Cambridge Assessment International Education

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CENTRE NUMBER						CANDIDATE NUMBER				

MATHEMATICS **0580/41**

Paper 4 (Extended) **May/June 2020**

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. Blank pages are indicated.

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1 **(a)** In 2018, Gretal earned $32 000.

View solution

(i) She paid tax of 24% on these earnings.

Work out the amount she paid in tax in 2018.

$ ..... [2]

(ii) In 2019, Gretal's earnings increased by 7%.

View solution

Work out her earnings in 2019.

$ ..... [2]

(b) Gretal invests $5000 at a rate of 2% per year compound interest.

View solution

Calculate the value of her investment at the end of 3 years.

$ ..... [2]

(c) One month, Gretal spent a total of $360 on presents.
She spent $\frac{1}{5}$ of this total on presents for her parents.
She spent $\frac{2}{3}$ of the remaining money on presents for her friends.
She spent the rest of the money on presents for her sisters.

View solution

Calculate the percentage of the $360 that she spent on presents for her sisters.

..... % [4]

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(d) Arjun earned \$36 515 in 2019.
This was an increase of 9% on his earnings in 2018.

View solution

Work out his earnings in 2018.

\$ ..... [2]

(e) Arjun and Gretal each pay rent.

View solution

In 2018, the ratio of the amount each paid in rent was Arjun : Gretal = 5 : 7.
In 2019, the ratio of the amount each paid in rent was Arjun : Gretal = 9 : 13.

Arjun paid the same amount of rent in both 2018 and 2019.
Gretal paid \$290 more rent in 2019 than she did in 2018.

Work out the amount Arjun paid in rent in 2019.

\$ ..... [4]

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2 The heights, h metres, of the 120 boys in an athletics club are recorded.
The table shows information about the heights of the boys.

Height (h metres)	$1.3 < h \leqslant 1.4$	$1.4 < h \leqslant 1.5$	$1.5 < h \leqslant 1.6$	$1.6 < h \leqslant 1.7$	$1.7 < h \leqslant 1.8$	$1.8 < h \leqslant 1.9$
Frequency	7	18	30	24	27	14

(a) (i) Write down the modal class.

View solution

..... $< h \leqslant$ ..... [1]

(ii) Calculate an estimate of the mean height.

View solution

..... m [4]

(b) (i) One boy is chosen at random from the club.

View solution

Find the probability that this boy has a height greater than 1.8 m.

..... [1]

(ii) Three boys are chosen at random from the club.

View solution

Calculate the probability that one of the boys has a height greater than 1.8 m and the other two boys each have a height of 1.4 m or less.

..... [4]

