Cambridge
O Level

Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

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5459209185

MATHEMATICS (SYLLABUS D) **4024/22**

Paper 2 **May/June 2015**

2 hours 30 minutes

Candidates answer on the Question Paper.

Additional Materials: Geometrical instruments
Electronic calculator

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Section A
Answer **all** questions.

Section B
Answer any **four** questions.

If working is needed for any question it must be shown in the space below that question.
Omission of essential working will result in loss of marks.
You are expected to use an electronic calculator to evaluate explicit numerical expressions.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142, unless the question requires the answer in terms of π.

The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 100.

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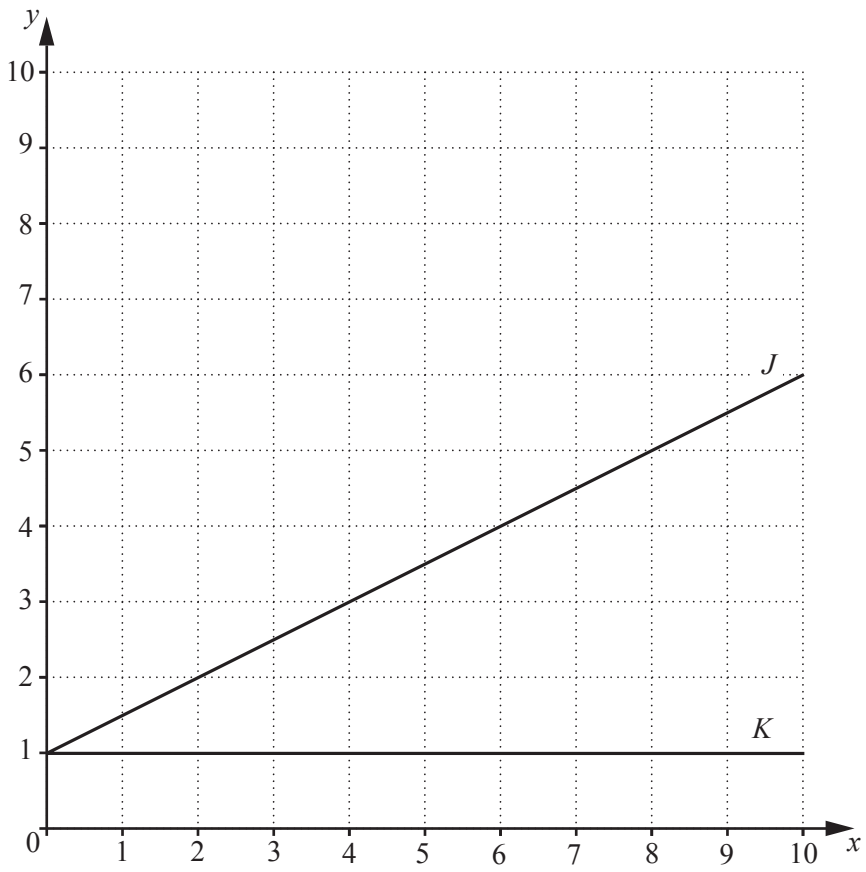
Section A [52 marks]

Answer **all** questions in this section.

1 **(a)** Simplify $\frac{4x-1}{3}+\frac{3x+5}{2}$.

Answer ..... [2]

(b)



(i) Find the gradient of line *J*.

Answer ..... [1]

(ii) Write down the equation of line *K*.

Answer ..... [1]

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(iii) Draw a line, L, through (6, 1) such that the area enclosed between J, K and L is 6 cm^2.

[1]

(iv) Find the equation of line L.

