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Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

7890471656

MATHEMATICS (SYLLABUS D) **4024/12**

Paper 1 **October/November 2020**

2 hours

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.
- Calculators must **not** be used in this paper.
- You may use tracing paper.
- You must show all necessary working clearly.

INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Blank pages are indicated.

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ELECTRONIC CALCULATORS MUST NOT BE USED IN THIS PAPER

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

..... [1]

(b) Evaluate 2.7×0.2 .

..... [1]

2 Find the fraction which lies exactly halfway between $\frac{3}{5}$ and $\frac{5}{7}$.
Give your answer in its simplest form.

..... [2]

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3 Factorise.

(a) $12t^2 - 4t$

..... [1]

(b) $a(x-y) + b(y-x)$

..... [1]

(c) $x^2 - 2x - 3$

..... [1]

4 Write these lengths in order of size, starting with the smallest.

$0.043\,\text{km}$ $433\,\text{cm}$ $4340\,\text{mm}$ $4\frac{1}{3}\,\text{m}$

..... , ... , ... , ... [2]
smallest

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5 Sandra buys a vase for $40 and sells it for $200.

Calculate her percentage profit.

..... % [2]

6 These are the minimum temperatures, in °C, recorded by a weather station each day during one week.

-2.3 -4.6 -1.2 -0.7 -1.4 -2.4 -3.5

(a) Find the range of these temperatures.

..... °C [1]

(b) How many of these temperatures are between -4°C and -2°C?

..... [1]

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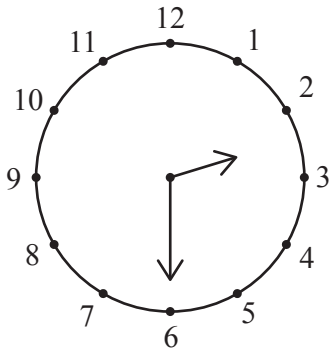
7 By writing each number correct to 1 significant figure, estimate the value of

$$\frac{6.044^2}{212 \times 0.304}.$$

..... [2]

8



NOT TO SCALE

In the diagram, the time on the clock is 2.30 pm.

Calculate the **reflex** angle between the two hands of the clock.

..... [2]

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9 **(a)** Simplify $3(3a-4)+2(2-a)$.

..... [2]

(b) Given that $4x = 3y$, find the numerical value of $\frac{8x+y}{y}$.

..... [1]

10 Solve the simultaneous equations.

$$3x-2y = 12$$
$$4x+\ y = 5$$

$x =$ .....

$y =$ ..... [3]

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11 **(a)** Express $340\,000$ in standard form.

..... [1]

(b) Evaluate $\dfrac{4\times10^{7}}{8\times10^{21}}$, giving your answer in standard form.

..... [2]

(c) $7\times10^{a}-3\times10^{a-1}=k\times10^{a}$

Find k.

$k=$ ..... [1]

12 **(a)** Simplify $(2x^{2})^{3}$.

..... [1]

(b) Simplify $6t^{3}\div\left(\dfrac{2}{3}t^{2}\right)$.

..... [2]

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13 **(a)** $P = \{ 1, 2, 3, 4, 5, 6, 7, 8 \}$

$Q = \{ 1, 3, 5, 7, 9, 11 \}$

Find $\mathrm{n}(P \cup Q)$.

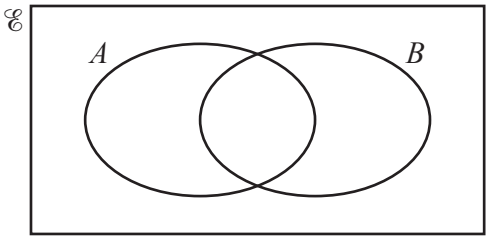
..... [1]

(b) $p \in A \cap B$

$q \in (A \cup B)'$

$r \in A \cap B'$

On the Venn diagram below, write each of the letters p, q and r in its appropriate subset.



