



Cambridge O Level

CANDIDATE
NAME

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CENTRE
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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.

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]

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 km

433 cm

4340 mm

$4\frac{1}{3}$ 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?

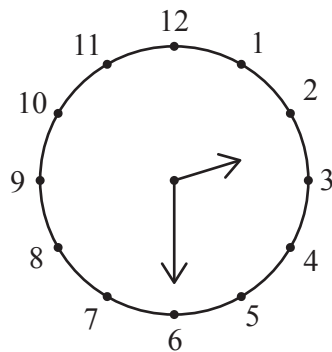
..... [1]

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 $\frac{4 \times 10^7}{8 \times 10^{21}}$, giving your answer in standard form.

..... [2]

(c) $7 \times 10^a - 3 \times 10^{a-1} = k \times 10^a$

Find k .

$k =$ [1]

12 (a) Simplify $(2x^2)^3$.

..... [1]

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

..... [2]

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

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

Find $n(P \cup Q)$.

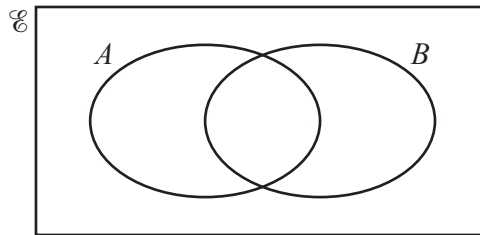
..... [1]

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

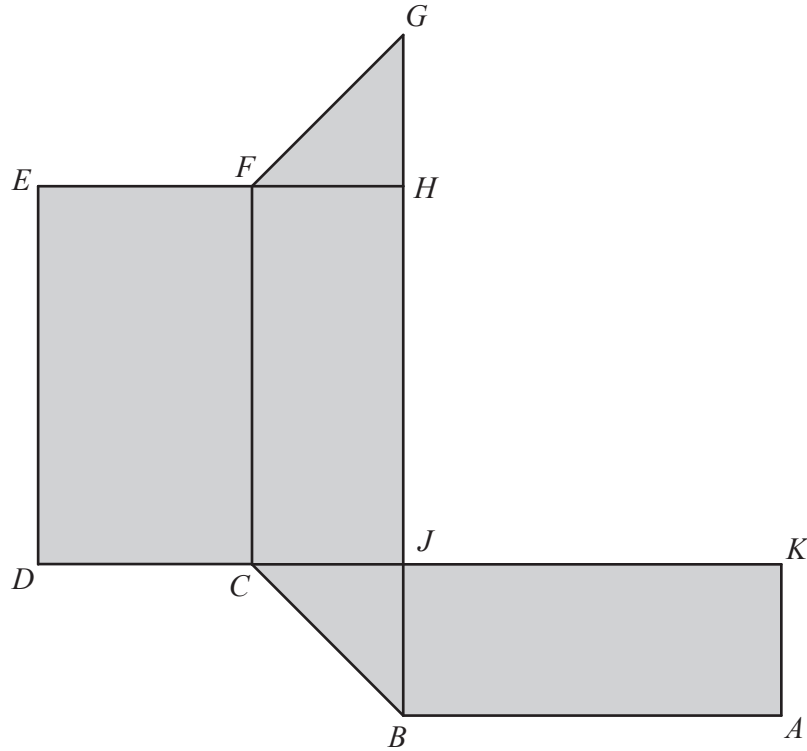
$$q \in (A \cup B)'$$

$$r \in A \cap B'$$

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



[3]



This net is folded to make a triangular prism.

(a) Which vertices join with A ?

..... [1]

(b) Which edge joins with DE ?