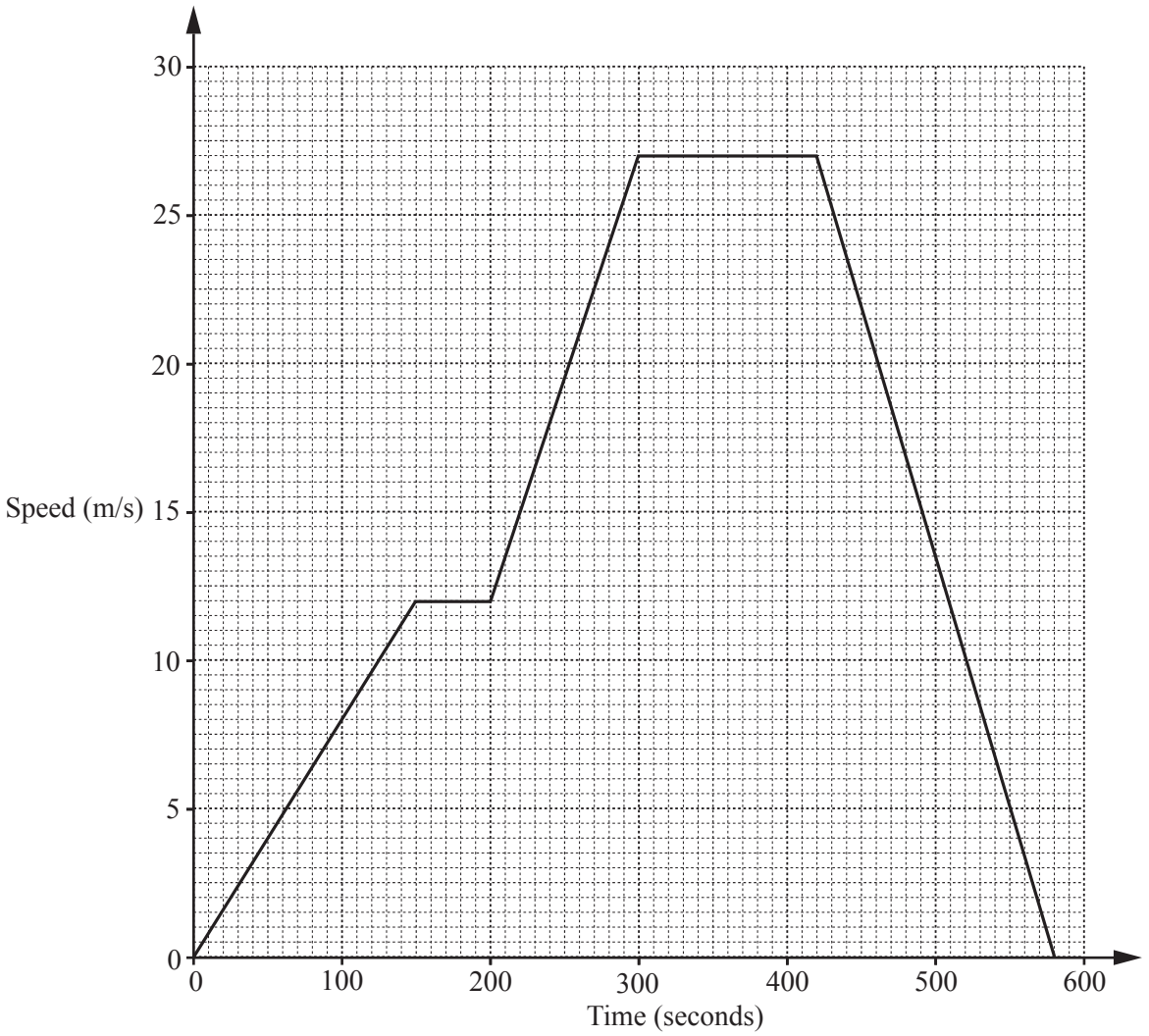
Answer ..... [2]

(v) The line N is perpendicular to line J at (2, 2).

Find the coordinates of the point where line N crosses the y-axis.

Answer ..... [2]

2 The diagram is a speed-time graph of a train's journey between two stations.



(a) What was the maximum speed of the train?

Answer .....m/s [1]

(b) Circle the statement that describes the train's motion 350 seconds after it left the first station.

Accelerating Decelerating Constant speed Stopped at a station [1]

(c) Calculate the acceleration of the train during the first 150 seconds of its journey.

Answer ..... m/s^2 [1]

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(d) What was the speed of the train 20 seconds before it completed its journey?

Answer .....m/s [1]

(e) How far did the train travel during the first 200 seconds?

Answer ..... m [2]

(f) Calculate the **average** speed of the train in kilometres per hour during the first 200 seconds.

Answer ..... km/h [2]

3 **(a)** In a survey, 50 students were asked how long they spent exercising during one particular week. The results are summarised in the table.

Time (t minutes)	Frequency
$0 \leqslant t < 30$	10
$30 \leqslant t < 60$	15
$60 \leqslant t < 90$	11
$90 \leqslant t < 120$	7
$120 \leqslant t < 150$	5
$150 \leqslant t < 180$	2

(i) Calculate an estimate of the mean time each student spent exercising that week.

Answer ..... minutes [3]

(ii) During that week, the time Simon spent exercising is shown below.

Tuesday 12.37 p.m. until 1.24 p.m.
Thursday 8.57 a.m. until 9.42 a.m.

Which interval is his time recorded in?

