Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTER NUMBER						CANDIDATE NUMBER				

3401194594

MATHEMATICS (US) **0444/43**

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, center 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 work 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 parentheses [ ].

This document has **20** pages.

DC (RW/JG) 211592/4

Formula List

For the equation $ax^2 + bx + c = 0$ $\quad x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Lateral surface area, A, of cylinder of radius r, height h. $\quad A = 2\pi rh$

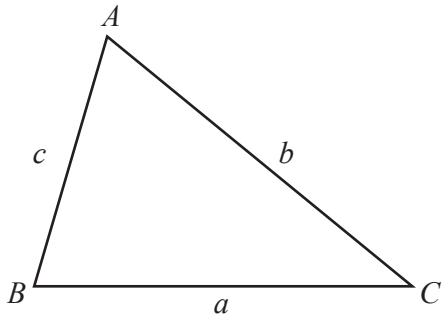
Lateral surface area, A, of cone of radius r, sloping edge l. $\quad A = \pi rl$

Surface area, A, of sphere of radius r. $\quad A = 4\pi r^2$

Volume, V, of pyramid, base area A, height h. $\quad V = \frac{1}{3}Ah$

Volume, V, of cone of radius r, height h. $\quad V = \frac{1}{3}\pi r^2 h$

Volume, V, of sphere of radius r. $\quad V = \frac{4}{3}\pi r^3$

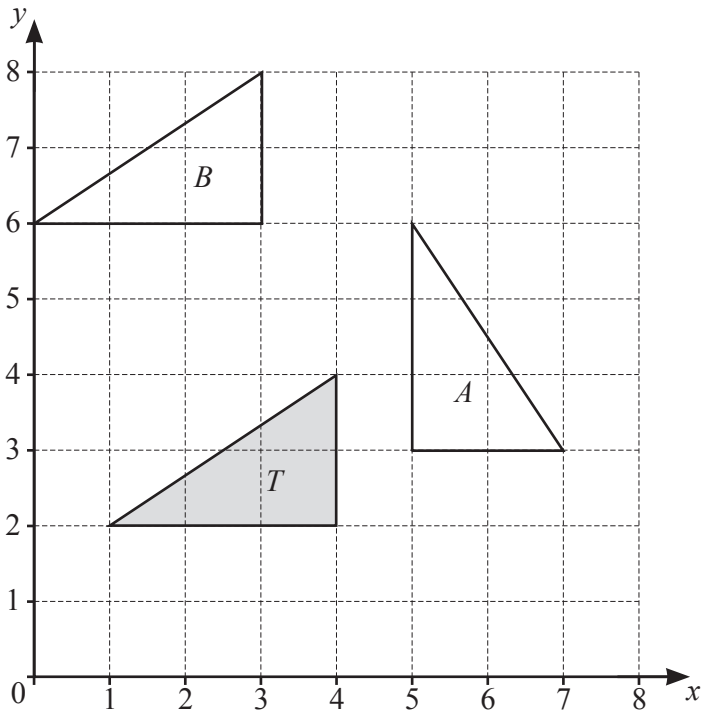


$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$\text{Area} = \frac{1}{2}bc\sin A$$

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.

.....

..... [3]

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

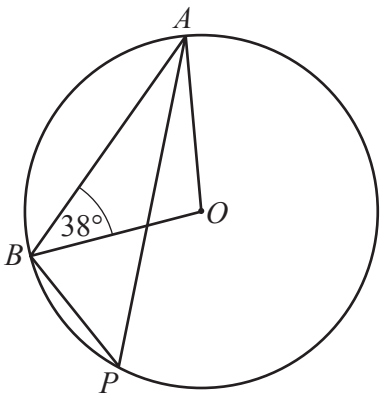
.....

..... [2]

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

..... cm [2]

2 **(a)**



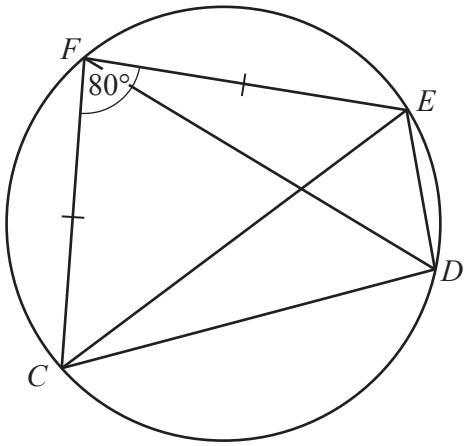
NOT TO SCALE

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

Find angle APB.

