



Cambridge IGCSE™

CANDIDATE
NAME
CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--

MATHEMATICS**0580/42**

Paper 4 (Extended)

February/March 2022**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.

2

- 1** A company employed 300 workers when it started and now employs 852 workers.

(a) Calculate the percentage increase in the number of workers.

..... % [2]

- (b)** Of the 852 workers, the ratio part-time workers : full-time workers = 5 : 7.

Calculate the number of full-time workers.

..... [2]

- (c)** The company makes 40 600 headphones in one year.

Write this number

(i) in words,

..... [1]

(ii) in standard form.

..... [1]

- (d)** In one month, the company sells 3 000 headphones.

Of these, 48% are exported, $\frac{3}{8}$ are sold to shops and the rest are sold online.

Calculate the number of headphones that are sold online.

..... [3]

3

- (e) One year, sales increased by 15%.
The following year sales increased by 18%.

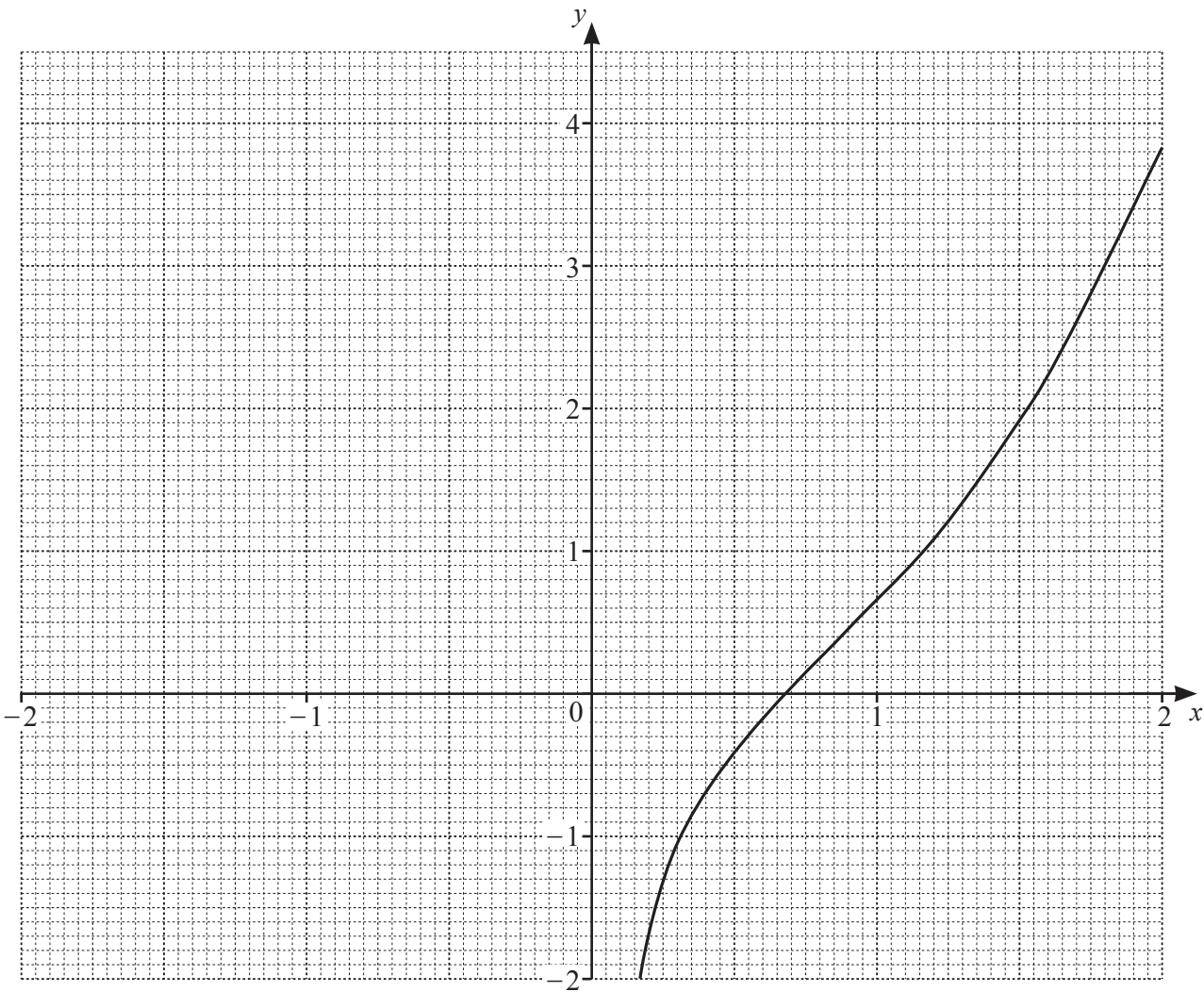
Calculate the overall percentage increase in sales.

