



# Cambridge IGCSE™

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**MATHEMATICS**

**0580/42**

Paper 4 (Extended)

**February/March 2024**

**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  $\pi$ , 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 brackets [ ].

This document has **20** pages. Any blank pages are indicated.

1 A grocer sells potatoes, mushrooms and carrots.

(a) A customer buys 3 kg of mushrooms at \$1.04 per kg and 4 kg of carrots at \$1.28 per kg.

Calculate the total cost.

\$ ..... [2]

(b) In one week, the ratio of the masses of vegetables sold by the grocer is

potatoes : mushrooms : carrots = 11 : 8 : 6.

(i) Work out the mass of mushrooms sold as a percentage of the total mass.

..... % [2]

(ii) The total mass of potatoes, mushrooms and carrots sold is 1500 kg.

Find the mass of carrots the grocer sells this week.

..... kg [2]

(iii) The profit the grocer makes selling 1 kg of carrots is \$0.75 .

Find the total profit the grocer makes selling carrots this week.

\$ ..... [1]

- (iv) On the last day of the week, the grocer reduces the price of 1 kg of potatoes by 8% to \$1.15 .

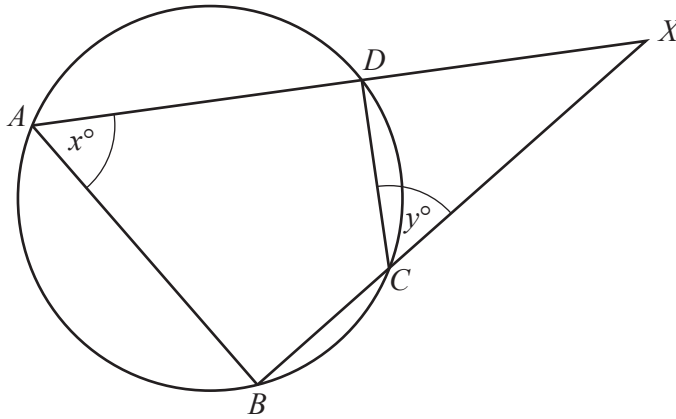
Calculate the original price of 1 kg of potatoes.

\$ ..... [2]

- (c) The grocer buys 620 kg of onions, correct to the nearest 20 kg.  
He packs them into bags each containing 5 kg of onions, correct to the nearest 1 kg.

Calculate the upper bound for the number of bags of onions that he packs.

..... [3]



NOT TO  
SCALE

$A$ ,  $B$ ,  $C$  and  $D$  are points on a circle.  
 $ADX$  and  $BCX$  are straight lines.  
 Angle  $BAD = x^\circ$  and angle  $DCX = y^\circ$ .

- (a) Explain why  $x = y$ .  
 Give a geometrical reason for each statement you make.

[2]

- (b) Show that triangle  $ABX$  is similar to triangle  $CDX$ .

[2]

(c)  $AD = 15$  cm,  $DX = 9$  cm and  $CX = 12$  cm.

(i) Find  $BC$ .

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

(ii) Complete the statement.

The ratio area of triangle  $ABX$  : area of triangle  $CDX = \dots\dots\dots : 1$ . [1]

- 3 (a) The table shows information about the marks gained by each of 10 students in a test.

Mark	15	16	17	18	19	20
Frequency	4	1	2	1	0	2

- (i) Calculate the range.

..... [1]

- (ii) Calculate the mean.

..... [3]

- (iii) Find the median.

..... [1]

- (iv) Write down the mode.

..... [1]

- (b) Paulo's mean mark for 7 homework tasks is 17.  
After completing the 8th task, his mean mark is 17.5 .