[3]

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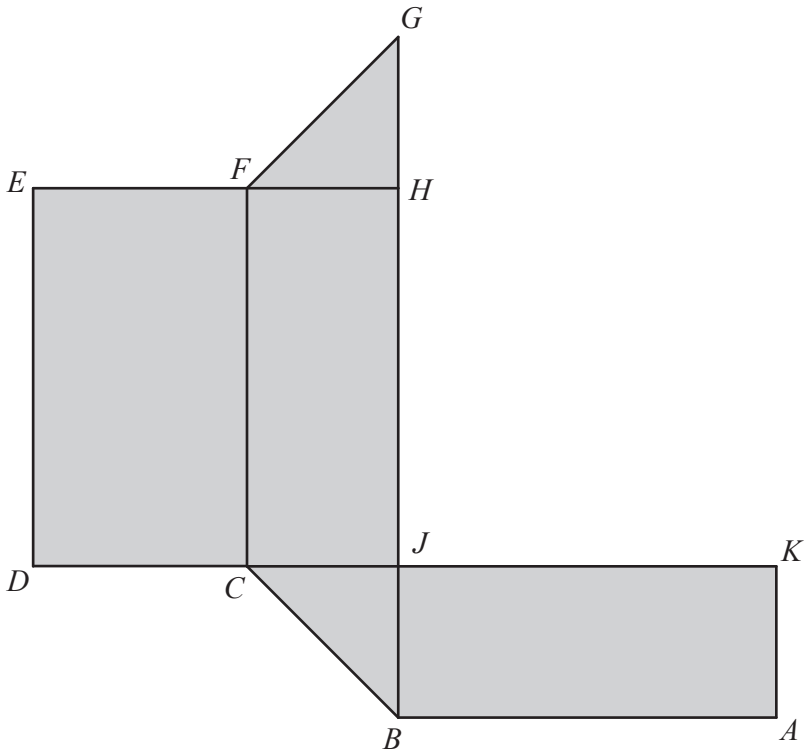

This net is folded to make a triangular prism.

(a) Which vertices join with A?

..... [1]

(b) Which edge joins with DE?

..... [1]

(c) $FH = 2\,\text{cm}$, $GH = 2\,\text{cm}$ and $JH = 5\,\text{cm}$.

Find the volume of the triangular prism.

..... cm^3 [2]

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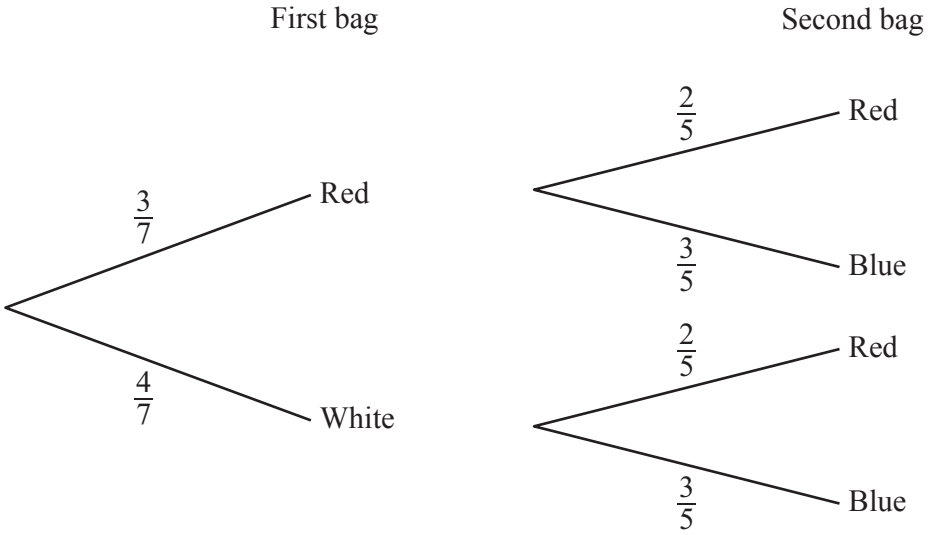
15 Two bags contain beads.

