Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

MATHEMATICS **0580/42**

Paper 4 (Extended) **October/November 2023**

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.
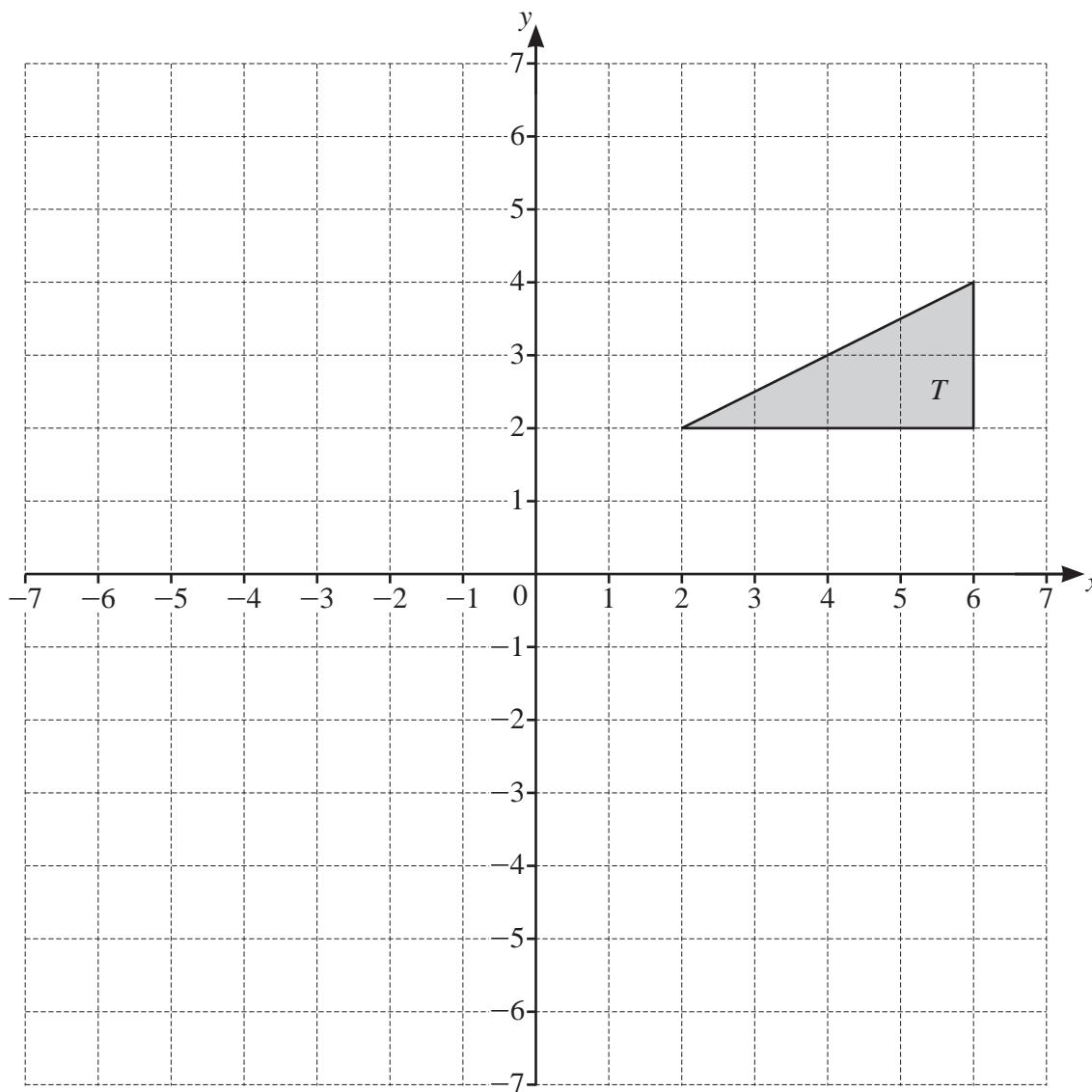
INFORMATION
- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

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

1

(a) (i) Translate triangle *T* by the vector $\begin{pmatrix} -7 \\ 1 \end{pmatrix}$. Label the image *K*. [2]

(ii) Describe fully the **single** transformation that maps triangle *K* onto triangle *T*.