..... % [3]

- 2 The table shows some values for $y = x^2 - \frac{1}{3x}$, $x \neq 0$.
The y -values are rounded to 1 decimal place.

x	-2	-1.5	-1	-0.75	-0.5	-0.25	-0.1
y	4.2	2.5	1.3			1.4	3.3

- (a) Complete the table. [2]
- (b) On the grid, draw the graph of $y = x^2 - \frac{1}{3x}$ for $-2 \leq x \leq -0.1$.
The graph of $y = x^2 - \frac{1}{3x}$ for $x > 0$ has been drawn for you.



- [4]
- (c) By drawing a suitable line on the grid, solve the equation $x^2 - \frac{1}{3x} + 1 = 0$.

$x =$ [2]

5**3**

$f(x) = 1 + 4x$

$g(x) = x^2$

(a) Find**(i)** $gf(3)$,

..... [2]

(ii) $fg(x)$,

..... [1]

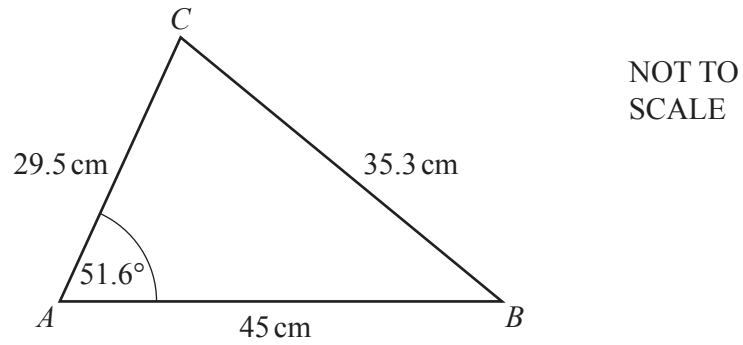
(iii) $f^{-1}f(x)$.

..... [1]

(b) Find the value of x when $f(x) = 15$. $x =$ [2]

6

4 (a)



In triangle ABC , $AB = 45$ cm, $AC = 29.5$ cm, $BC = 35.3$ cm and angle $CAB = 51.6^\circ$.

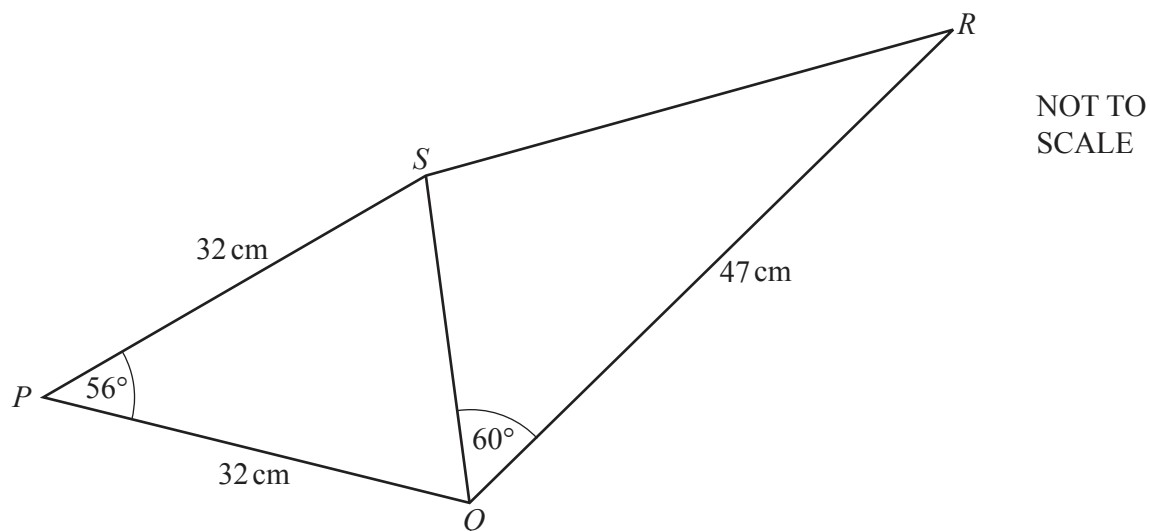
(i) Calculate angle ABC .

