Cambridge Assessment International Education

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MATHEMATICS **0580/41**

Paper 4 (Extended) **May/June 2022**

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.

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1 **(a)** The list shows 15 midday temperatures, in degrees Celsius, in Suntown.

View solution

17 21 21 18 23 22 25 19

21 17 19 18 21 24 23

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

1	7
2	

Key: 1|7 represents 17 °C

[2]

(ii) Find the median.

View solution

..... °C [1]

(iii) Find the upper quartile.

View solution

..... °C [1]

(iv) Rahul draws a pie chart to show this information.

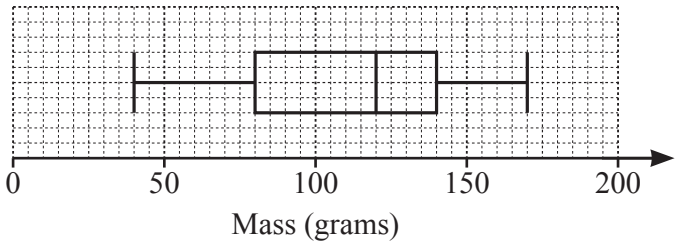
View solution

Calculate the sector angle for the number of days the temperature is 18 °C.

..... [2]

(b)

View solution



The box-and-whisker plot shows information about the masses, in grams, of some apples.

(i) Find the median.

..... g [1]

(ii) Find the range.

View solution

..... g [1]

(iii) Find the interquartile range.

View solution

..... g [1]

(c) (i) The time, t minutes, spent on homework in one week by each of 200 students is recorded. The table shows the results.

Time (t minutes)	$40 < t \leqslant 60$	$60 < t \leqslant 80$	$80 < t \leqslant 90$	$90 < t \leqslant 100$	$100 < t \leqslant 150$
Frequency	6	10	70	84	30

Calculate an estimate of the mean.

View solution

..... min [4]

(ii) A new table with different class intervals is completed.

View solution

Time (t minutes)	$40 < t \leqslant 90$	$90 < t \leqslant 150$
Frequency	86	114

On a histogram the height of the bar for the $40 < t \leqslant 90$ interval is 17.2 cm.

Calculate the height of the bar for the $90 < t \leqslant 150$ interval.

..... cm [2]

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2 **(a)** Alex, Bobbie and Chris share strawberries in the ratio Alex : Bobbie : Chris = 3 : 2 : 2.
Chris receives 12 strawberries.

View solution

Calculate the total number of strawberries shared.

..... [2]

(b) In a sale, a shop reduces all prices by 12%.

View solution

(i) Dina buys a book which has an original price of $6.50 .

Calculate how much Dina pays for the book.

$ ..... [2]

(ii) Elu pays $11 for a toy.

View solution

Calculate the original price of the toy.

$ ..... [2]

(c) Feri invests some money.
The rate of interest for the first year is 2.5%.
At the end of the second year the overall percentage increase of Feri's investment is 6.6%.

View solution

Find the rate of interest for the second year.

..... % [2]

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(d) A radioactive substance decays at an exponential rate of 2% per day.
The initial mass is 80 g.

View solution

(i) Find the mass at the end of 5 days.

..... g [2]

(ii) Find how many **more** whole days, after day 5, it takes for the mass to reduce to less than 67 g.

View solution

..... [3]

3 **(a)** Geeta buys x apples, $(x+7)$ oranges and $(2x-1)$ bananas.
The total number of pieces of fruit Geeta buys is 30.

View solution

(i) Find the number of apples Geeta buys.

..... [3]

(ii) The cost of one apple is 15 cents.
The cost of one orange is 18 cents.
The total cost of all the fruit is \$5.55 .

View solution

Find the cost, in cents, of one banana.

..... cents [3]

(b) **(i)** Solve.

View solution

$$\frac{3w}{16} - 1 = \frac{1}{2}$$

$w =$ ..... [2]

(ii)

View solution

$$\frac{3(2^{-y})}{16} - 1 = \frac{1}{2}$$

Find the value of y.

$y =$ ..... [2]

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(c) **(i)** Solve the simultaneous equations.