Answer ..... [1]

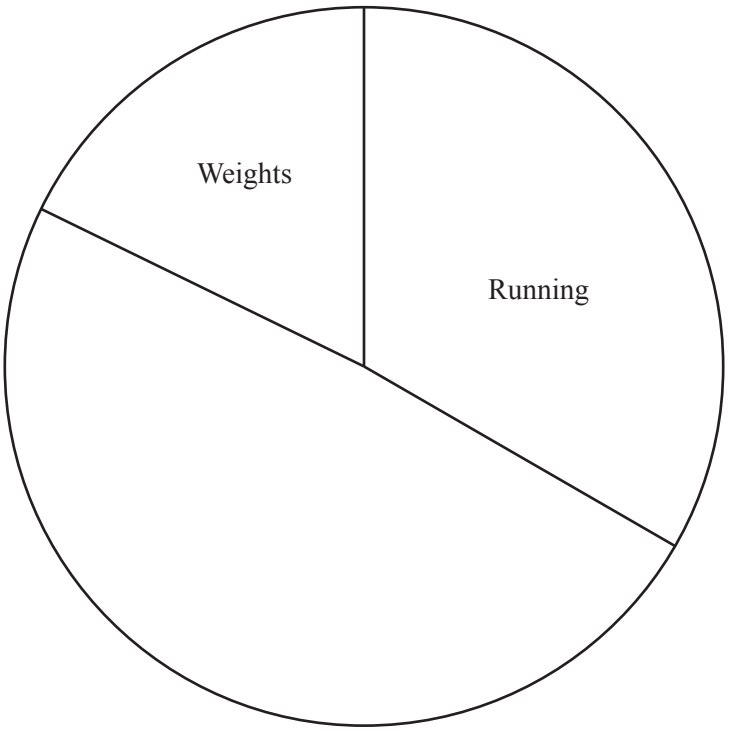
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(b) A gym has four different types of machines.
Carol is going to draw a pie chart to show how many times the machines are used in one day.
She has started to make a table.

Machine	Frequency	Angle of sector
Running	90	120°
Rowing	75	
Cycling	57	
Weights		64°

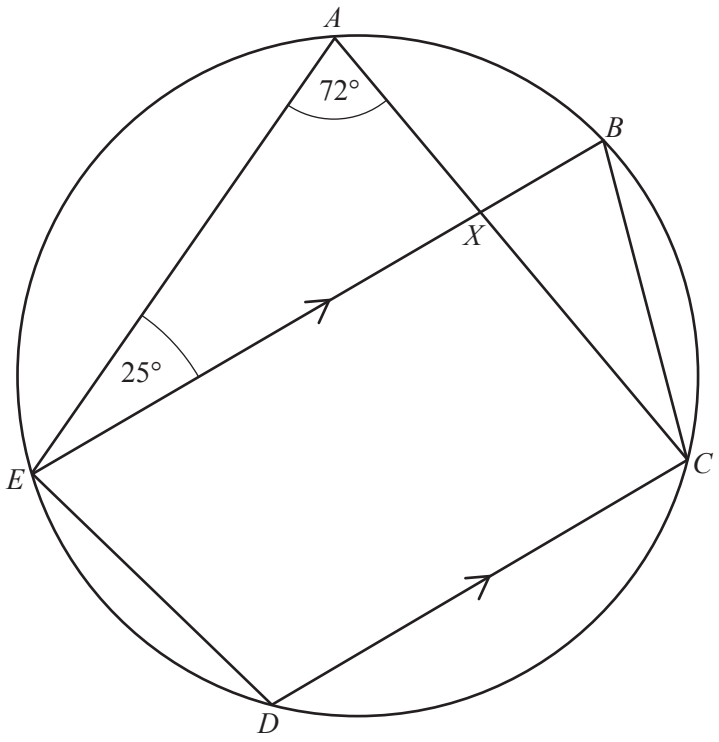
(i) Complete the table. [2]

(ii) Complete the pie chart.



[1]

4 (a)



A, B, C, D and E are five points on the circumference of a circle.
EB is parallel to DC, $E\hat{A}C = 72°$ and $A\hat{E}B = 25°$.
X is the intersection of AC and EB.

Find

(i) $E\hat{B}C$,

Answer ..... [1]

(ii) $C\hat{X}B$,

Answer ..... [1]

(iii) $E\hat{D}C$,

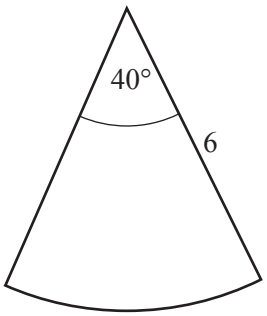
Answer ..... [1]

(iv) $A\hat{C}D$.

Answer ..... [1]

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(b)



The angle of a sector of a circle, radius 6 cm, is 40°.

(i) The area of the sector is $k\pi\,\text{cm}^2$.

Find the value of k.

