



# Cambridge IGCSE™

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**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  $\pi$ , 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 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]

- (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.

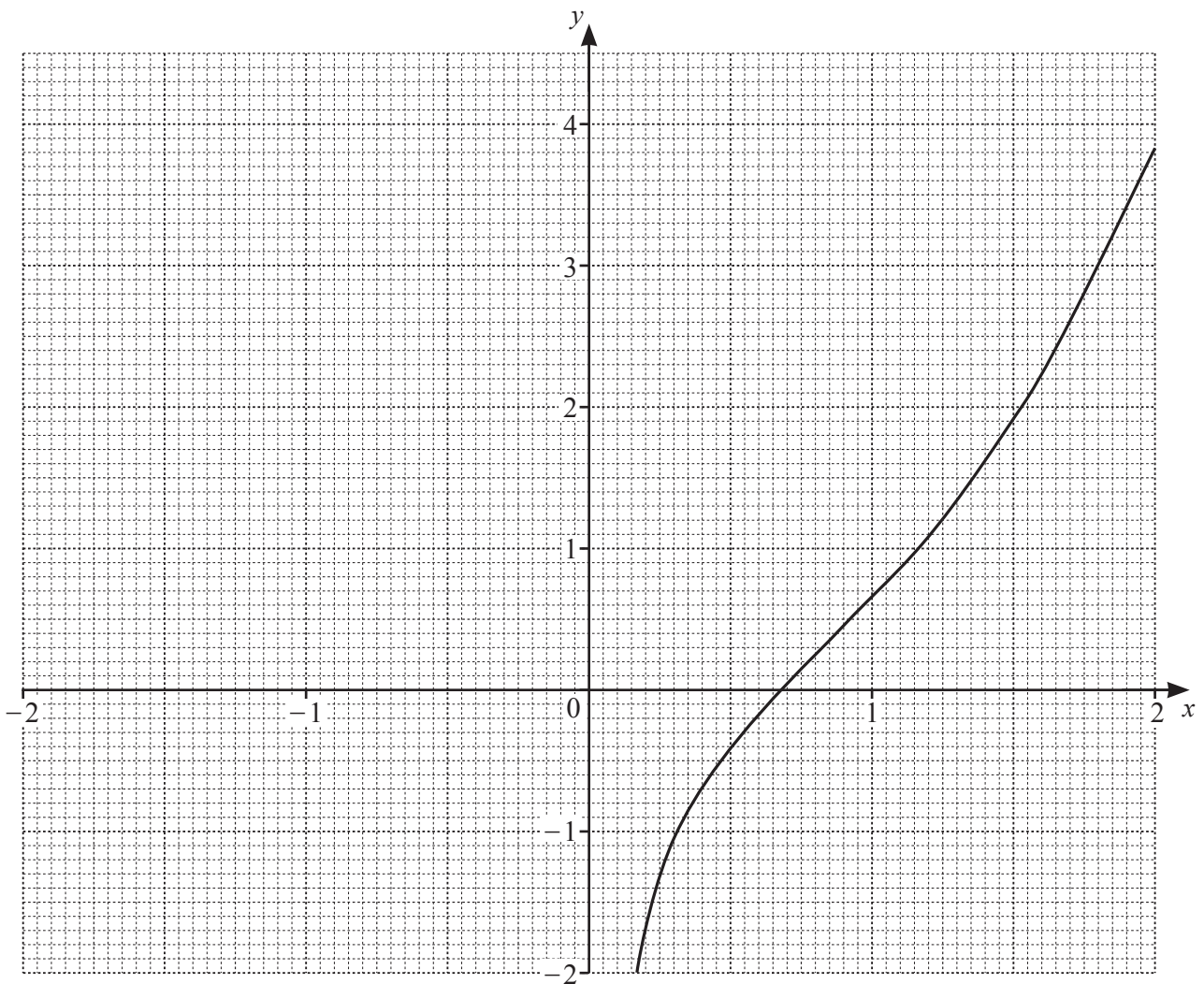
$x$	-2	-1.5	-1	-0.75	-0.5	-0.25	-0.1
$y$	4.2	2.5	1.3			1.4	3.3

(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  $x^2 - \frac{1}{3x} + 1 = 0$ .