....

.... [1]

(b) Reflect triangle *T* in the line $y = 4$. [2]

(c) Rotate triangle *T* through 90° clockwise about (0, 0). [2]

(d) (i) Enlarge triangle *T* by scale factor $-\dfrac{1}{2}$, centre (0, 0). Label the image *P*. [2]

(ii) Describe fully the **single** transformation that maps triangle *P* onto triangle *T*.

....

.... [2]

2 **(a)** Daisy records her 50 homework marks.
The table shows the results.

Homework mark	15	16	17	18	19	20
Frequency	1	3	19	11	10	6

(i) Write down the range.

.... [1]

(ii) Write down the mode.

.... [1]

(iii) Find the median.

.... [1]

(iv) Calculate the mean.

.... [3]

(b)   21   33   20   25   21   34   22   21   20   30   18

The list shows Ed's scores in 11 tests.

(i) Complete the stem-and-leaf diagram to show this information.

1	
2	
3	

Key: 2|5 represents 25

[2]

(ii) Find the median.

.... [1]

(iii) Find the interquartile range.

.... [2]

4

3 **(a)** The value of Priya's car decreases by 10% every year.
The value today is $7695.

(i) Calculate the value of the car after one year.

$ .... [2]

(ii) Calculate the value of the car one year ago.

$ .... [2]

(b) Ali invests $600 at a rate of 2% per year simple interest.

Calculate the value of Ali's investment at the end of 5 years.

$ .... [3]

(c) Sara invests $500 at a rate of r% per year compound interest.
At the end of 12 years, the value of Sara's investment is $601.35, correct to the nearest cent.

Find the value of r.

$r =$ .... [3]

5

(d) The mass of a radioactive substance decreases exponentially at a rate of 3% each day.

    (i) Find the overall percentage decrease at the end of 10 days.
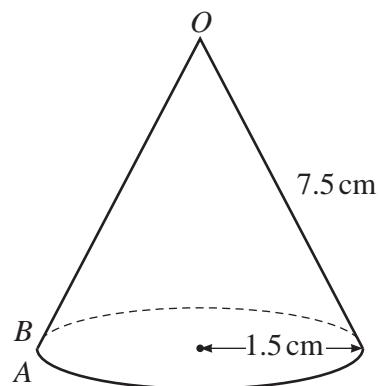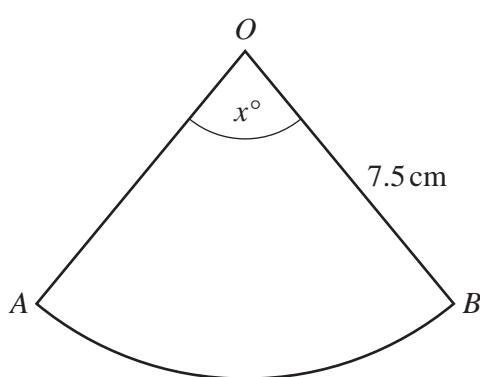
.... % [2]

    (ii) Find the number of whole days it takes until the mass of this substance is one half of its original amount.

.... [3]

4 **(a)**
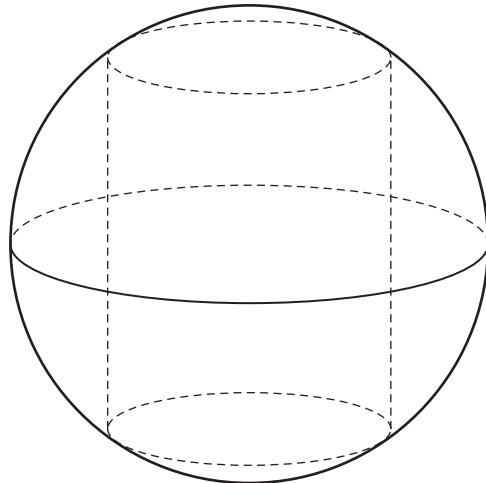
The diagram shows a sector of a circle that is made into a cone by joining *OA* to *OB*.
The sector angle is $x°$ and the radius of the sector is 7.5 cm.
The base radius of the cone is 1.5 cm.