Angle APB = ... [3]

(b)



NOT TO SCALE

$CDEF$ is a cyclic quadrilateral and $FC = FE$.
Angle $CFE = 80°$.

Find

(i) angle CDE,

Angle CDE = ... [1]

(ii) angle CDF.

Angle CDF = ... [2]

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

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

(i) simple interest is paid,

$ ..... [2]

(ii) compound interest is paid.

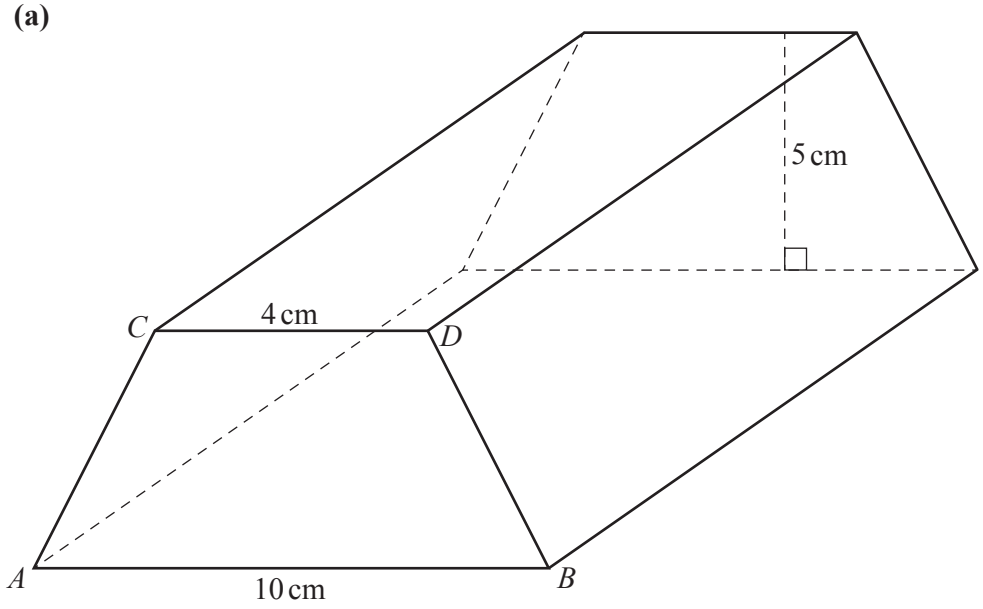
$ ..... [3]

(b) Each year the value of a car decreases by 10% of its value at the beginning of the year.
The value now is $6269.40 .

Calculate the value of the car 3 years ago.

$ ..... [3]

4 (a)



NOT TO SCALE

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

$AB = 10$ cm, $CD = 4$ cm and the height of the trapezoid 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]

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

..... cm^2 [6]

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

Calculate the volume of this prism.

..... cm^3 [3]

(b) A new town is built with a boundary that is a circle of radius R miles.
The population of the town is 50 000.
The population density is 3500 persons per square mile.

Calculate the value of R.

$R =$ ..... [3]

5 **(a)** Solve the system of linear equations.
You must show all your work.

$$5p - 3q = 18$$
$$3p + 2q = 7$$

$p =$ .....

$q =$ ..... [4]

(b) Solve the equation.

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

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

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

(i) Solve the inequality.

..... [3]

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

..... [1]

(d) Factorize completely.

$$16a - 4a^2$$

..... [2]

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

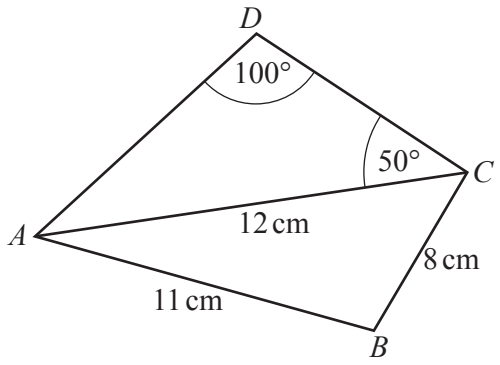
(i) $\frac{1}{2a} \div \frac{3}{4b}$

..... [2]

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

..... [2]

6



NOT TO SCALE

(a) Calculate AD.

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

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

[4]

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

..... cm^2 [3]

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

..... cm [3]

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 .

Find the value of c.

