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.

© UCLES 2020

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]

© UCLES 2020

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

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]

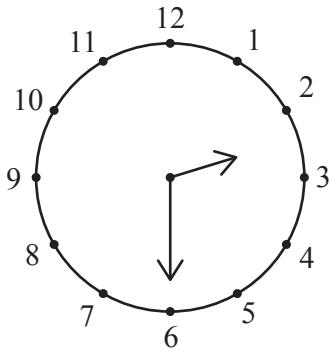
© UCLES 2020

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]

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]

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]

© UCLES 2020

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

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

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

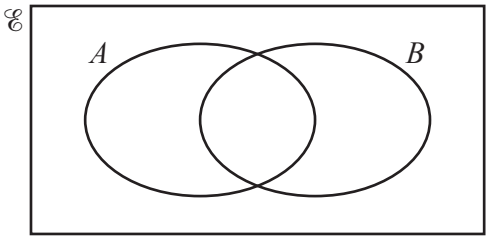
..... [1]

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

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

$r \in A \cap B'$

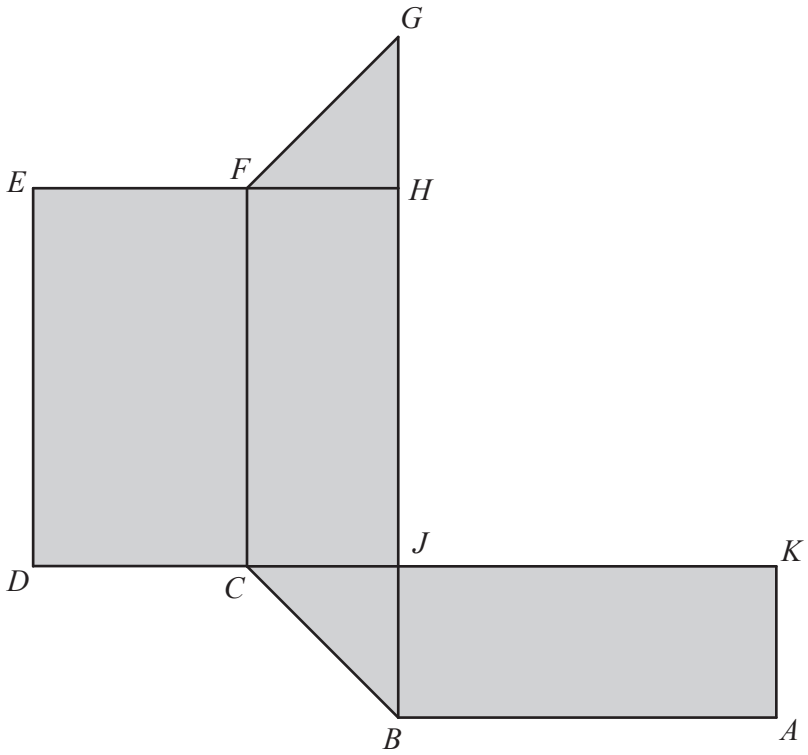
On the Venn diagram below, write each of the letters p, q and r in its appropriate subset.



[3]

© UCLES 2020

14



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 $JH = 5\,\text{cm}$.

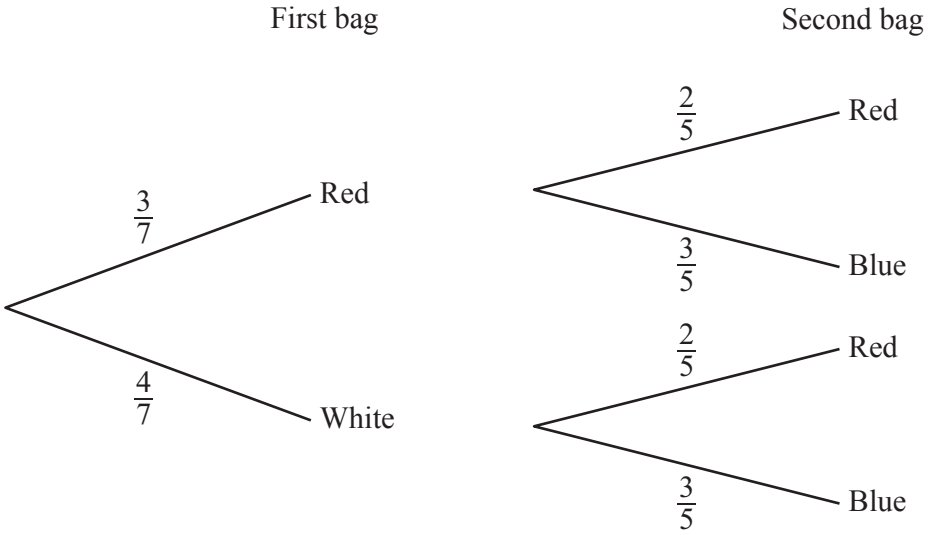
Find the volume of the triangular prism.