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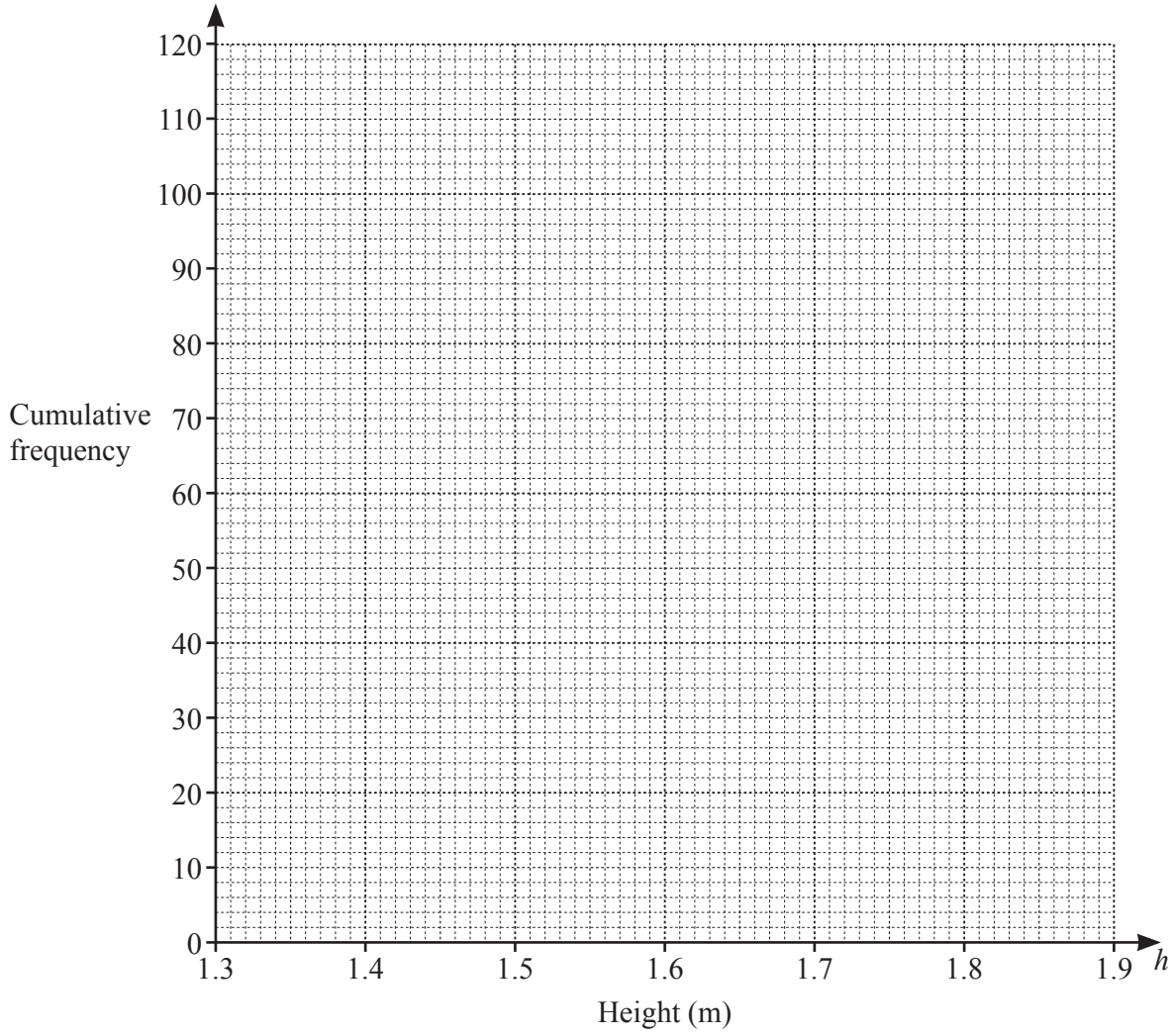
(c) (i) Use the frequency table on page 4 to complete the cumulative frequency table.

Height (h metres)	$h \leqslant 1.4$	$h \leqslant 1.5$	$h \leqslant 1.6$	$h \leqslant 1.7$	$h \leqslant 1.8$	$h \leqslant 1.9$
Cumulative frequency	7	25				

[2]

(ii) On the grid, draw a cumulative frequency diagram to show this information.

View solution



[3]

(d) Use your diagram to find an estimate for

View solution

(i) the median height,

..... m [1]

(ii) the 40th percentile.

View solution

..... m [2]

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3 **(a)** $s = ut + \frac{1}{2}at^2$

View solution

Find the value of s when $u = 5.2$, $t = 7$ and $a = 1.6$.

$s =$ ..... [2]

(b) Simplify.

View solution

(i) $3a - 5b - a + 2b$

..... [2]

(ii) $\frac{5}{3x} \times \frac{9x}{20}$

View solution

..... [2]

(c) Solve.

View solution

(i) $\frac{15}{x} = -3$

$x =$ ..... [1]

(ii) $4(5 - 3x) = 23$

View solution

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

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(d) Simplify.

$$(27x^9)^{\frac{2}{3}}$$

View solution

..... [2]