View solution

$$2p + q = 2$$
$$p - q = -\frac{1}{2}$$

$p =$ .....

$q =$ ..... [2]

(ii) Hence, for $0° \leqslant u \leqslant 360°$ and $0° \leqslant v \leqslant 360°$, solve the simultaneous equations.

View solution

$$2\sin u + \cos v = 2$$
$$\sin u - \cos v = -\frac{1}{2}$$

$u =$ ..... or $u =$ .....

$v =$ ..... or $v =$ ..... [4]

4 $f(x) = 2x - 1$ $g(x) = 3x - 2$ $h(x) = \frac{1}{x},\ x \neq 0$ $j(x) = 5^x$

View solution

(a) Find

(i) $f(2)$,

..... [1]

View solution

(ii) $gf(2)$.

..... [1]

(b) Find $g^{-1}(x)$.

View solution

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

(c) Find x when $h(x) = j(-2)$.

View solution

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

(d) Write $f(x) - h(x)$ as a single fraction.

View solution

..... [2]

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(e) Find the value of $\mathrm{jj}(2)$.

View solution

..... [1]

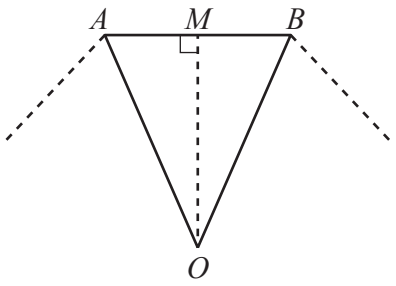
(f) Find x when $\mathrm{j}^{-1}(x) = 4$.

View solution

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

5 **(a)** *ABCDEFGH* is a regular octagon with sides of length 6 cm.
The diagram shows part of the octagon.
O is the centre of the octagon and *M* is the midpoint of *AB*.

View solution



NOT TO SCALE

(i) **(a)** Show that angle *OAM* is 67.5°.

[2]

(b) Calculate the area of the octagon.

..... cm^2 [4]

(ii) Find the area of the circle that passes through the vertices of the octagon.

View solution

..... cm^2 [3]

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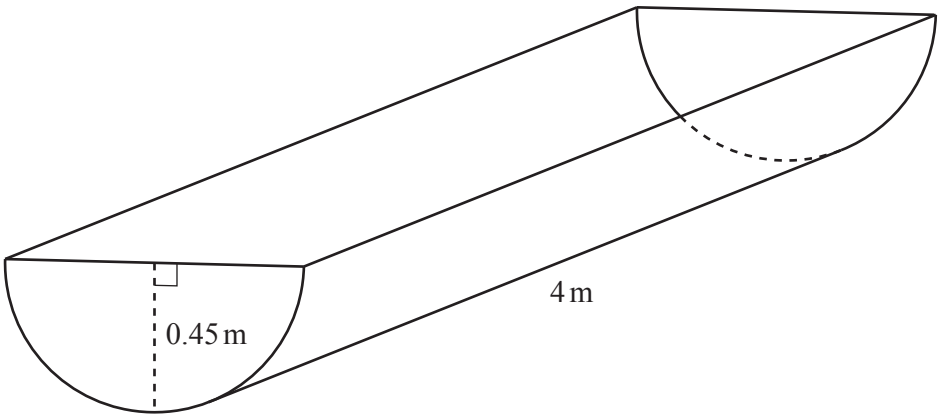
(b)



NOT TO SCALE

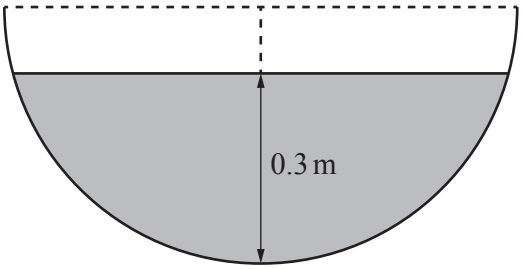
View solution

The diagram shows a horizontal container for water with a uniform cross-section.
The cross-section is a semicircle.
The radius of the semicircle is 0.45 m and the length of the container is 4 m.