..... [1]

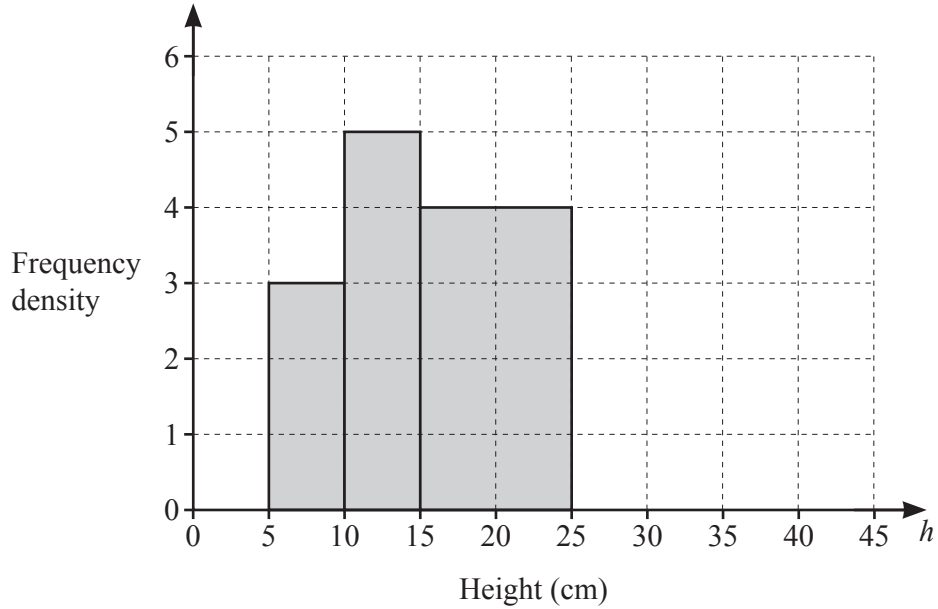
(c) $FH = 2$ cm, $GH = 2$ cm and $JH = 5$ cm.

Find the volume of the triangular prism.

..... cm^3 [2]

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

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



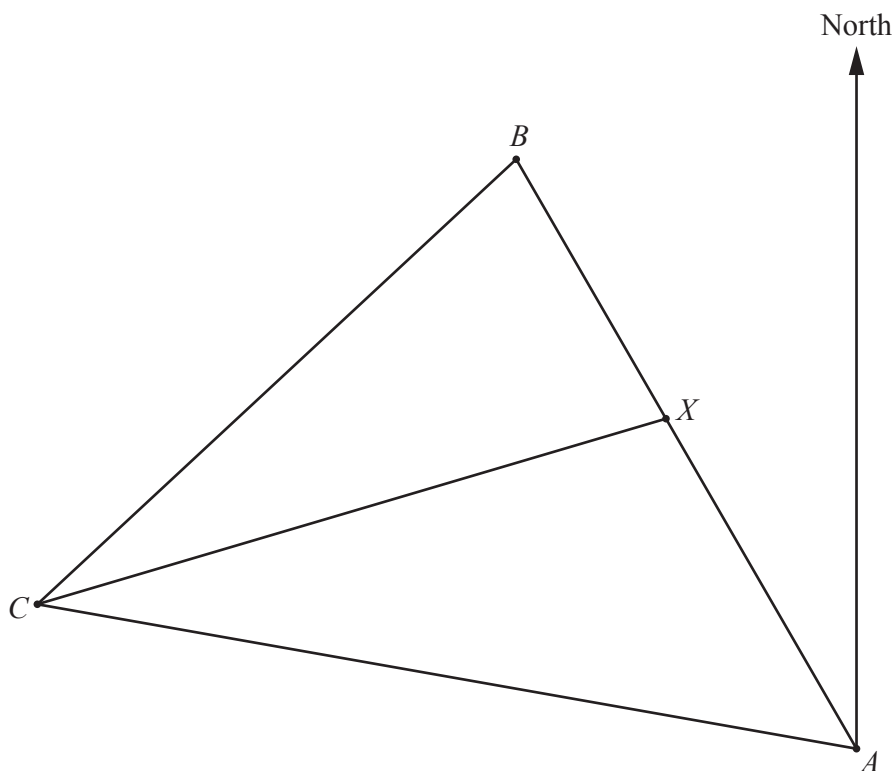
- (a) Use the histogram to find the value of p .

$p = \dots\dots\dots$ [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 .