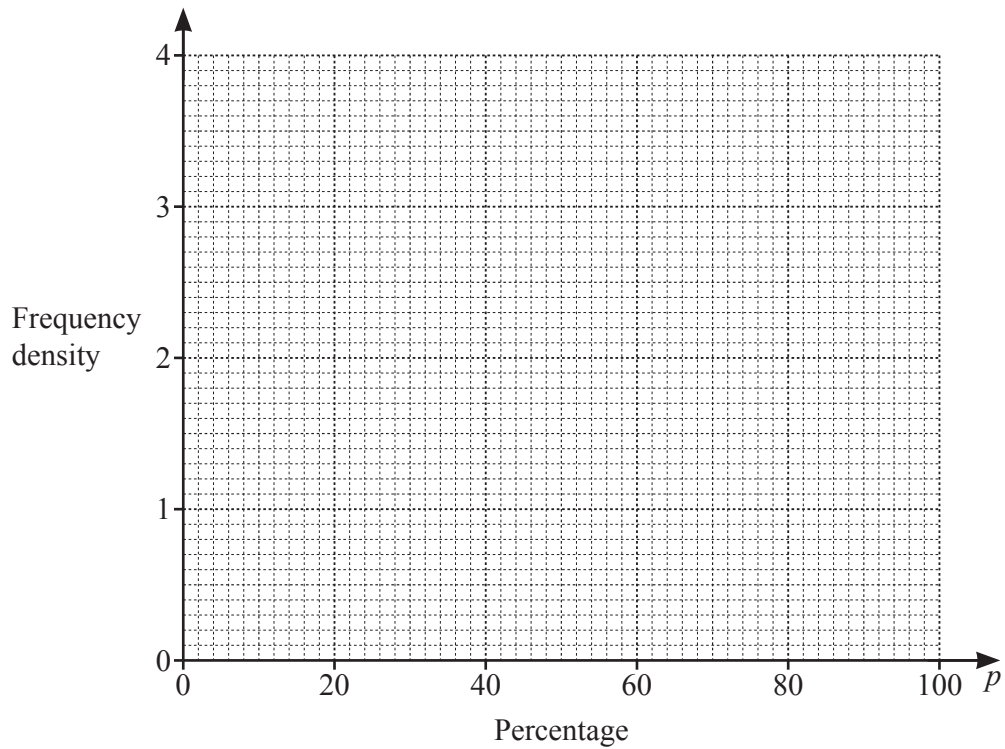
Calculate Paulo's mark for the 8th task.

..... [3]

(c) The table shows the percentage scored by each of 100 students in their final exam.

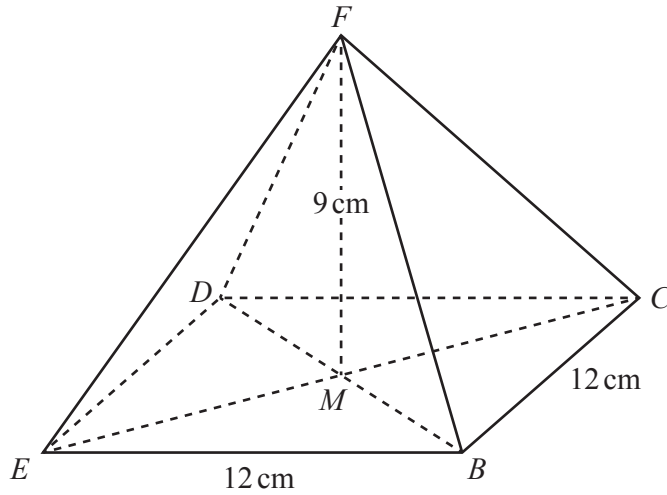
Percentage ( $p$ )	$0 < p \leq 30$	$30 < p \leq 50$	$50 < p \leq 60$	$60 < p \leq 70$	$70 < p \leq 100$
Frequency	12	18	35	20	15

On the grid, draw a histogram to show this information.



[4]

4 (a)



NOT TO SCALE

The diagram shows a pyramid with a square base  $BCDE$ .  
 The diagonals  $CE$  and  $BD$  intersect at  $M$ , and the vertex  $F$  is directly above  $M$ .  
 $BE = 12$  cm and  $FM = 9$  cm.

(i) Calculate the volume of the pyramid.

[The volume,  $V$ , of a pyramid with base area  $A$  and height  $h$  is  $V = \frac{1}{3}Ah$  .]

