



# Cambridge IGCSE™

CANDIDATE  
NAME

CENTER  
NUMBER

--	--	--	--	--

CANDIDATE  
NUMBER

--	--	--	--



**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  $\pi$ , 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.

## Formula List

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

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

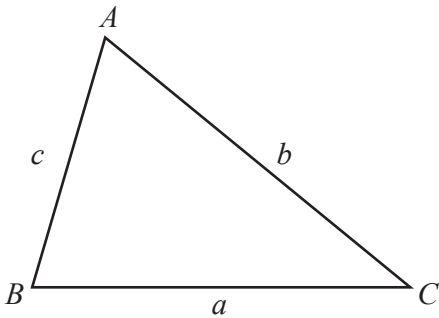
Lateral surface area,  $A$ , of cone of radius  $r$ , sloping edge  $l$ .  $A = \pi rl$

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

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

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

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

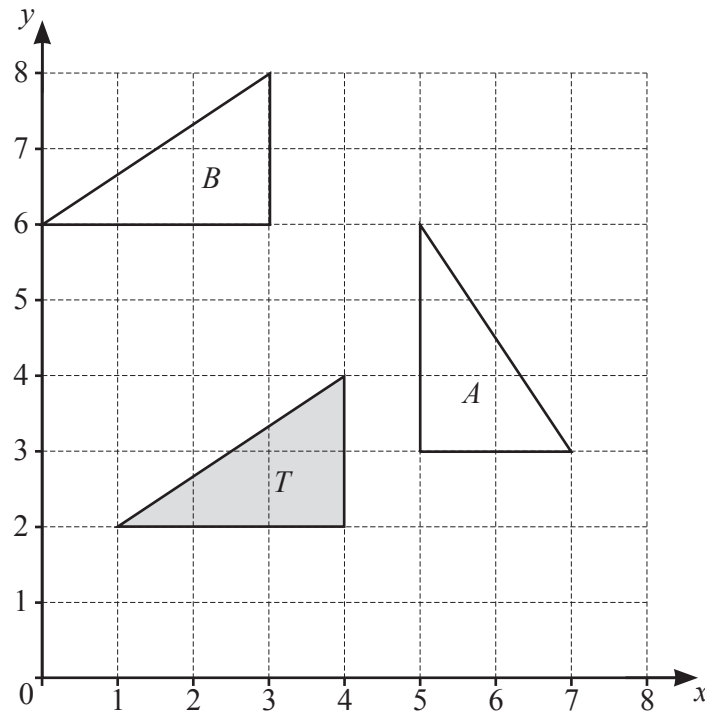


$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

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

1 The diagram shows three triangles,  $T$ ,  $A$ , and  $B$ , drawn on a  $1 \text{ cm}^2$  grid.



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

.....  
 ..... [3]

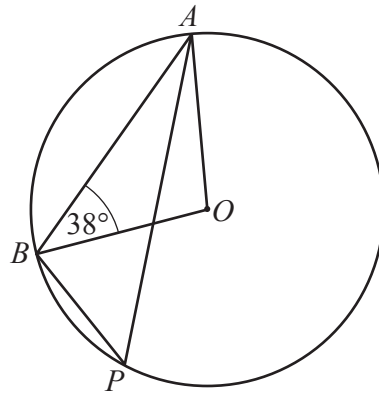
(b) (i) Describe fully the **single** transformation that maps triangle  $T$  onto triangle  $B$ .

.....  
 ..... [2]

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

..... cm [2]

2 (a)



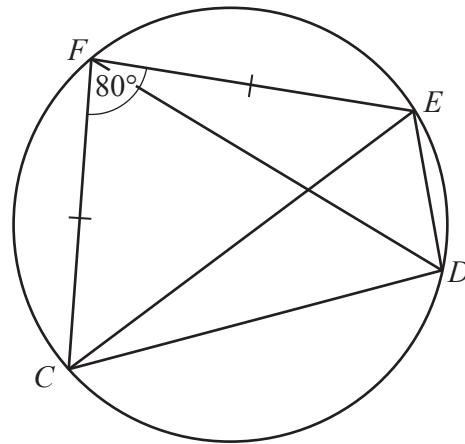
NOT TO SCALE

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

Find angle  $APB$ .