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

3

$$f(x) = 1 + 4x$$

$$g(x) = x^2$$

(a) Find

(i)  $gf(3)$ ,

..... [2]

(ii)  $fg(x)$ ,

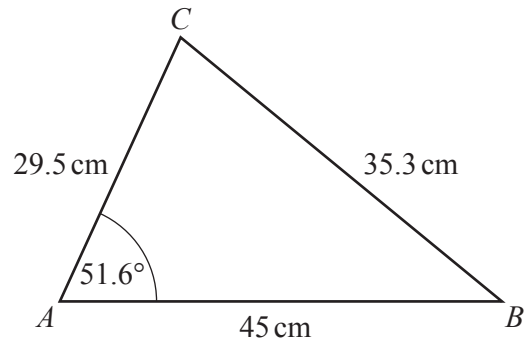
..... [1]

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

..... [1]

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

4 (a)

NOT TO  
SCALE

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

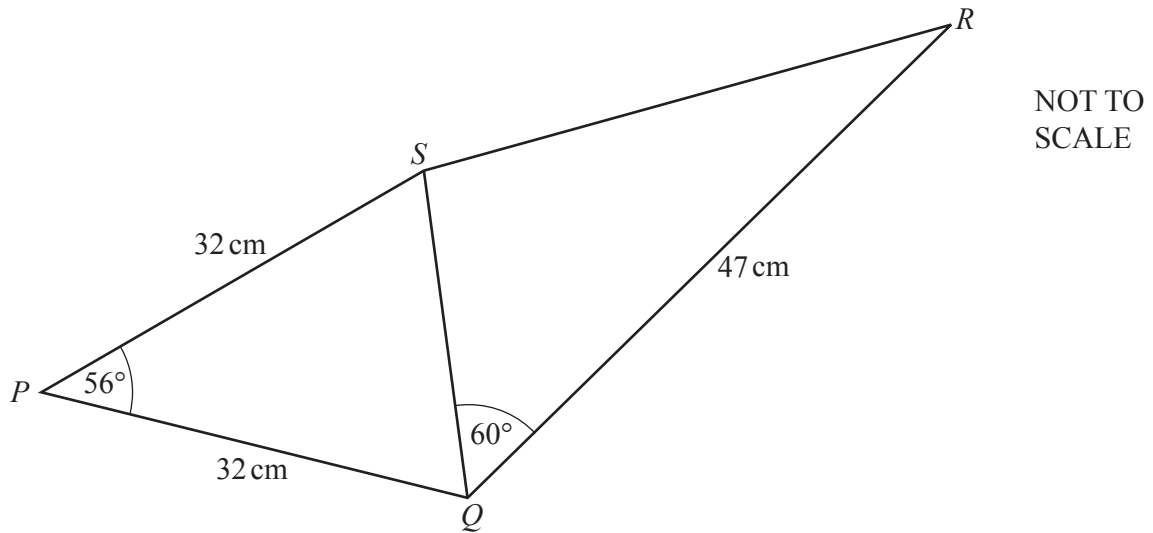
(i) Calculate angle  $ABC$ .

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

(ii) Calculate the area of triangle  $ABC$ .