The first bag contains 7 beads, of which 3 are red and 4 are white.
The second bag contains 5 beads, of which 2 are red and 3 are blue.

One bead is taken, at random, from each bag.
The tree diagram is shown below.



Find the probability that

(a) both beads are red,

..... [1]

(b) both beads are white,

..... [1]

(c) **exactly** one bead is red.

..... [2]

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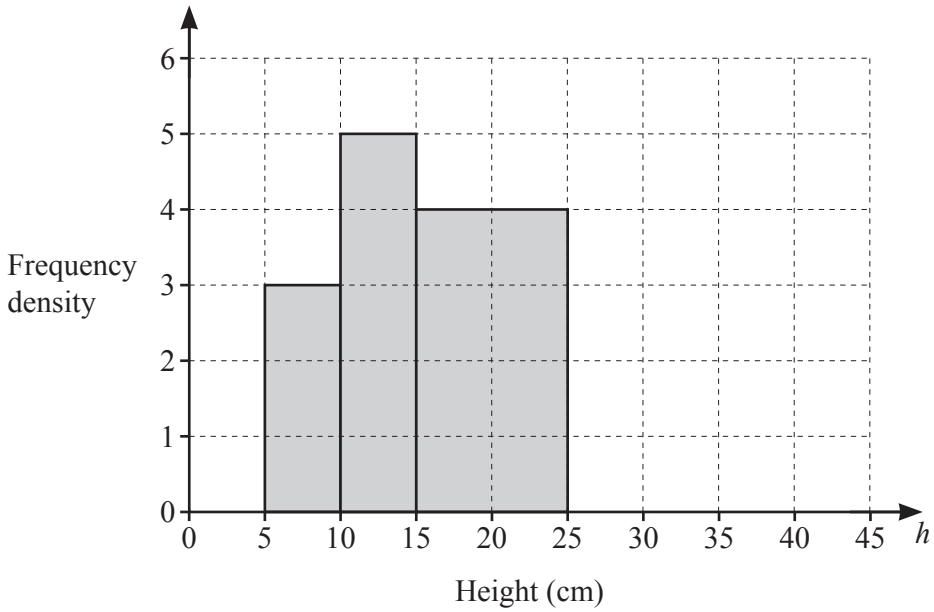
16 The heights of a sample of plants were measured.
The results are shown in the table and in the histogram.

Height (h cm)	$5 < h \leqslant 10$	$10 < h \leqslant 15$	$15 < h \leqslant 25$	$25 < h \leqslant 40$
Frequency	15	25	p	30



(a) Use the histogram to find the value of p.

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

(b) Complete the histogram. [1]

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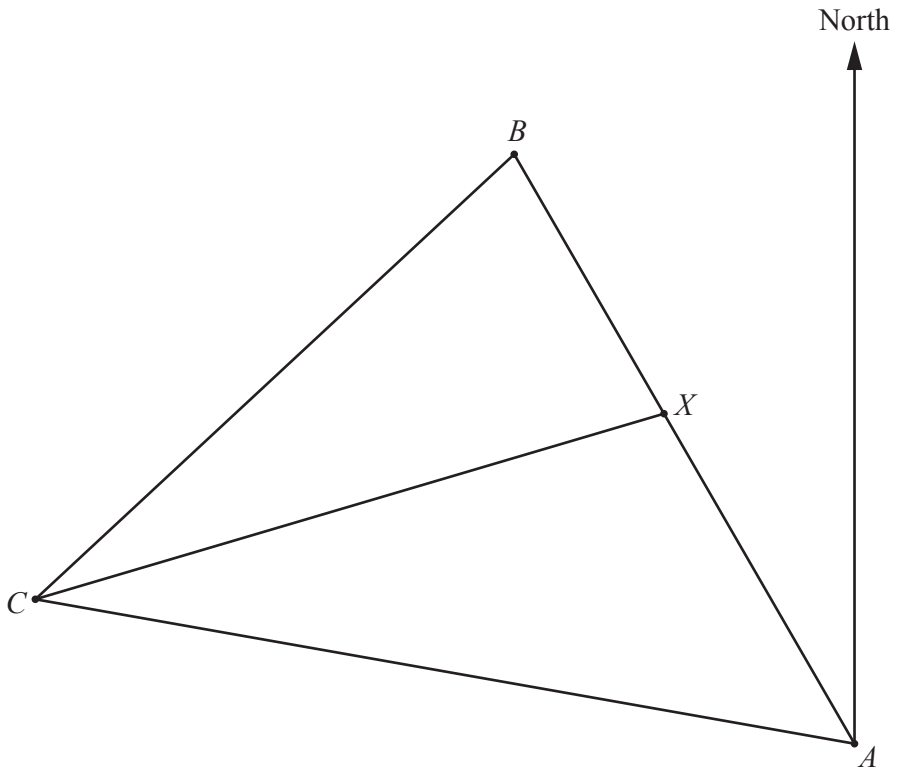
17 The diagram shows the positions of three boats A, B and C.