..... cm^3 [2]

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]

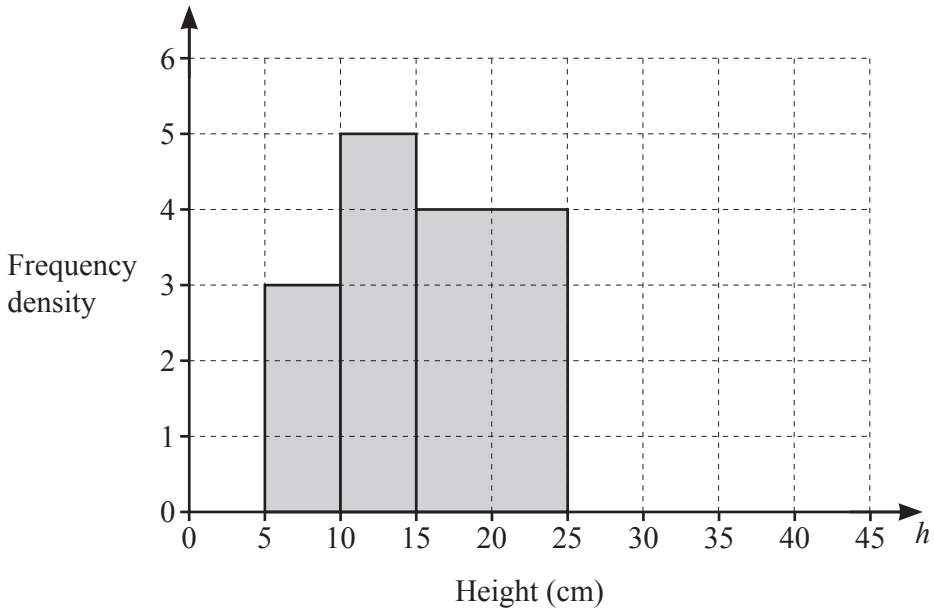
(c) **exactly** one bead is red.

..... [2]