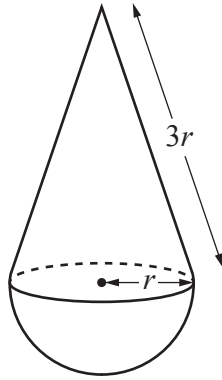
.....  $\text{cm}^3$  [2]

(ii) Calculate the total surface area of the pyramid.

.....  $\text{cm}^2$  [5]



(b)

NOT TO  
SCALE

The diagram shows a toy made from a cone and a hemisphere.  
 The base radius of the cone and the radius of the hemisphere are both  $r$  cm.  
 The slant height of the cone is  $3r$  cm.

The total surface area of the toy is  $304 \text{ cm}^2$ .

Calculate the value of  $r$ .

[The curved surface area,  $A$ , of a cone with radius  $r$  and slant height  $l$  is  $A = \pi r l$ .]

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

$r = \dots\dots\dots$  [4]

5 (a) (i) Factorise.  
 $x^2 - x - 12$

..... [2]

(ii) Simplify.  
 $\frac{x^2 - 16}{x^2 - x - 12}$

..... [2]

(b) Simplify.  
 $(2x - 3)^2 - (x + 1)^2$

..... [3]

(c) Write as a single fraction in its simplest form.

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

..... [4]

(d) Expand and simplify.

$$(x-3)(x-5)(2x+1)$$

..... [3]

(e) Solve the simultaneous equations.

You must show all your working.

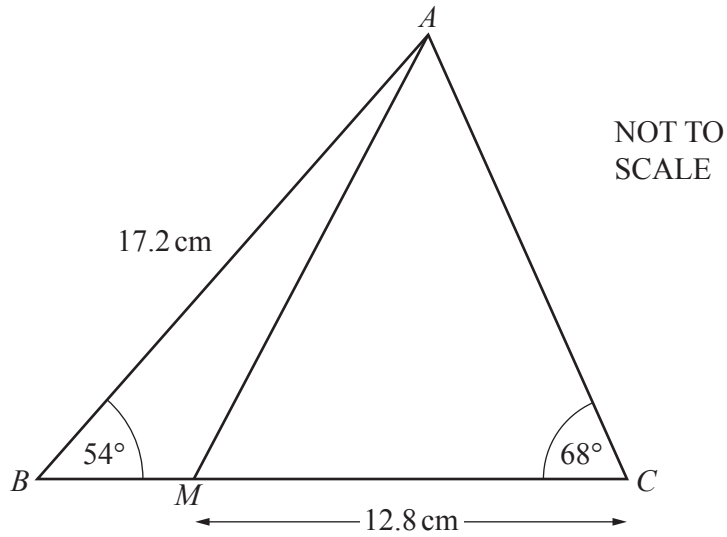
$$x - 3y = 13$$

$$2x^2 - 9y = 116$$

$$x = \dots\dots\dots y = \dots\dots\dots$$

$$x = \dots\dots\dots y = \dots\dots\dots [6]$$

6



The diagram shows triangle  $ABC$  with  $AB = 17.2 \text{ cm}$ .  
 Angle  $ABC = 54^\circ$  and angle  $ACB = 68^\circ$ .

(a) Calculate  $AC$ .

$AC = \dots\dots\dots \text{ cm [3]}$

(b)  $M$  lies on  $BC$  and  $MC = 12.8 \text{ cm}$ .

Calculate  $AM$ .

$AM = \dots\dots\dots \text{ cm [3]}$

(c) Calculate the shortest distance from  $A$  to  $BC$ .

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

7 (a)  $\mathbf{p} = \begin{pmatrix} 8 \\ -5 \end{pmatrix}$       $\mathbf{q} = \begin{pmatrix} -4 \\ 5 \end{pmatrix}$

(i) Find  $3\mathbf{q}$ .