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

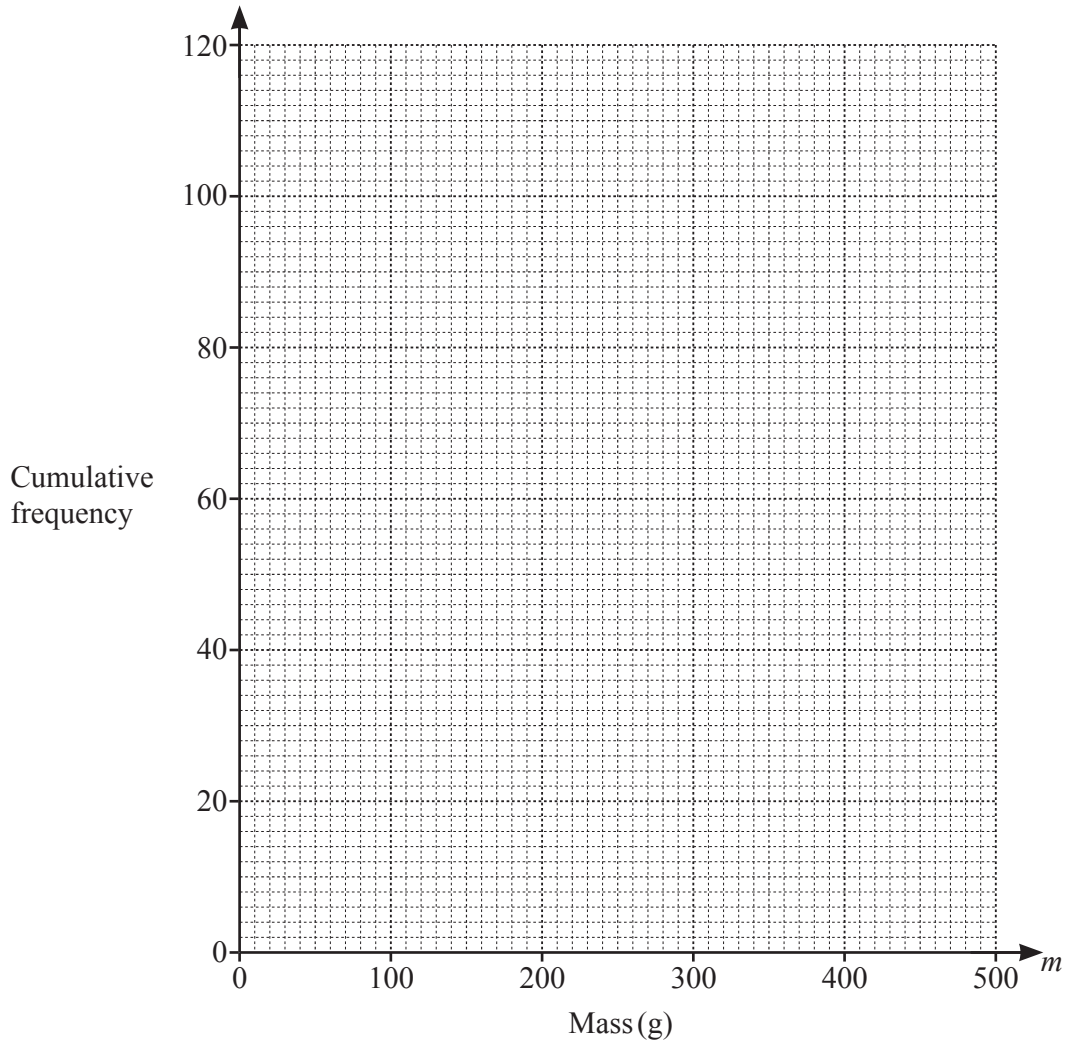
(c) Complete the cumulative frequency table.

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]

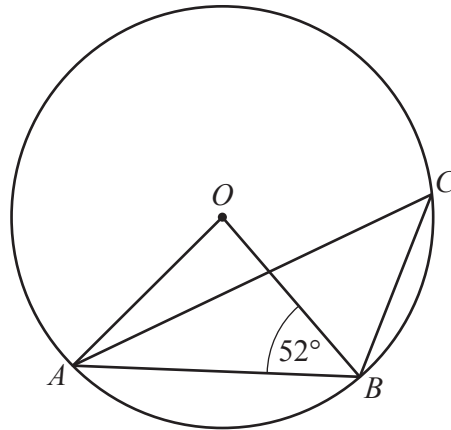
(iv) the number of letters with a mass  $m$  where  $250 < m \leq 400$ .

..... [2]

- 6 (a) The interior angle of a regular polygon is  $156^\circ$ .  
 Calculate the number of sides of this polygon.

..... [2]

(b)



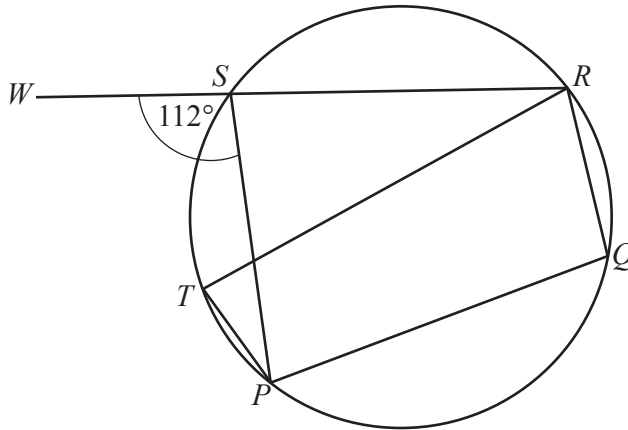
NOT TO  
SCALE

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

Calculate angle  $ACB$ .

