Cambridge Assessment International Education

MEM

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

9928435260

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 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.

[Turn over

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.

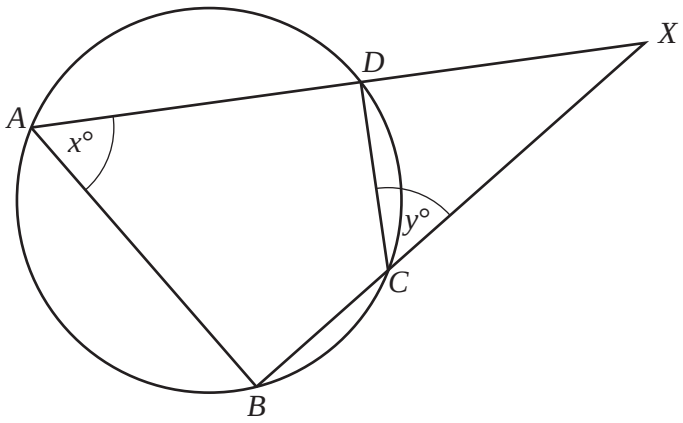
$ ..... [2]

(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]

2



NOT TO SCALE

A, *B*, *C* and *D* are points on a circle.
ADX and *BCX* are straight lines.
Angle *BAD* = *x*° and angle *DCX* = *y*°.

(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) $AD = 15\,\text{cm}$, $DX = 9\,\text{cm}$ and $CX = 12\,\text{cm}$.

(i) Find BC.

$BC =$ ..... cm [3]

(ii) Complete the statement.

The ratio area of triangle ABX : area of triangle CDX = ... : 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 .

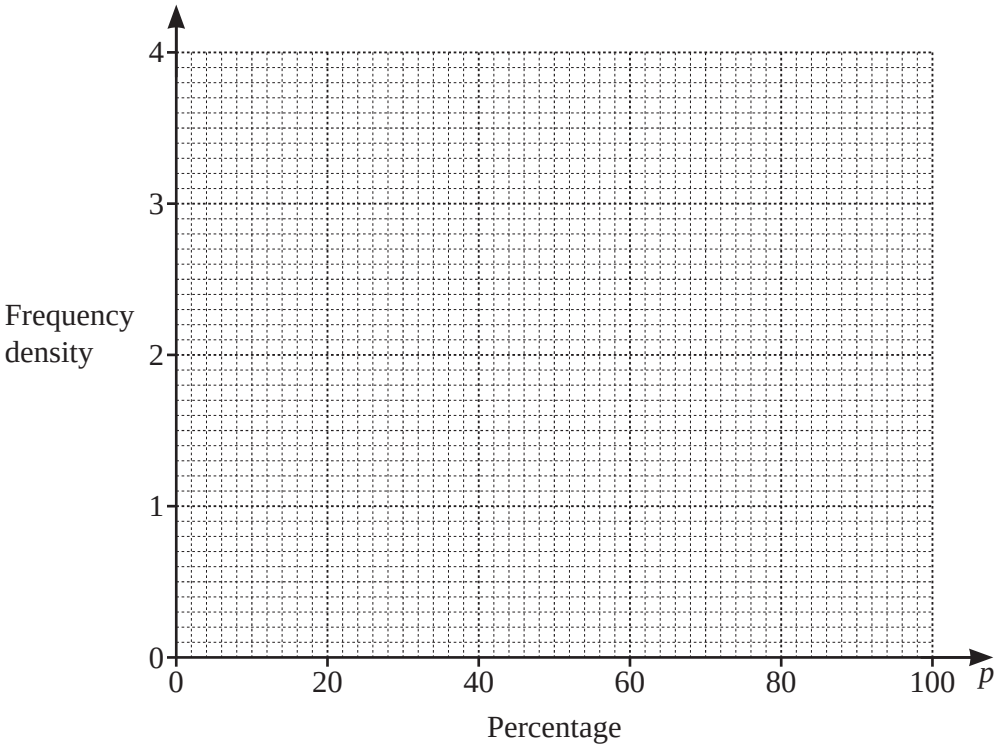
Calculate Paulo's mark for the 8th task.