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

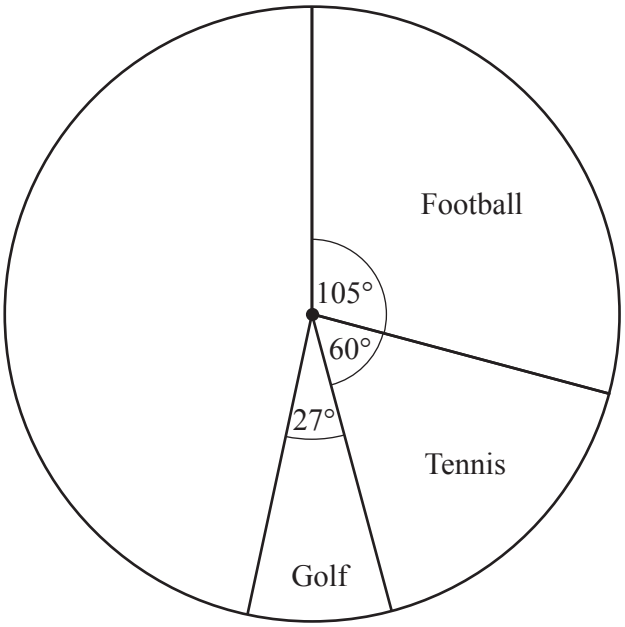
(b) A bottle of water costs \$$w$.
A bottle of juice costs \$$(w + 1)$.

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]

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



(i) Show that 100 people choose tennis.

[1]

(ii) Work out how many people choose golf.

..... [2]

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

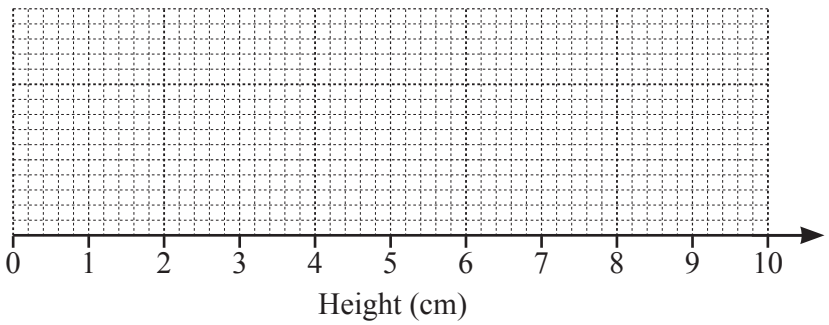
Complete the pie chart to show this information.

[2]

(b) The heights of some plants are measured:

- 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]

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

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

Find

(i) the range,

..... [1]

(ii) the mode,

..... [1]

(iii) the median.

..... [1]

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

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.

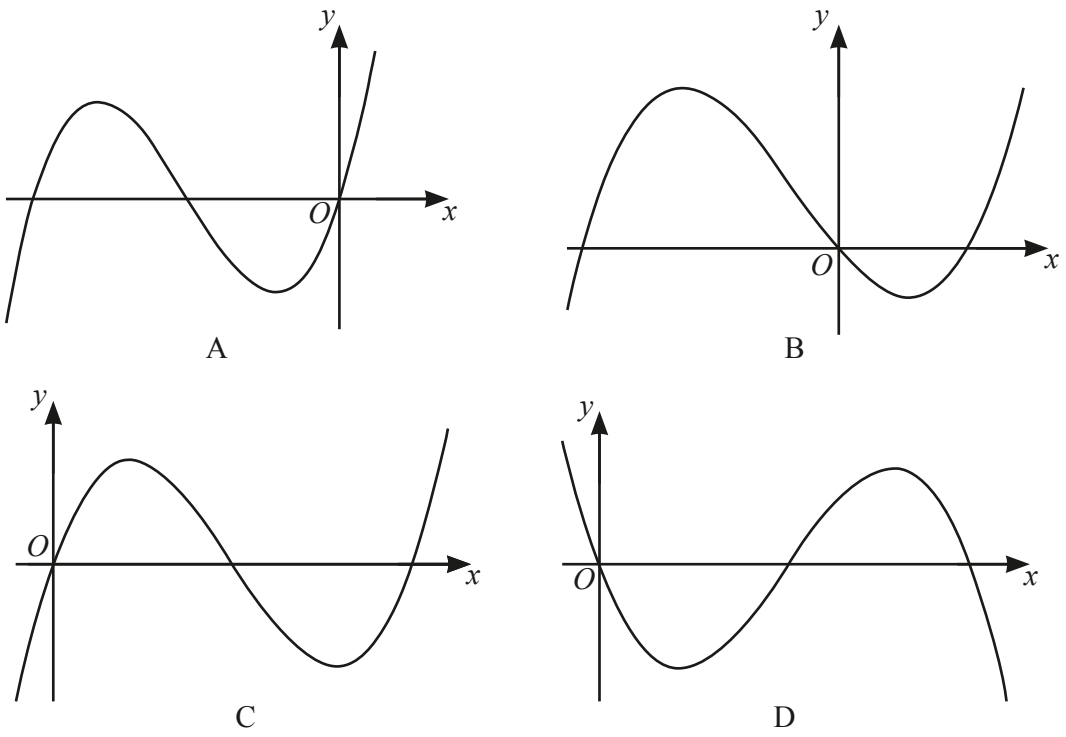
..... s [4]