Angle  $APB = \dots\dots\dots$  [3]

(b)



NOT TO SCALE

$CDEF$  is a cyclic quadrilateral and  $FC = FE$ .  
Angle  $CFE = 80^\circ$ .

Find

(i) angle  $CDE$ ,

Angle  $CDE = \dots\dots\dots$  [1]

(ii) angle  $CDF$ .

Angle  $CDF = \dots\dots\dots$  [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.

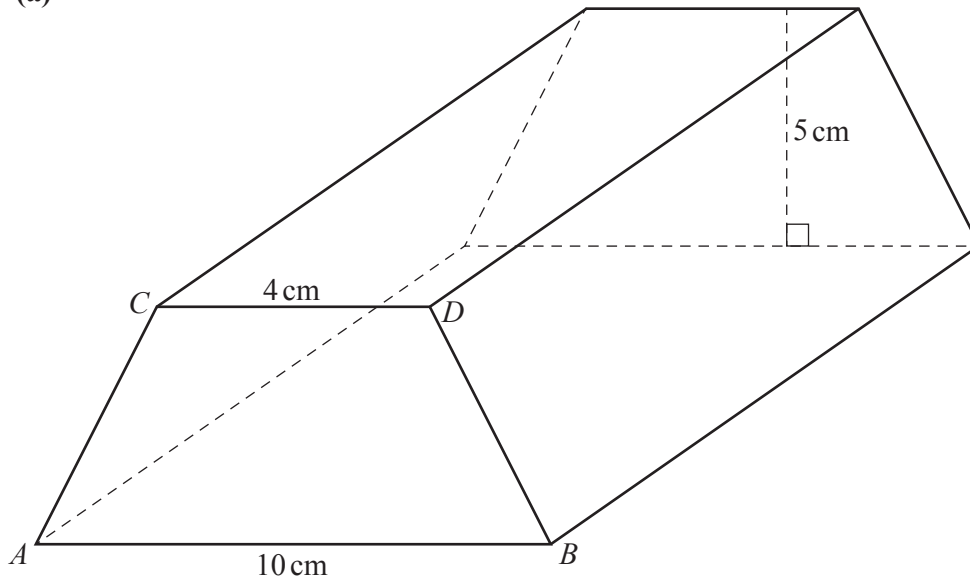
\$ ..... [3]

(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<sup>3</sup>.

- (i) The prism is made of iron.  
1 cm<sup>3</sup> 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.

.....  $\text{cm}^2$  [6]

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

Calculate the volume of this prism.

.....  $\text{cm}^3$  [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.

$$5p - 3q = 18$$

$$3p + 2q = 7$$

$$p = \dots\dots\dots$$

$$q = \dots\dots\dots [4]$$

- (b) Solve the equation.

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

$$x = \dots\dots\dots [2]$$

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

- (i) Solve the inequality.

$$\dots\dots\dots [3]$$

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

$$\dots\dots\dots [1]$$



(d) Factorize completely.

$$16a - 4a^2$$

..... [2]

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

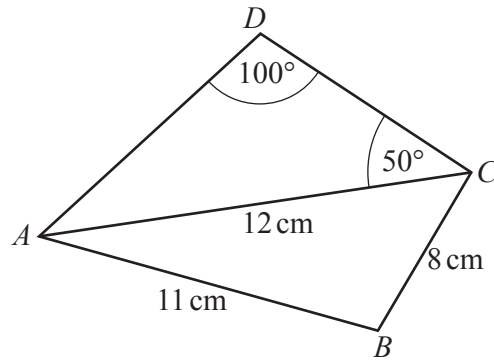
(i)  $\frac{1}{2a} \div \frac{3}{4b}$

..... [2]

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

..... [2]

6



NOT TO SCALE

(a) Calculate  $AD$ .

$AD = \dots\dots\dots$  cm [3]

(b) Calculate angle  $BAC$  and show that it rounds to  $40.42^\circ$ , correct to 2 decimal places.