Angle  $ACB =$  ..... [2]

(c)



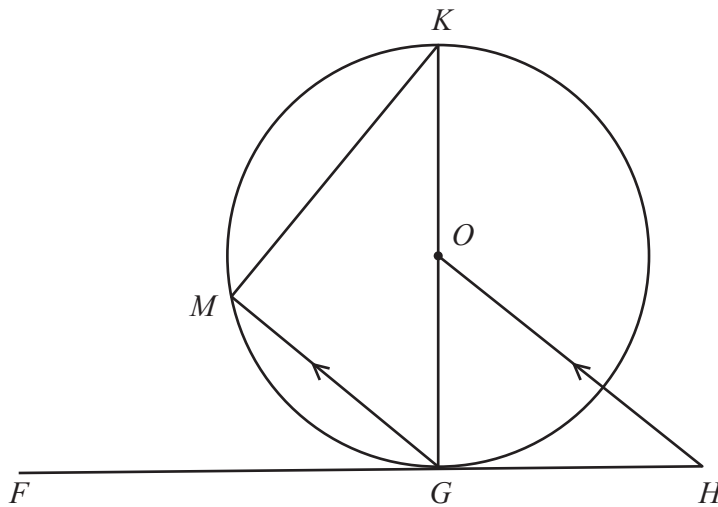
NOT TO SCALE

$P, Q, R, S$  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]

7 Two rectangular picture frames are mathematically similar.

- (a) The areas of the frames are  $350 \text{ cm}^2$  and  $1134 \text{ cm}^2$ .  
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.

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

- 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]

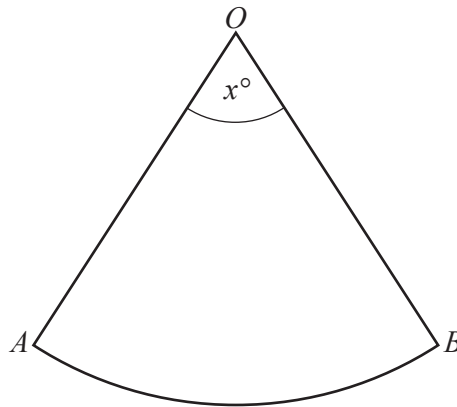
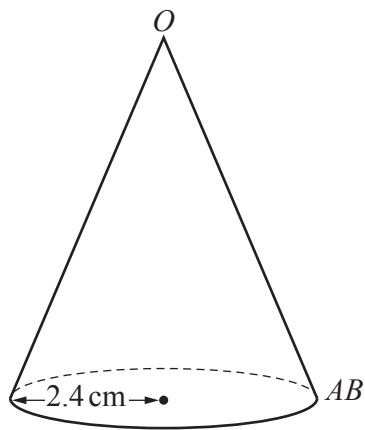
- (c) Use the quadratic formula to solve  $7x^2 - 25x - 300 = 0$ .  
You must show all your working.

$x = \dots\dots\dots$  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  $2.4\text{ cm}$  is  $95.4\text{ cm}^3$ .  
 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  $x^\circ$ .  
 [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  $8\text{ cm}$ .  
 Fuel flows along this pipe at a rate of  $2\text{ metres per second}$ .  
 It takes  $24\text{ minutes}$  to fill the tank.

Calculate the capacity of the tank.  
 Give your answer in litres.

..... litres [4]

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]

