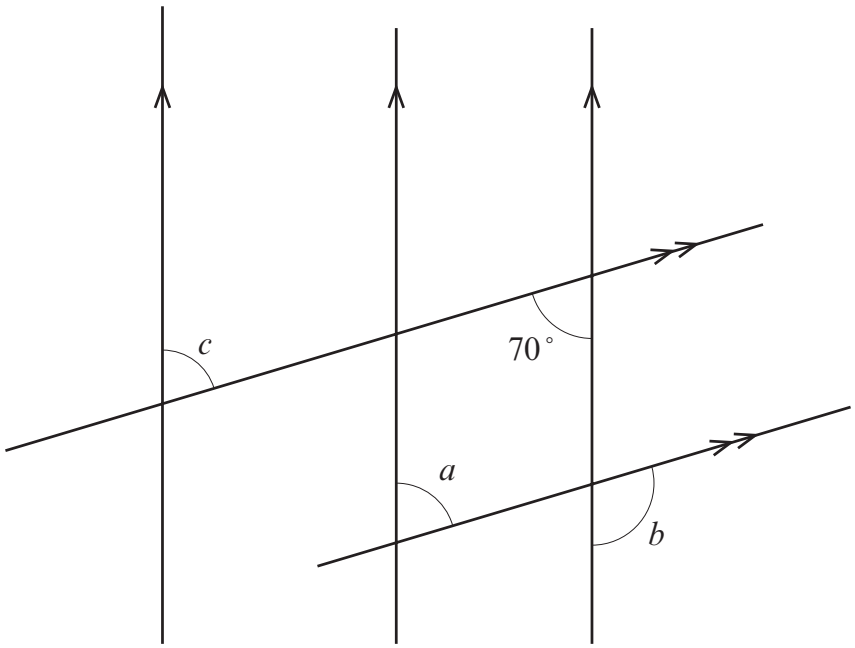


Diagram not drawn to scale

Find the size of each of the angles marked *a, b* and *c*.

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$a =$ ..... ° $b =$ ..... ° $c =$ ..... °

[3]

(b) Calculate the size of the interior angle of a regular 10 sided polygon.

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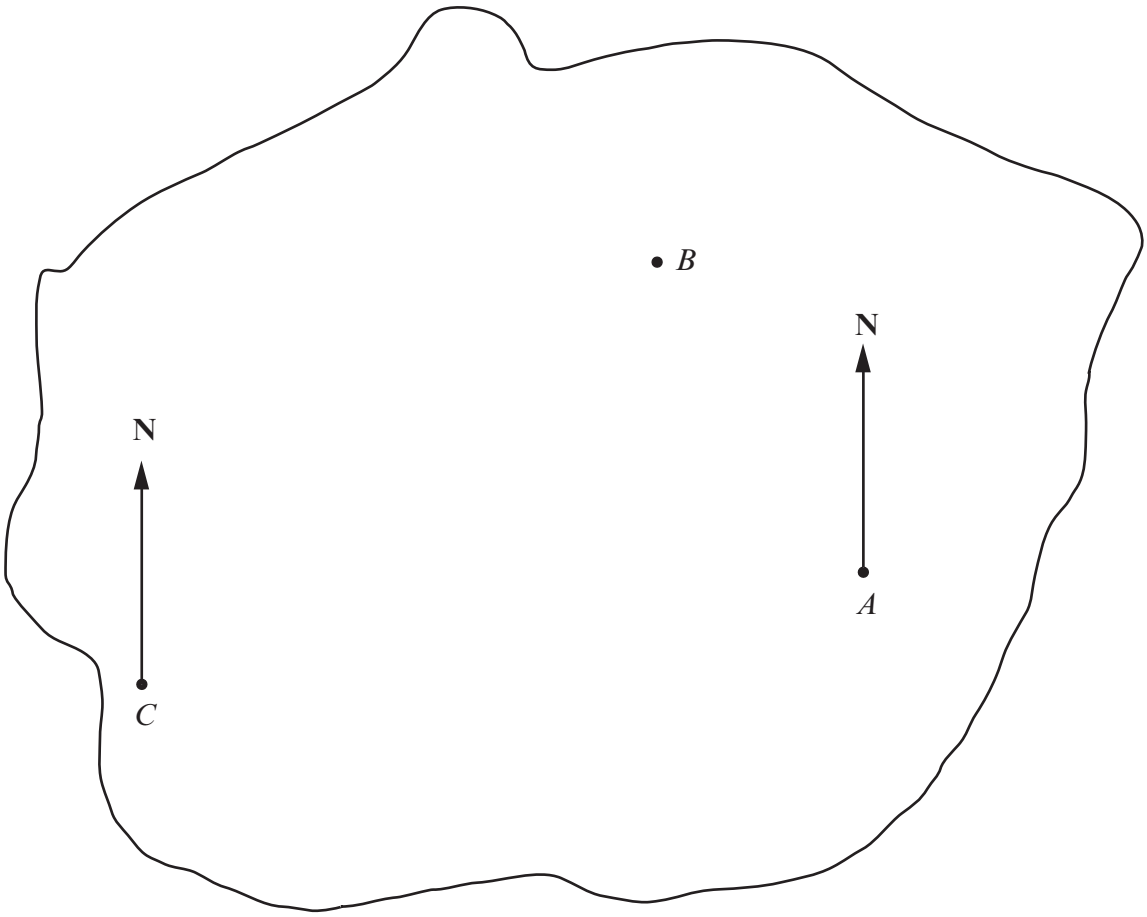
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[3]

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(c)



(i) Write down the bearing of point *B* from point *A*.

.....

(ii) A point *D* is to be plotted on the above plan.
The bearing of *D* from *C* is 038°, and the bearing of *D* from *A* is 305°.
Find and mark the position of *D* on the above plan.

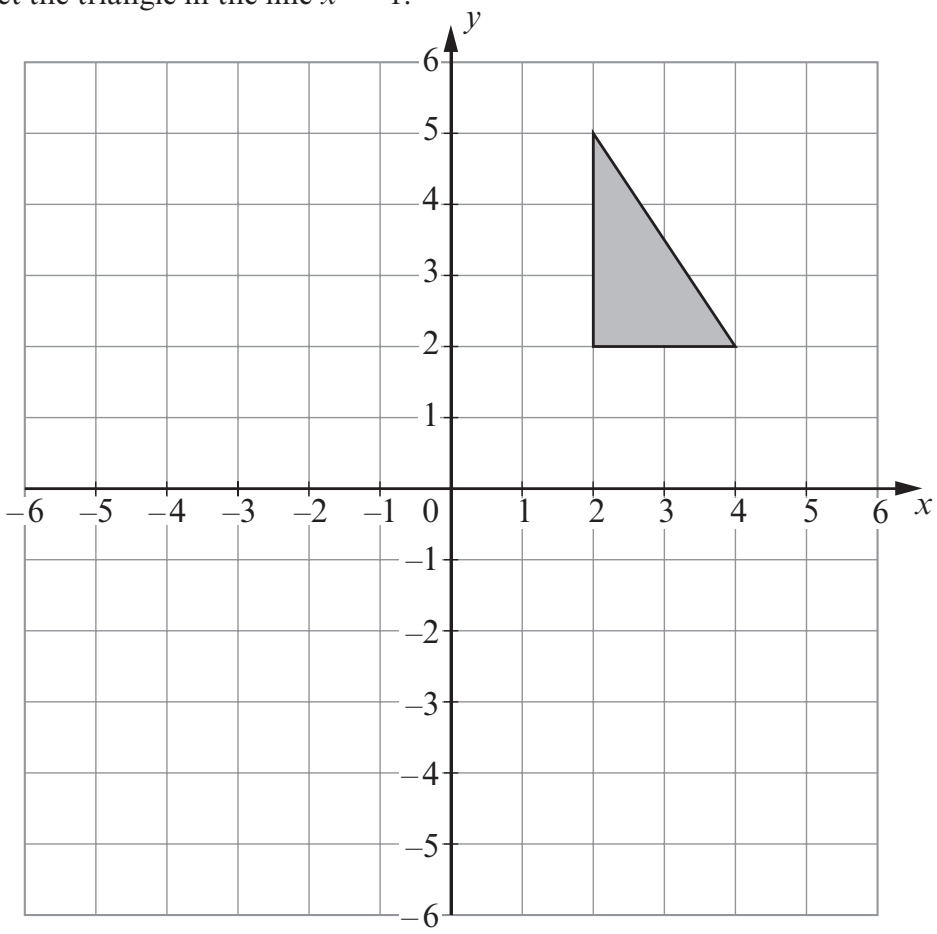
[4]

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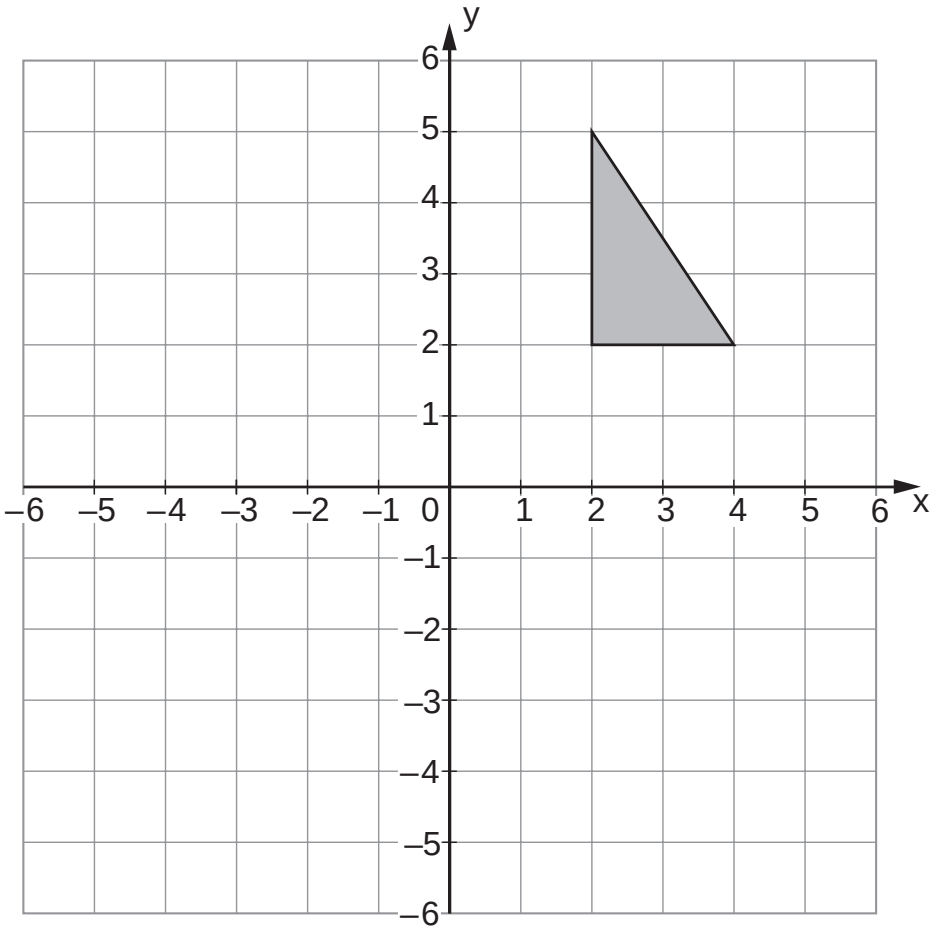
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4. *(a)* Reflect the triangle in the line $x = -1$. [2]