© UCLES 2020

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

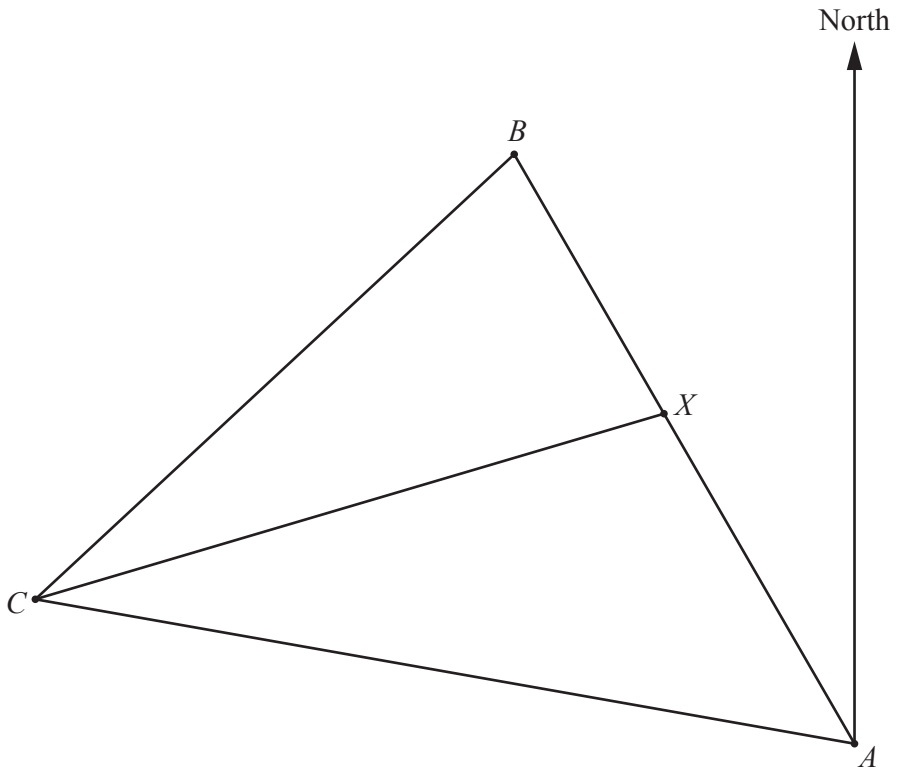


(a) Use the histogram to find the value of p.

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

(b) Complete the histogram. [1]

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

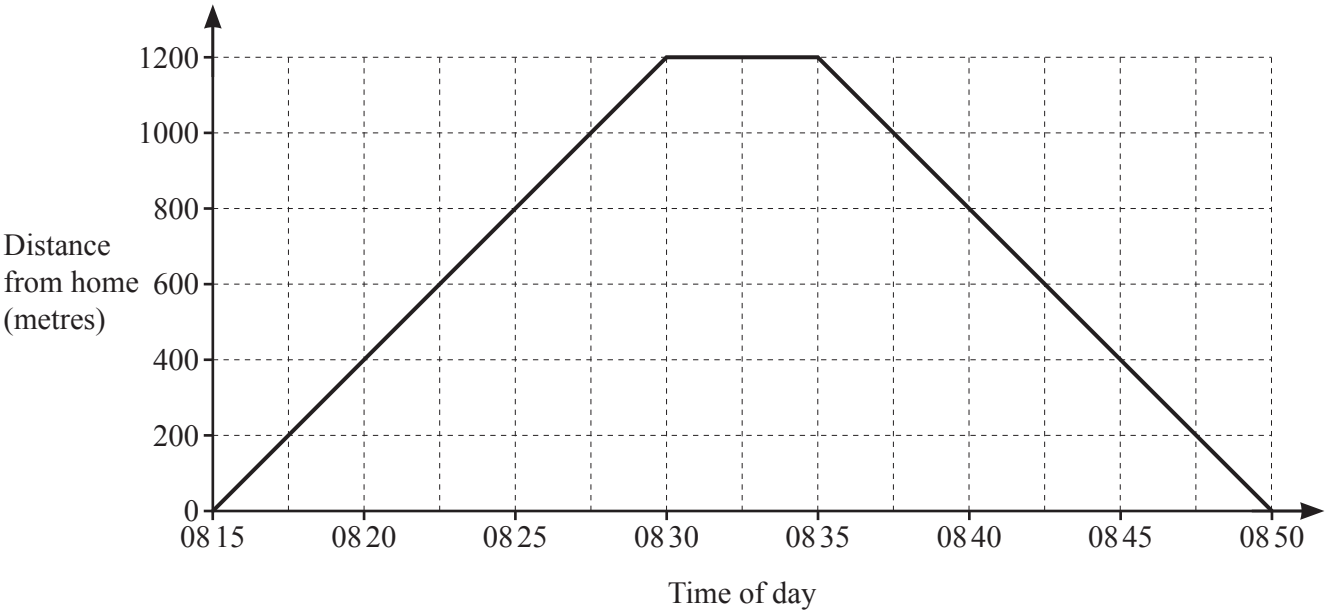
and

- nearer to C than to B.

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

© UCLES 2020

18



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]