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

(ii) Calculate the area of triangle ABC .

$\dots\dots\dots$ cm^2 [2]

(b)



The diagram shows a quadrilateral $PQRS$ formed from two triangles, PQS and QRS . Triangle PQS is isosceles, with $PQ = PS = 32$ cm and angle $SPQ = 56^\circ$. $QR = 47$ cm and angle $SQR = 60^\circ$.

(i) Calculate SR .

$SR = \dots\dots\dots$ cm [4]

(ii) Calculate the shortest distance from P to SQ .

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

5 The table shows information about the mass, m grams, of each of 120 letters.

Mass (m grams)	$0 < m \leq 50$	$50 < m \leq 100$	$100 < m \leq 200$	$200 < m \leq 500$
Frequency	43	31	25	21

(a) Calculate an estimate of the mean mass.

..... g [4]

(b) Iraj draws a histogram to show this information.
He makes the height of the first bar 17.2 cm.

Calculate the height of each of the remaining bars.

height of bar for $50 < m \leq 100$ cm

height of bar for $100 < m \leq 200$ cm

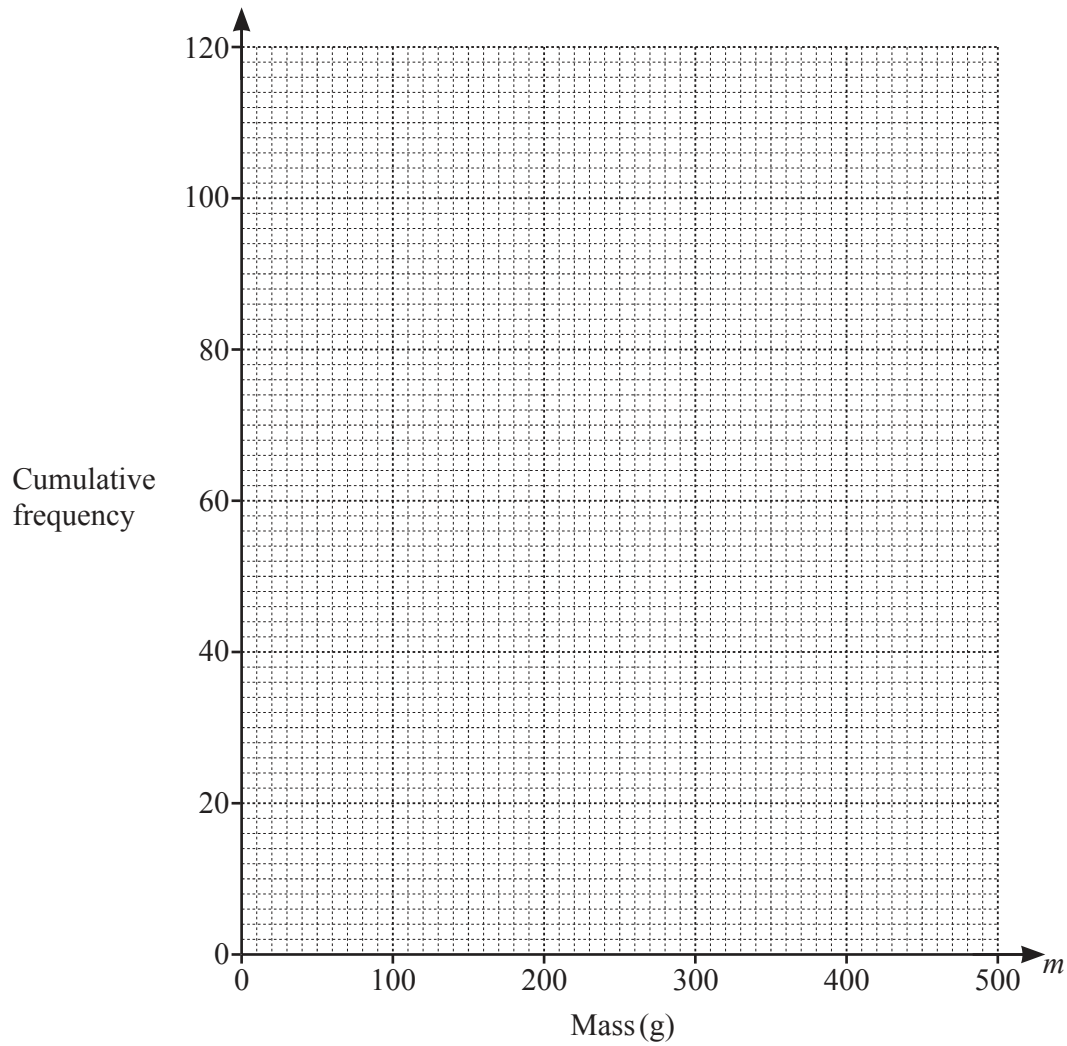
height of bar for $200 < m \leq 500$ cm [3]