Calculate the value of *x*.

$x = $ .... [3]

(b)

The diagram shows a cylinder with radius 8 cm inside a sphere with radius 17 cm.
Both ends of the cylinder touch the curved surface of the sphere.

(i) Show that the height of the cylinder is 30 cm.

[2]
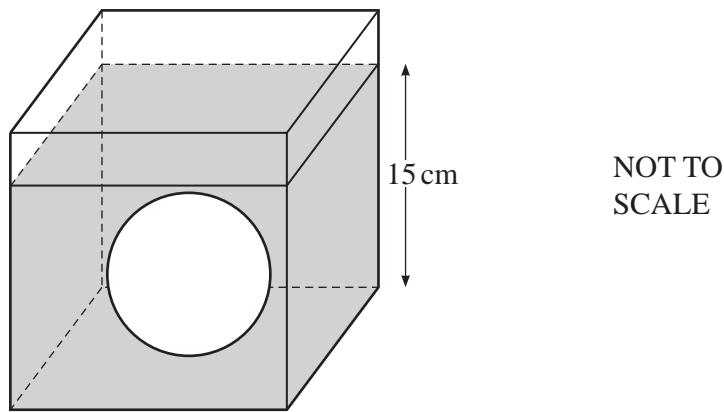
(ii) Calculate the volume of the cylinder as a percentage of the volume of the sphere.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

.... % [4]

(c)

15 cm

NOT TO
SCALE

The diagram shows a solid sphere with radius 6 cm inside a cube with side length 20 cm.
The cube contains water to a depth of 15 cm.
The sphere is removed.

Calculate the new depth of water in the cube.

[The volume, V, of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

.... cm [3]

8

5 **(a)** In a shop the cost of a fiction book is \$$x$ and the cost of a reference book is \$$(x+2)$.
The cost of 11 fiction books is the same as the cost of 10 reference books.

Find the value of x.

$x =$ .... [2]

(b) In another shop, the cost of a fiction book is \$$y$ and the cost of a reference book is \$$(y+2)$.
Maria spends \$95 on fiction books and \$147 on reference books.
She buys a total of 12 books.

(i) Show that $6y^2 - 109y - 95 = 0$.
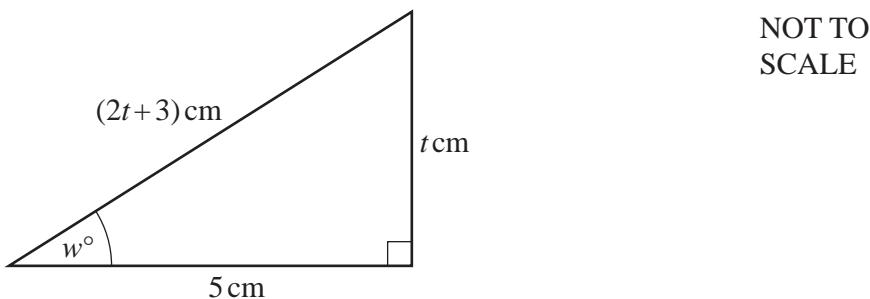
[4]

(ii) Factorise $6y^2 - 109y - 95$.

.... [2]

(iii) Find the value of y.

$y =$ .... [1]

6
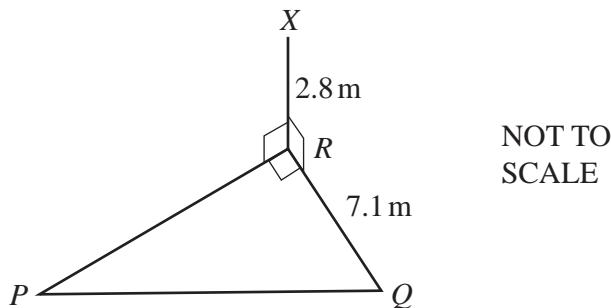
NOT TO
SCALE

The diagram shows a right-angled triangle.

Find the value of w.