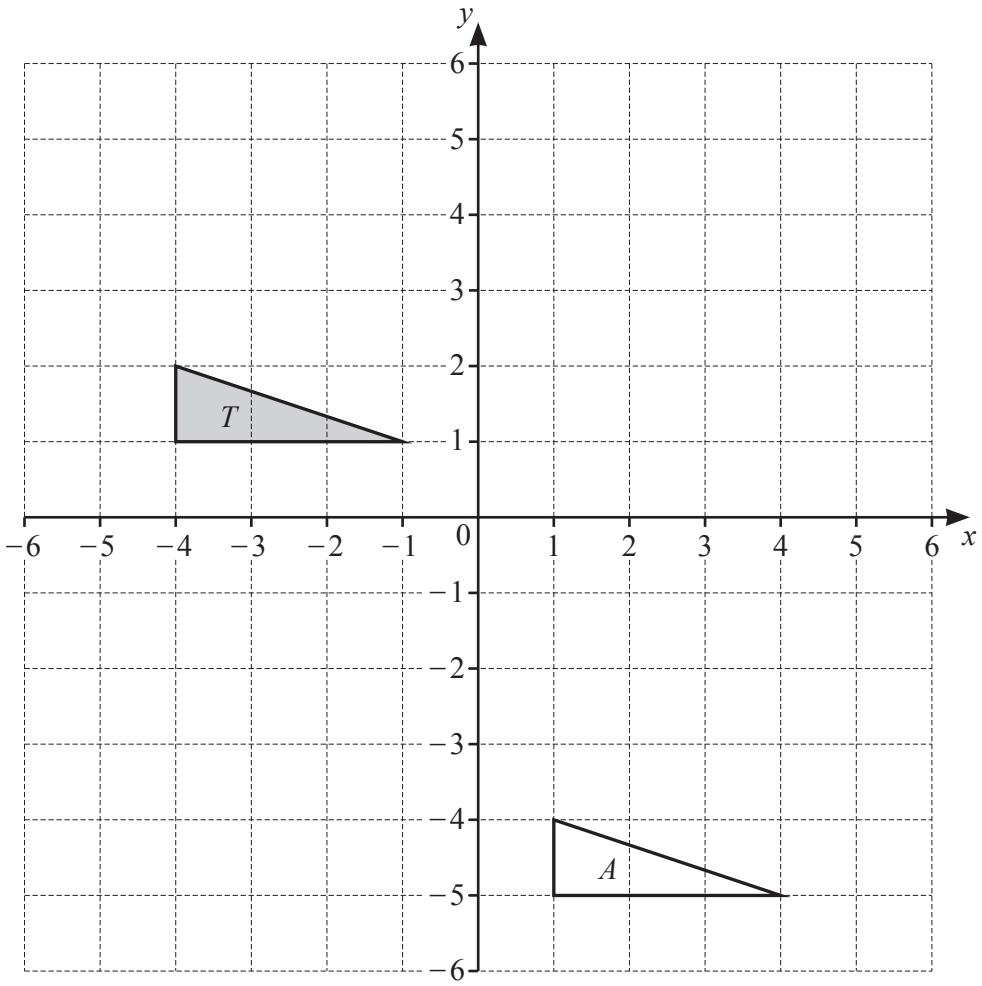
(e) Expand and simplify.

$$(3x - 5y)(2x + y)$$

View solution

..... [2]

4



View solution

(a) Draw the image of triangle T after a reflection in the line $y = -1$. [2]

View solution

(b) Draw the image of triangle T after a rotation through 90° clockwise about (0, 0). [2]

(c) Describe fully the **single** transformation that maps triangle T onto triangle A.

View solution

.....

..... [2]

5 x is an integer.

$\mathscr{E} = \{x : 41 \leqslant x \leqslant 50\}$

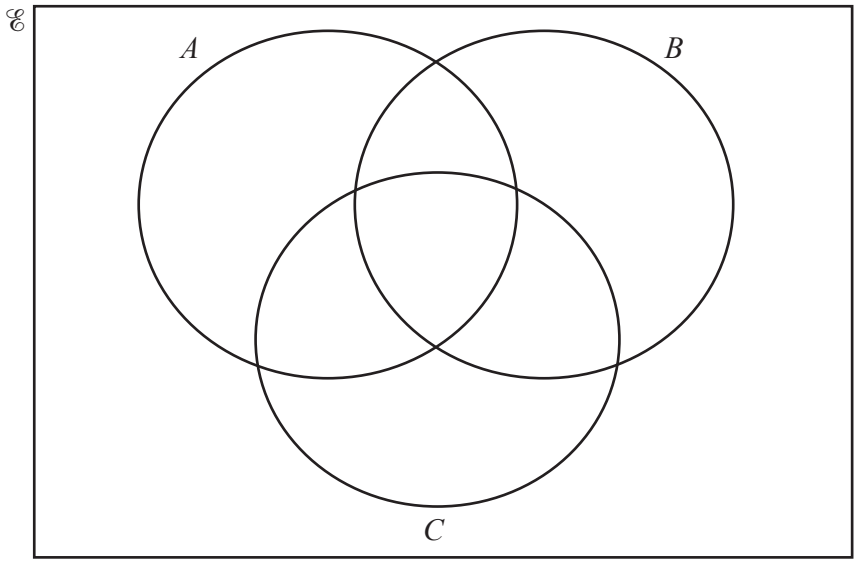
$A = \{x : x \text{ is an odd number}\}$

$B = \{x : x \text{ is a multiple of } 3\}$

$C = \{x : x \text{ is a prime number}\}$

(a) Complete the Venn diagram to show this information.