(c) Complete the cumulative frequency table.

Mass (m grams)	$m \leq 50$	$m \leq 100$	$m \leq 200$	$m \leq 500$
Cumulative frequency				

[2]

(d) Draw a cumulative frequency diagram.



[3]

(e) Use the cumulative frequency diagram to find an estimate for

(i) the median,

..... g [1]

(ii) the upper quartile,

..... g [1]

(iii) the 40th percentile,

..... g [2]

(iv) the number of letters with a mass m where $250 < m \leq 400$.

..... [2]

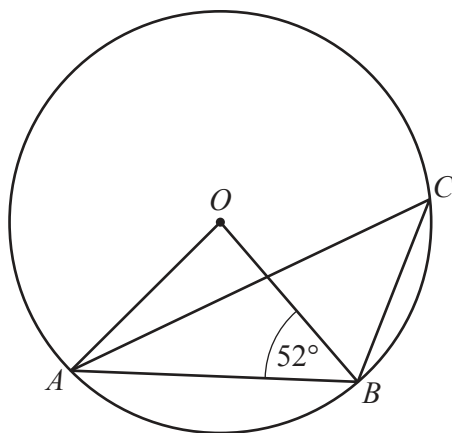
10

- 6 (a) The interior angle of a regular polygon is 156° .

Calculate the number of sides of this polygon.

..... [2]

(b)



NOT TO
SCALE

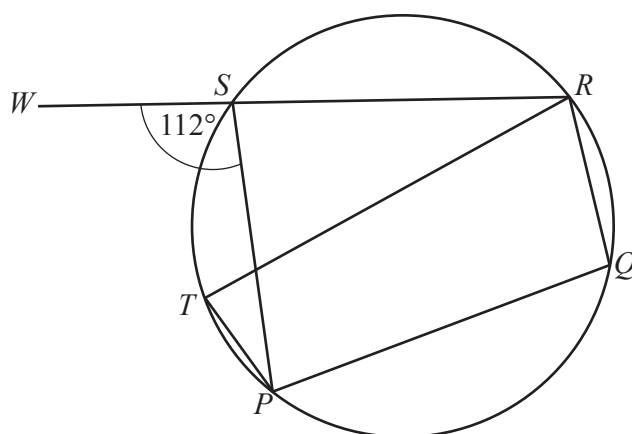
A , B and C lie on a circle, centre O .
Angle $OBA = 52^\circ$.

Calculate angle ACB .