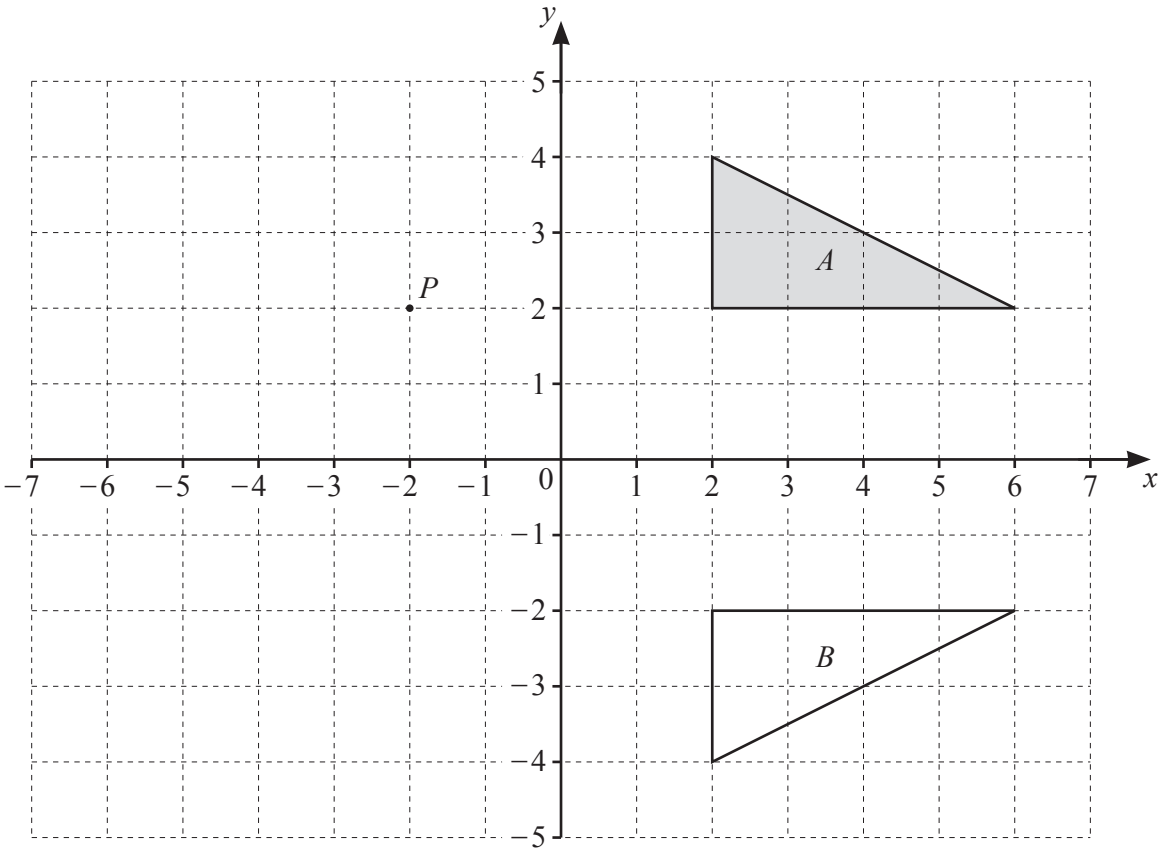
(c) Calculate the speed Safira walks to the shop.
Give your answer in km/h.

..... km/h [2]

© UCLES 2020

[Turn over

19



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.

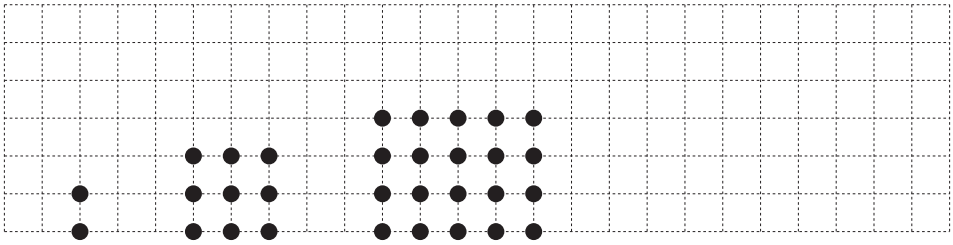
$\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

(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]

© UCLES 2020

20



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.