(a) By measurement, find the bearing of B from A.

..... [1]

(b) CX is the bisector of angle ACB.

(i) **Using compasses and a straight edge only**, construct the locus of points inside triangle ABC that are equidistant from B and C. [2]

(ii) A ship is

- nearer to AC than to BC

and

- nearer to C than to B.

Shade the region in which this ship is situated. [1]

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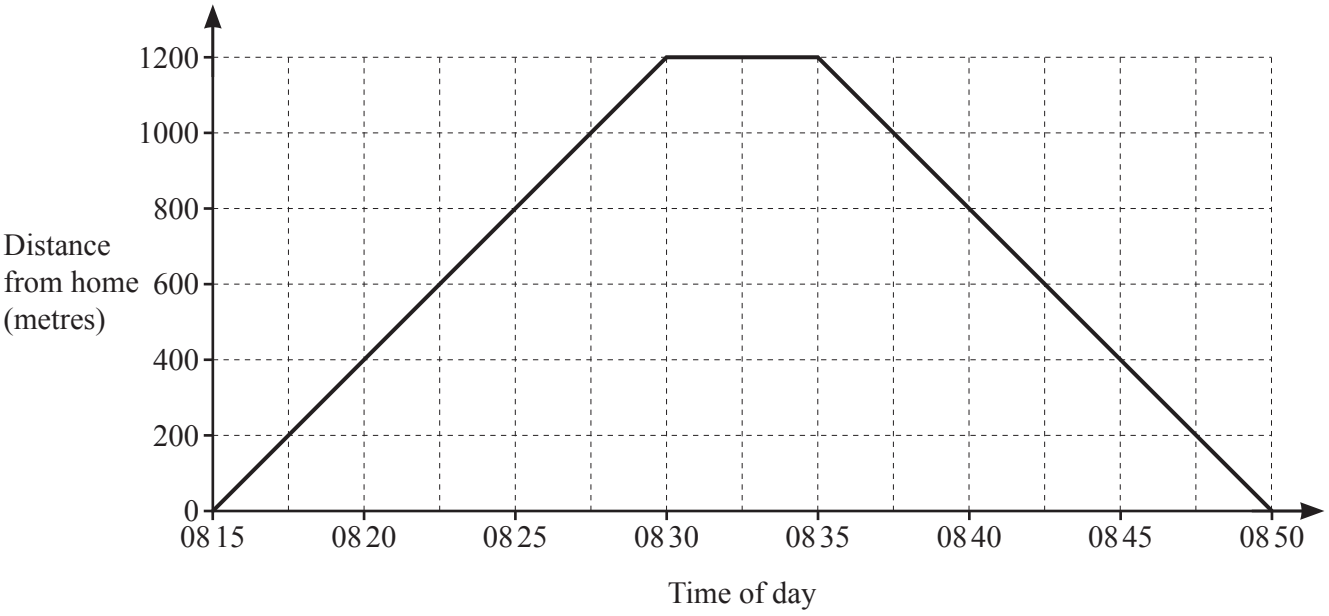

The diagram is the distance–time graph of Safira's journey from home to a shop and back again.
She leaves home at 08 15 and returns at 08 50.