(b) Translate the triangle shown 4 to the left and 2 down. [1]

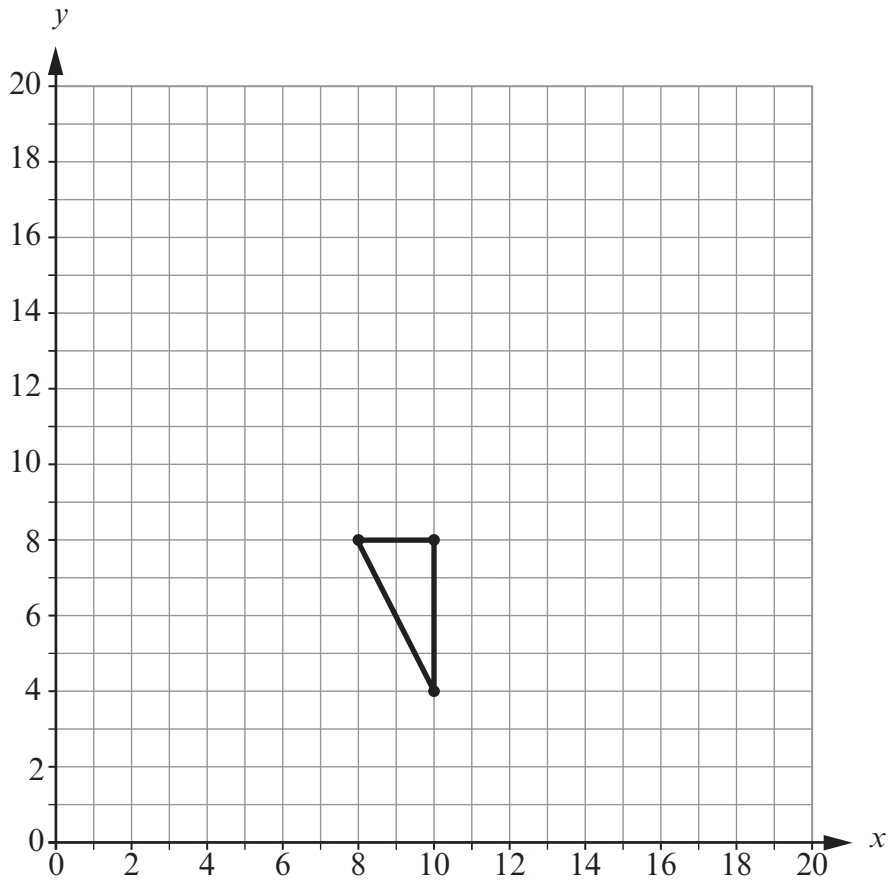


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(c) Enlarge the triangle using centre (0, 0) by a scale factor of $\frac{1}{2}$.

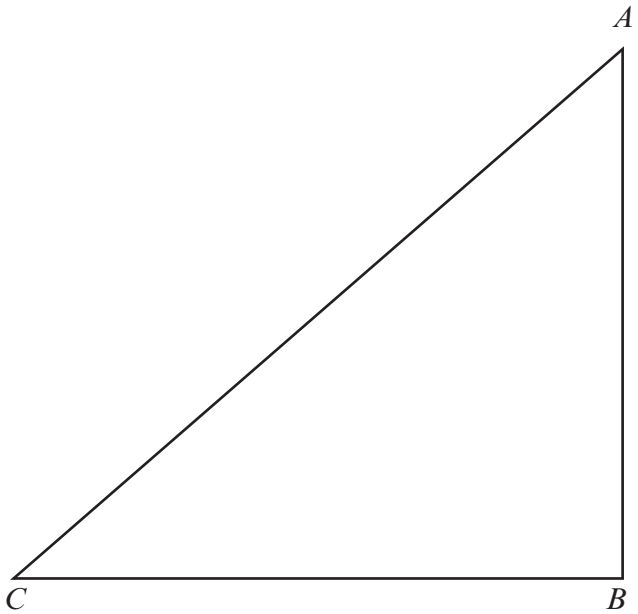
[2]



(d) The diagram below shows a triangle ABC. Find and **shade** the region inside the triangle which satisfies **both** of the following conditions.

(i) All points in the region are nearer to AC than to AB.

(ii) All points in the region are less than 5 cm from A.



[3]

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5. *(a)* Cheryl scored 60 marks out of 80 in a test.
Express Cheryl's score as a percentage.

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[2]

(b) Share £300 in the ratio 5 : 7.

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[3]

(c) Calculate 75% of £562.80.

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[2]

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6. *(a)* Write down the nth term of the sequence 6, 10, 14, 18, 22, ...

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[2]

(b) Solve $3x + 4 = 8 - 7x$.

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[2]

0185 090011

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7. *(a)* Explain how you know that 24 is **not** a square number.

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[1]

(b) Express 112 as a product of prime numbers in index form.

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[3]

(c) Evaluate $\frac{1}{5} \div \frac{1}{3}$.

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[1]

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(d) Evaluate $2\frac{1}{3} \times 3\frac{3}{7}$. Simplify your answer.

[2]

8. The length of a table top is 2050 mm, measured to the nearest 10 mm.

(a) Write down the **least** and **greatest** possible values of the length of the table top.

Least value ..... mm Greatest value ..... mm

[2]

(b) The width of the table top is 1040 mm, measured to the nearest 10 mm.
Find the least possible perimeter of the table top.

[3]

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9. *(a)* Factorise $x^2 - 2x - 8$.

[2]

(b) Expand and simplify $(2x + 1)(x - 5)$.

[2]

(c) Solve $\frac{21 - 2x}{5} = 4 - x$.

[3]

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(d) Simplify $6x^7y^2 \times 4x^3y^5$.

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[2]

(e) Simplify $a^5 \times a^{-2}$.

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[1]

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10. The heart rate of each of 60 people at a gym was recorded.
The following table shows a grouped frequency distribution of the results.

Heart rate, r (beats per minute)	$80 \leqslant r < 90$	$90 \leqslant r < 100$	$100 \leqslant r < 110$	$110 \leqslant r < 120$	$120 \leqslant r < 130$	$130 \leqslant r < 140$
Number of people	4	14	22	10	6	4

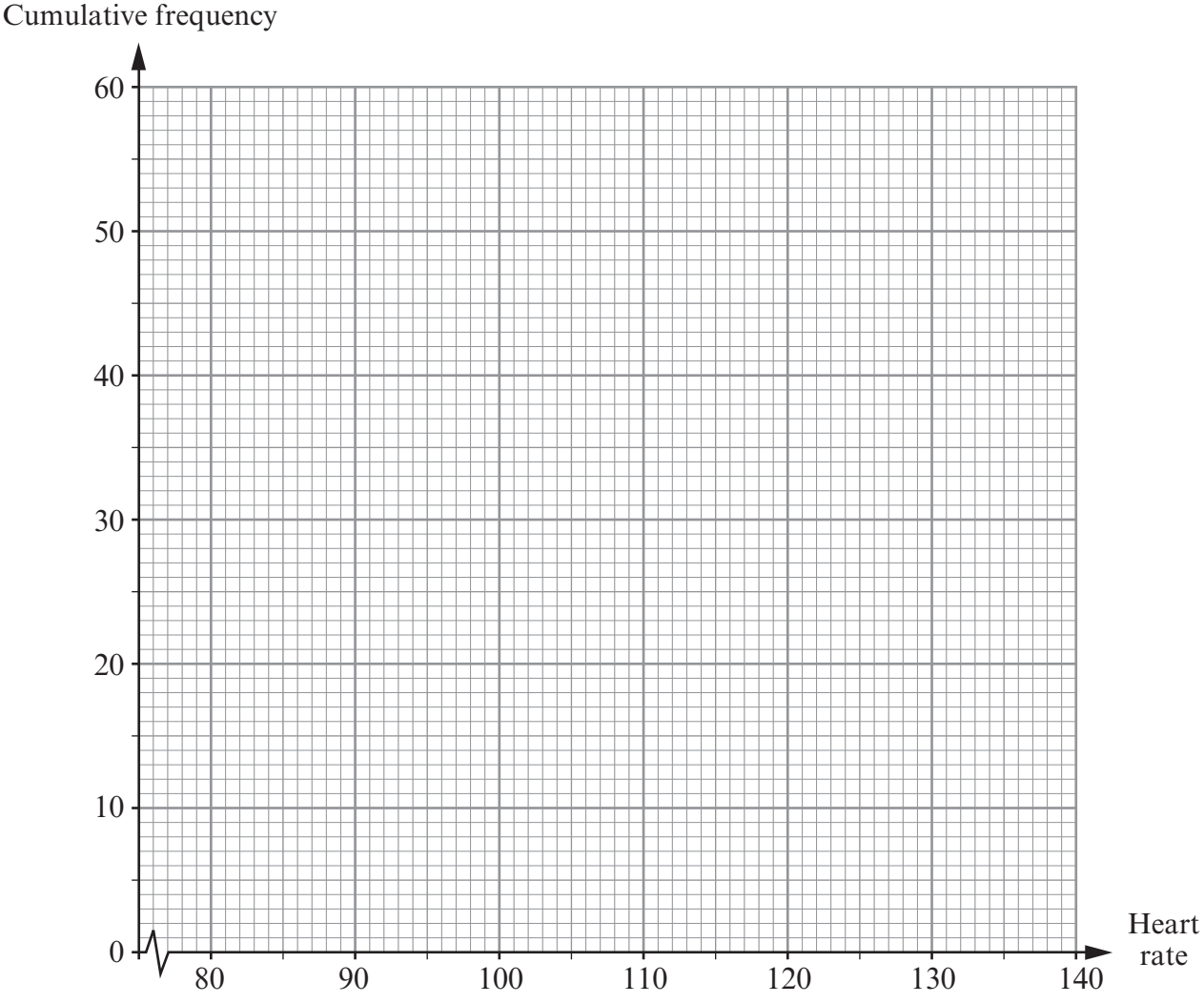
(a) Complete the following cumulative frequency table.