$\begin{pmatrix} \phantom{0} \\ \phantom{0} \end{pmatrix}$  [1]

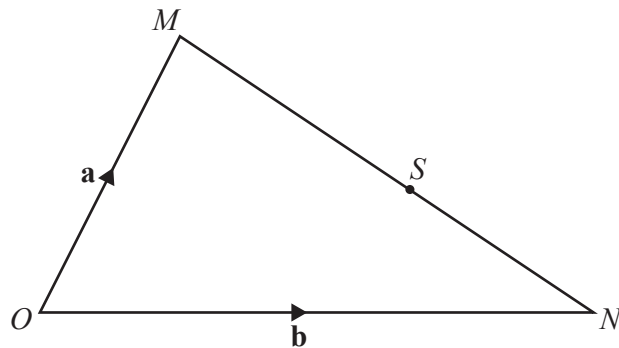
(ii) (a) Find  $\mathbf{p} - \mathbf{q}$ .

$\begin{pmatrix} \phantom{0} \\ \phantom{0} \end{pmatrix}$  [1]

(b) Find  $|\mathbf{p} - \mathbf{q}|$ .

..... [2]

(b)



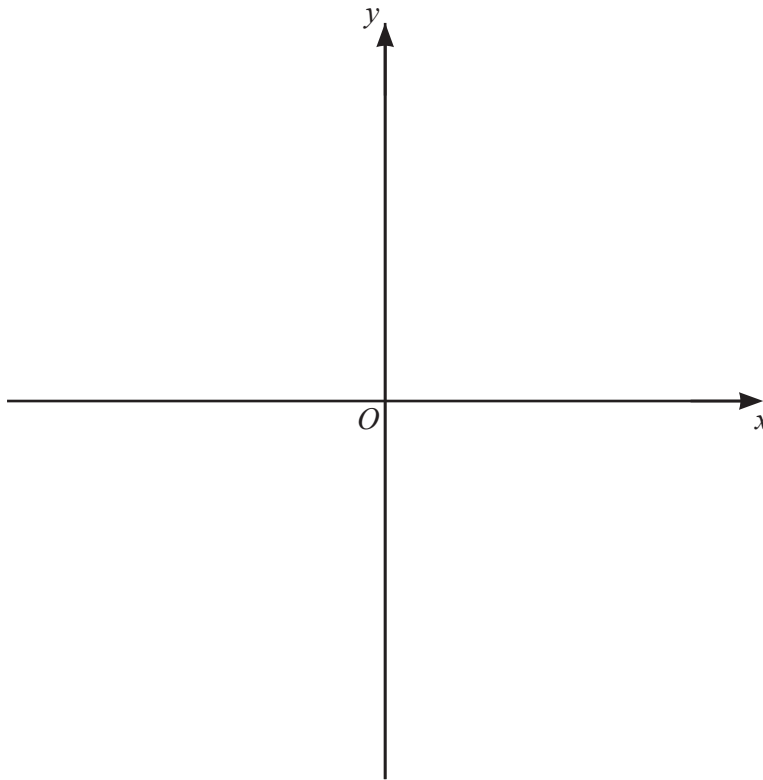
NOT TO SCALE

In triangle  $OMN$ ,  $O$  is the origin,  $\vec{OM} = \mathbf{a}$  and  $\vec{ON} = \mathbf{b}$ .  
 $S$  is a point on  $MN$  such that  $MS : SN = 5 : 3$ .

Find, in terms of  $\mathbf{a}$  and/or  $\mathbf{b}$ , the position vector of  $S$ .  
 Give your answer in its simplest form.