View solution



[3]

(b) List the elements of

View solution

(i) $A \cap C$,

..... [1]

(ii) $(B \cup C)'$.

View solution

..... [1]

(c) Find $\mathrm{n}(A \cap B \cap C)$.

View solution

..... [1]

6 Raheem makes baskets and mats.
Each week he makes x baskets and y mats.

He makes fewer than 10 mats.
The number of mats he makes is greater than or equal to the number of baskets he makes.

View solution

(a) One of the inequalities that shows this information is $y < 10$.

Write down the other inequality.

..... [1]

View solution

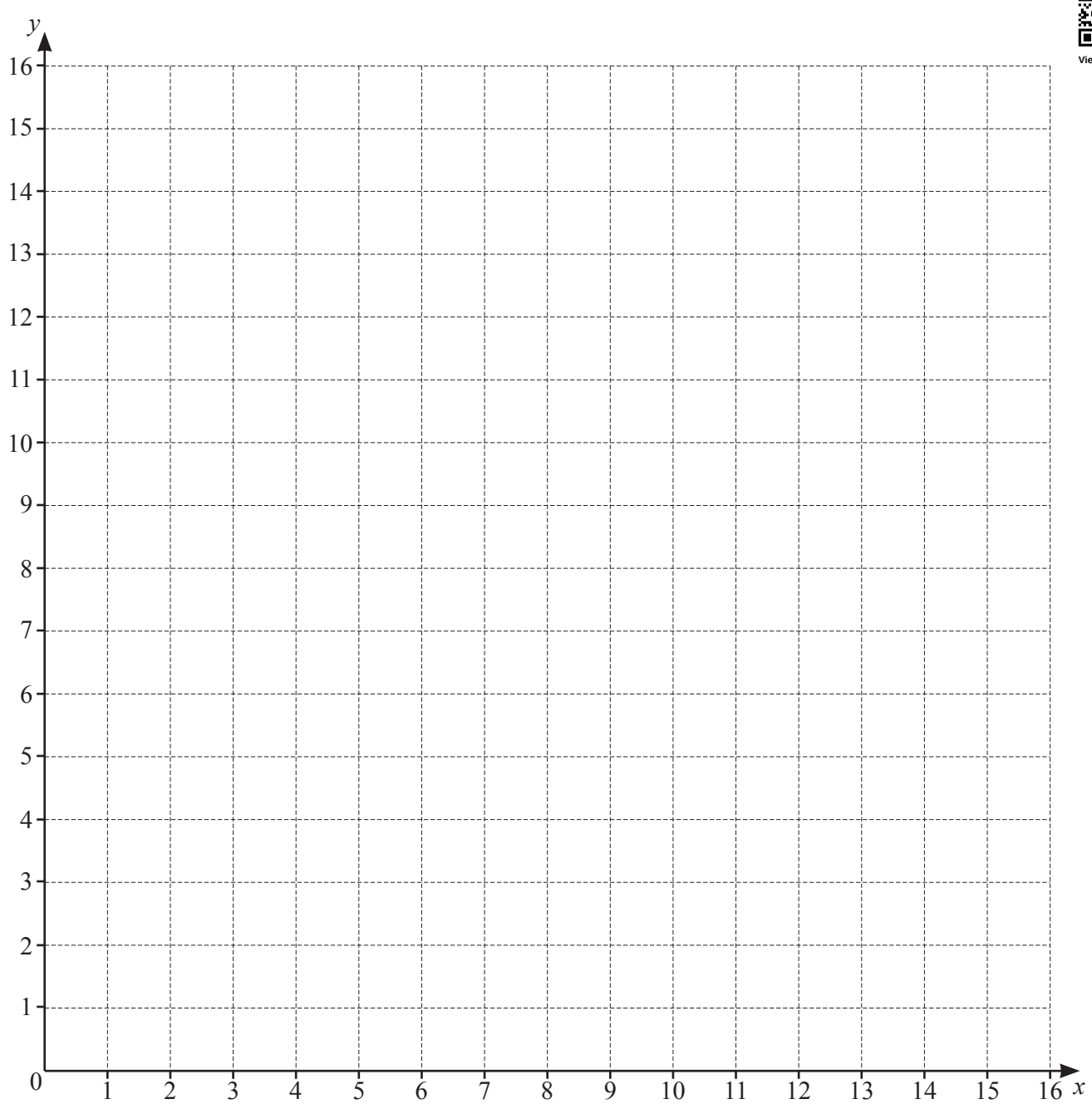
(b) He takes $2\frac{1}{4}$ hours to make a basket and $1\frac{1}{2}$ hours to make a mat.
Each week he works for a maximum of 22.5 hours.