Heart rate (less than)	80	90	100	110	120	130	140
Cumulative frequency	0	4	18				

[1]

(b) On the graph paper below, draw a cumulative frequency diagram to show this information.

[3]



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(c) Use your cumulative frequency diagram to find estimates for

(i) the median,

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(ii) the interquartile range.

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[3]

11. *(a)* Factorise the expression $6x^2 - 11x - 10$ and hence solve the equation $6x^2 - 11x - 10 = 0$.

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[3]

(b) Factorise $4y^2 - 81$.

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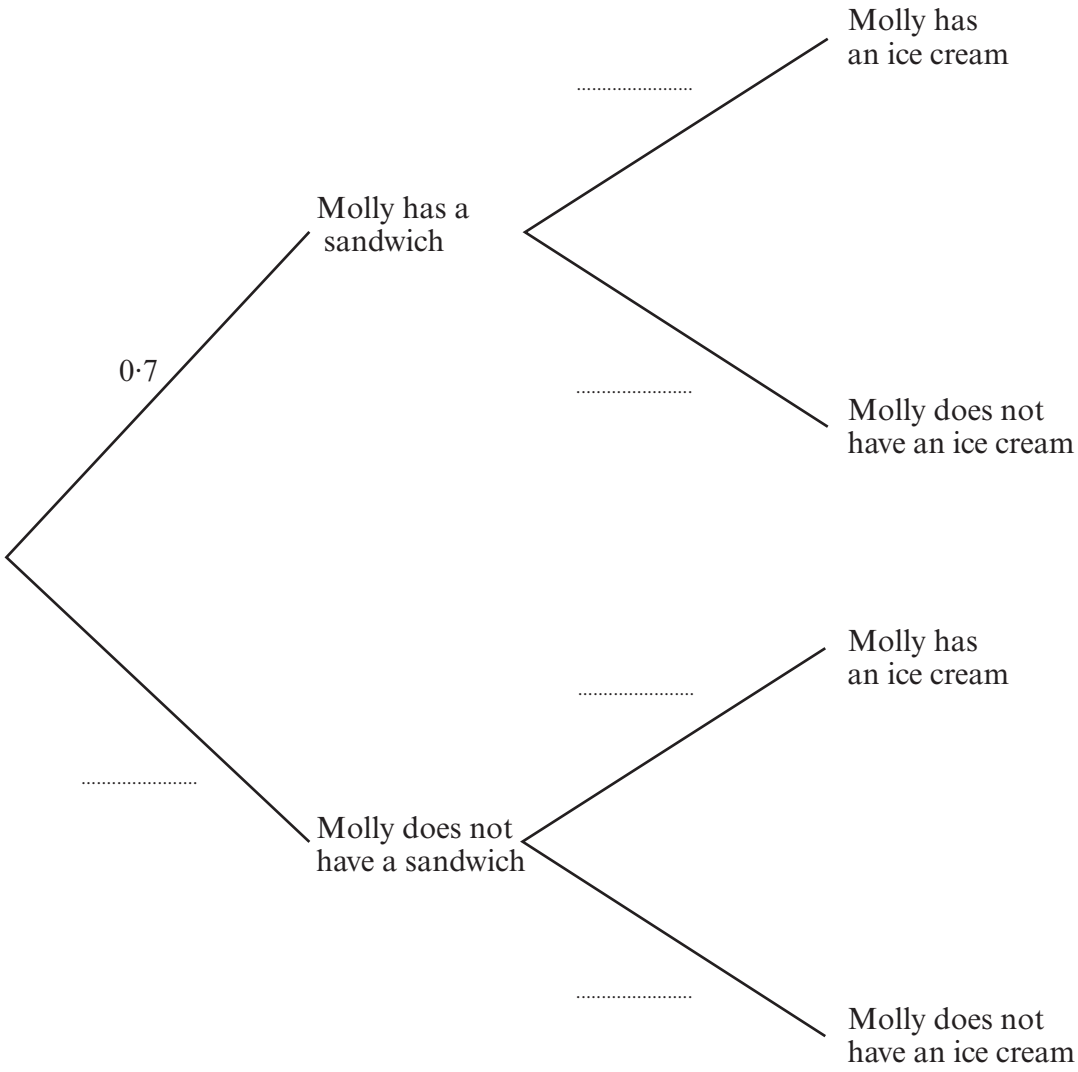
[2]

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12. At lunchtime, the probability that Molly has a sandwich is 0·7.
Whether or not Molly has a sandwich, the probability that Molly has an ice cream mid-afternoon is 0·2.

(a) Complete the following tree diagram.



[2]

(b) Calculate the probability that Molly has a sandwich for lunch and has an ice cream mid-afternoon.

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[2]

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13. Vectors **OK**, **OL** and **OM** are shown in the diagram below.

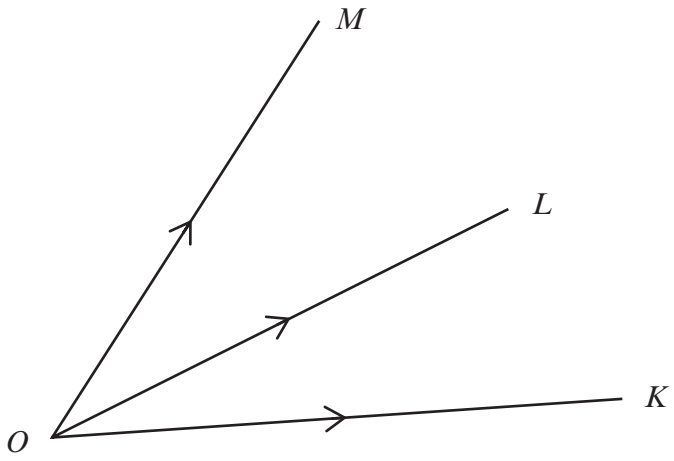


Diagram not drawn to scale

Given that **OK** = 2**a** + **b**, **OL** = 5**a** + 3**b** and **OM** = 14**a** + 9**b**,

(a) express each of the following in terms of **a** and **b** in their simplest form,

(i) **KL**

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(ii) **LM**

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[3]

(b) show that **KM** = *p***KL** where *p* is a constant,

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[2]

(c) explain fully the geometrical implication of your answer in part *(b)*.

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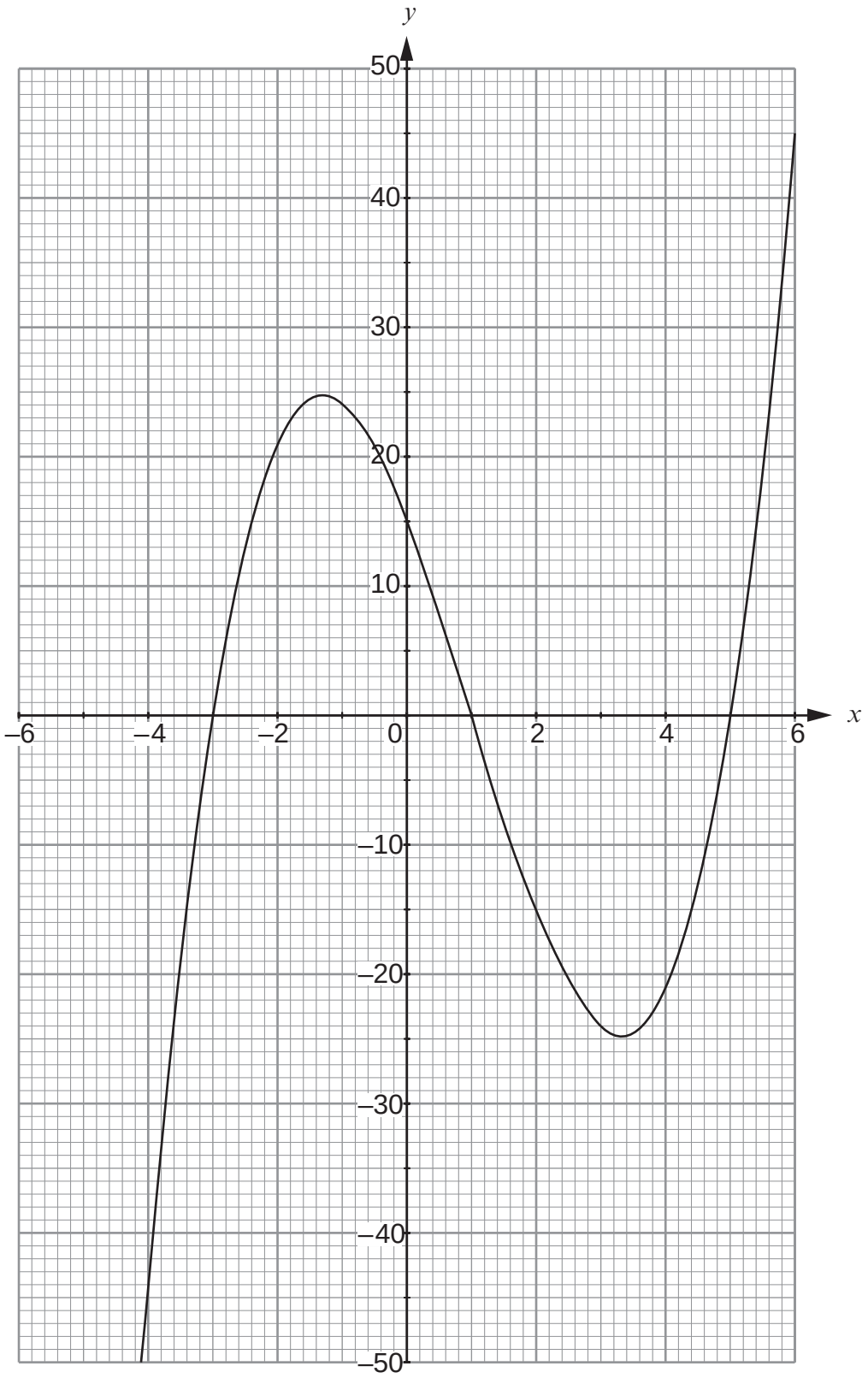
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[2]

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14. The graph of $y = x^3 - 3x^2 - 13x + 15$, for values of x between $x = -4$ and $x = 6$, has been drawn below.