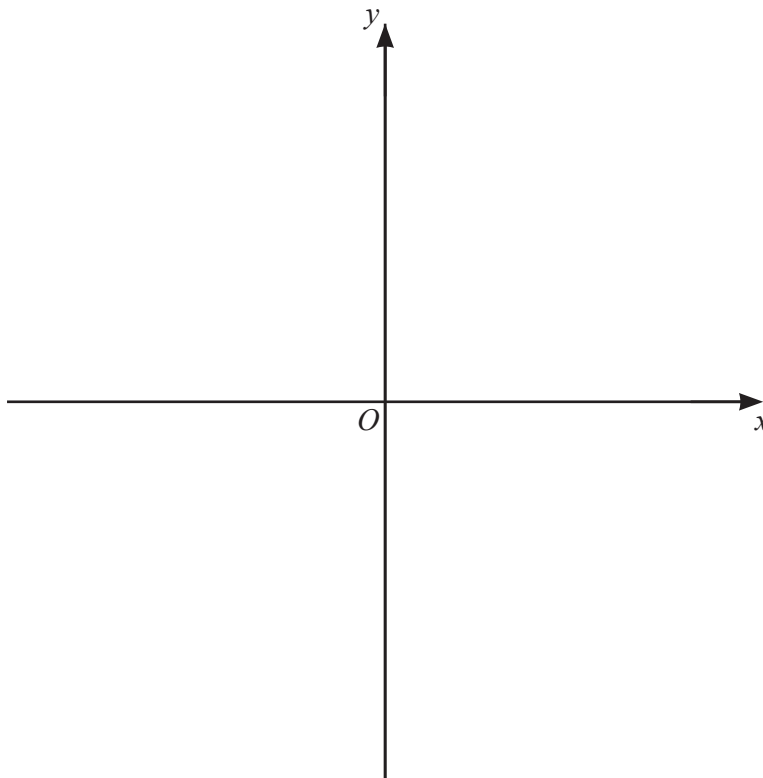
..... [3]

- 8 (a) On the axes, sketch the graph of  $y = 4 - 3x$ .



[2]

- (b) On the axes, sketch the graph of  $y = -x^2$ .



[2]

- (c) (i) Find the coordinates of the turning points of the graph of  $y = 10 + 9x^2 - 2x^3$ .  
You must show all your working.

( ..... , ..... ) and ( ..... , ..... ) [5]

- (ii) Determine whether each turning point is a maximum or a minimum.  
Show how you decide.

[3]

- 9 (a) Janna and Kamal each invest \$8000.  
At the end of 12 years, they each have \$12 800.

- (i) Janna invests in an account that pays simple interest at a rate of  $r\%$  per year.

Calculate the value of  $r$ .

$$r = \dots\dots\dots [3]$$

- (ii) Kamal invests in an account that pays compound interest at a rate of  $R\%$  per year.

Calculate the value of  $R$ .

$$R = \dots\dots\dots [3]$$

- (b) The population of a city is growing exponentially at a rate of 1.8% per year.  
The population now is 260 000.

Find the number of complete years from now when the population will first be more than 300 000.