$w =$ .... [7]

7 **(a)**
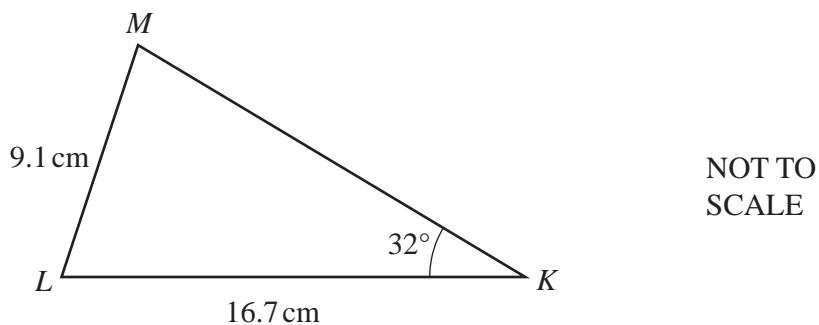
The diagram shows a right-angled triangle *PQR* on horizontal ground.
X is vertically above *R* and the angle of elevation of *X* from *P* is 21°.
XR = 2.8 m and *RQ* = 7.1 m.

**(i)** Calculate the angle of elevation of *X* from *Q*.

.... [2]

(ii) Calculate *PQ*.

.... m [3]

(b)
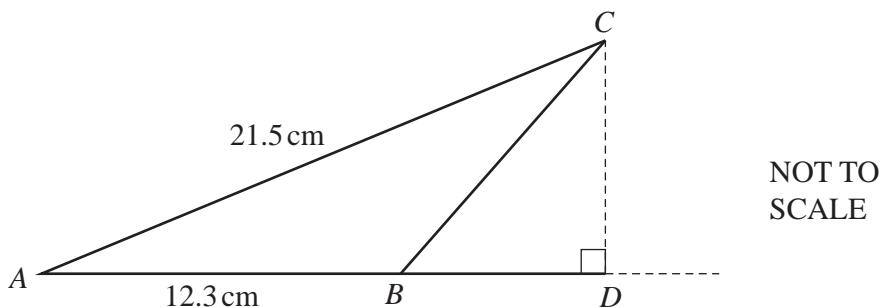
Calculate the acute angle *KML*.

Angle *KML* = ... [3]

(c)

The area of triangle *ABC* is $62.89\,\text{cm}^2$.

(i) Show that angle $BAC = 28.4°$, correct to 1 decimal place.

[2]

(ii) Calculate *BC*.

.... cm [3]
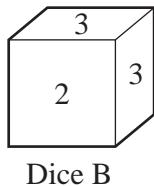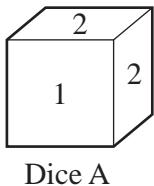
(iii) *AB* is extended to a point *D* such that angle $BDC = 90°$.

Calculate *BD*.

.... cm [3]

8

Dice A   Dice B

The diagram shows two fair dice.
Dice A is numbered   1, 2, 2, 2, 3, 6.
Dice B is numbered   2, 3, 3, 4, 4, 4.

(a) (i) Dice A is rolled once.

Write down the probability that it lands on the number 6.

.... [1]

(ii) Dice A is rolled 150 times.

Find the number of times it is expected to land on the number 6.

.... [1]

(b) Dice A and Dice B are each rolled once.

(i) Find the probability that the two numbers they land on have a total of 6.

.... [3]

(ii) Find the probability that when the two numbers they land on have a total of 6, both numbers are 3.