..... [3]

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

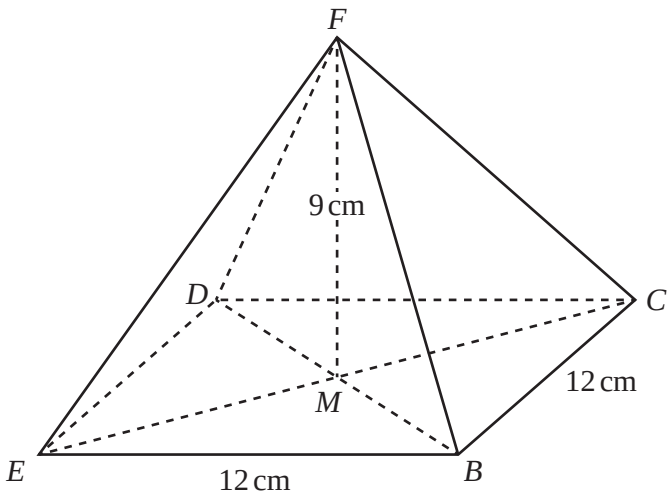
Percentage (p)	$0 < p \leqslant 30$	$30 < p \leqslant 50$	$50 < p \leqslant 60$	$60 < p \leqslant 70$	$70 < p \leqslant 100$
Frequency	12	18	35	20	15

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.

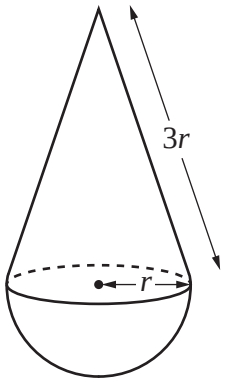
[The volume, *V*, of a pyramid with base area *A* and height *h* is $V = \frac{1}{3}Ah$.]

..... cm^3 [2]

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

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

$r =$ ..... [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]

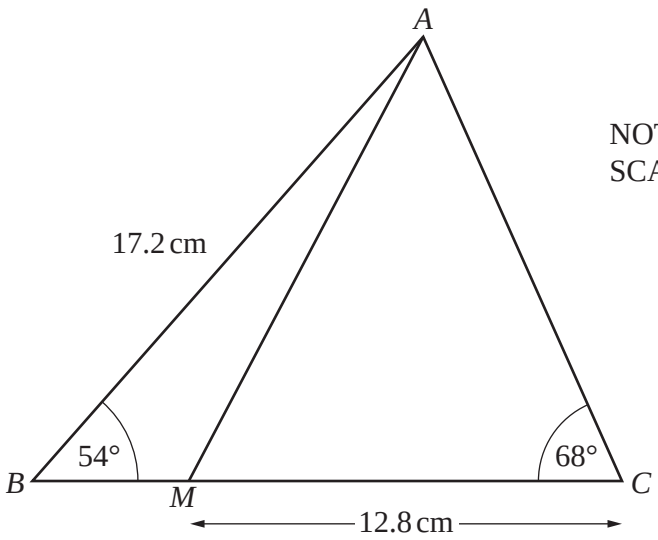
(e) Solve the simultaneous equations.
You must show all your working.

$$x-3y=13$$
$$2x^2-9y=116$$

$x =$ ..... $y =$ .....

$x =$ ..... $y =$ ..... [6]

6



The diagram shows triangle ABC with $AB = 17.2$ cm.
Angle $ABC = 54°$ and angle $ACB = 68°$.

(a) Calculate AC.

$AC =$ ..... cm [3]

(b) M lies on BC and $MC = 12.8$ cm.

Calculate AM.

$AM =$ ..... cm [3]

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

.....cm [3]

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

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

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

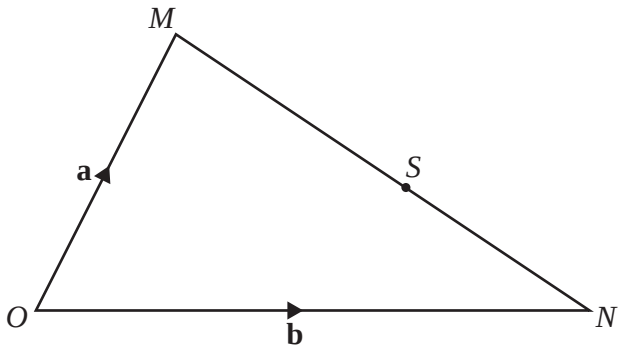
(ii) **(a)** Find $\mathbf{p} - \mathbf{q}$.