(i) Calculate the volume of the container.

..... m^3 [2]

(ii)



NOT TO SCALE

View solution

The greatest depth of the water in the container is 0.3 m.
The diagram shows the cross-section.

Calculate the number of litres of water in the container.
Give your answer correct to the nearest integer.

..... litres [6]

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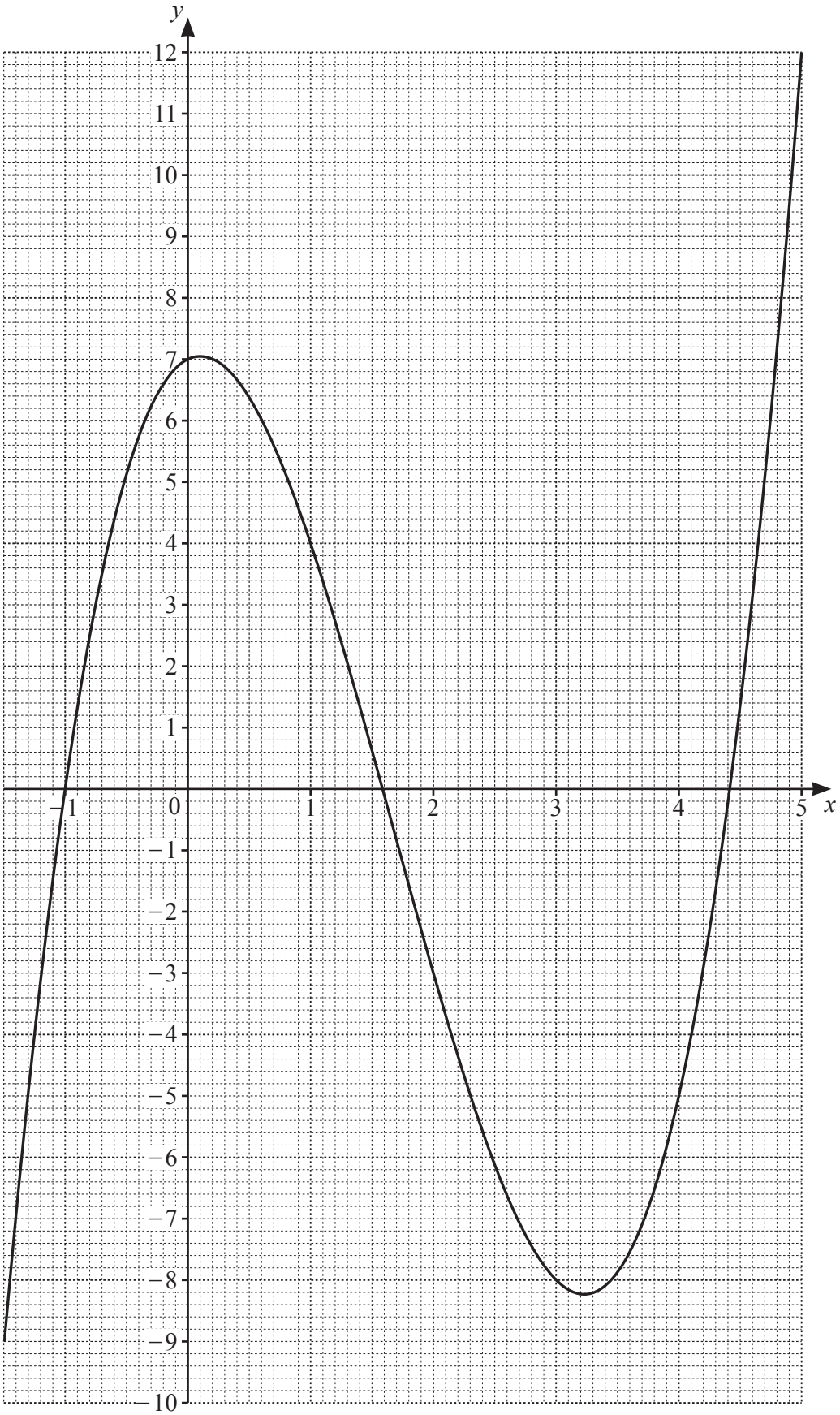
6 (a)

View solution



The diagram shows the graph of $y = f(x)$ for $-1.5 \leqslant x \leqslant 5$.