Angle $ACB =$ [2]

11

(c)

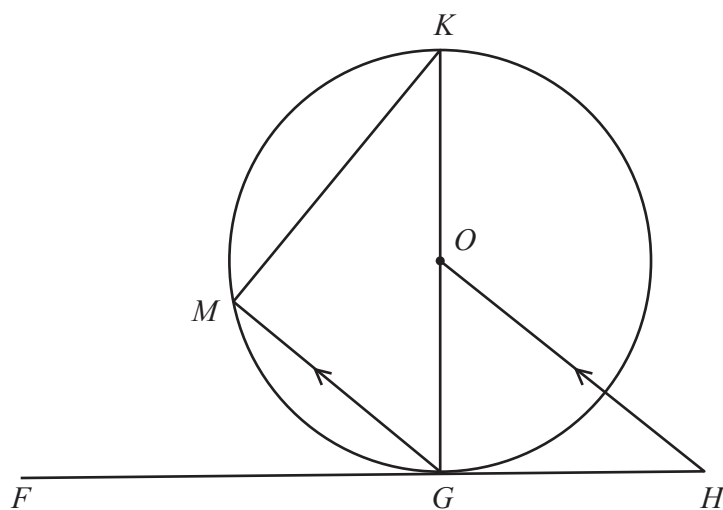
NOT TO
SCALE

P, Q, R, S and T lie on a circle.
 WSR is a straight line and angle $WSP = 112^\circ$.

Calculate angle PTR .

Angle $PTR = \dots\dots\dots$ [2]

(d)

NOT TO
SCALE

G, K and M lie on a circle, centre O .
 FGH is a tangent to the circle at G and MG is parallel to OH .

Show that triangle GKM is mathematically similar to triangle OHG .
 Give a geometrical reason for each statement you make.

.....

.....

.....

.....

.....

[4]

12

7 Two rectangular picture frames are mathematically similar.

- (a) The areas of the frames are 350 cm^2 and 1134 cm^2 .
The width of the smaller frame is 17.5 cm.

Calculate the width of the larger frame.

..... cm [3]

- (b) A picture in the smaller frame has length 15 cm and width 10.5 cm, both correct to the nearest 5 mm.

Calculate the upper bound for the area of this picture.

..... cm^2 [2]

- (c) In a sale, the price of a large frame is reduced by 18%.
Parthi pays \$166.05 for 5 large frames in the sale.

Calculate the original price of one large frame.

\$ [2]

- (d) Parthi advertises a large frame for a price of \$57 or 48.20 euros.
The exchange rate is $\$1 = 0.88$ euros.

Calculate the difference between these prices, in dollars and cents, correct to the nearest cent.

\$ [3]

13

- 8** Darpan runs a distance of 12 km and then cycles a distance of 26 km. His running speed is x km/h and his cycling speed is 10 km/h faster than his running speed. He takes a total time of 2 hours 48 minutes.

- (a)** An expression for the time, in hours, Darpan takes to run the 12 km is $\frac{12}{x}$.

Write an equation, in terms of x , for the total time he takes in hours.

..... [3]

- (b)** Show that this equation simplifies to $7x^2 - 25x - 300 = 0$.

[4]

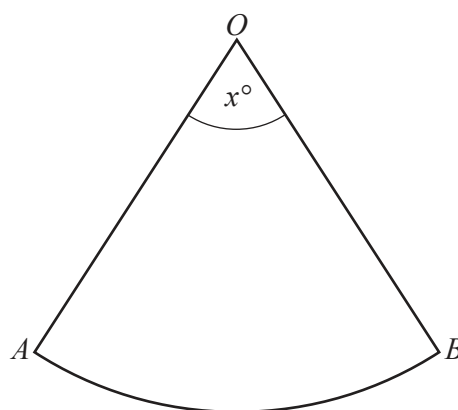
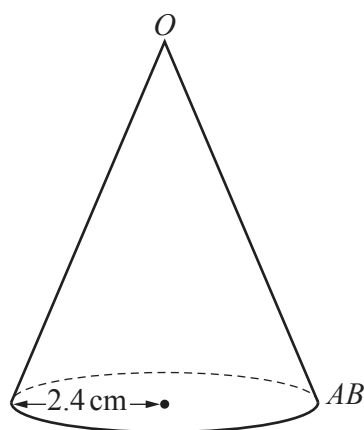
- (c)** Use the quadratic formula to solve $7x^2 - 25x - 300 = 0$.
You must show all your working.