$\begin{pmatrix} \quad \\ \quad \end{pmatrix}$ [1]

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

..... [2]

(b)



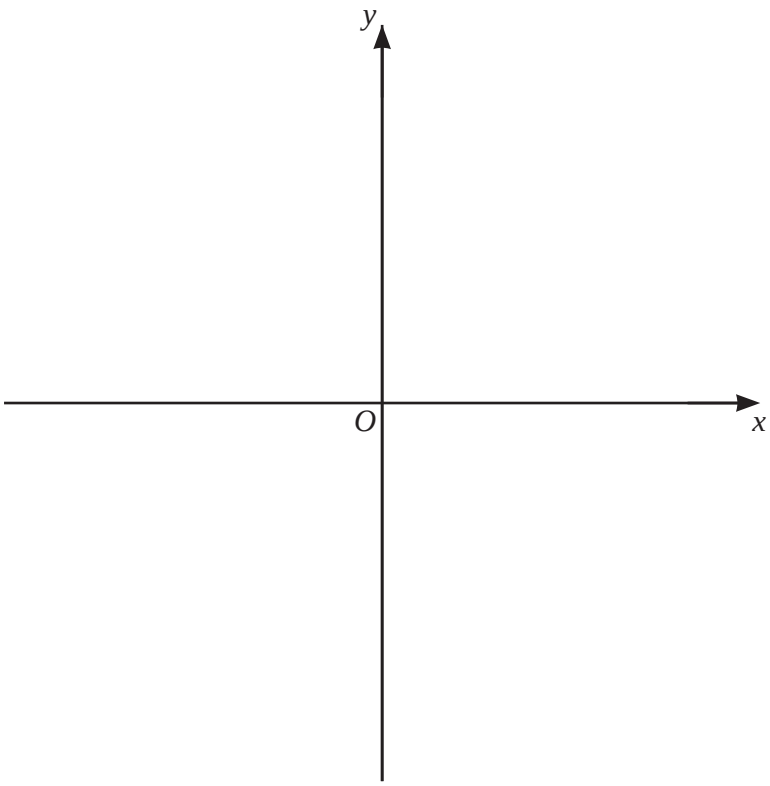
NOT TO SCALE

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

Find, in terms of **a** and/or **b**, the position vector of S.
Give your answer in its simplest form.

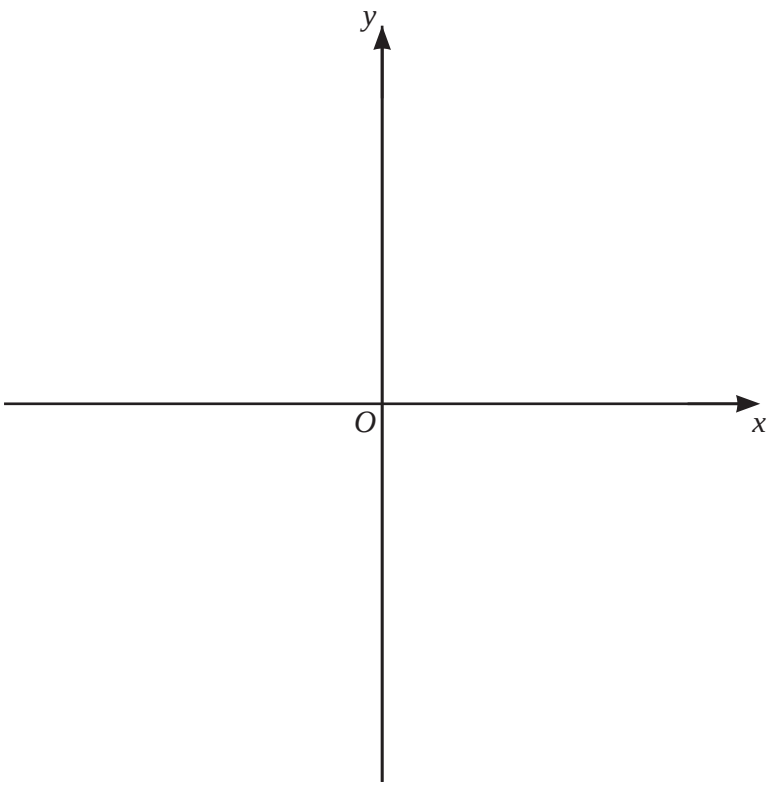
..... [3]

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.

