Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

0689463607

MATHEMATICS (SYLLABUS D) **4024/21**

Paper 2 **May/June 2022**

2 hours 30 minutes

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 100.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

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1 **(a)** In 2020, the running cost for Frederick's car was \$5200.

28% of the running cost was spent on insurance.
$\frac{3}{25}$ of the running cost was spent on maintenance.
\$740 of the running cost was spent on tax.
The remainder of the running cost was spent on petrol.

(i) Calculate the amount Frederick spent on petrol.

\$ ..... [3]

(ii) In 2021, the tax increased by 1.5%.

Calculate the tax in 2021.

\$ ..... [2]

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(b) In January, the cost of petrol is \$2.20 per litre.

(i) Find the cost of 38.7 litres of petrol.

\$ ..... [1]

(ii) The average amount of petrol Frederick's car uses is 7 litres per 100 km.
In January, he spends \$215.60 on petrol.

Calculate the number of kilometres he drives in January.

..... km [3]

(iii) In February, the cost of petrol increases to \$2.24 per litre.

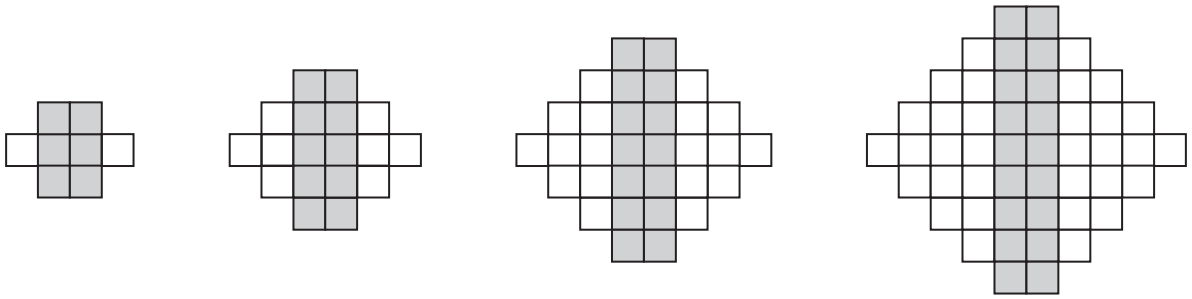
Calculate the percentage increase in the cost of petrol from January to February.

..... % [2]

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[Turn over

2 Here are the first four patterns in a sequence made using grey tiles and white tiles.



Pattern 1 Pattern 2 Pattern 3 Pattern 4

(a) Complete the table for the first five patterns in this sequence.

Pattern number	1	2	3	4	5
Number of grey tiles	6	10	14		
Number of white tiles	2	8	18		
Total number of tiles	8	18	32		

[2]

(b) Find an expression, in terms of n, for the number of grey tiles in Pattern n.

..... [2]

(c) Pattern k has 98 grey tiles.

Find k.

$k =$ ..... [2]

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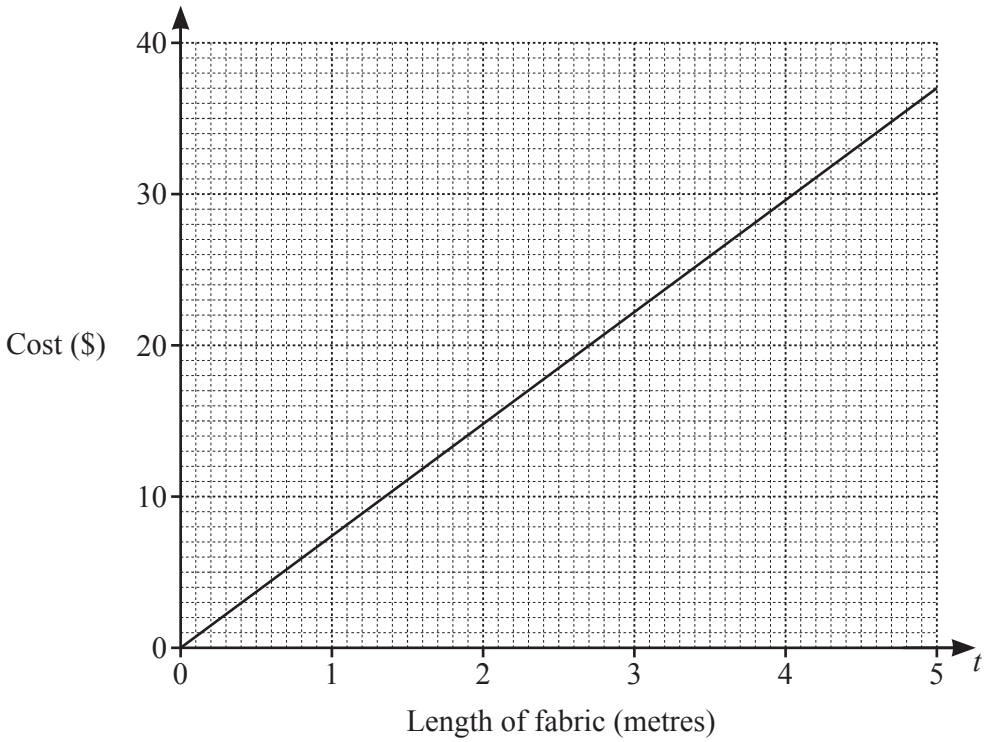
(d) Find an expression, in terms of n, for the number of white tiles in Pattern n.