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(a) Use the graph to solve $x^3 - 3x^2 - 13x + 15 = 0$.

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[1]

(b) Using the graph, estimate the gradient of the curve $y = x^3 - 3x^2 - 13x + 15$ when $x = 4$.

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[3]

(c) By drawing an appropriate line on the graph, solve the equation

$$x^3 - 3x^2 - 13x + 5 = 0.$$

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[3]

(d) Use the trapezium rule with 4 strips to estimate the area of the region enclosed by the curve $y = x^3 - 3x^2 - 13x + 15$ and the x-axis between $x = -3$ and $x = 1$.

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[4]

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15. *(a)* Express $0{\cdot}6\dot{5}\dot{2}$ as a fraction.

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[2]

(b) Given that $p = \sqrt{5}$, $q = \sqrt{13}$ and $r = \sqrt{325}$, simplify pqr.

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[2]

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WJEC
CBAC

GCSE MARKING SCHEME

MATHEMATICS - TWO TIER LEGACY

NOVEMBER 2011

INTRODUCTION

The marking schemes which follow were those used by WJEC for the November 2011 examination in GCSE MATHEMATICS - TWO TIER LEGACY. They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

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Mathematics Paper 2 - Higher Tier	9

PAPER 1 – HIGHER TIER

Higher Tier November 2011 Paper 1	Mark	Comments (Final Post-conference version 13.11.11)
1.(a) Strategy, e.g. knowing that the probabilities add to 1, or that RED with BLUE is 0.5, or Green the same as Red	M1	Also for their P(Red) + their P(Blue) = 0.5 Either correct response implies M1 also
RED 0.18	A1	
BLUE 0.32	A1	
(b) 0.12 + 0.18	M1	
0.3(0) or 30% or equivalent	A1	
	5	
2.(a) 90 (kg), 172 (cm)	B2	B1 for either or if reversed
(b) Positive	B1	Do not accept a description
(c) Suitable line, with some points above and below	B1	No requirement to pass through the means
(d) Answers in the range >60 (kg) but $\underline{<}$ 70 (kg)	B1	OR Suitable answer from their line of best fit
(e) No, with a suitable reason e.g. No as there is no data around 210cm, or "graph doesn't go that high"	B1 6	No maybe implied in their statement
3.(a) a = 70°, b = 110°, c = 70°	B3	B1 for each. FT b = 180 – a and c = a or c = 180 - b
(b) 360/10	B1	OR alternatively: 8 triangles at 180 or 1440 B1
180 – 360/10	M1	(8 × 180)÷ 10 M1
144(0)	A1	144 A1
(c)(i) Bearing 326 $\pm$2°	B1	
(ii) 038° $\pm$2° from C	M1	
305° $\pm$2° from A	M1	
D indicated or implied by point	A1	Depends on at least 1 M mark
	10	
4. (a) Correct reflection in the line x = -1	B2	B1 for a reflection in any line indicated or either axis, OR B1 for drawing x =-1
(b) Correct translation	B1	
(c) Enlargement ½	M1	Note: Scale factor 2 is NOT MR, M0 A0
Correct position	A1	
(d) Bisector of angle CAB	B1	$\pm 2^0$
Arc radius 5cm centre A	B1	$\pm$ 1 mm
Correct region shaded	B1	FT for intention of bisector & arc
	8	
5.(a) 60/80 × 100	M1	
75(%)	A1	Allow SC1 for 75/100
(b) 300/12 × 5 OR 300/12 × 7	M1	Intention 300/(5+7) then ×5 or ×7
(£)125	A1	CAO
(£) 175	A1	CAO
(c) 75/100 × 562.80 OR ¾ × 562.80 OR 281.4(0) + 140.7(0)	M1	OR equivalent e.g. attempting to find 7 lots of 10% and adding 5%
(£)422.1(0)	A1	
	7	
6.(a) 4n + 2	B2	B1 for 4n. B0 for n + 4 = 4n
(b) 3x + 7x = 8 - 4	B1	FT until 2nd error
x = 4/10 (or equivalent)	B1	ISW. Accept x = -4/-10
	4	
7.(a) E.g. '$2^3 \times 3$ not even powers',	E1	Accept 'no number times itself gives 24' only **with** 4×4 **and** 5×5 given. Accept 4×4 = 16 **and** 5×5 = 25. Do not accept '16, 25' Do not accept "not even powers" without $2^3 \times 3$ Accept '$2\sqrt{6}$ not a whole number'
(b) Method that produces at least 2 correct prime factors	M1	Before 2nd error
Sight of correct factors (2, 2, 2, 2, 7)	A1	Ignore 1s seen
$2^4 \times 7$	B1	FT their factors (with at least on index >1 used). Do not ignore 1s.
(c) 3/5 or 0.6	B1	CAO
(d) 7/3 × 24/7	M1	Unsimplified answer award M1 only
= 8	A1	
	7	
8.(a) 2045 and 2055	B2	B1 for each. Accept 2044.999(9999...) not 2044.9
(b) Sight of least width 1035 (mm)	B1	
2045+1035+2045+1035	M1	FT their least length, **not** 2050 AND their least width, **not** 1040
6160 (mm)	A1	CAO
	5	

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Higher Tier November 2011 Paper 1	Mark	Comments (Final Post-conference version 13.11.11)
9. (a) $(x-4)(x+2)$	B2	B1 for $(x \quad 4)(x \quad 2)$ with no or incorrect signs
(b) $2x^2 - 9x - 5$	B2	B1 for $2x^2$ -5 or -9x as part of a trinomial. ISW 'solving'
(c) $21 - 2x = 20 - 5x$	B1	FT until second error
$3x = -1$	B1	
$x = -1/3$ (= -0.33….) ISW	B1	Do not accept -0.3 unless -1/3 seen. FT: 21 – 2x = 20 – x B0, -x = -1 B1, x = 1 B1 FT: 21 – 2x = 4 – 5x B0, 3x = -17 B1, x = -17/3 B1 125 – 10x = 4 – x is 2 errors so no FT
(d) $24x^{10}y^7$	B2	B1 for any two factors number, x & y correct, or correct but with "times" left in expression
(e) a^3	B1	CAO
	10	
10.(a) 40, 50, 56, 60	B1	FT to (b) only if cumulative in (a).
(b) At least 5 plots correct horizontally	B1	B0 for bars, B1 for vertical lines. Accept plots, e.g 89 to 90 for <90
At least 5 plots correct vertically	B1	B1 for bars or vertical lines
All **7** points plotted correctly **and** joined	B1	Joined with a curve or a straight line
(c) (i) Median from their cum. freq. diagram	B1	FT their cumulative frequency or other **cumulative** diagram in (c)
Difference of heart rate reading for 45 & 15	M1	Allow consistent misread of the scale.
Interquartile range	A1	Correct for their cumulative freq. diagram
	7	
11.(a) $(3x+2)(2x-5)$	B2	B1 for $(3x\ldots2)(2x-\ldots)$
$x = -2/3$ and $x = 5/2$	B1	FT their pair of brackets
(b) $(2y+9)(2y-9)$	B2	B1 for $(2y\ldots9)(2y\ldots9)$
	5	
12.(a) 0.3, 0.2, 0.8, 0.2, 0.8	B2	B1 0.3 with one other correct, or 0.2 & 0.8 as a pair
(b) 0.7×0.2	M1	
$= 0.14$	A1	FT from their tree, not 0.5s and must be <1
	4	
13.(a) Method for either (i) or (ii)	M1	(Accept missing brackets if no other marks in (a))
(i) $3\mathbf{a} + 2\mathbf{b}$	A1	Simplifying $-(2\mathbf{a} + \mathbf{b}) + 5\mathbf{a} + 3\mathbf{b}$ correctly
(ii) $9\mathbf{a} + 6\mathbf{b}$	A1	Simplifying $-(5\mathbf{a} + 3\mathbf{b}) + 14\mathbf{a} + 9\mathbf{b}$ correctly
(b) **KM** = $12\mathbf{a}+8\mathbf{b}$ seen or implied	M1	FT (i) + (ii)
Showing p = 4	A1	CAO
(c) Collinear (or parallel)and 4 times length,	E2	E1 for parallel OR collinear OR 4 times length
OR Collinear with ratio KL:LM as 1:3, OR equivalent	7	Accept 'all on straight line' for collinear
14.(a) $x = -3, 1, 5$	B1	All three required
(b) Tangent at $x = 4$	B1	
Gradient = change y / change x	M1	Independent of tangent drawn or not, no values required
11 from a tangent or ft reasonable **tangent**	A1	
(c) Line $y = 10$ stated or shown	B1	Maybe implied
Solution ~ -2.6, ~0.4, ~5.3	B2	FT from incorrect line B1 for 2 solutions, or 3 solutions from consistent MR
(d) Using trapezium rule or evidence of summation of areas.	M1	Must be for required area
At least 2 correct non zero y values.	M1	Equal strips gives (-3,0),(-2,21),(-1,24),(0,15),(1,0)
Correct expression for total area.	A1	Allow 1 error in y value. 10.5+22.5+19.5+7.5
Answer 60	A1	CAO
	11	An answer of '260' gets M0, M1, A0, A0 but then SC1
15. (a) (x=) 0.6525252… & (100x=) 65.252525… with attempt to find the difference	M1	Or equivalent
646 / 990	A1	A final answer of 64.6/99 is M1 only
(b) $65\sqrt{5}$	B2	B1 for $325=5\times5\times13$ or $\sqrt{325} = 5\sqrt{13}$ or partial simplification or shown by division
	4	

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Surname	Centre Number	Candidate Number
Other Names		0

WJEC CBAC

GCSE

185/09

MATHEMATICS

HIGHER TIER

PAPER 1

P.M. MONDAY, 6 June 2011

2 hours

CALCULATORS ARE NOT TO BE USED FOR THIS PAPER

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen. Do not use correction fluid.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** the questions in the spaces provided.