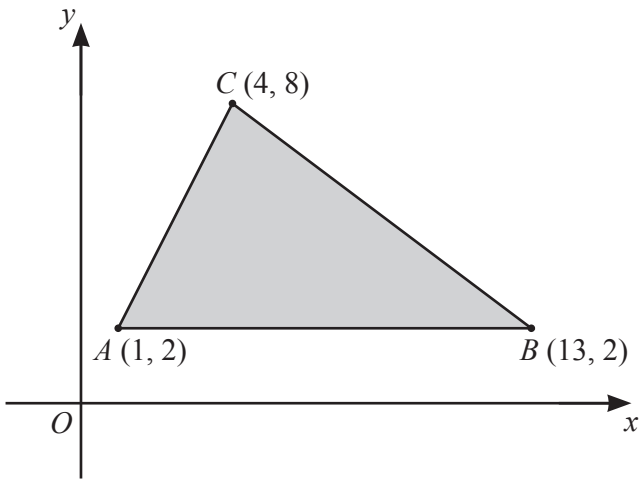
$q =$ ..... [1]

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

..... [1]

© UCLES 2020

21



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]

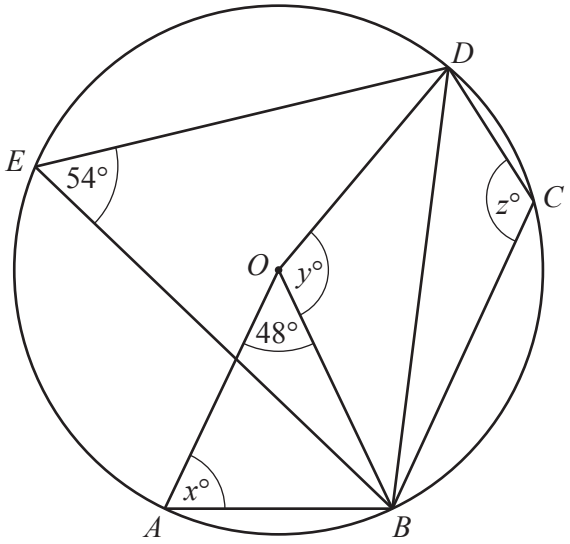
(b) The point $(k, 7)$, where k is an integer, lies **inside** triangle ABC.

Find the possible values of k.

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

© UCLES 2020

22



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.

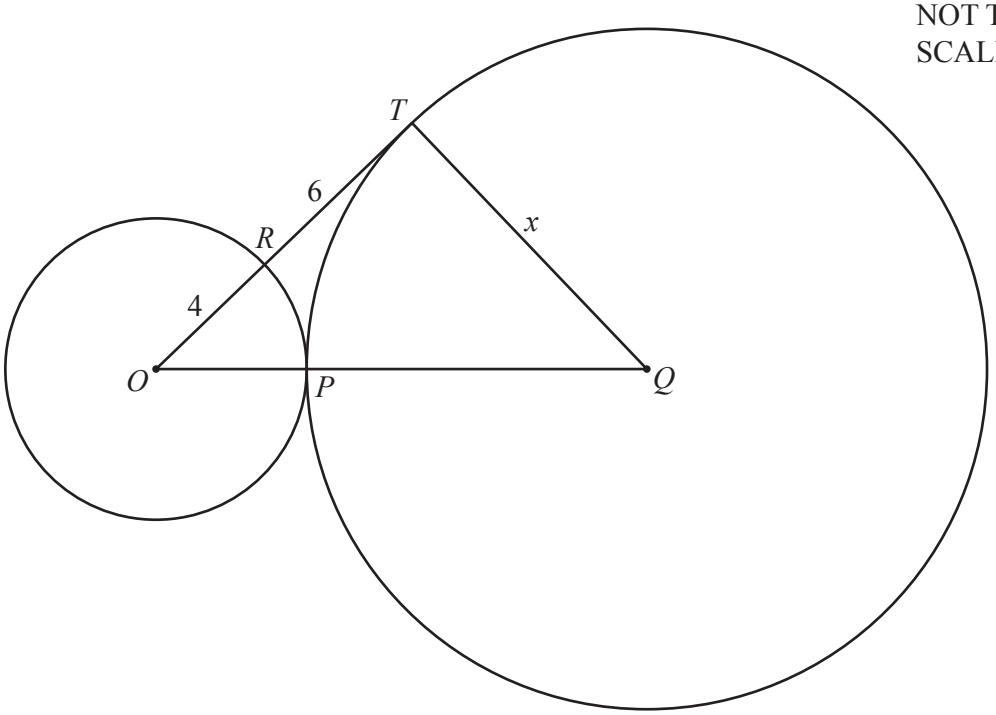
$y =$ ..... [1]

(c) Find z.

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

23

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]

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]

© UCLES 2020

BLANK PAGE

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.

© UCLES 2020