Cambridge Assessment International Education

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MATHEMATICS **0580/43**

Paper 4 (Extended) **October/November 2021**

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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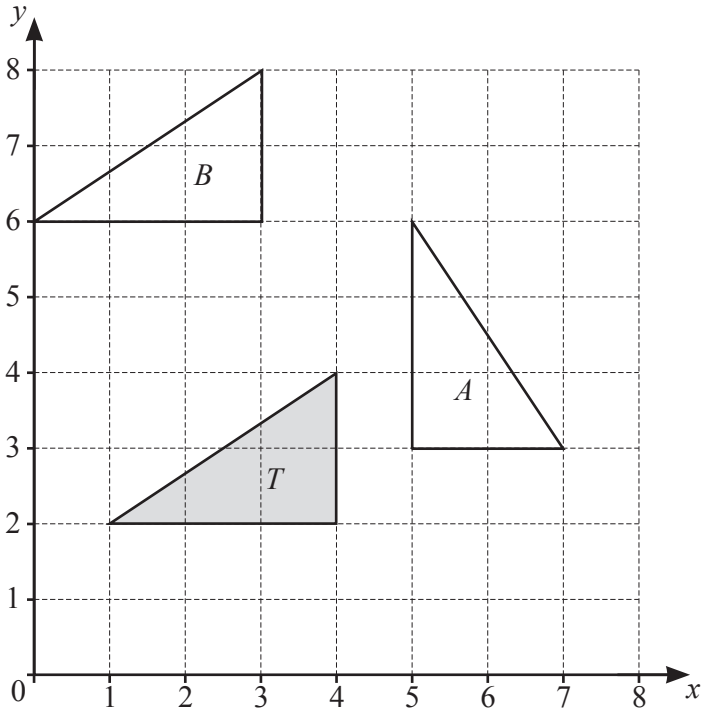
1 The diagram shows three triangles, T, A, and B, drawn on a 1 cm^2 grid.



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

View solution

.....

..... [3]

(b) **(i)** Describe fully the **single** transformation that maps triangle T onto triangle B.

View solution

.....

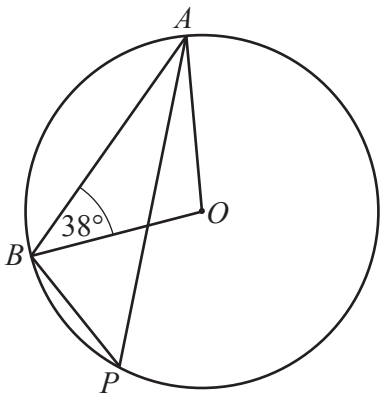
..... [2]

(ii) Calculate the distance that each point of triangle T moves when it is mapped onto triangle B.

View solution

..... cm [2]

2 **(a)**



NOT TO SCALE

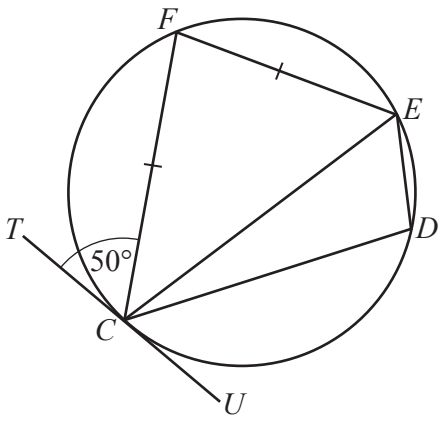
View solution

A, B and P are points on a circle, centre O and angle $OBA = 38°$.

Find angle APB.

Angle APB = ... [3]

(b)



NOT TO SCALE

View solution

$CDEF$ is a cyclic quadrilateral and $FC = FE$.
TU is a tangent to the circle at C and angle $TCF = 50°$.

Find

(i) angle EFC,

Angle EFC = ... [2]

(ii) angle CDE.

View solution

Angle CDE = ... [1]