$$\dots\dots\dots \text{ years } [3]$$

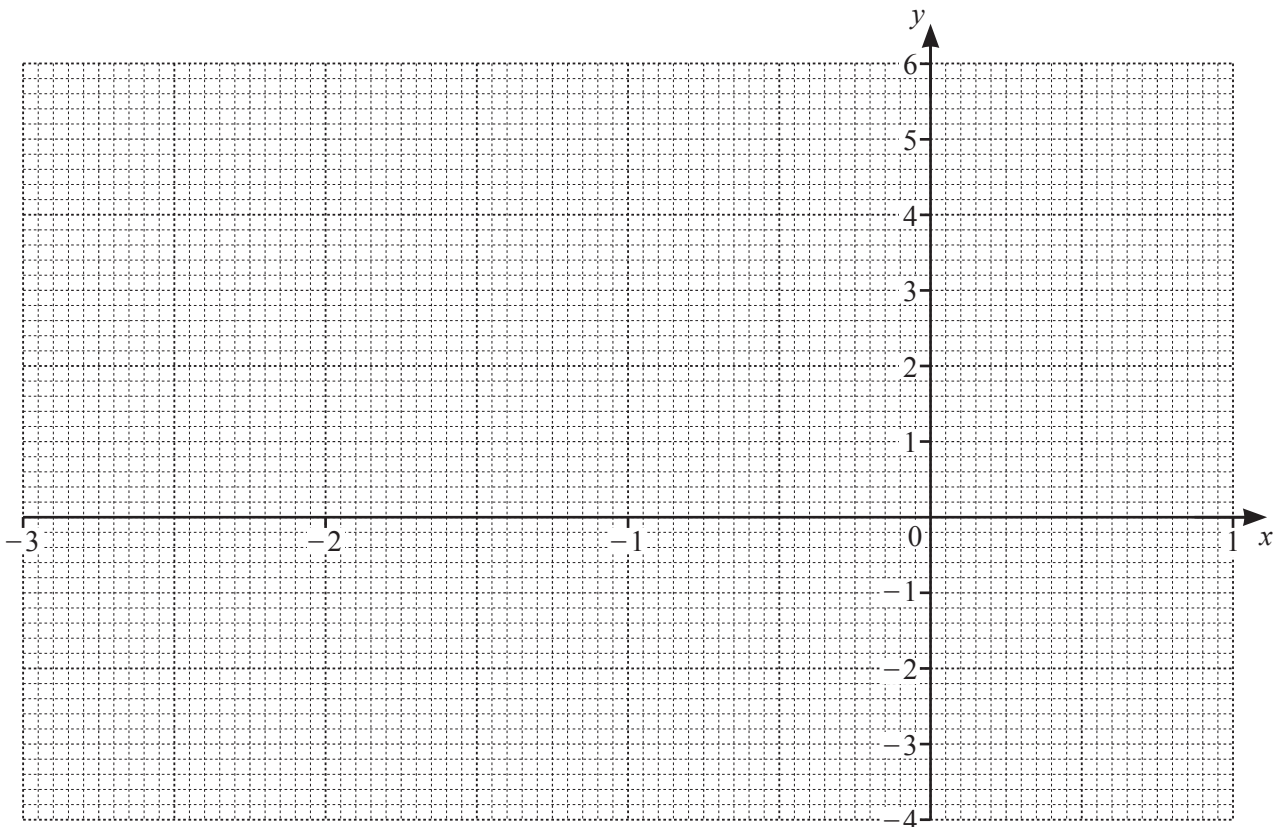


10 The table shows some values for  $y = 2x^3 + 6x^2 - 2.5$ .

$x$	-3	-2.5	-2	-1.5	-1	-0.5	0	0.5	1
$y$		3.75	5.5	4.25	1.5		-2.5	-0.75	

(a) Complete the table. [3]

(b) On the grid, draw the graph of  $y = 2x^3 + 6x^2 - 2.5$  for  $-3 \leq x \leq 1$ .



[4]

(c) By drawing a suitable line on the graph, solve the equation  $2x^3 + 6x^2 = 4.5$ .

$x = \dots\dots\dots$  or  $x = \dots\dots\dots$  or  $x = \dots\dots\dots$  [3]

(d) The equation  $2x^3 + 6x^2 - 2.5 = k$  has exactly two solutions.

Write down the two possible values of  $k$ .

$k = \dots\dots\dots$  or  $k = \dots\dots\dots$  [2]

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

(a) Find.

(i)  $gf(2)$

..... [2]

(ii)  $g^{-1}(x)$

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

(b) Find in its simplest form  $g(x-2)$ .

..... [2]

(c) Find the value of  $x$  when

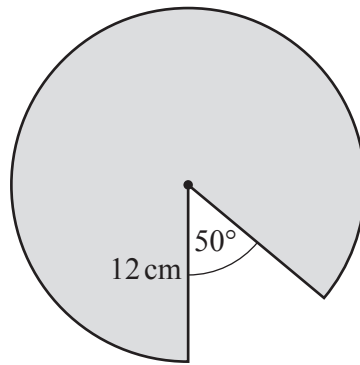
(i)  $fg(x) = 0.1$

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

(ii)  $h(x) - g(7) = 0.$

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

12 (a)



NOT TO SCALE

The diagram shows a circle of radius 12 cm, with a sector removed.

Calculate the perimeter of the remaining shaded shape.

..... cm [4]

(b) The diagram in **part(a)** shows the top of a cylindrical cake with a slice removed. The volume of cake that remains is  $3510 \text{ cm}^3$ .

Calculate the height of the cake.

..... cm [3]

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