(i) Find $f(2)$.

..... [1]

(ii) Solve the equation $f(x) = 0$ for $-1.5 \leqslant x \leqslant 5$.

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

(iii) $f(x) = k$ has three solutions for $-1.5 \leqslant x \leqslant 5$ where k is an integer.

Find the smallest possible value of k.

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

(iv) On the grid, draw a line $y = mx$ so that $f(x) = mx$ has exactly one solution for $-1.5 \leqslant x \leqslant 5$. [2]

(b) $y = 3x^2 - 12x + 7$

View solution

(i) Find the value of $\frac{dy}{dx}$ when $x = 5$.

..... [3]

(ii) Find the coordinates of the point on the graph of $y = 3x^2 - 12x + 7$ where the gradient is 0.

View solution

(..... , ...) [2]

(c) When $y = 2x^p + qx^2$, $\frac{dy}{dx} = 14x^6 + 6x$.

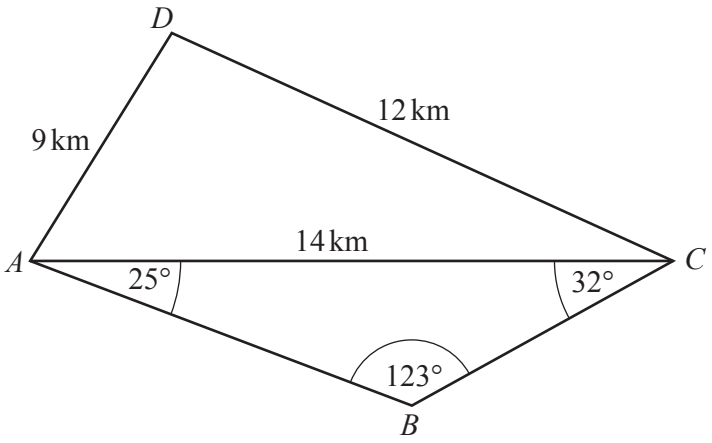
View solution

Find the value of p and the value of q.

$p =$ .....

$q =$ ..... [2]

7



NOT TO SCALE

(a) Calculate angle ACD.

View solution

Angle ACD = ... [4]

(b) Show that $BC = 7.05\,\text{km}$, correct to 2 decimal places.

View solution

[3]

(c) Calculate the shortest distance from B to AC.

View solution

..... km [3]

(d) Calculate the length of the straight line BD.

View solution

$BD =$ ..... km [4]

(e) C is due east of A.

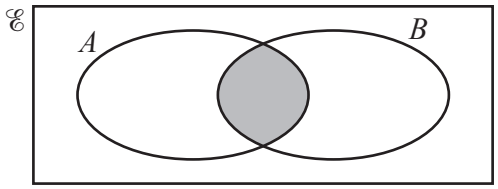
Find the bearing of D from C.

View solution

..... [2]

8 **(a)** **(i)** Use set notation to describe the shaded region in the Venn diagram.

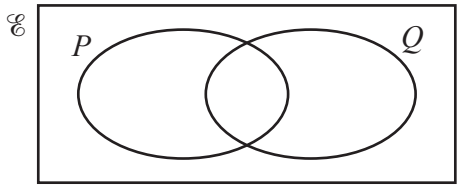
View solution



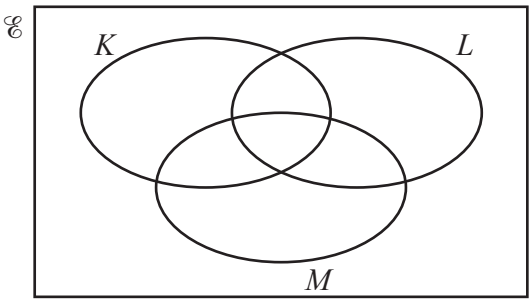
..... [1]

(ii) Shade the correct region in each Venn diagram.