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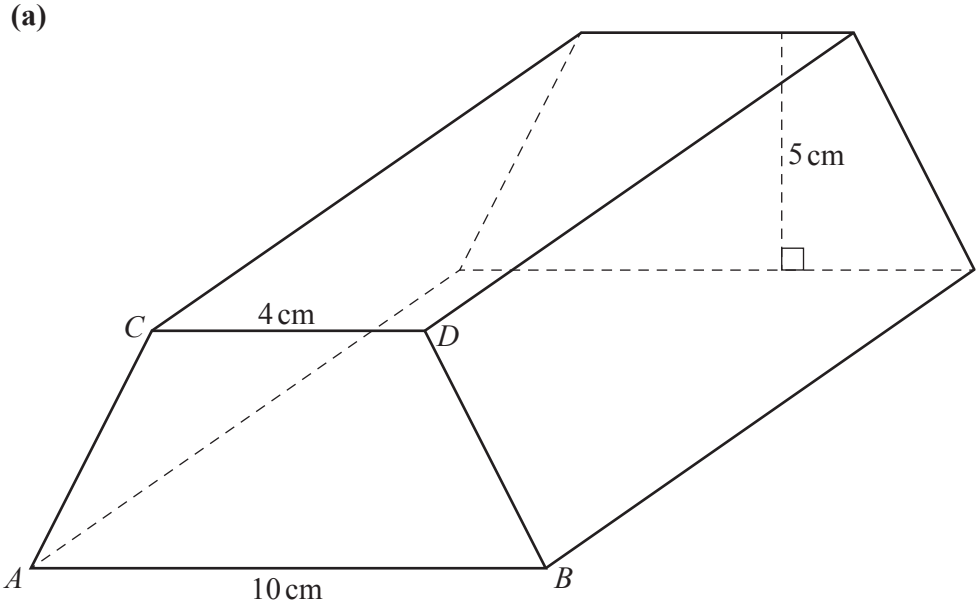
3 (a)



NOT TO SCALE

The diagram shows a prism.
The cross-section of the prism is a trapezium with CD parallel to AB and $AC = BD$.

$AB = 10$ cm, $CD = 4$ cm and the height of the trapezium is 5 cm.
The volume of the prism is 525 cm^3.

(i) The prism is made of iron.
1 cm^3 of iron has a mass of 7.8 g.

Calculate the mass of the prism.
Give your answer in kilograms.

..... kg [2]

(ii) Calculate the length of the prism.

..... cm [3]

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(iii) Calculate the total surface area of the prism.

View solution

..... cm^2 [6]

(iv) In a mathematically similar prism, the height of the trapezium is 10 cm.

View solution

Calculate the volume of this prism.

..... cm^3 [3]

(b) A cuboid measures 10 cm by 4 cm by 6 cm.
Each side is measured correct to the nearest centimetre.

View solution

Complete the inequality for the volume, V, of this cuboid.

..... $cm^3 \leqslant V <$ ..... cm^3 [3]

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4 **(a)** Solve the simultaneous equations.
You must show all your working.

View solution

$$2p - q = 7$$
$$3p + 2q = 7$$

$p =$ .....

$q =$ ..... [3]

(b) Solve the equation.

View solution

$$\frac{x}{4} + \frac{2x}{3} = 1$$

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

(c) $-8 < 3x - 2 \leqslant 7$

View solution

(i) Solve the inequality.

..... [3]

(ii) Find the integer values of x that satisfy the inequality.

View solution

..... [1]

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(d) Factorise completely.

View solution

$16a - 4a^2$

..... [2]

(e) Write each of the following as a single fraction, in its simplest form.

View solution

(i) $\frac{1}{2a} \div \frac{3}{4b}$

..... [2]

(ii) $2 - \frac{x}{x-1}$

View solution

..... [2]

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5 **(a)** $500 is invested at a rate of 3% per year.

View solution

Calculate the total interest earned at the end of 7 years when

(i) simple interest is paid,

$ ..... [2]

(ii) compound interest is paid.

View solution

$ ..... [3]

(b) The value of a car decreases exponentially by 10% each year.
The value now is $6269.40 .

View solution

Calculate the value of the car 3 years ago.

$ ..... [3]

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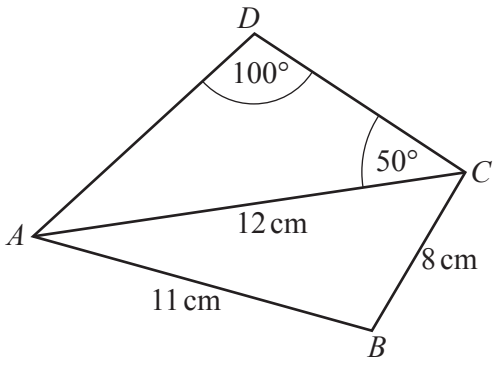
6



NOT TO SCALE

(a) Calculate AD.

View solution

$AD =$ ..... cm [3]

(b) Calculate angle BAC and show that it rounds to 40.42°, correct to 2 decimal places.

View solution

[4]

(c) Calculate the area of the quadrilateral $ABCD$.

View solution

..... cm^2 [3]

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

View solution

..... cm [3]

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7 **(a)** Amir buys 3 cakes that cost c cents each and 2 loaves of bread that cost $(2c - 11)$ cents each. He spends a total of \$5.87 .