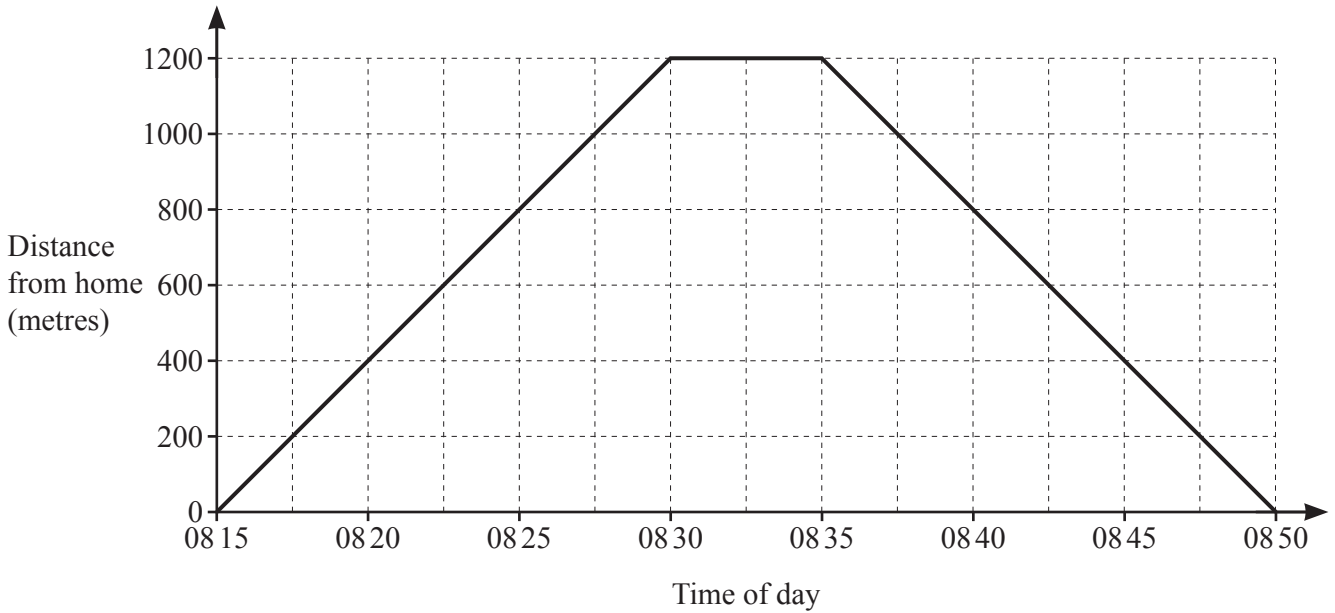
(i) **Using compasses and a straight edge only**, construct the locus of points inside triangle ABC that are equidistant from B and C . [2]

(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]

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.