Answer ..... [2]

(ii) Find an expression, in terms of π, for the perimeter of the sector.
Give your answer in the form $(a + b\pi)$ centimetres.

Answer ..... cm [2]

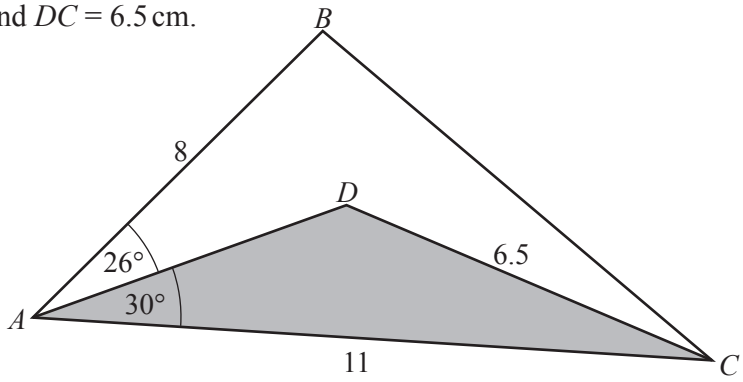
(iii) A geometrically similar sector has perimeter $(72 + n\pi)$ centimetres.

Find the value of n.

Answer ..... [1]

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5 In the diagram, $AB = 8$ cm, $AC = 11$ cm and $DC = 6.5$ cm.
$B\hat{A}D = 26°$ and $D\hat{A}C = 30°$.



(a) Calculate BC.

Answer ..... cm [4]

(b) Calculate the obtuse angle ADC.

Answer ..... [3]

(c) Find the percentage of triangle ABC that has been shaded.

Answer .....% [4]

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6 **(a)** Yuvraj and Sachin travel to England.
Yuvraj exchanges 20 500 rupees and receives £250.
Sachin exchanges 26 650 rupees into pounds (£) at the same exchange rate.

How many pounds does Sachin receive?

Answer £ ..... [2]

(b) Dan goes to a bank to exchange some pounds (£) for euros (€).
He has £400 which he wants to exchange.
The bank only gives euros in multiples of 5 euros.
The exchange rate is £1 = €1.17.

Find the number of euros he receives and his change from £400.

Answer Dan receives €.....

His change is £..... [3]

(c) Kristianne buys a fridge and a freezer in a sale.
The sale offers 15% off everything and she pays a total of $357.
Before the sale, the freezer cost $250.

What was the cost of the fridge before the sale?

Answer $ ..... [3]

Section B [48 marks]

Answer **four** questions in this section.

Each question in this section carries 12 marks.

7 **(a)**

$$f(x) = \frac{2x + 7}{3}$$

(i) Find $f^{-1}(x)$.

Answer $f^{-1}(x) =$ ..... [2]