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

- (d)** Calculate the number of minutes Darpan takes to run the 12 km.

..... min [2]

9 (a)

NOT TO
SCALE

The volume of a paper cone of radius 2.4 cm is 95.4 cm^3 .

The paper is cut along the slant height from O to AB .

The cone is opened to form a sector OAB of a circle with centre O .

Calculate the sector angle x° .

[The volume, V , of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... [6]

- (b) An empty fuel tank is filled using a cylindrical pipe with diameter 8 cm.
Fuel flows along this pipe at a rate of 2 metres per second.
It takes 24 minutes to fill the tank.

Calculate the capacity of the tank.

Give your answer in litres.

..... litres [4]

15

10 (a) Expand and simplify.

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

..... [3]

(b) Make g the subject of the formula.

$$M = \frac{2fg}{g-c}$$

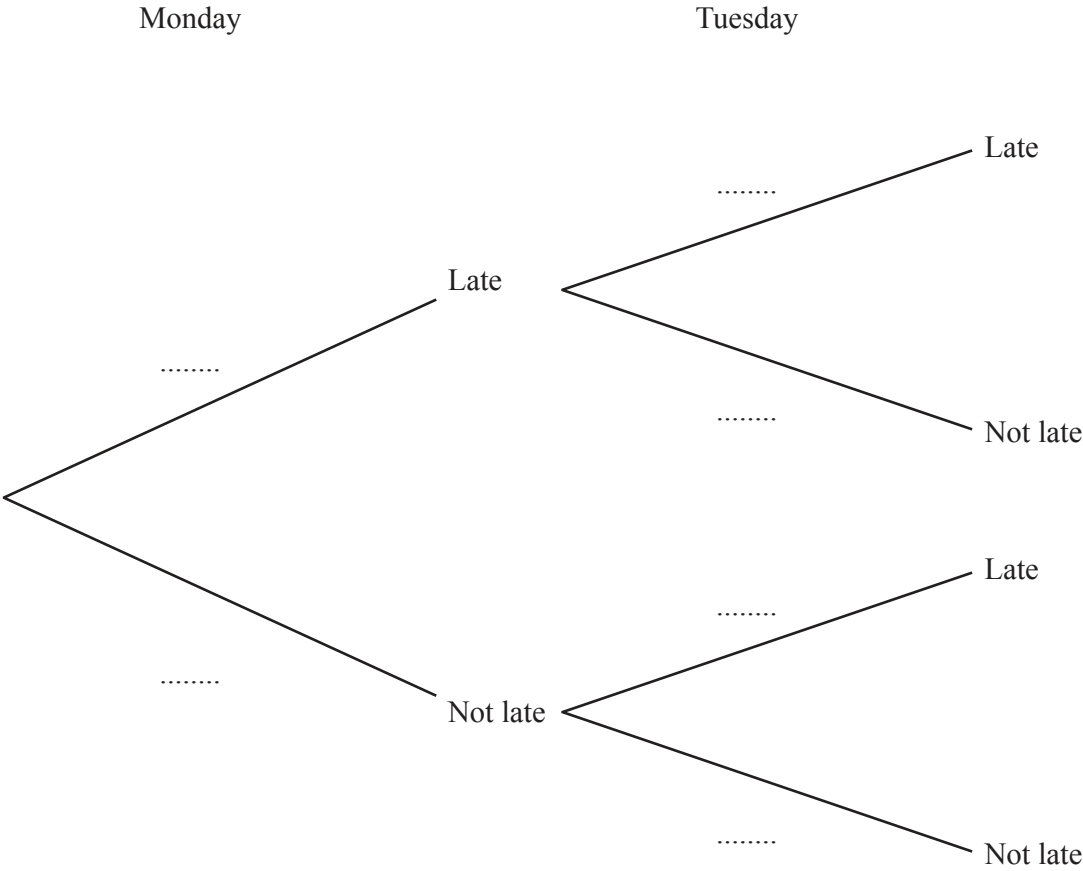
 $g =$ [4]**(c)** Simplify.

$$\frac{4x^2 - 16x}{x^2 - 16}$$

..... [3]

11 (a) The probability that Shalini is late for school on any day is $\frac{1}{6}$.