[4]

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

$\dots\dots\dots$   $\text{cm}^2$  [3]

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

$\dots\dots\dots$  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  $c$ .

$$c = \dots\dots\dots [3]$$

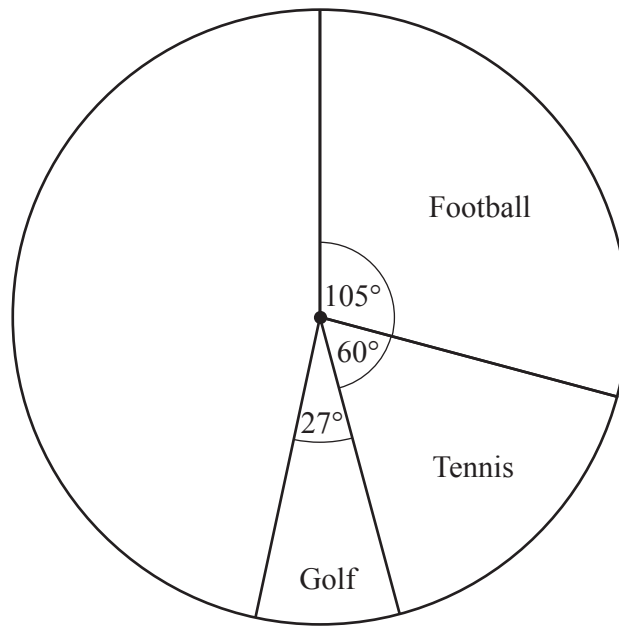
- (b) A bottle of water costs \$ $w$ .  
A bottle of juice costs \$ $(w + 1)$ .

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  $w$ .

$$w = \dots\dots\dots [3]$$

- 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.

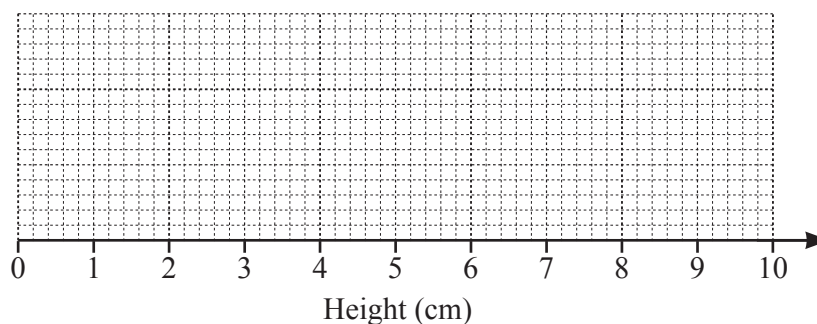
Complete the pie chart to show this information.

[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)	$10 < t \leq 20$	$20 < t \leq 25$	$25 < t \leq 30$	$30 < t \leq 50$	$50 < t \leq 80$
Frequency	2	8	12	16	12

Calculate an estimate of the mean.

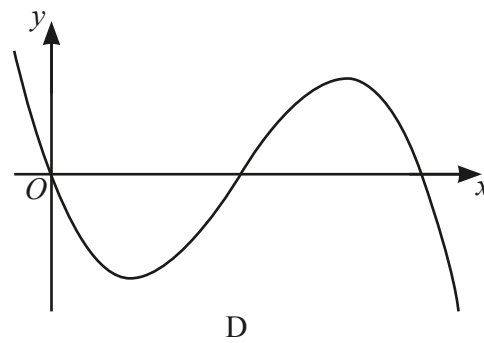
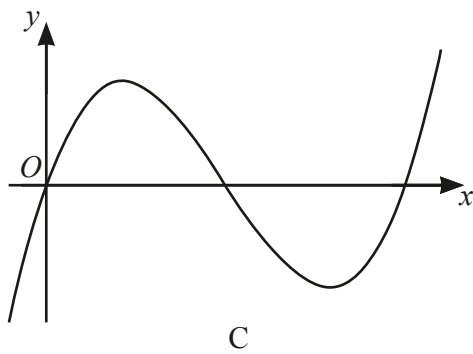
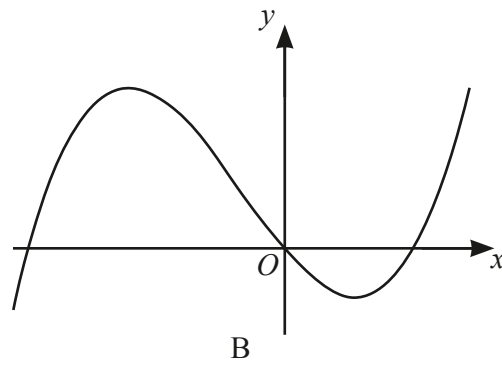
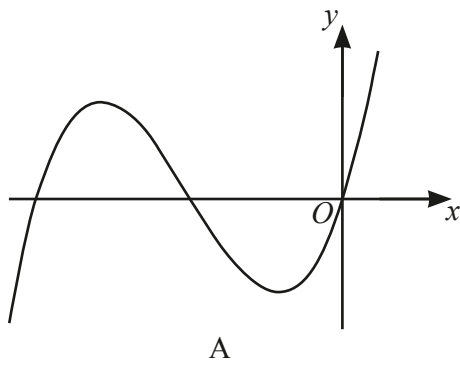
..... s [4]