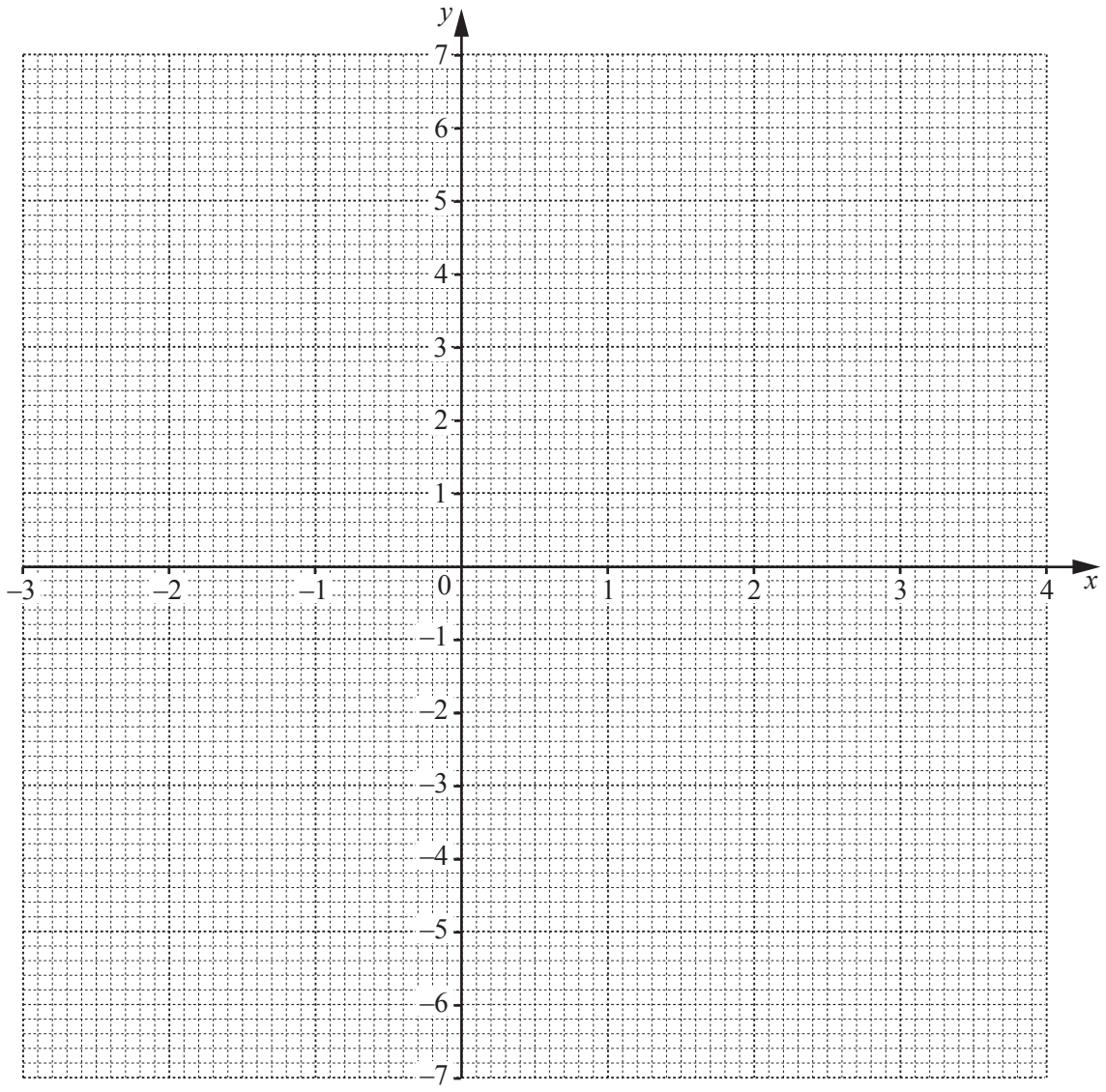
(ii) Given that $f(m) = \frac{m}{2}$, find m.

Answer ..... [2]

(b) **(i)** Complete the table of values for $y = 6 + x - x^2$, and hence draw the graph of $y = 6 + x - x^2$ on the grid opposite.

x	-3	-2	-1	0	1	2	3	4
y	-6	0		6	6		0	-6

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[3]

(ii) Use your graph to estimate the maximum value of $6 + x - x^2$.

Answer ..... [1]

(iii) By drawing the line $x + y = 4$, find the approximate solutions to the equation

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

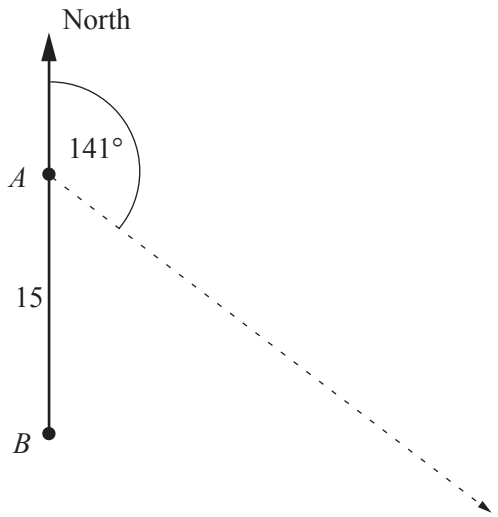
Answer $x =$ ..... or ..... [2]

(iv) The equation $x - x^2 = k$ has a solution $x = 3.5$.

By drawing a suitable line on the grid, find the other solution.
Label your line with the letter L.

Answer ..... [2]

8 Two ports, A and B, are 15 km apart and B is due south of A.
A boat sails from A on a bearing of 141°.



(a) State the bearing of A from the boat.

Answer ..... [1]

(b) Calculate the shortest distance between the boat and B.

Answer ..... km [2]

(c) When the boat is due east of B, calculate its distance from A.

Answer ..... km [2]

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(d) The scale drawing, drawn to a scale of 1 cm to 2 km, shows A, B and a third port, C.



(i) When the boat has travelled 24 km, it stops at the point X.

Mark and label X on the diagram. [2]

(ii) A second boat is located

I less than 12 km from A
II nearer to BC than to BA.

Shade the region in which this second boat must lie. [3]

(iii) The point Y is the position of the second boat when it is as far as possible from X.

Mark and label Y on the diagram and hence find the maximum possible distance between the two boats.