(a) How many minutes does she stay in the shop?

..... minutes [1]

(b) At 08 30, her brother leaves home and goes to the shop.
He walks at the same speed as Safira.

(i) On the grid, draw the graph of his journey to the shop. [1]

(ii) How far is he from the **shop** when he meets Safira?

..... m [1]

(c) Calculate the speed Safira walks to the shop.
Give your answer in km/h.

..... km/h [2]

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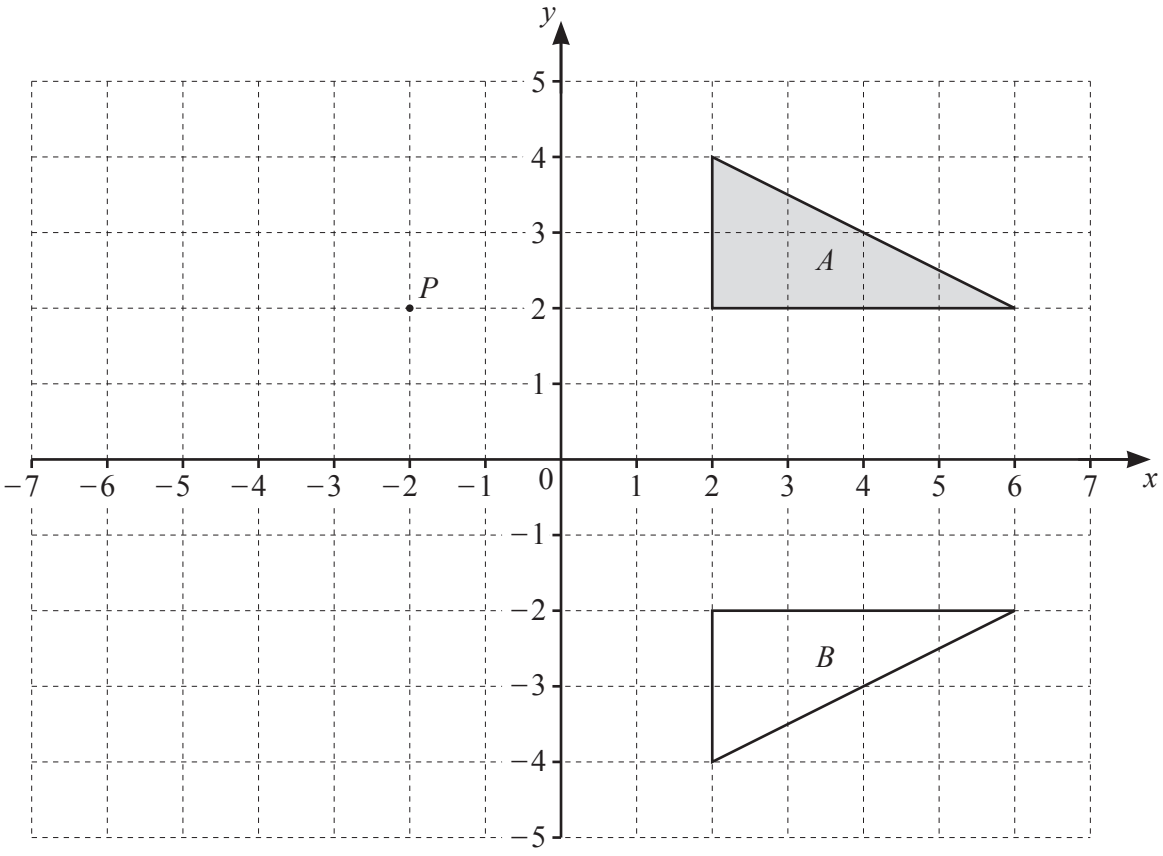

Triangle A, triangle B and the point P (–2, 2) are drawn on the grid.