(i) Complete the tree diagram for Monday and Tuesday.



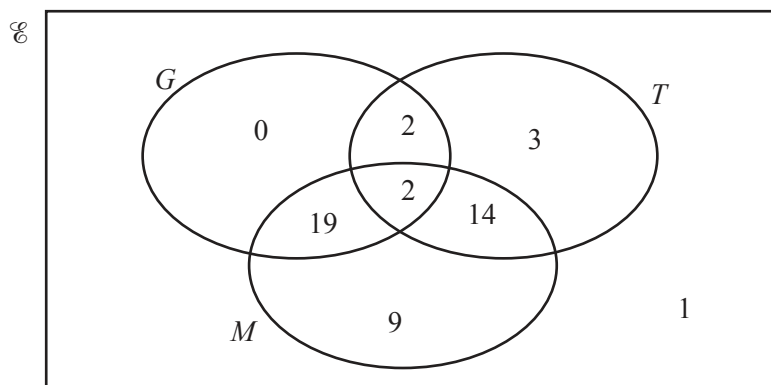
[2]

(ii) Calculate the probability that Shalini is late on Monday but is not late on Tuesday.

..... [2]

17

- (b) The Venn diagram shows the number of students in a group of 50 students who wear glasses (G), who wear trainers (T) and who have a mobile phone (M).



- (i) Use set notation to describe the region that contains only one student.

- (ii) Find $n(T' \cap (G \cup M))$.

..... [1]

..... [1]

- (iii) One student is picked at random from the 50 students.

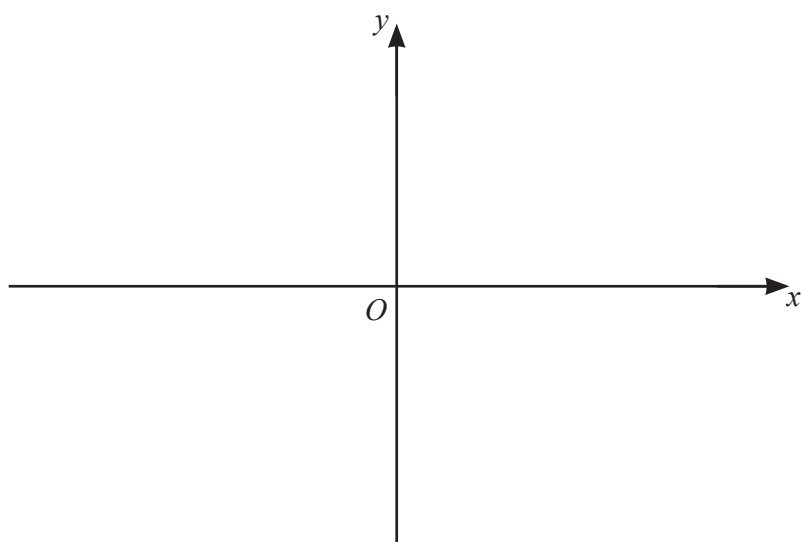
Find the probability that this student wears trainers but does not wear glasses.

..... [1]

- (iv) Two students are picked at random from those wearing trainers.

Find the probability that both students have mobile phones.

..... [3]

18**12 (a)** Solve the equation $\tan x = 11.43$ for $0^\circ \leq x \leq 360^\circ$. $x = \dots\dots\dots$ or $x = \dots\dots\dots$ [2]**(b)** Sketch the curve $y = x^3 - 4x$.

[3]

19

- (c) A curve has equation $y = x^3 + ax + b$.
The stationary points of the curve have coordinates $(2, k)$ and $(-2, 10 - k)$.

Work out the value of a , the value of b and the value of k .

$a = \dots\dots\dots$, $b = \dots\dots\dots$, $k = \dots\dots\dots$ [6]

BLANK PAGE

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 after the live examination series.

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