Answer ..... km [2]

9 **(a)** Factorise completely

(i) $4x^3 - 10xy$,

Answer ..... [1]

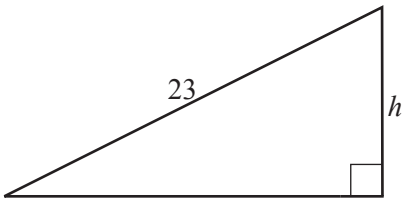
(ii) $9a^2 - b^2$.

Answer ..... [1]

(b) Solve $\frac{7}{3-2m} = 4$.

Answer ..... [2]

(c)



A right-angled triangle has a base that is 7 cm longer than its height, h cm.
The hypotenuse of the triangle is 23 cm.

(i) Show that h satisfies the equation $h^2 + 7h - 240 = 0$.

[2]

(ii) Write down an expression, in terms of h, for the area of the triangle.

Answer ..... cm^2 [1]

(iii) Hence state the exact area of the triangle.

Answer ..... cm^2 [1]

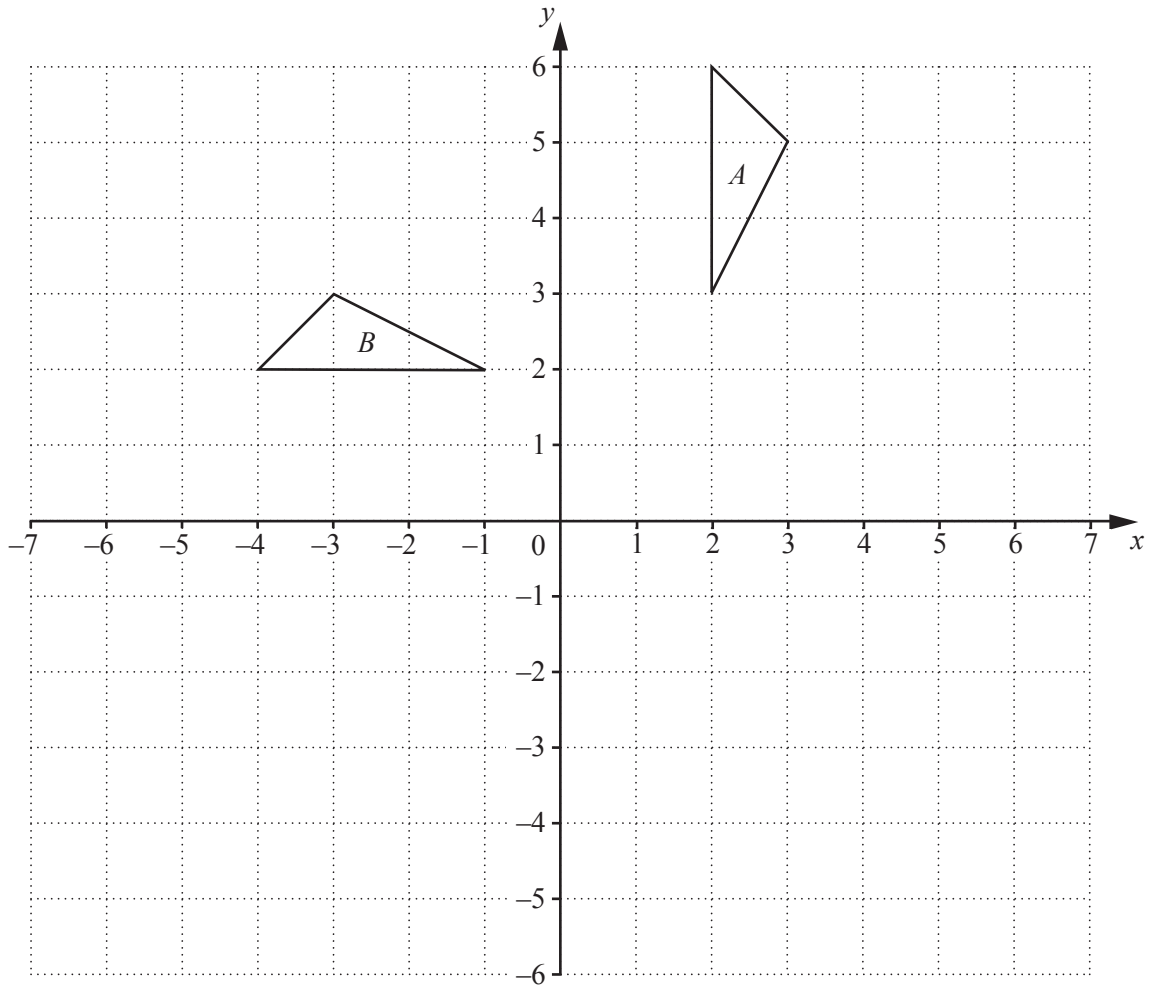
(iv) Solve $h^2 + 7h - 240 = 0$, giving your answers correct to 1 decimal place.