Take π as 3·14.

INFORMATION FOR CANDIDATES

You should give details of your method of solution when appropriate.

Unless stated, diagrams are not drawn to scale.

Scale drawing solutions will not be acceptable where you are asked to calculate.

The number of marks is given in brackets at the end of each question or part-question.

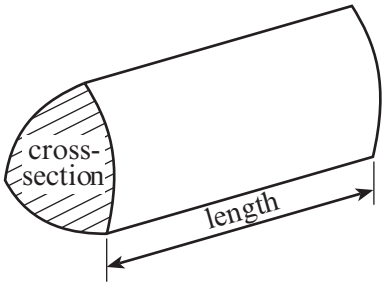
For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1	**7**	
2	**7**	
3	**7**	
4	**7**	
5	**6**	
6	**7**	
7	**7**	
8	**8**	
9	**5**	
10	**7**	
11	**8**	
12	**6**	
13	**13**	
14	**5**	
TOTAL MARK		

0185 090001

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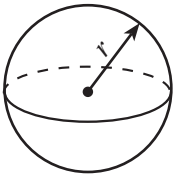
Formula List

Volume of prism = area of cross-section × length



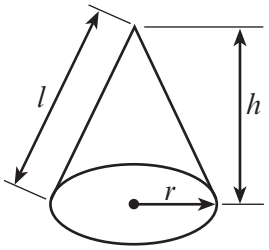
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

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

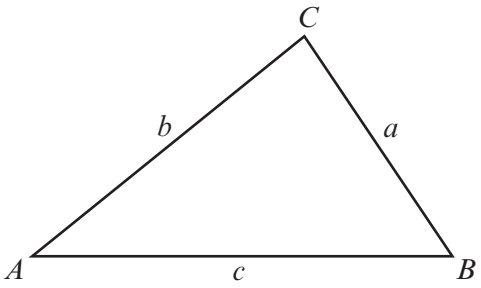


In any triangle ABC

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

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

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



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$

where $a \neq 0$ are given by

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

Standard Deviation

Standard deviation for a set of numbers

$x_1, x_2, \ldots, x_n$, having a mean of $\bar{x}$ is given by

$$s = \sqrt{\frac{\sum(x-\bar{x})^2}{n}} \quad \textbf{or} \quad s = \sqrt{\frac{\sum x^2}{n} - \left\{\frac{\sum x}{n}\right\}^2}$$

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1. *(a)* Estimate the value of $\frac{207 \times 148}{49}$.

[2]

(b) Given that $47 \times 235 = 11045$, write down the value of $\frac{1104{\cdot}5}{0{\cdot}47}$.

[1]

(c) In a quiz, a team scores 13 out of 20. Express this as a percentage.

[1]

(d) Which of the following fractions is closest to $\frac{2}{5}$?

$$\frac{7}{20} \qquad \frac{1}{4} \qquad \frac{7}{15}$$

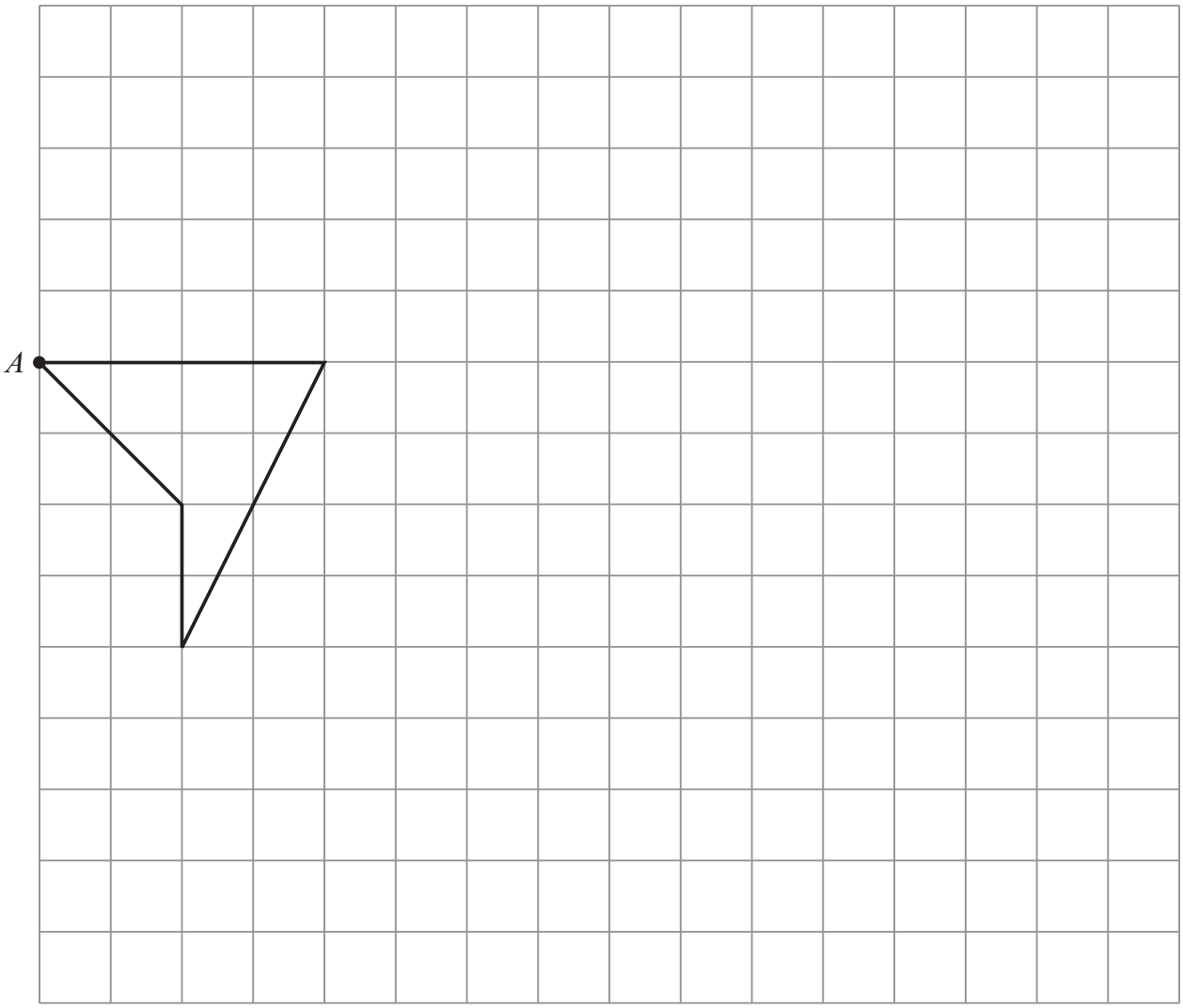
Show all your working.

[3]

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2. *(a)* Enlarge the shape shown on the grid by a scale factor of 2 using A as the centre of the enlargement.

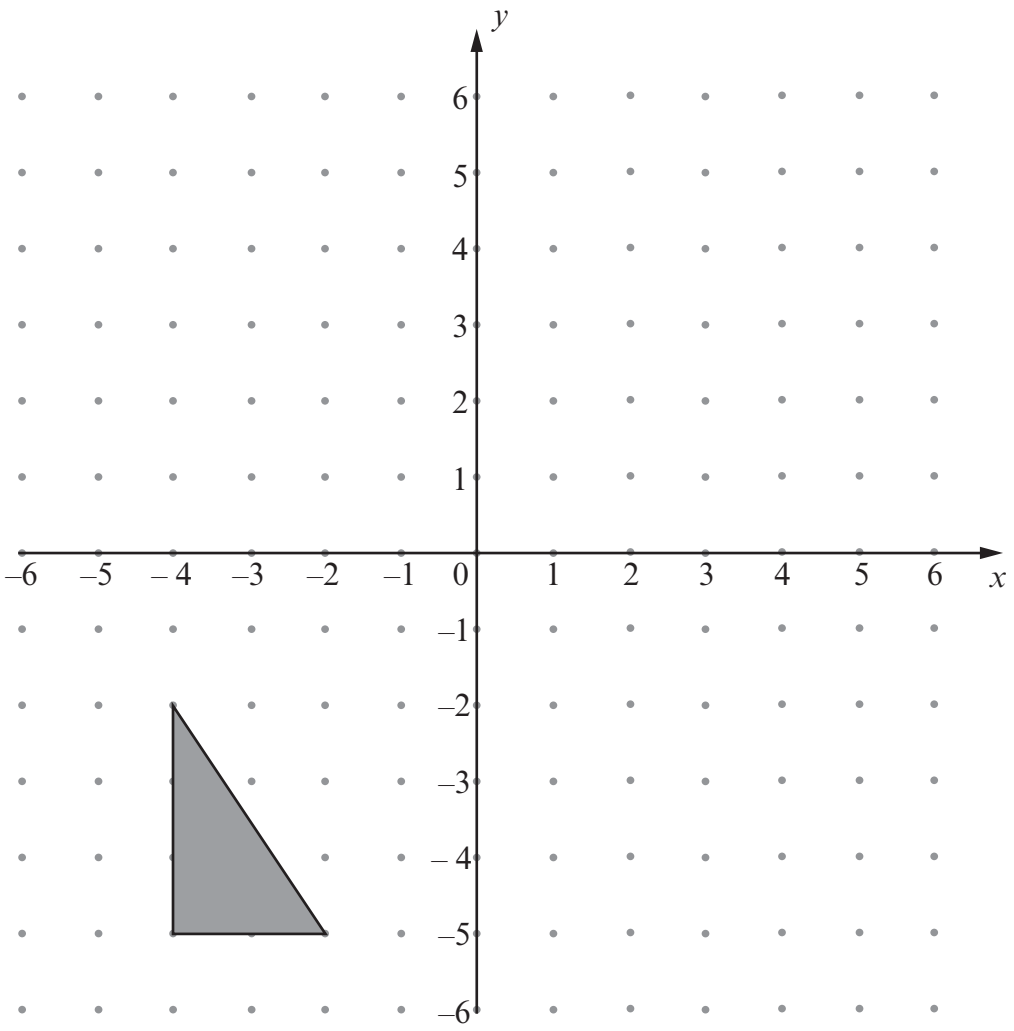


[3]

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(b) Rotate the triangle shown through 90° clockwise about the origin.