..... [2]

(e) Find the **total** number of tiles in Pattern 20.

..... [2]

3 **(a)** The graph shows the cost, in dollars, of buying a length of fabric t metres long.



(i) Use the graph to find the cost of buying 3.8 m of fabric.

$ ..... [1]

(ii) Samira buys k metres of fabric.
She pays with a $20 note and receives $1.50 change.

Use the graph to find the value of k.

$k =$ ..... [2]

(b) Anita cuts 10 m of fabric into three lengths to make a blouse, a skirt and a dress.
The lengths of fabric needed to make the blouse, the skirt and the dress are in the ratio 6 : 8 : 11.

Find the length of the fabric that is cut to make the dress.

..... m [2]

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(c) The upper bound for the area of a rectangular piece of fabric is $8.8125\,\text{m}^2$.
The width of the piece of fabric is 2.3 metres, correct to the nearest 0.1 m.
The length of the piece of fabric is d metres, correct to the nearest 0.1 m.

Find the value of d.

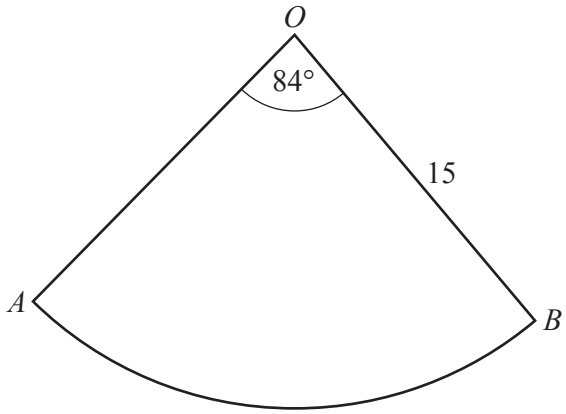
$d =$ ..... [3]

4 **(a)** A cuboid has dimensions x cm by x cm by 10 cm.
The volume of the cuboid is 62.5 cm^3.

Find the value of x.

$x =$ ..... [2]

(b)



NOT TO SCALE

A piece of card, AOB, is a sector of a circle, centre O, with angle 84° and radius 15 cm.

(i) Show that the arc length of the sector is 7π cm.

[1]

(ii) OA is joined to OB to form the curved surface of a cone.

Calculate the radius of the cone.

..... cm [2]

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(iii) Find the height of the cone.

..... cm [2]

(c) An empty barrel, in the shape of a cylinder, has radius 20 cm and height 80 cm.
The barrel is filled with water at a rate of 5500 cm^3/minute.

Calculate the time taken to completely fill the barrel.
Give your answer in minutes and seconds, correct to the nearest second.