Answer h = ... or ..... [3]

(v) Calculate the perimeter of the triangle.

Answer ..... cm [1]

10 (a)



(i) Describe fully the **single** transformation that maps triangle *A* onto triangle *B*.

Answer .....

..... [2]

(ii) Triangle *B* is mapped onto triangle *C* by a translation, vector $\begin{pmatrix} -2 \\ -3 \end{pmatrix}$.

Draw and label triangle *C*. [2]

(iii) Triangle *A* is mapped onto triangle *D* by a reflection in the line $y = x$.

Draw and label triangle *D*. [2]

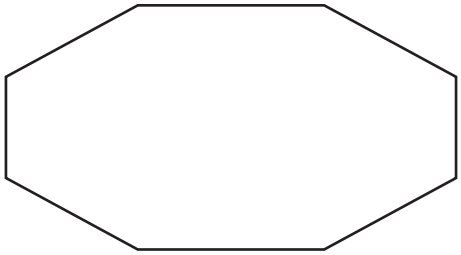
(iv) Triangle *E* is geometrically similar to triangle *A* and its longest side is 12 cm.

Calculate the area of triangle *E*.

Answer ..... cm^2 [2]

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(b)



State the number of lines of symmetry of the octagon above.

Answer ..... [1]

(c) The cross-section of a prism is an equilateral triangle.

State the number of planes of symmetry of the prism.

Answer ..... [1]

(d) Name two special quadrilaterals that have exactly 2 lines of symmetry and also rotational symmetry of order 2.

Answer ..... and ..... [2]

11 **(a)** Some people were asked which continent they visited on their last holiday.
The results are shown in the table below.

Continent	Number of people
North America (NA)	7
Europe (E)	15
Asia (A)	8

(i) Find the probability that one of these people, chosen at random, visited North America.

Answer ..... [1]

(ii) Find the probability that one of these people, chosen at random, did **not** go to Asia.
Give your answer as a fraction in its lowest terms.

Answer ..... [1]

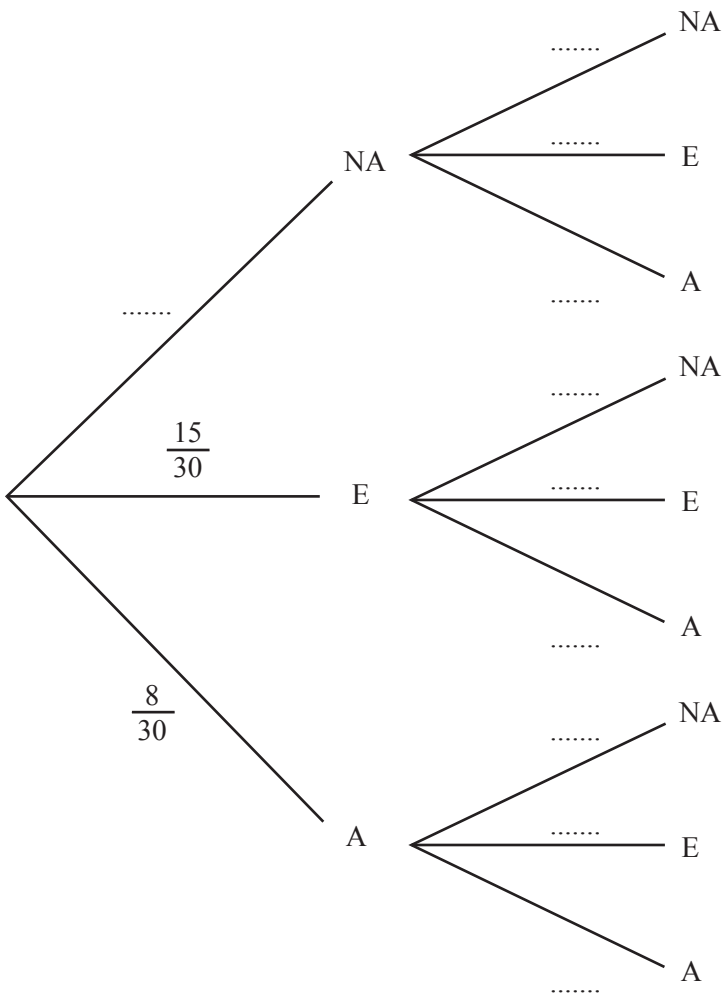
(iii) Two of these people are chosen at random.
The tree diagram opposite shows the possible outcomes and some of their probabilities.

(a) Complete the tree diagram. [2]

(b) What is the probability that the two people went to the same continent?