View solution

Find the value of c.

$c =$ ..... [3]

(b) A bottle of water costs \$$w$.
A bottle of juice costs \$$(w + 1)$.

View solution

Alex spends \$22 on bottles of water and \$42 on bottles of juice.
The number of bottles of water is equal to the number of bottles of juice.

Find the value of w.

$w =$ ..... [3]

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(c) Alicia walks a distance of 9 km at a speed of x km/h.
She then runs a distance of 5 km at a speed of $(2x + 1)$ km/h.

View solution

The total time Alicia takes is 2.5 hours.

(i) Show that $10x^2 - 41x - 18 = 0$.

[4]

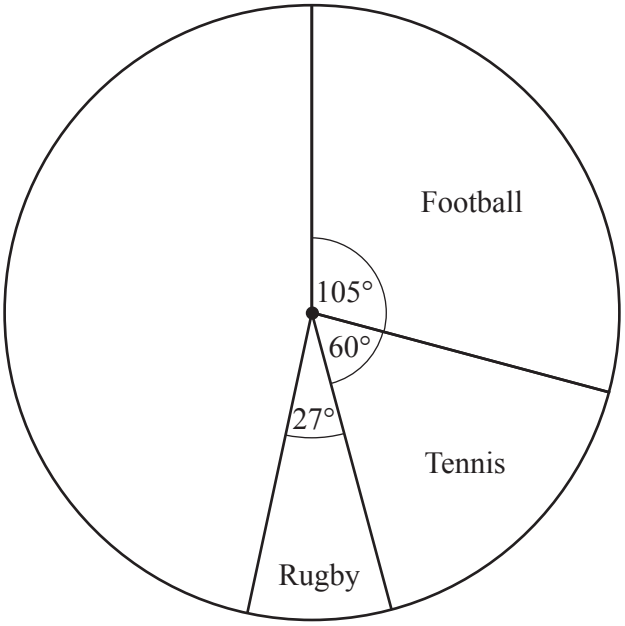
(ii) Work out Alicia's running speed.
You must show all your working.

View solution

..... km/h [4]

8 **(a)** Jean asks 600 people to choose their favourite sport.
The pie chart shows some of this information.

View solution



(i) Show that 100 people choose tennis.

[1]

(ii) Work out how many people choose rugby.

View solution

..... [2]

(iii) 125 people choose cricket and the rest choose swimming.

Complete the pie chart to show this information.

View solution

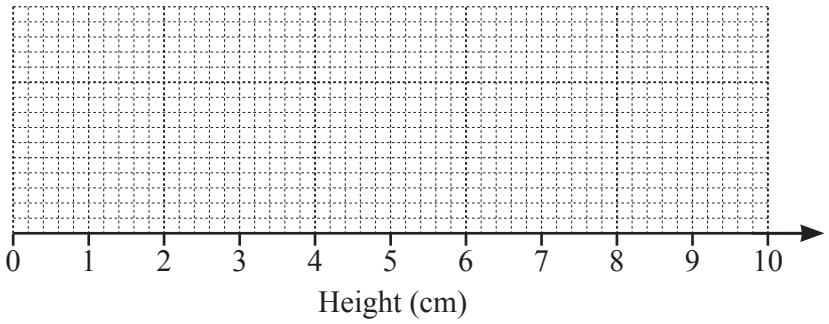
[2]

(b) The heights of some plants are measured:

View solution

- smallest height = 0.6 cm
- range = 8.1 cm
- median = 5.2 cm
- lower quartile = 3.4 cm
- interquartile range = 4.1 cm.

On the grid, draw a box-and-whisker plot to show this information.



[3]

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(c) A dice is rolled 100 times.
The frequency table shows the results.

View solution

Score	1	2	3	4	5	6
Frequency	16	25	17	19	8	15

Find

(i) the range,

..... [1]

(ii) the mode,

View solution

..... [1]

(iii) the median.

View solution

..... [1]

(d) 50 students answer a mathematics question.
The table shows the time, t seconds, taken by each student to answer the question.

View solution

Time (t seconds)	$10 < t \leqslant 20$	$20 < t \leqslant 25$	$25 < t \leqslant 30$	$30 < t \leqslant 50$	$50 < t \leqslant 80$
Frequency	2	8	12	16	12

Calculate an estimate of the mean.

..... s [4]

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9 $f(x) = x(x-1)(x-2)$

(a) Find the coordinates of the points where the graph of $y = f(x)$ crosses the x-axis.

View solution

(..... , ...)

(..... , ...)