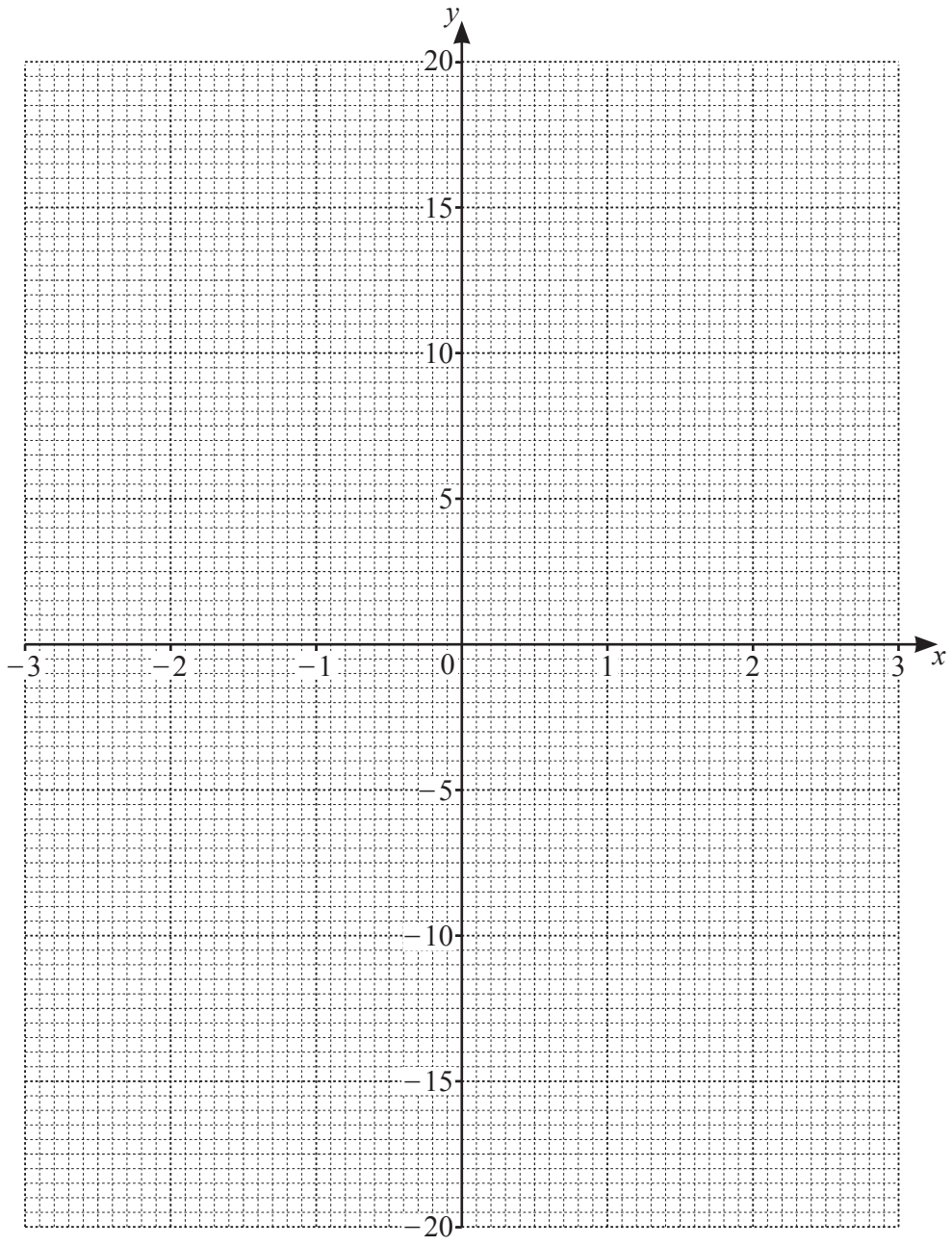
..... minutes ..... seconds [3]

5 **(a)** Complete the table of values for $y = x^3 - 4x + 3$.

x	-3	-2	-1	0	1	2	3
y		3	6	3	0	3	18

[1]

(b) Draw the graph of $y = x^3 - 4x + 3$ for $-3 \leqslant x \leqslant 3$.