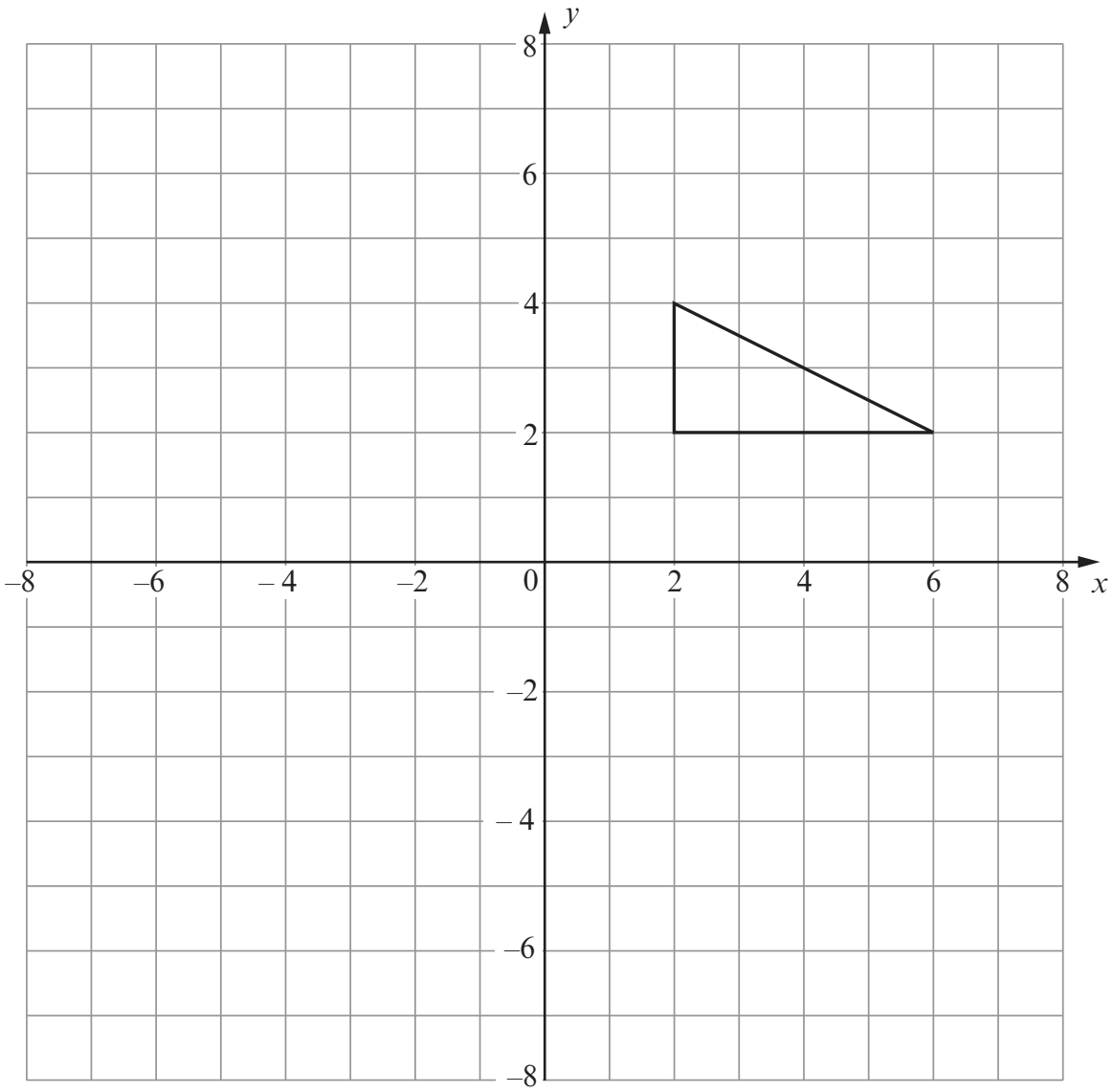
[2]

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(c) Translate the triangle shown by 8 units to the left and 1 unit down.

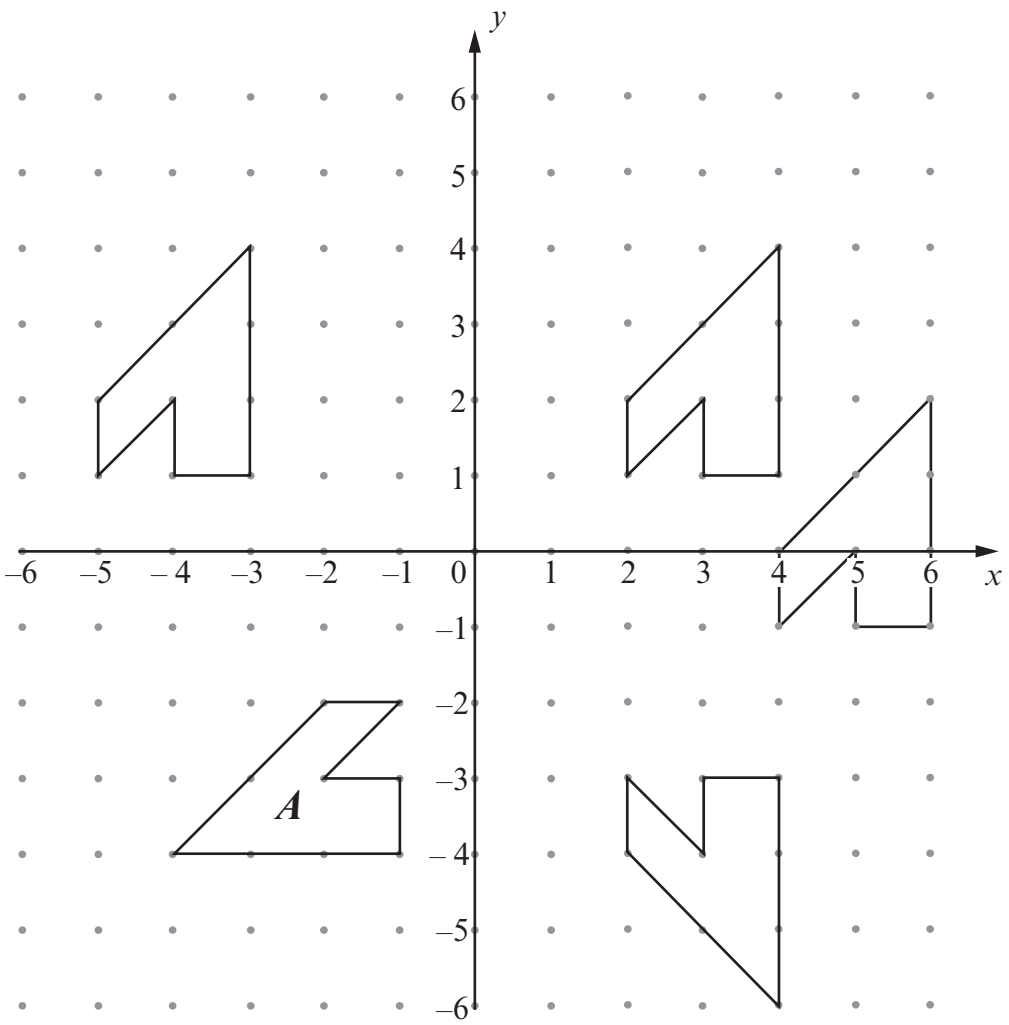


[1]

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(d)



Indicate with the letter ***B*** on the diagram which one of the shapes shown may be obtained by reflecting shape ***A*** in the line $y = -x$.

[1]

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3. *(a)* Factorise $18a - 27$.

.....

[1]

(b) Factorise $b^3 - 3b$.

.....

[1]

(c) Expand $5(2x + 7)$.

.....

[1]

(d) Solve $\frac{12}{x} = 4$.

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.....

[1]

(e) Solve $8x + 5 = 4x + 7$.

.....

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[3]

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4. *(a)* Calculate the size of each of the angles marked x, y and z in the diagram below.

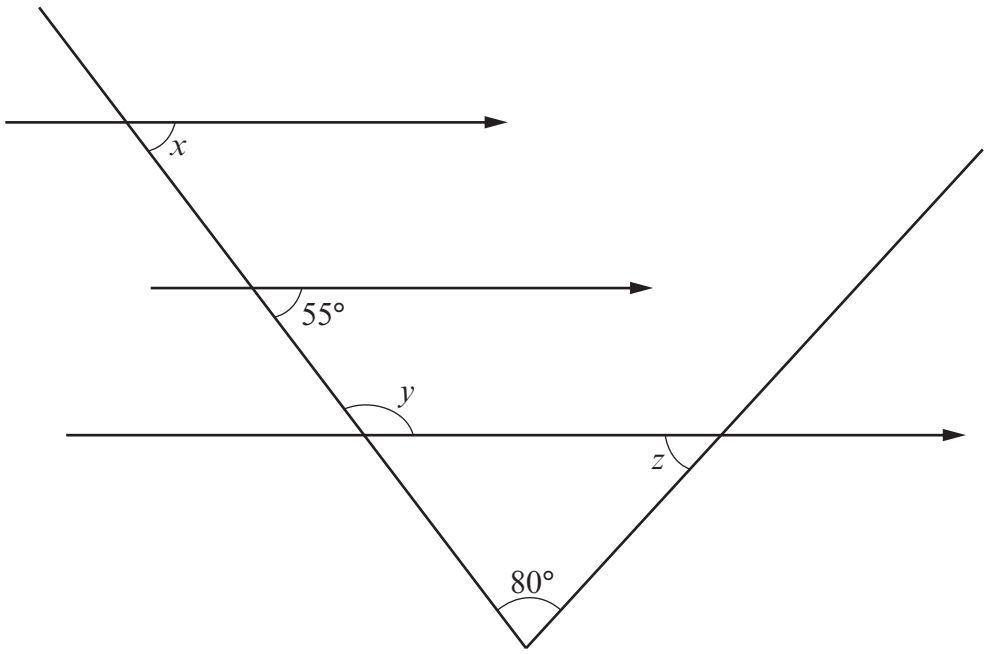


Diagram not drawn to scale

.....

.....

.....

.....

x = ... ° y = ... ° z = ... °

[4]

(b) Calculate the size of each of the exterior angles of a regular pentagon.

.....

.....

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.....

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[3]

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5. The table shows some of the values of $y = x^3 - 8$ for values of x from –2 to 4.

(a) Complete the table by finding the values of y for $x = -1$ and $x = 3$.

x	–2	–1	0	1	2	3	4
$y = x^3 - 8$	–16		–8	–7	0		56

.....