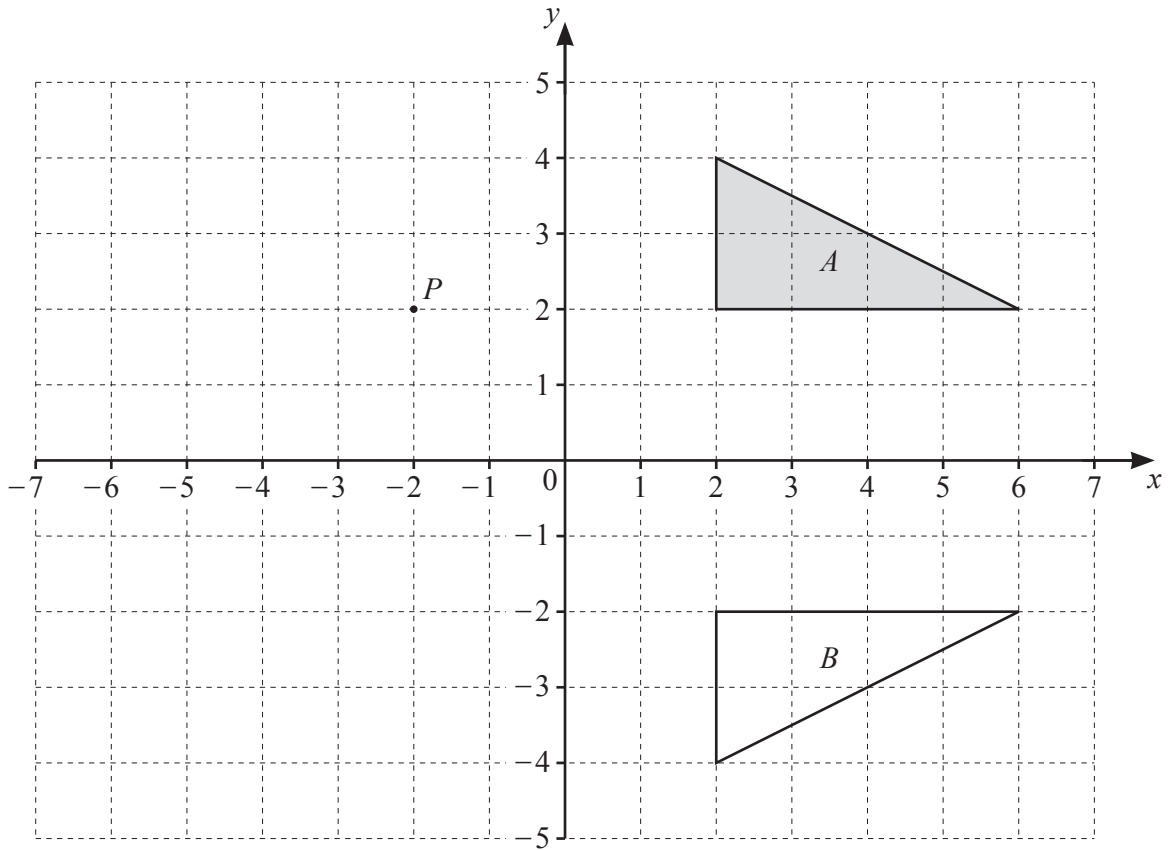
(i) On the grid, draw the graph of his journey to the shop. [1]

(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]



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*.

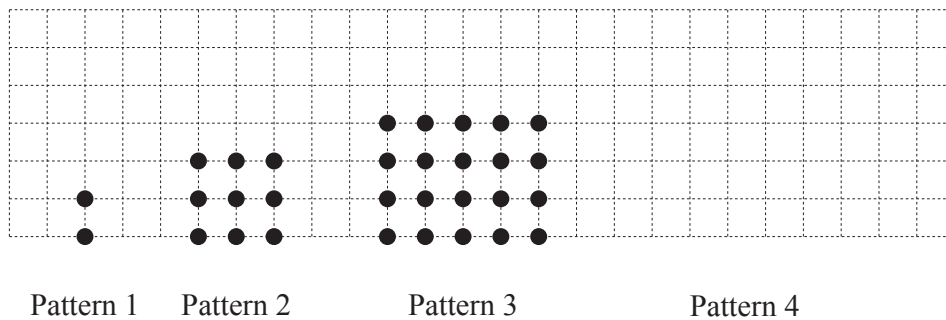
..... [2]

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

$\left(\begin{array}{cc} & \\ & \end{array} \right)$ [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]



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 .

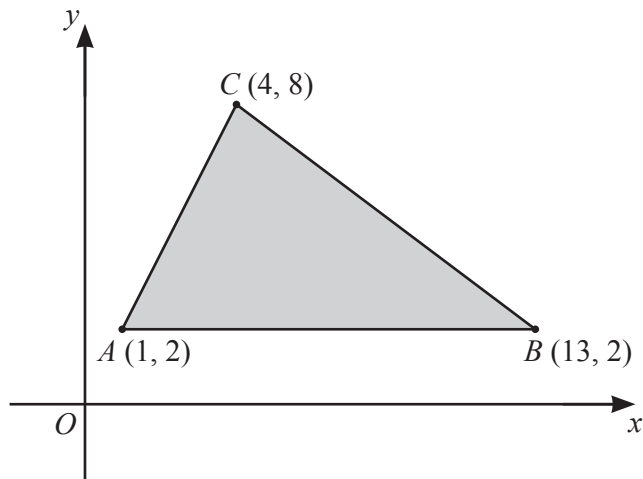
$p = \dots\dots\dots$ [1]

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

$q = \dots\dots\dots$ [1]

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

$\dots\dots\dots$ [1]



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.