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

..... [2]

(ii) Write down the matrix that represents this transformation.

$\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(b) Triangle A is mapped onto triangle C by an enlargement, centre P, scale factor $-\frac{1}{2}$.

On the grid, draw and label triangle C. [2]

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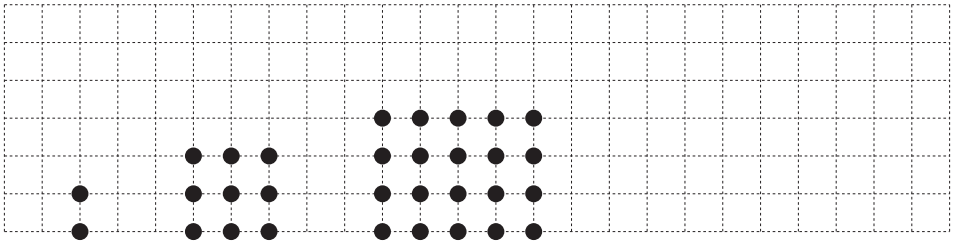

Pattern 1 Pattern 2 Pattern 3 Pattern 4

The diagram shows a sequence of patterns.

Each pattern has one more row, and two more dots in each row, than the pattern before it.

(a) On the diagram, draw Pattern 4. [1]

(b) **(i)** Complete the table for the first four patterns in this sequence.

Pattern number	1	2	3	4	.....	n
Number of rows	2	3	4		.....	p
Number of dots **in each row**	1	3			.....	q
Total number of dots	2	9			.....	

[1]

(ii) Find an expression, in terms of n, for p.

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

(iii) Find an expression, in terms of n, for q.

$q =$ ..... [1]

(iv) Find an expression, in terms of n, for the **total** number of dots in Pattern n.

..... [1]

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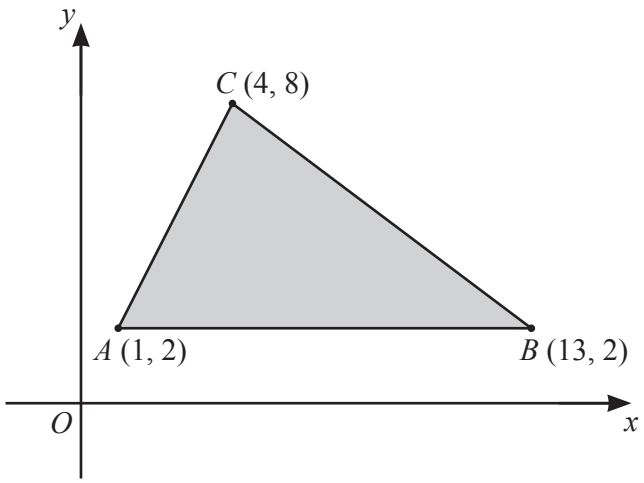

NOT TO SCALE

The diagram shows a triangle formed by joining the points A (1, 2), B (13, 2) and C (4, 8).
The equation of the line BC is $2x + 3y = 32$.

(a) The region **inside** triangle ABC is defined by three inequalities.
One of these is $2x + 3y < 32$.

Write down the other two inequalities.

.....

..... [2]

(b) The point $(k, 7)$, where k is an integer, lies **inside** triangle ABC.

Find the possible values of k.

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

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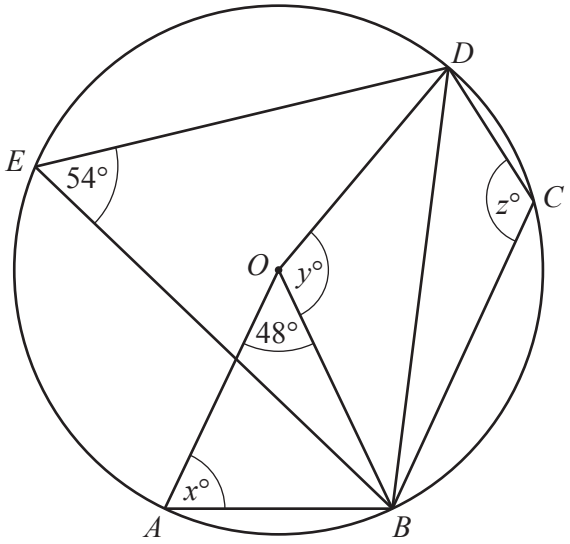