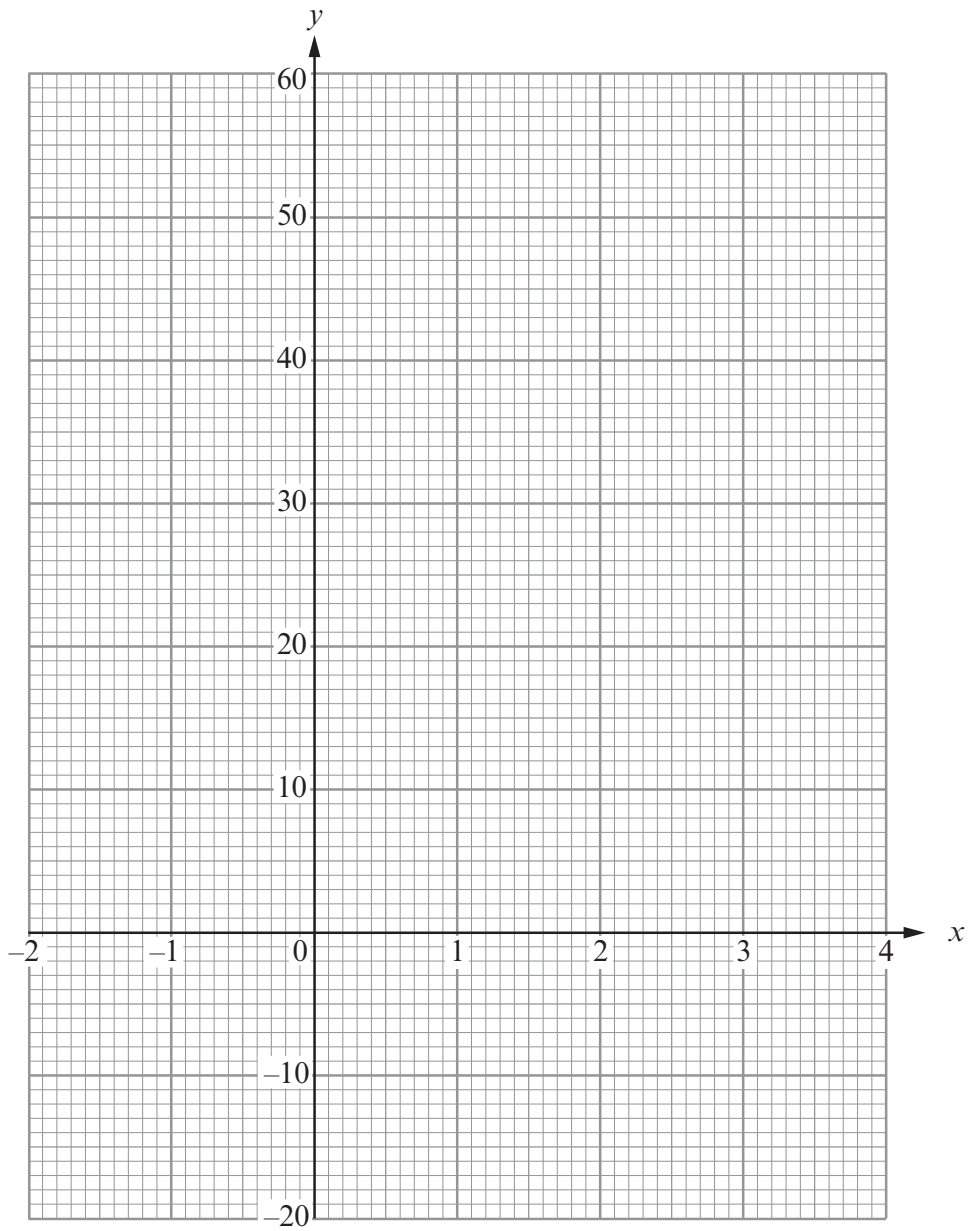
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[2]

(b) On the graph paper below, draw the graph of $y = x^3 - 8$ for values of x from –2 to 4.

[2]



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(c) Use your graph to solve the equation $x^3 - 8 = 40$.

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.....

[2]

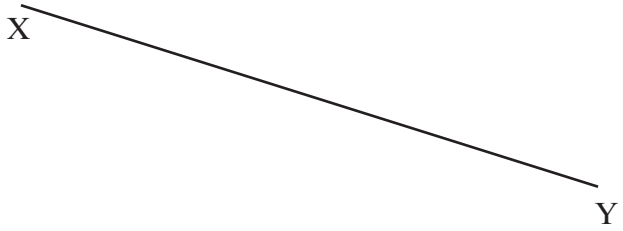
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6. *(a)* Shade the region that satisfies both of the following conditions.

(i) The points are less than 5 cm from X.
(ii) The points are nearer to Y than to X.

[3]



(b)

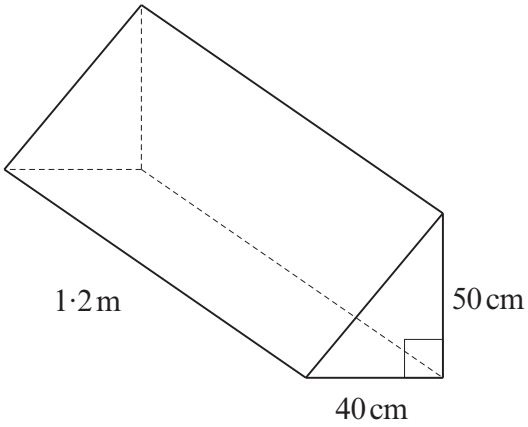


Diagram not drawn to scale

Calculate the volume of the triangular prism, giving your answer in cm^3.

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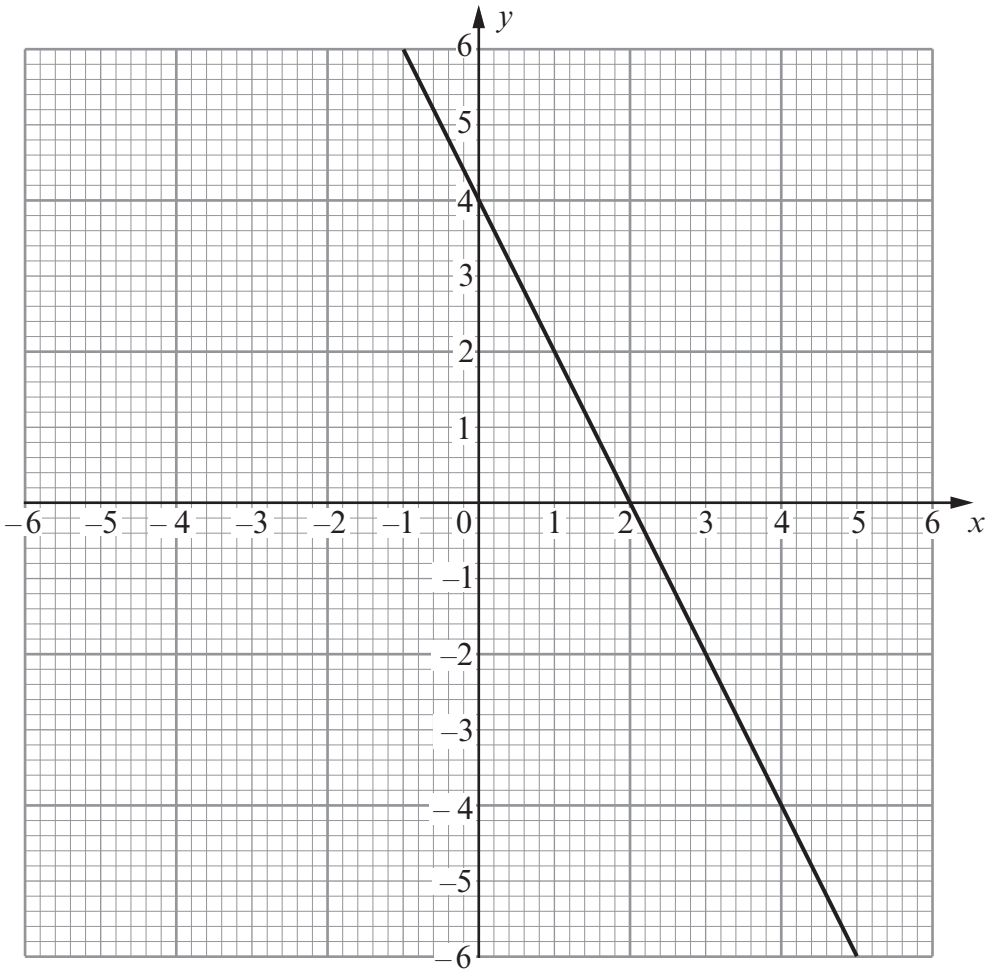
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[4]

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7. *(a)* Find the equation of the straight line shown in the following diagram. Write your answer in the form $y = mx + c$.



.....

.....

.....

.....

Equation of the straight line is $y =$ .....

[3]

(b) Write down the equation of a straight line that is parallel to $y = 5x$.

.....

[1]

(c) Find the mid-point of the straight line that joins the points with coordinates (2, –7) and (6, 13).

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.....

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[3]

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8. *(a)* Solve the following simultaneous equations by an algebraic method.
Show all your working.

$$3x + 4y = 19$$
$$4x + 5y = 23$$

[4]

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(b) Solve the following equation.

$$\frac{x+3}{6} + \frac{2x-5}{3} = \frac{2}{9}$$

[4]

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9. *(a)* Write each of the following numbers in standard form.

(i) 5800

.....

(ii) 0·004

.....

[2]

(b) Find, in standard form, the value of $\frac{5{\cdot}6\times10^{6}}{2\times10^{-3}}$.

.....

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[2]

(c) Find the value of $\left(8\times10^{3}\right)-\left(2\times10^{3}\right)$.

.....

.....

[1]

10. Customers collect reward points for shopping at a local supermarket.
The following table shows a grouped frequency distribution of the number of points collected by 60 different customers.

Number of points collected	1 - 20	21 - 40	41 - 60	61 - 80
Number of customers	4	12	34	10

(a) Complete the following cumulative frequency table.