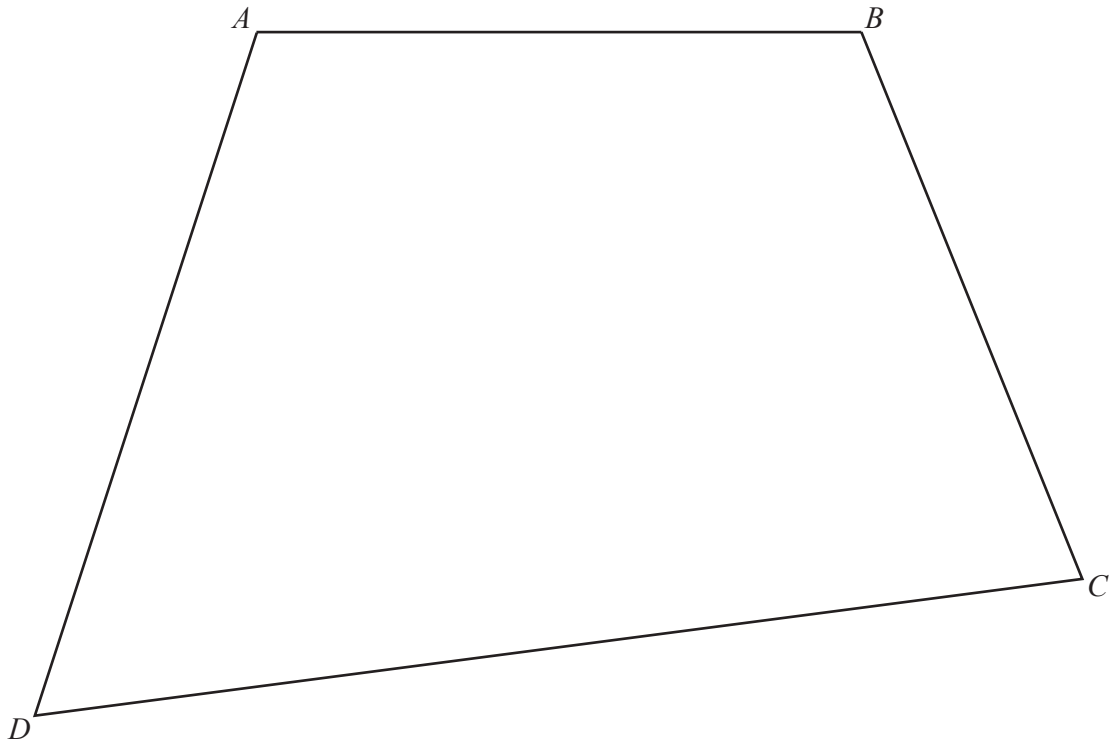
[3]

(c) By drawing a suitable straight line on your graph, find the solutions of the equation $x^3 - 4x - 2 = 0$.

$x =$ ..... or $x =$ ..... or $x =$ ..... [3]

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6



Scale: 1 cm to 50 m

The diagram shows a field, *ABCD*, drawn to a scale of 1 cm to 50 m.

(a) The field has a straight path from *D* to the midpoint of *AB*.

Draw the path and measure the angle the path makes with *DC*.

..... [2]

(b) Grass is to be planted on an area of the field.

The area to be planted is to be

- less than 325 m from *B*
- nearer to *CB* than *CD*

and

- can only be on one side of the path.

By drawing appropriate loci, find and shade the largest possible area for the grass to be planted. [4]

(c) Find the **actual** length of the part of the path that forms a boundary for the grass.

..... m [1]

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7 **(a)** Yasir travels to work either by car, bus, train or bike.
The probabilities of using these means of transport on any work day are shown in the table.

Means of transport	Car	Bus	Train	Bike
Probability	0.12	0.40	0.26	p

(i) Find p.

$p =$ ..... [1]

(ii) Find the probability that on Monday and Tuesday he travels to work by train on one day and by bus on the other day.

..... [2]

(iii) Find the probability that he travels to work by bus at least once on Wednesday or Thursday.