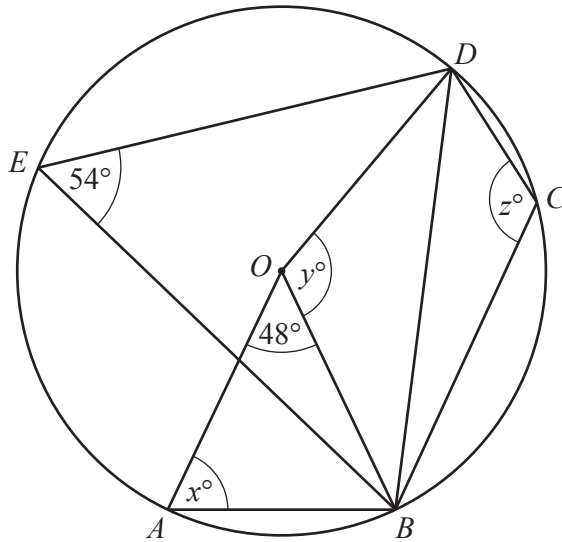
.....

..... [2]

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

Find the possible values of k .

$k =$ [2]



NOT TO SCALE

In the diagram, A, B, C, D and E lie on the circle, centre O .
 $\widehat{AOB} = 48^\circ$, $\widehat{DEB} = 54^\circ$.

(a) Find x .

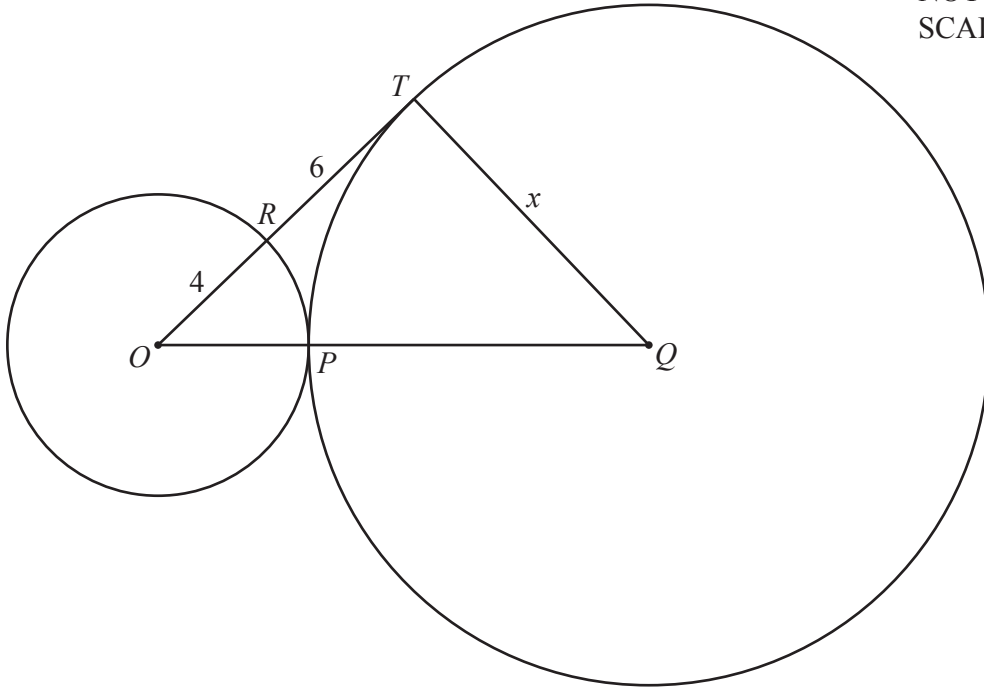
$x = \dots\dots\dots$ [2]

(b) Find y .

$y = \dots\dots\dots$ [1]

(c) Find z .

$z = \dots\dots\dots$ [1]

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 .

$$x = \dots\dots\dots [4]$$

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

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

$$\left(\begin{array}{c} \\ \end{array} \right) [2]$$

(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} .

$$\mathbf{X} = \phantom{\begin{pmatrix} & \\ & \end{pmatrix}} [2]$$

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