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

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

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

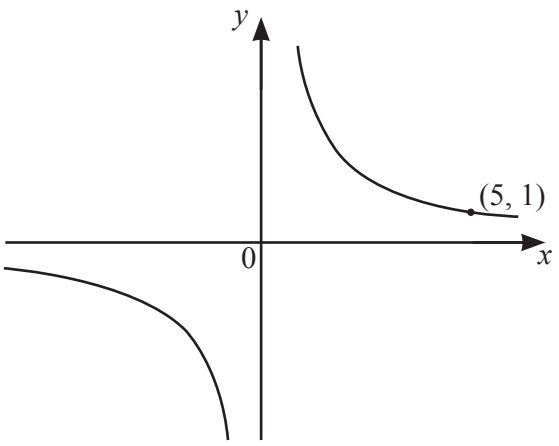
(ii)



Which of the sketches shows the graph of $y = f(x)$?

..... [1]

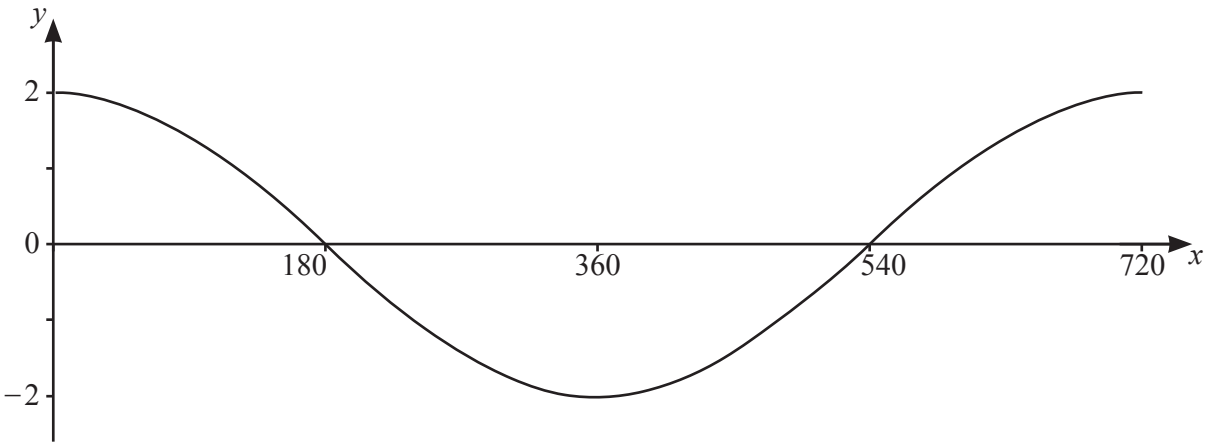
(b) The diagram shows a sketch of the graph of $y = g(x)$.



Find $g(x)$.

$g(x) =$ ..... [2]

(c)



The graph shows the function $\mathrm{h}(x) = a\cos(bx)$ for $0° \leqslant x \leqslant 720°$.

(i) Complete the range of $\mathrm{h}(x)$.

..... $\leqslant \mathrm{h}(x) \leqslant$ ..... [1]

(ii) Find the value of a and the value of b.

$a =$ .....

$b =$ ..... [2]

(d) Describe fully the **single** transformation that maps the graph of $y = \mathrm{j}(x)$ onto the graph of

(i) $y = \mathrm{j}(x-5)$,

.....

..... [2]

(ii) $y = 5\,\mathrm{j}(x)$.

.....

..... [3]

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

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

..... [1]

(ii) Sarah spins the spinner twice.

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.

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.

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.

..... [3]

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

(a) Find the value of

(i) h(3),

..... [1]

(ii) f(h(3)).

..... [1]

(b) Solve the equation $g(f(x)) = 0$.

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

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

Find $p(x)$.

..... [2]

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

Find the value of x.

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

Question 12 is printed on the next page.

12 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.

The total time Alicia takes is 2.5 hours.

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

[4]

(b) Work out Alicia's running speed.
You must show all your work.

..... km/h [4]