Number of points collected	$\leqslant 20$	$\leqslant 40$	$\leqslant 60$	$\leqslant 80$
Cumulative frequency	4			

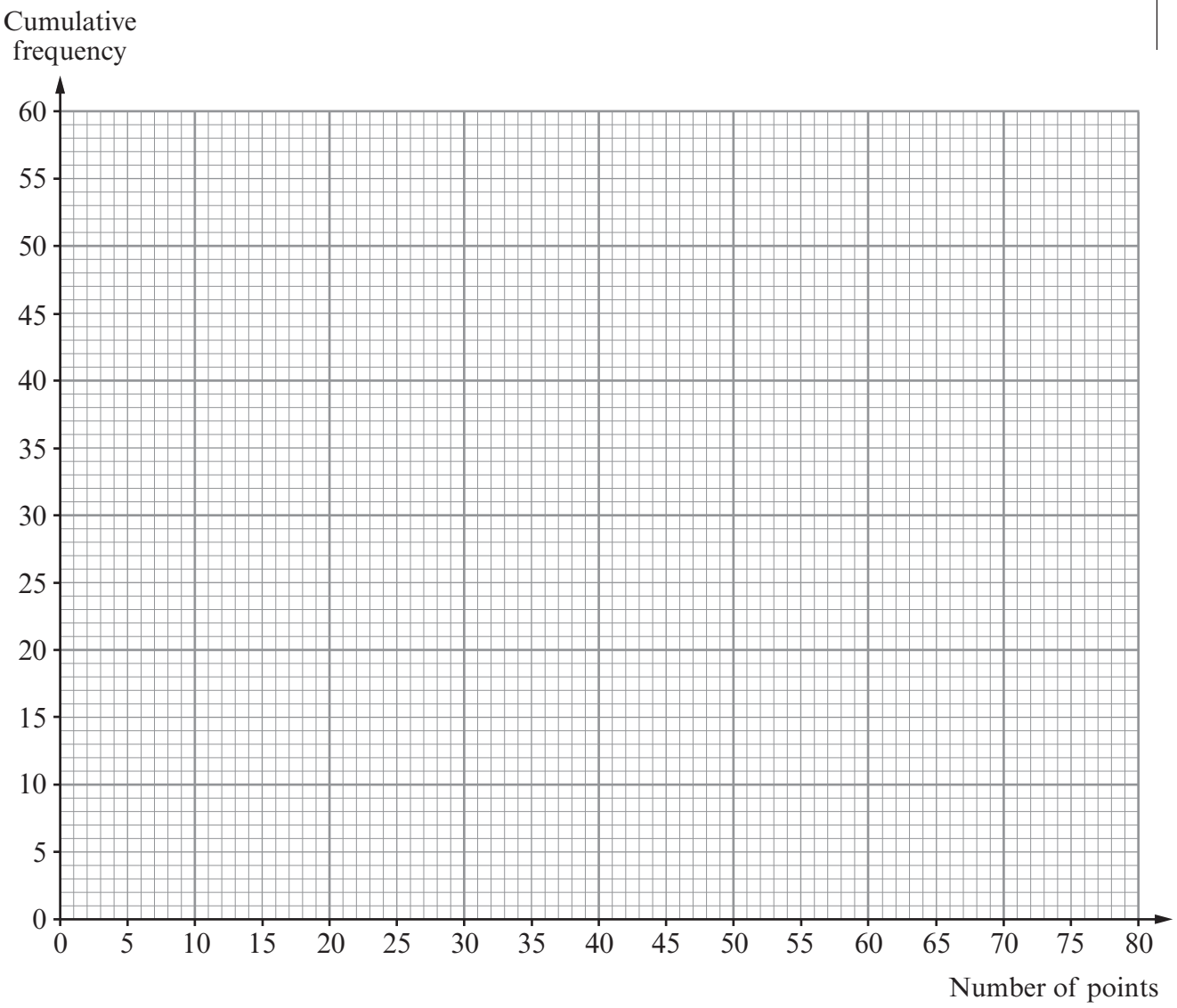
[1]

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(b) On the graph paper below, draw a cumulative frequency diagram to show this information.

[3]



(c) Use your cumulative frequency diagram to find an estimate for

(i) the median,

.....

(ii) the interquartile range.

.....

.....

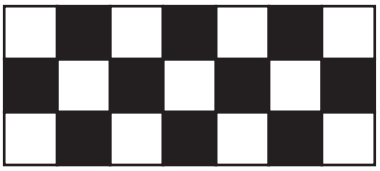
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[3]

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11. A tiler makes rectangular patterns using black and white tiles placed alternately.
He always starts by placing a white tile in the top left hand corner.
The diagram shows the 7 tile by 3 tile pattern.



(a) Find the number of black tiles and the number of white tiles needed to form the 20 tile by 20 tile pattern.

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.....

Number of black tiles .....

Number of white tiles .....

[2]

(b) Find the number of black tiles and the number of white tiles needed to form the 15 tile by 15 tile pattern.

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.....

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.....

Number of black tiles .....

Number of white tiles .....

[2]

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(c) Find, in terms of x, the number of black tiles and the number of white tiles needed to form the x tile by x tile pattern when x is an even number.

.....

.....

.....

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.....

Number of black tiles .....

Number of white tiles .....

[2]

(d) Find, in terms of y, the number of black tiles and the number of white tiles needed to form the y tile by y tile pattern when y is an odd number.

.....

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.....

.....

Number of black tiles .....

Number of white tiles .....

[2]

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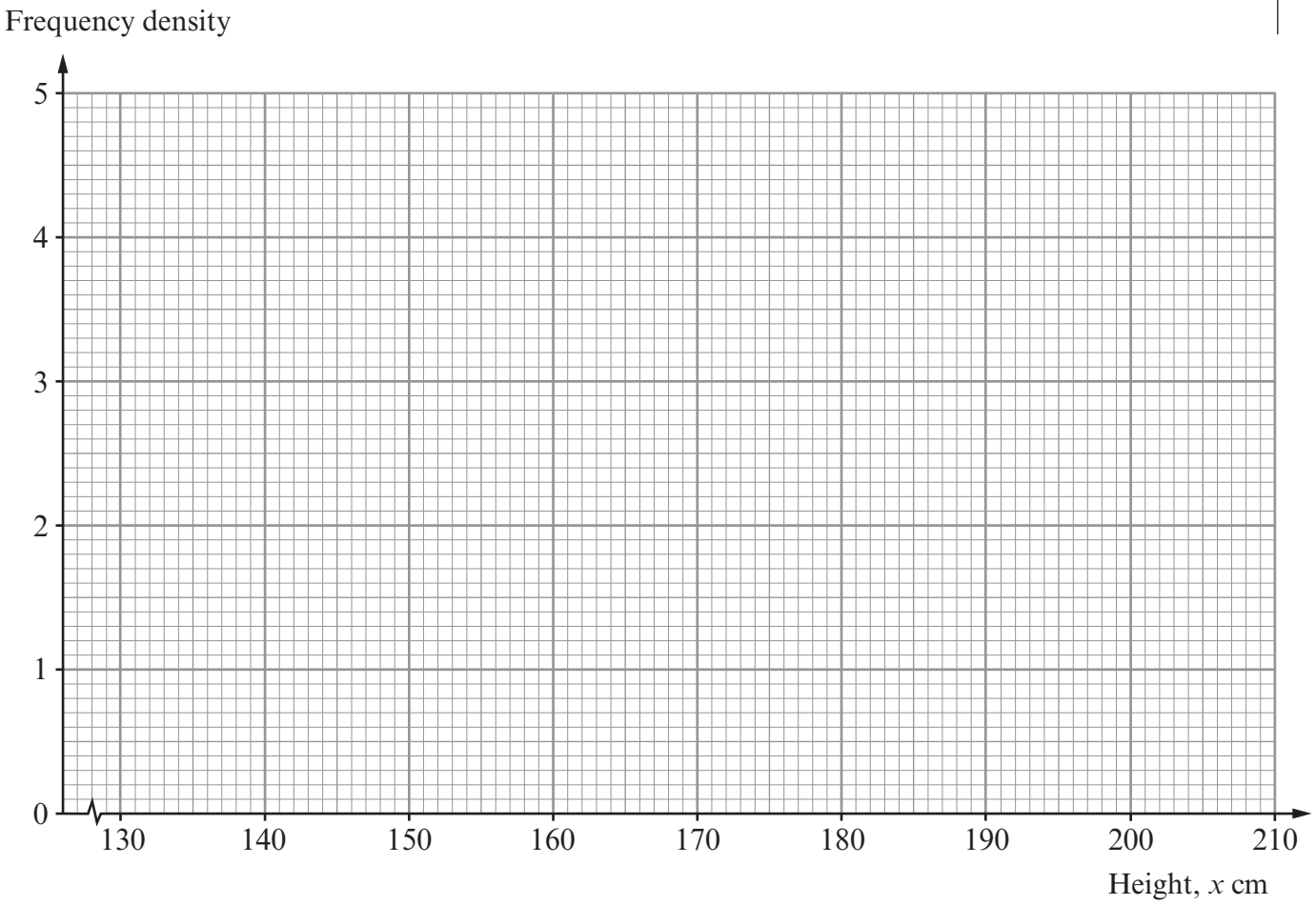
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12. The heights of a group of people are summarised in the grouped frequency distribution below.

Height, x cm	Number of people	Frequency density
$130 \leqslant x < 150$	8	0·4
$150 \leqslant x < 160$	16	1·6
$160 \leqslant x < 170$	20	
$170 \leqslant x < 180$	42	
$180 \leqslant x < 190$	24	
$190 \leqslant x < 210$	4	

(a) Complete the frequency density column in the table and draw a histogram.

[3]



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(b) Calculate an estimate for the number of people in the group whose heights are at least 162 cm.

.....

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.....

.....

[3]

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13. *(a)* (i) Factorise $x^2 - 64$.

(ii) Simplify $\dfrac{x^2-64}{2x^2-15x-8}$.

[4]

(b) Express $0{\cdot}8\dot{2}\dot{3}$ as a fraction.

[2]

(c) Evaluate $\left(\sqrt{72}-\sqrt{2}\right)^2$.

[3]

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(d) Simplify

(i) $81^{-\frac{1}{2}}$,

.....

.....

(ii) $125^{\frac{2}{3}}$.

.....

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.....

[4]

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14. A bag contains 11 marbles.
There are 3 yellow, 3 blue and 5 red marbles in the bag.
Two marbles are selected at random from the bag.

(a) Calculate the probability that both the selected marbles are blue.

[2]

(b) Calculate the probability that exactly one of the selected marbles is red.

[3]

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