.. [2]
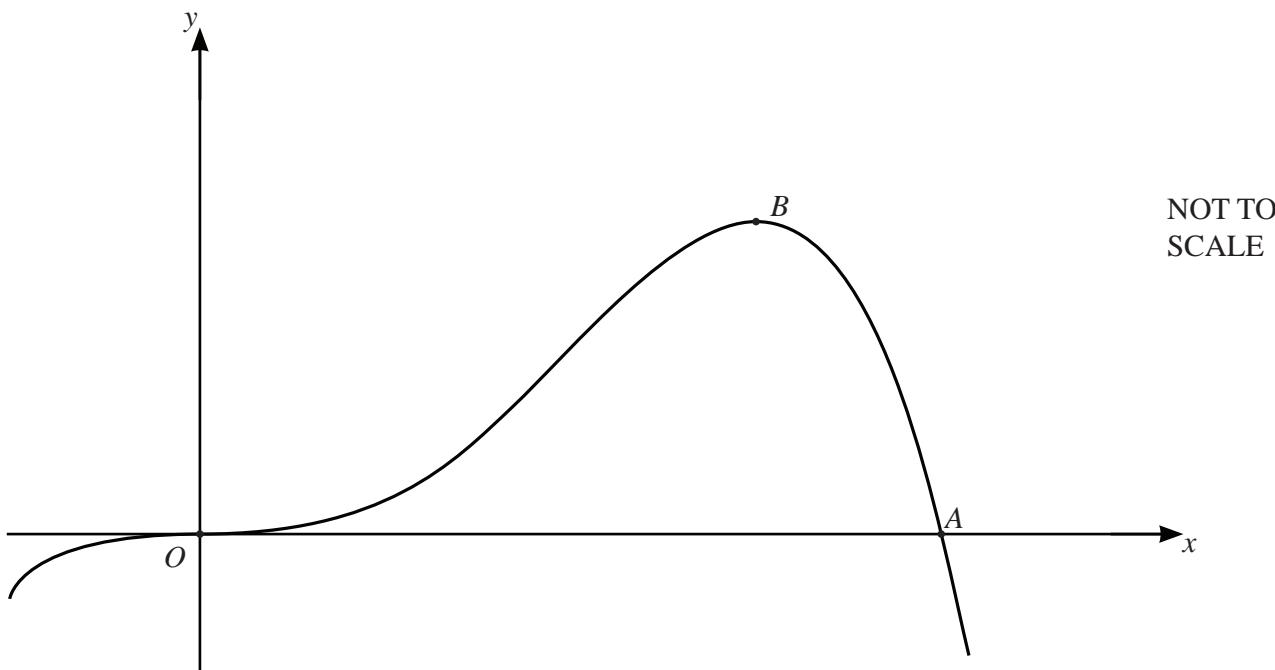
(c) Dice B is rolled n times.

The probability that on the nth roll it first lands on a number 3 is $\dfrac{32}{729}$.

Find the value of n.

$n =$ .... [2]

9

The diagram shows a sketch of the graph of $y = 4x^3 - x^4$.
The graph crosses the x-axis at the origin O and at the point A.
The point B is a maximum point.

(a) Differentiate $4x^3 - x^4$.

.... [2]

(b) Find the coordinates of B.
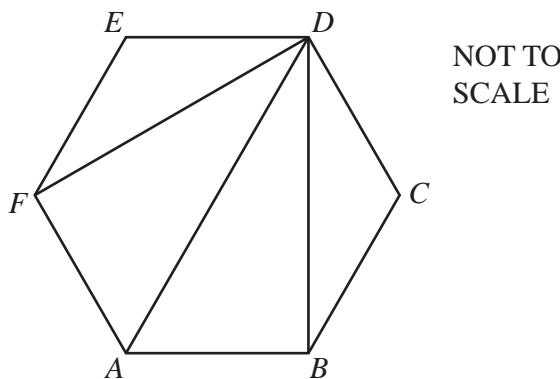
(...................... , ...) [3]

(c) Find the gradient of the graph at the point A.

.... [3]

10 (a)

NOT TO SCALE

ABCDEF is a regular hexagon.
DF, *DA* and *DB* are diagonals.
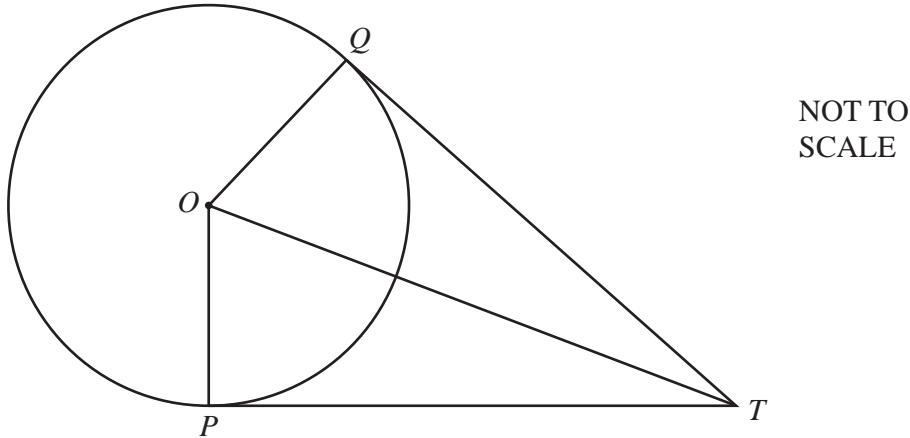
Complete the following statements using three different triangles.