View solution



$Q \cup P'$



$(K \cup L) \cap M'$

[2]

(b)

View solution

V	E	N	N	D	I	A	G	R	A	M

The diagram shows 11 cards.

(i) One of these cards is chosen at random.

Write down the probability that the letter on the card is **not** A.

..... [1]

(ii) A card is chosen at random from these 11 cards and then replaced.
A second card is then chosen at random.

View solution

Find the probability that exactly one card has the letter N.

..... [3]

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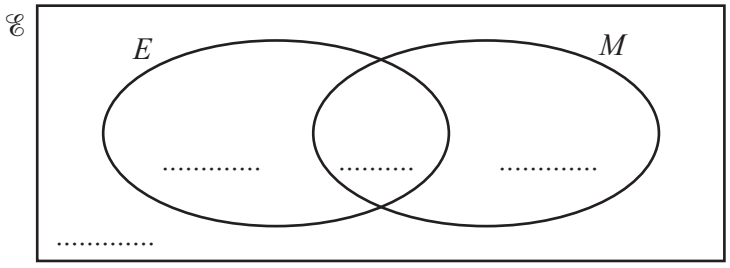
(c)



50 students are asked if they like English (E) and if they like mathematics (M).
3 say they do not like English and do not like mathematics.
33 say they like English.
42 say they like mathematics.

(i) Complete the Venn diagram. [2]

(ii) A student is chosen at random.

Find the probability that this student likes English and likes mathematics.

..... [1]

(iii) Two students are chosen at random.

Find the probability that they both like mathematics.

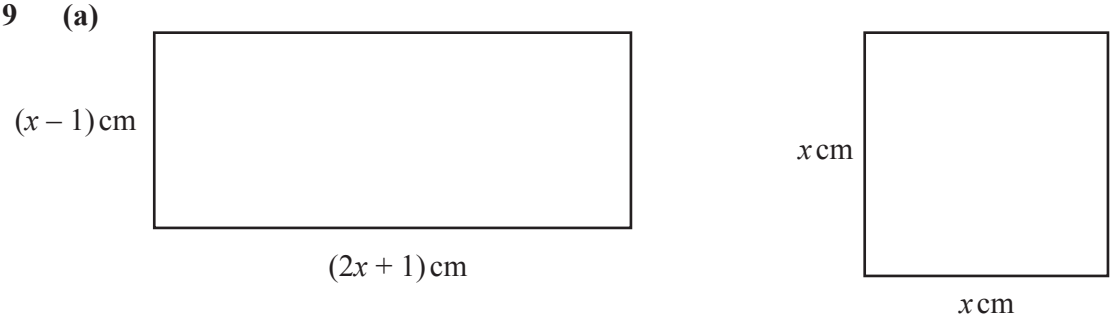
..... [2]

(iv) Two students who like English are chosen at random.

Find the probability that they both also like mathematics.

..... [2]

9 (a)



View solution

NOT TO SCALE

The area of the rectangle is $29\,cm^2$ greater than the area of the square.
The difference between the perimeters of the two shapes is k cm.

Find the value of k.
You must show all your working.

$k =$ ..... [6]

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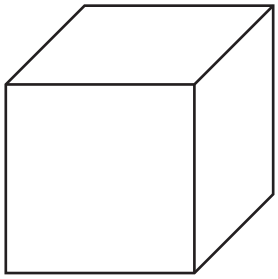
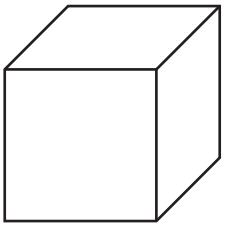
(b)



$(y + 1)$ cm



y cm

NOT TO SCALE

The volume of the larger cube is $5\,\text{cm}^3$ greater than the volume of the smaller cube.

(i) Show that $3y^2 + 3y - 4 = 0$.

[4]

(ii) Find the volume of the smaller cube.
Show all your working and give your answer correct to 2 decimal places.

..... cm^3 [4]

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