Show that $3x + 2y \leqslant 30$.

[2]

(c) On the grid, draw three straight lines and shade the **unwanted** regions to show these inequalities.

View solution



[5]

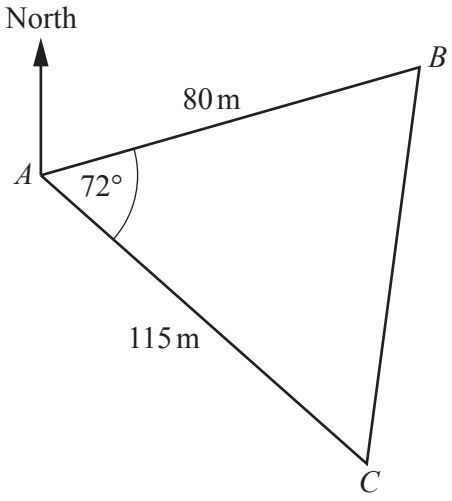
(d) He makes \$40 profit on each basket he sells and \$28 profit on each mat he sells.

View solution

Calculate the maximum profit he can make each week.

\$ ..... [2]

7



NOT TO SCALE

The diagram shows the positions of three points A, B and C in a field.

(a) Show that BC is 118.1 m, correct to 1 decimal place.

View solution

[3]

(b) Calculate angle ABC.

View solution

Angle ABC = ... [3]

(c) The bearing of C from A is 147°.

View solution

Find the bearing of

(i) A from B,

..... [3]

(ii) B from C.

View solution

..... [2]

(d) Mitchell takes 35 seconds to run from A to C.

View solution

Calculate his average running speed in kilometres per hour.

..... km/h [3]

(e) Calculate the shortest distance from point B to AC.

View solution

..... m [3]

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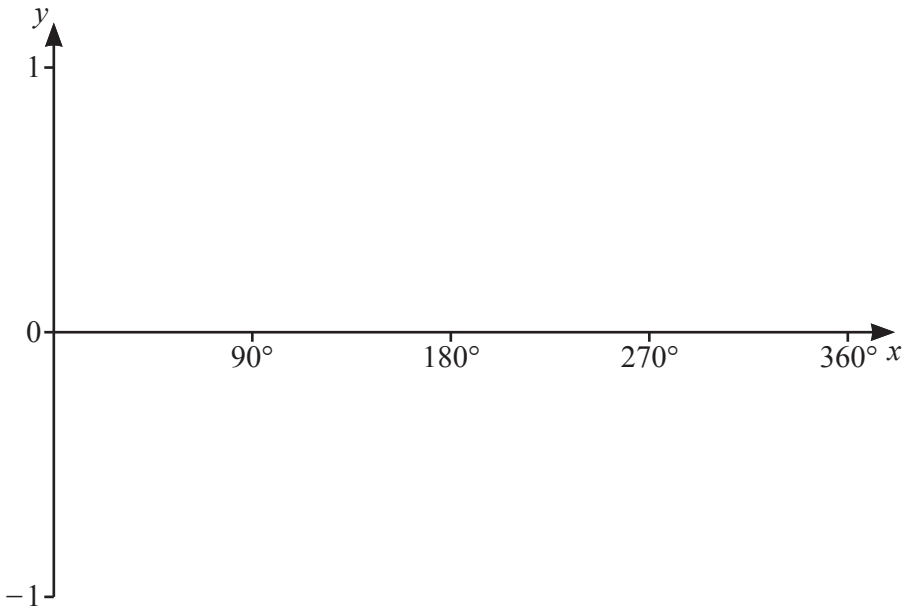
8 **(a)** **(i)** On the axes, sketch the graph of $y = \sin x$ for $0° \leqslant x \leqslant 360°$.

View solution



[2]

(ii) Describe fully the symmetry of the graph of $y = \sin x$ for $0° \leqslant x \leqslant 360°$.