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

(b) Show that $f(x) = x^3 - 3x^2 + 2x$.

View solution

[2]

(c) Find the coordinates of the turning points of the graph of $y = f(x)$.
Show all your working and give your answers correct to 1 decimal place.

View solution

(..... , ...)

(..... , ...) [8]

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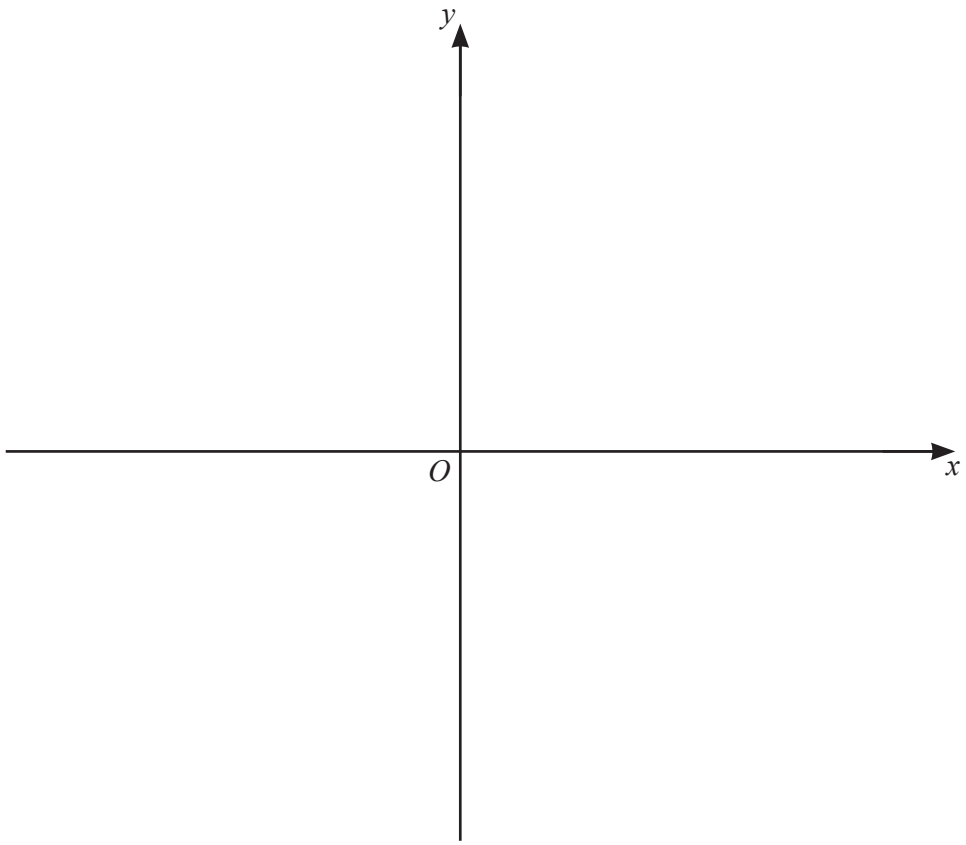
(d) Sketch the graph of $y = f(x)$.

View solution



[2]

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10 (a) Sarah spins a fair four-sided spinner numbered 0, 1, 1 and 3.

View solution

(i) What number is the spinner most likely to land on?

..... [1]

(ii) Sarah spins the spinner twice.

View solution

Find the probability that it lands on the number 1 both times.

..... [2]

(iii) Sarah spins the spinner until it lands on the number 3.

View solution

The probability that this happens on the nth spin is $\frac{729}{16384}$.

Find the value of n.

$n =$ ..... [2]

(b) Scott takes an examination.
The examination is in two parts, a theory test and a practical test.
Both parts must be passed to pass the examination.

View solution

The probability that Scott passes the theory test is 0.9 .
The probability that Scott passes the practical test is 0.8 .

Find the probability that

(i) Scott passes the examination,

..... [2]

(ii) Scott passes the theory test or the practical test but not both.

View solution

..... [3]

11 $f(x) = 2x - 1$ $g(x) = x^2 + 2x$ $h(x) = 4^x$ $j(x) = 2^x$

View solution

(a) Find the value of

(i) h(3),

..... [1]

(ii) fh(3).

View solution

..... [1]

(b) Solve the equation $gf(x) = 0$.

View solution

$x =$ ..... or $x =$ ..... [4]

(c) $p^{-1}(x) = f(x)$

View solution

Find $p(x)$.

..... [2]

(d) $\mathrm{h}(x)\mathrm{j}(x) = \dfrac{1}{\sqrt{2}}$

Find the value of x.

View solution

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

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