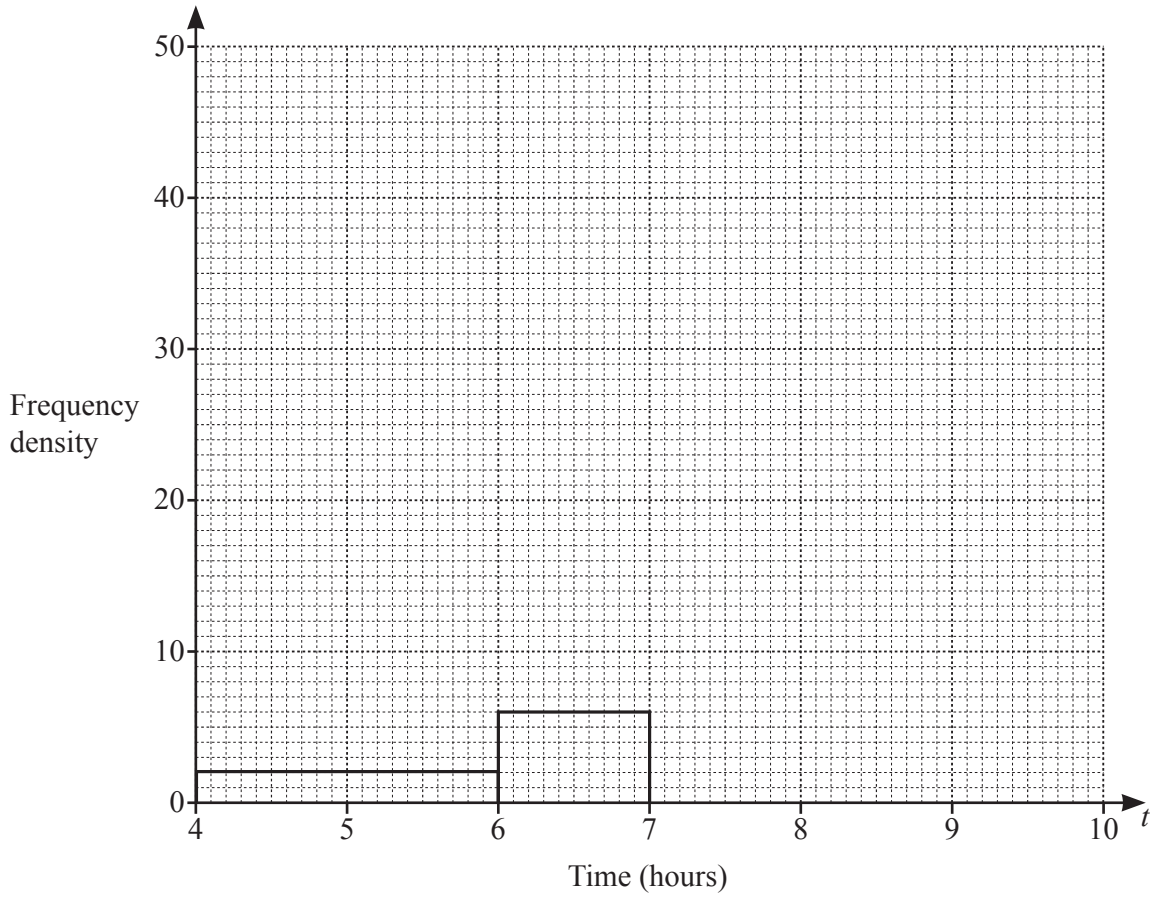
..... [3]

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(b) Yasir records the length of time he spends at work on each of 70 work days.
The table shows the results.

Time (t hours)	$4 < t \leqslant 6$	$6 < t \leqslant 7$	$7 < t \leqslant 7\frac{1}{2}$	$7\frac{1}{2} < t \leqslant 8$	$8 < t \leqslant 8\frac{3}{4}$	$8\frac{3}{4} < t \leqslant 10$
Frequency	4	6	9	23	18	10

(i) Complete the histogram to represent the data.



[3]

(ii) Yasir starts work each day at 9.00 a.m.
He is paid overtime if he works later than 5.15 p.m.

Estimate the number of days he is paid overtime during these 70 work days.

..... [2]

8 **(a)** Apples cost \$$x$ per kilogram and oranges cost \$$y$ per kilogram.
The total cost of 5 kg of apples and 10 kg of oranges is \$40.

(i) Show that $x + 2y = 8$.

[1]

(ii) The total cost of 4 kg of apples and 3 kg of oranges is \$19.

Use simultaneous equations to find the cost of 1 kilogram of apples and of 1 kilogram of oranges.
Show your working.

Apples \$ .....

Oranges \$ ..... [4]

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

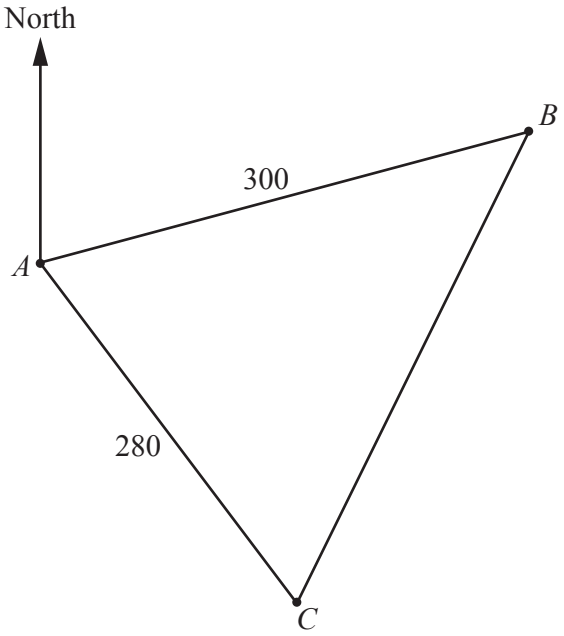
..... [3]

(c) Solve $\frac{4}{x-1}+\frac{2}{2x+3}=1$.

Show all your working and give your answers correct to 2 decimal places.