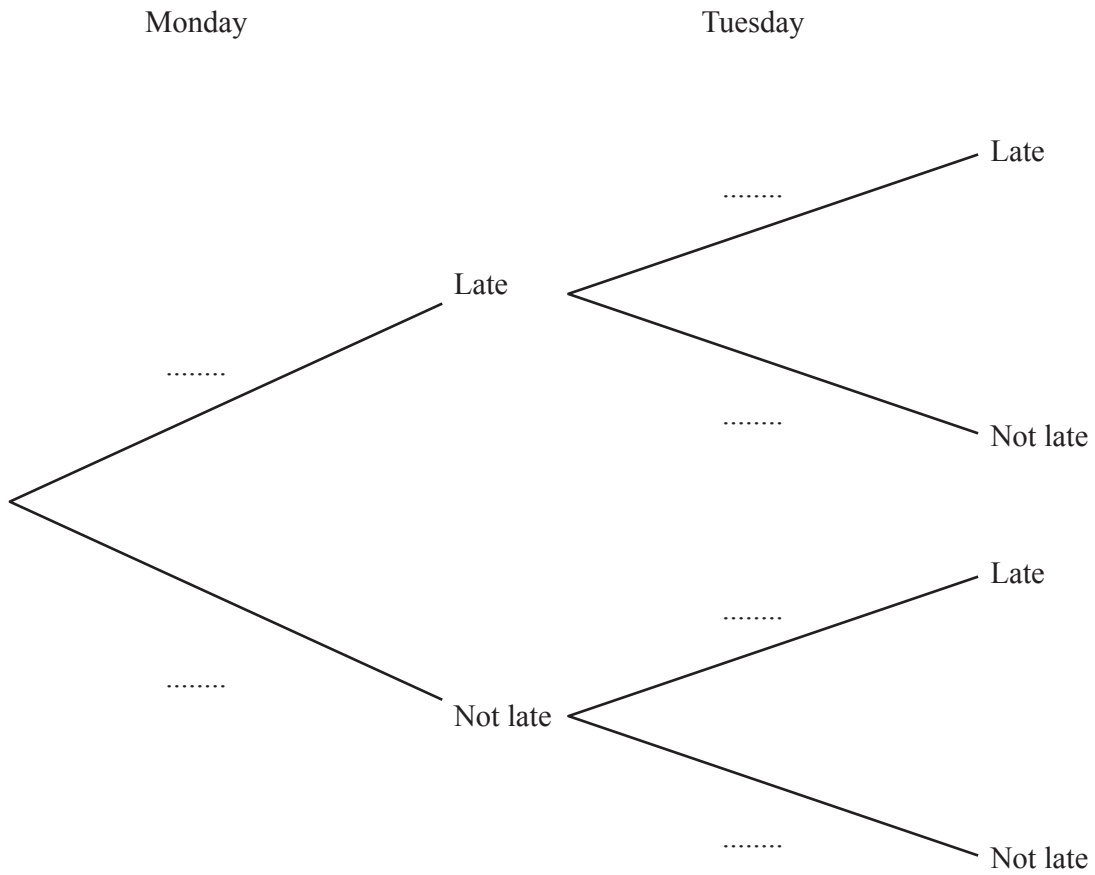
(c) Simplify.

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

..... [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.



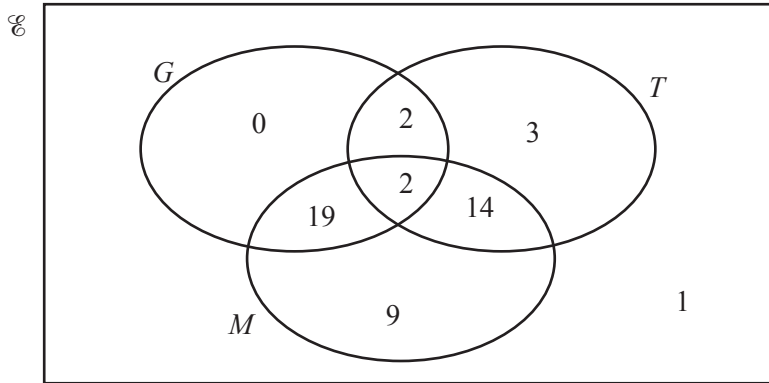
[2]

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

..... [2]



- (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.

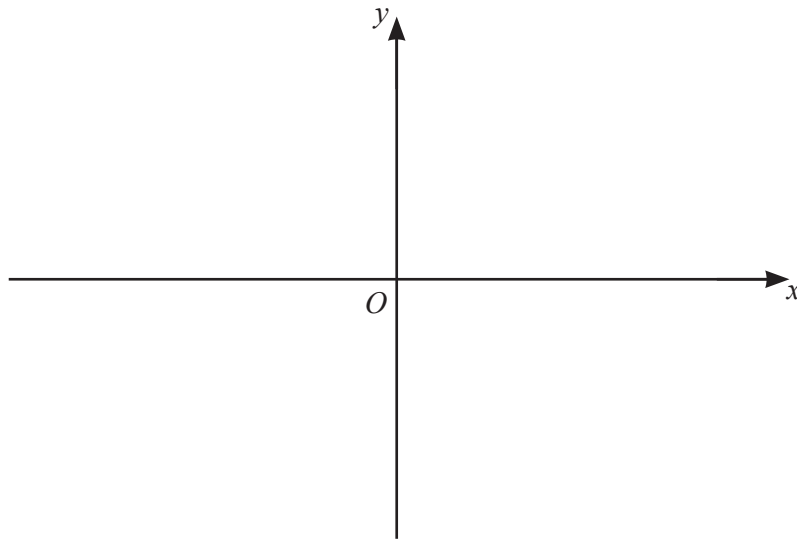
Find the probability that both students have mobile phones.

..... [3]

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]

- (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]

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