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]

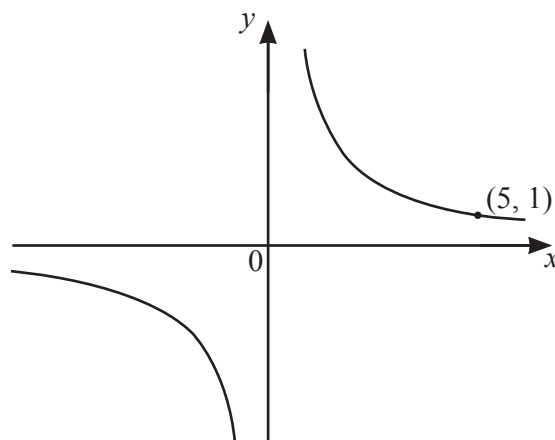
(ii)



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

..... [1]

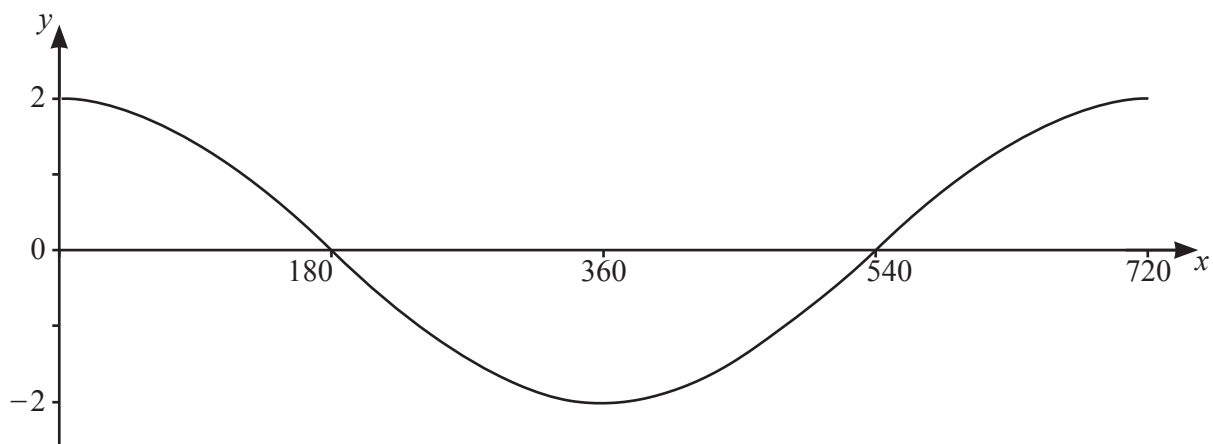
(b) The diagram shows a sketch of the graph of  $y = g(x)$ .



Find  $g(x)$ .

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

(c)



The graph shows the function  $h(x) = a \cos(bx)$  for  $0^\circ \leq x \leq 720^\circ$ .

(i) Complete the range of  $h(x)$ .

.....  $\leq h(x) \leq$  ..... [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  $y = j(x)$  onto the graph of

(i)  $y = j(x - 5)$ ,

.....  
 ..... [2]

(ii)  $y = 5j(x)$ .

.....  
 ..... [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  $n$ th 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  $g(f(x)) = 0$ .

$x = \dots\dots\dots$  or  $x = \dots\dots\dots$  [4]

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

Find  $p(x)$ .

..... [2]

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

Find the value of  $x$ .

$x = \dots\dots\dots$  [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]

---

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at [www.cambridgeinternational.org](http://www.cambridgeinternational.org) after the live examination series.

Cambridge Assessment International Education is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which itself is a department of the University of Cambridge.