View solution

.....

..... [2]

(b) Solve $4\sin x - 1 = 2$ for $0° \leqslant x \leqslant 360°$.

View solution

$x =$ ..... and $x =$ ..... [3]

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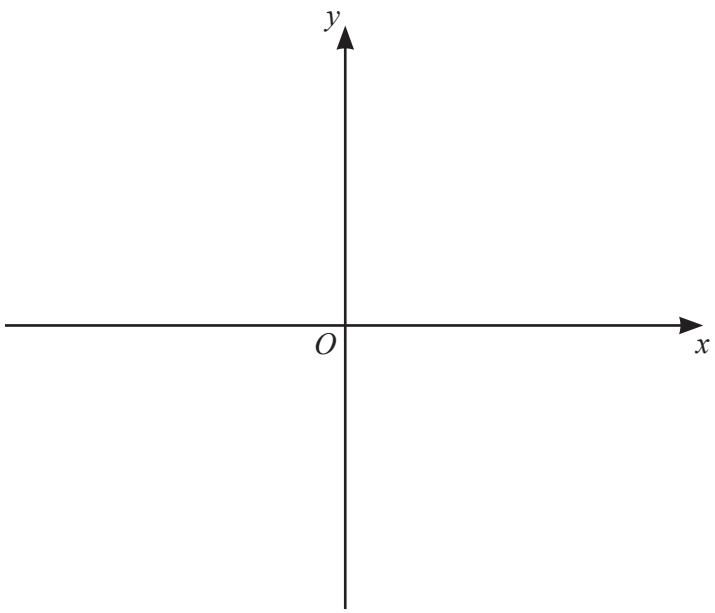
(c) **(i)** Write $x^2 + 10x + 14$ in the form $(x+a)^2 + b$.

View solution

..... [2]

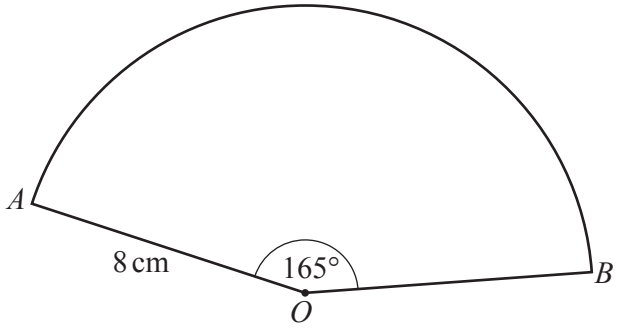
(ii) On the axes, sketch the graph of $y = x^2 + 10x + 14$, indicating the coordinates of the turning point.

View solution



[3]

9



NOT TO SCALE

The diagram shows a sector of a circle with centre O, radius 8 cm and sector angle 165°.

(a) Calculate the total perimeter of the sector.

View solution

..... cm [3]

(b) The surface area of a sphere is the same as the area of the sector.

View solution

Calculate the radius of the sphere.
[The surface area, A, of a sphere with radius r is $A = 4\pi r^2$.]

..... cm [4]

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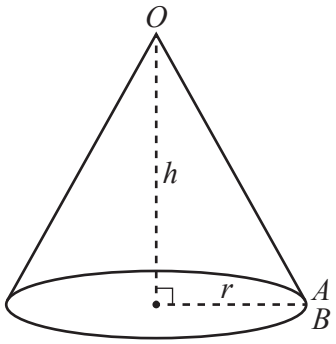
(c)

View solution



NOT TO SCALE

A cone is made from the sector by joining OA to OB.

(i) Calculate the radius, r, of the cone.

$r =$ ..... cm [2]

(ii) Calculate the volume of the cone.
[The volume, V, of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

View solution

..... cm^3 [4]

10 **(a)** A rhombus $ABCD$ has a diagonal AC where A is the point $(-3, 10)$ and C is the point $(4, -4)$.

View solution

(i) Calculate the length AC.

..... [3]

(ii) Show that the equation of the line AC is $y = -2x + 4$.

View solution

[2]

(iii) Find the equation of the line BD.

View solution

..... [4]

(b) A curve has the equation $y = x^3 + 8x^2 + 5x$.

View solution

(i) Work out the coordinates of the two turning points.

(..... , ...) and (..... , ...) [6]

(ii) Determine whether each of the turning points is a maximum or a minimum. Give reasons for your answers.

View solution

[3]

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