$r =$ ..... [3]

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

Calculate the value of R.

$R =$ ..... [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.

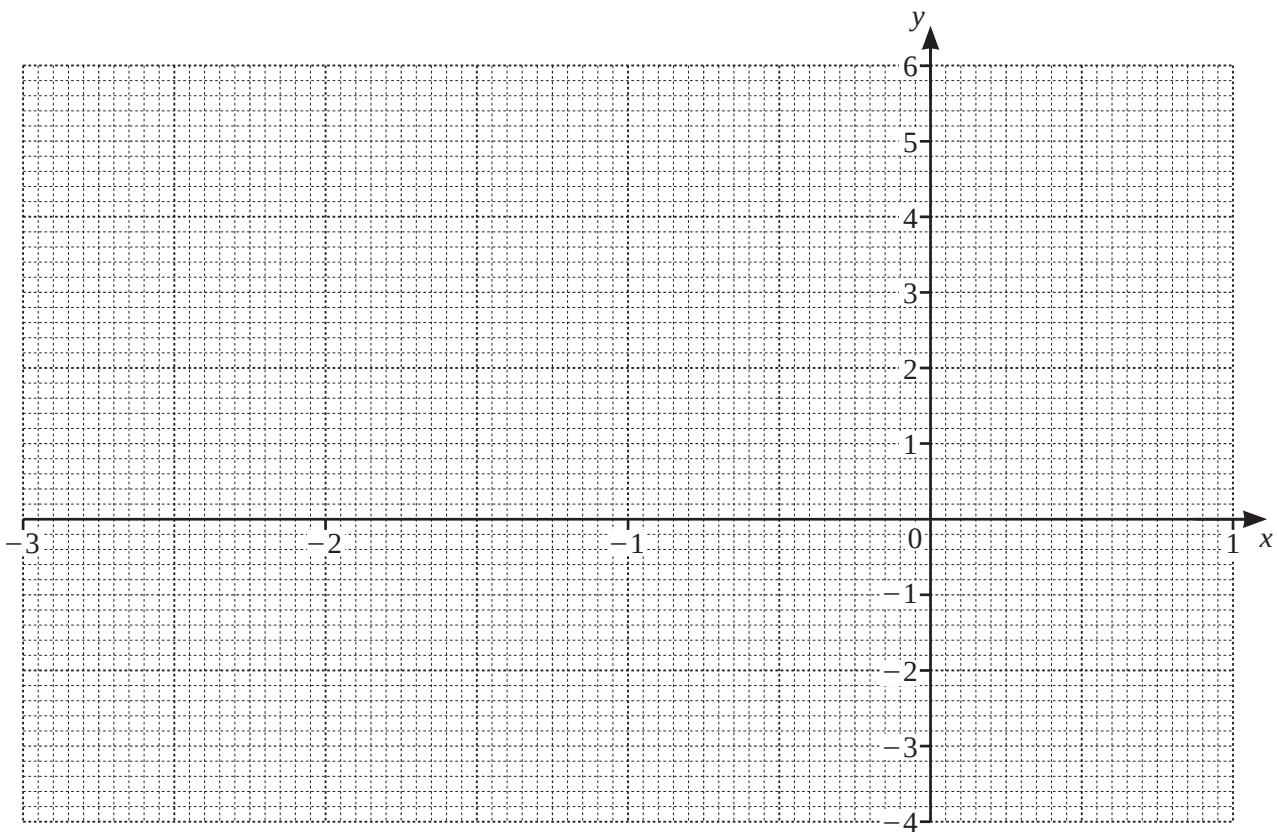
..... years [3]

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 $-3 \leqslant x \leqslant 1$.



[4]

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

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

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

Write down the two possible values of k.

$k =$ ..... or $k =$ ..... [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

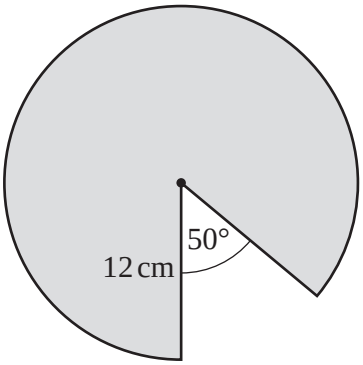
(i) $fg(x) = 0.1$

$x =$ ..... [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 $3510\,cm^3$.

Calculate the height of the cake.

..... cm [3]

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