$x =$ ..... or $x =$ ..... [6]

9



NOT TO SCALE

The diagram shows the positions of three towns, A, B and C.
B is on a bearing of 072° from A.
C is on a bearing of 150° from A.
$AB = 300\,\text{km}$ and $AC = 280\,\text{km}$.

(a) Find the bearing of A from C.

..... [1]

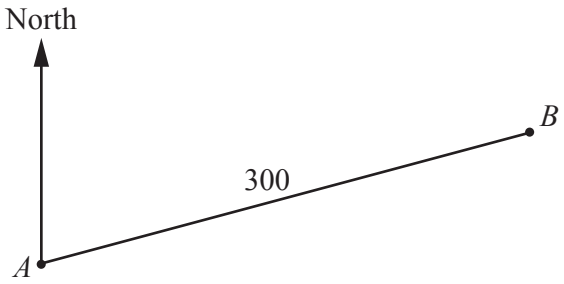
(b) Calculate BC.

$BC =$ ..... km [4]

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(c) Town D is 145 km from town B.
Angle ADB is 120°.

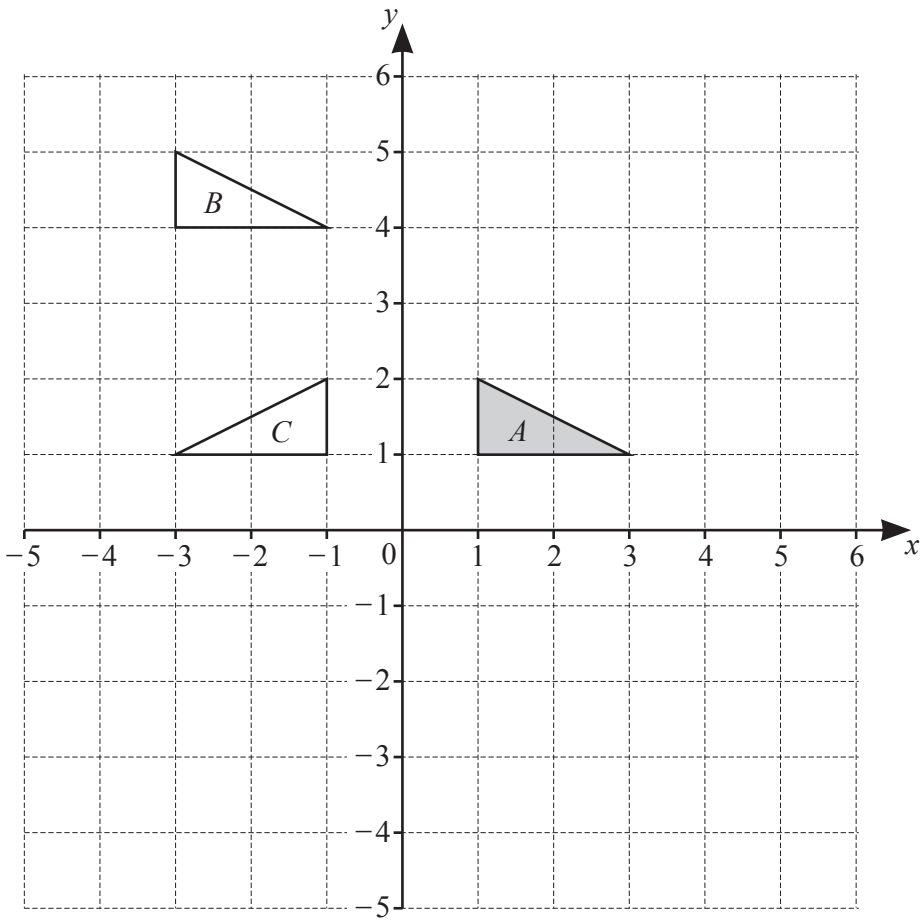
Find the two possible bearings of D from A.
You may add lines to this sketch to help you.



NOT TO SCALE

..... or ..... [5]

10



The diagram shows triangles A, B and C.

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

..... [2]

(b) Find the matrix representing the transformation that maps triangle A onto triangle C.

$\begin{pmatrix} & \\ & \end{pmatrix}$ [1]

(c) Triangle A is mapped onto triangle D by an enlargement with centre (2, 3) and scale factor 3.

Draw triangle D. [2]

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11 P is the point $(3, -3)$ and Q is the point $(1, 5)$.

(a) Calculate the length of PQ.

..... [2]

(b) Find the equation of the perpendicular bisector of PQ.

..... [5]

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