Answer ..... [2]

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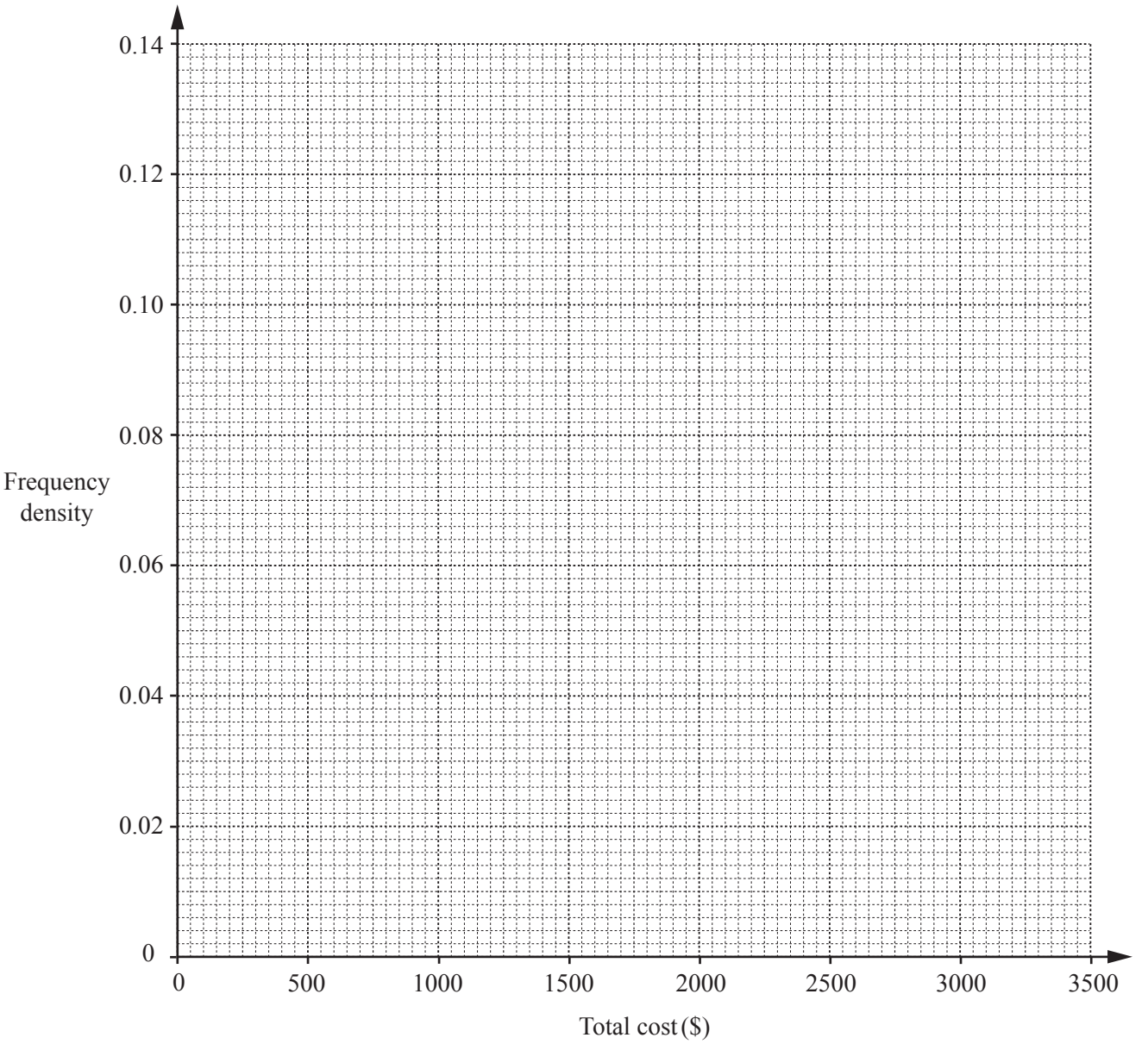


TURN OVER FOR THE REST OF THIS QUESTION

(b) The table shows the distribution of the total cost per person for holidays in 2014 for another group of people.

Total cost per person ($\$c$)	$0 \leqslant c < 250$	$250 \leqslant c < 500$	$500 \leqslant c < 1000$	$1000 \leqslant c < 2000$	$2000 \leqslant c < 3500$
Frequency	35	20	15	8	6

(i) Draw a histogram to represent this data.



[3]

(ii) Estimate the number of people who spent less than \$700 on holidays in 2014.

Answer ..... [2]

(iii) Of the people who spent less than \$250 on holidays in 2014, $\frac{2}{7}$ did not go on holiday.

How many people did not go on holiday in 2014?

Answer ..... [1]

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