NOT TO SCALE

In the diagram, A, B, C, D and E lie on the circle, centre O.
$A\hat{O}B = 48°$, $D\hat{E}B = 54°$.

(a) Find x.

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

(b) Find y.

$y =$ ..... [1]

(c) Find z.

$z =$ ..... [1]

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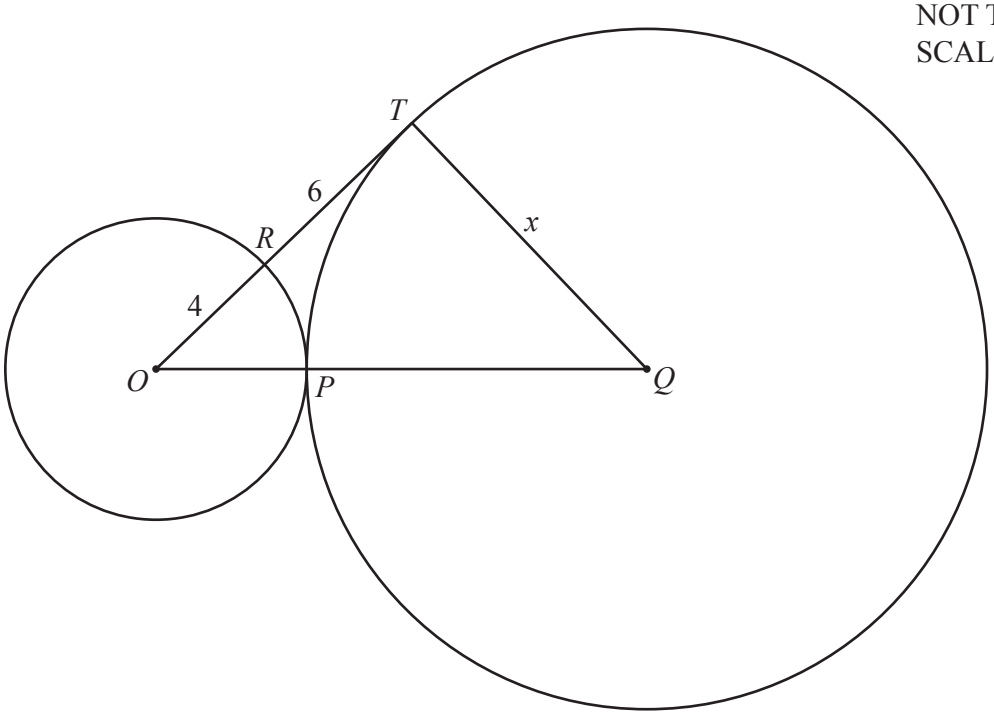
NOT TO SCALE



In the diagram, the circles with centres O and Q touch at P where OPQ is a straight line.
The line ORT intersects the smaller circle at R and is a tangent to the larger circle at T.

$OR = 4$ cm and $RT = 6$ cm.
The radius of the larger circle is x cm.

Calculate the value of x.

$x =$ ..... [4]

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24 $\mathbf{A} = \begin{pmatrix} 2 & 1 \\ -3 & -2 \end{pmatrix}$

(a) Find $\mathbf{A}^2$.

$\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(b) The matrix $\mathbf{X}$ satisfies the equation $\mathbf{X}\begin{pmatrix} 2 & 1 \\ -3 & -2 \end{pmatrix} = \begin{pmatrix} 0 & 2 \end{pmatrix}$.

Find $\mathbf{X}$.

$\mathbf{X} =$ [2]

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