Triangle   *DEF*   is congruent to triangle ....

Triangle .... is congruent to triangle ....

[2]

(b)

NOT TO SCALE

P and *Q* are points on the circle with centre *O*.
TP and *TQ* are tangents to the circle from the point *T*.

Complete the following statements and reasons.

In triangles *OPT* and *OQT*

OP = ... because each is a radius of the circle

OT is a common side

Angle *OPT* = angle .... = 90°   because ....

Triangles *OPT* and *OQT* are congruent using the criterion ....

This proves that the tangents *TP* and *TQ* are ....

[5]

16

11 $f(x) = 1 - 3x$ $g(x) = (x-1)^2$ $h(x) = \dfrac{3}{x}, x \neq 0$

(a) Find g(3).

.... [1]

(b) Find $f(x-2)$, giving your answer in its simplest form.

.... [2]

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

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

(d) $gf(x) - g(x)f(x) = 3x^3 + ax^2 + bx + c$

Find the value of each of a, b and c.

$a = $ ....

$b = $ ....

$c = $ .... [5]

(e) Find $h(x) - f(x)$, giving your answer as a single fraction in its simplest form.
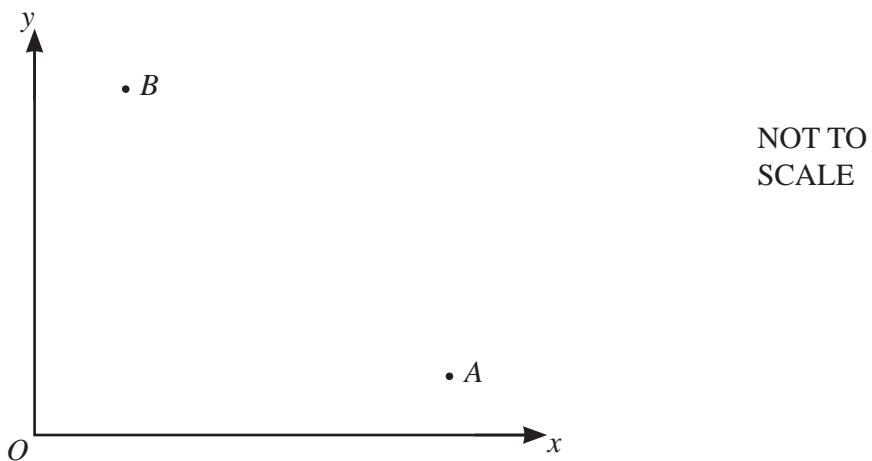
.... [3]

(f) $h(x^n) = 3x^7$

Find the value of n.

$n =$ .... [1]

12

O is the origin $(0, 0)$, A is the point $(8, 1)$ and B is the point $(2, 5)$.

(a) Write as column vectors.

(i) $\overrightarrow{OB}$

$$\overrightarrow{OB} = \begin{pmatrix} \\ \end{pmatrix} \quad [1]$$

(ii) $\overrightarrow{AB}$

$$\overrightarrow{AB} = \begin{pmatrix} \\ \end{pmatrix} \quad [1]$$

(b) Find the equation of the line AB.
Give your answer in the form $y = mx + c$.

$y =$ .... [3]

(c) Find the equation of the perpendicular bisector of *AB*.
Give your answer in the form $y = mx + c$.

$y =$ .... [4]

(d) The line *AB* meets the *y*-axis at *P*.
The perpendicular bisector of *AB* meets the *y*-axis at *Q*.

Find the length of *PQ*.

.... [2]

20

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