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MATHEMATICS

0580/32

Paper 3 (Core)

February/March 2022

2 hours

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 104.
- 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) One day, Mahika records the number of teachers and students who cycle to school.

	Tally	Frequency
Teachers		
Students		

- (i) Complete the frequency column in the table. [1]

- (ii) Work out the percentage of people who cycle that are students.

..... % [2]

- (b) Mahika records how 120 students from Year 1 and Year 2 travel to school.
Each student walks, cycles or travels by bus.

- 48 students are in Year 1.
- 77 students walk.
- 5 students in Year 2 cycle.
- 36 students travel by bus.
- $\frac{4}{9}$ of the students who travel by bus are in Year 1.

- (i) Complete the table.

	Walk	Cycle	Bus	Total
Year 1				
Year 2				
Total				120

[3]

- (ii) One of the 120 students is chosen at random.

Work out the probability that this student does not travel by bus to school.

..... [2]

- (c) There have been 24 complaints about one of the buses.

The complaints are:

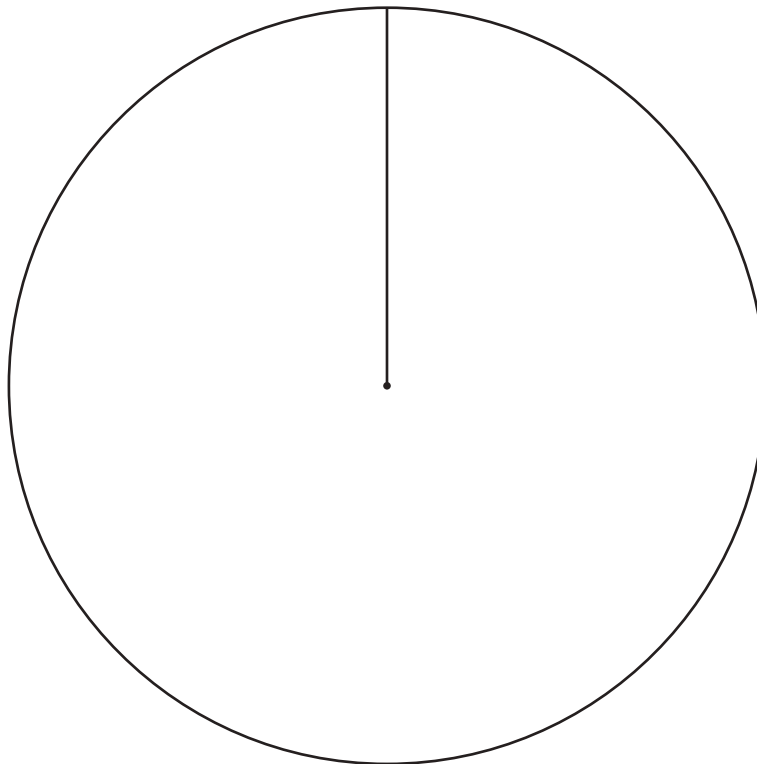
- The bus is late.
- The price is too high.
- The bus is crowded.

- (i) Complete the table.

Complaint	Frequency	Pie chart sector angle
Late	10	
Price	6	
Crowded	8	

[2]

- (ii) Complete the pie chart.

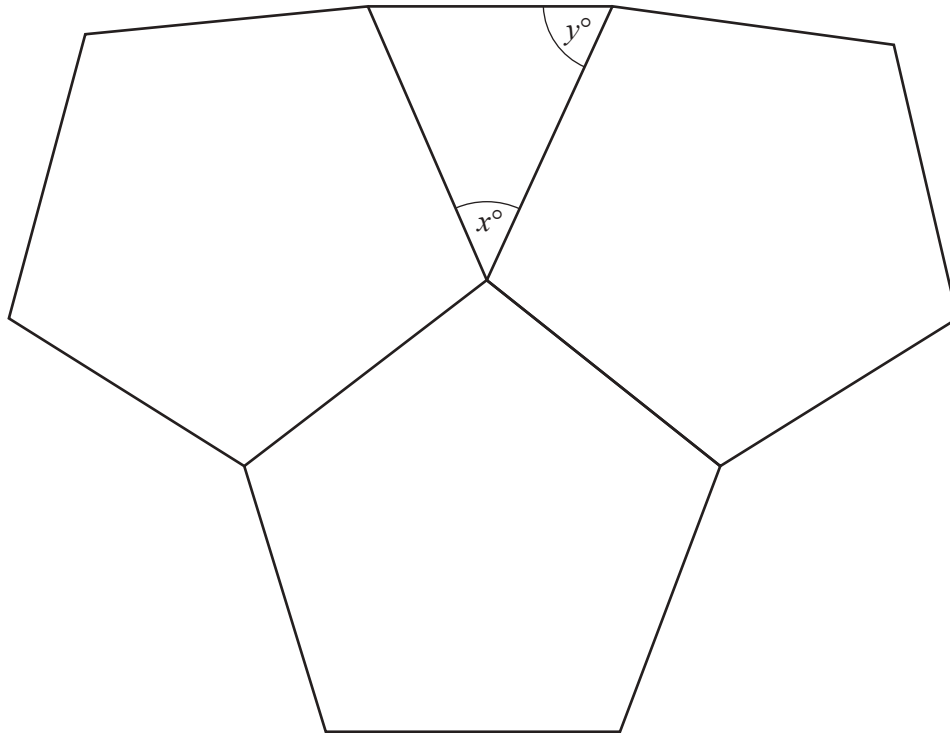


[2]

2 (a) Calculate the interior angle of a regular pentagon.

..... [2]

(b) The diagram shows three congruent regular pentagons and a triangle.



NOT TO SCALE

(i) Work out the value of x .
Give a geometrical reason for your answer.

$x =$ because

..... [2]

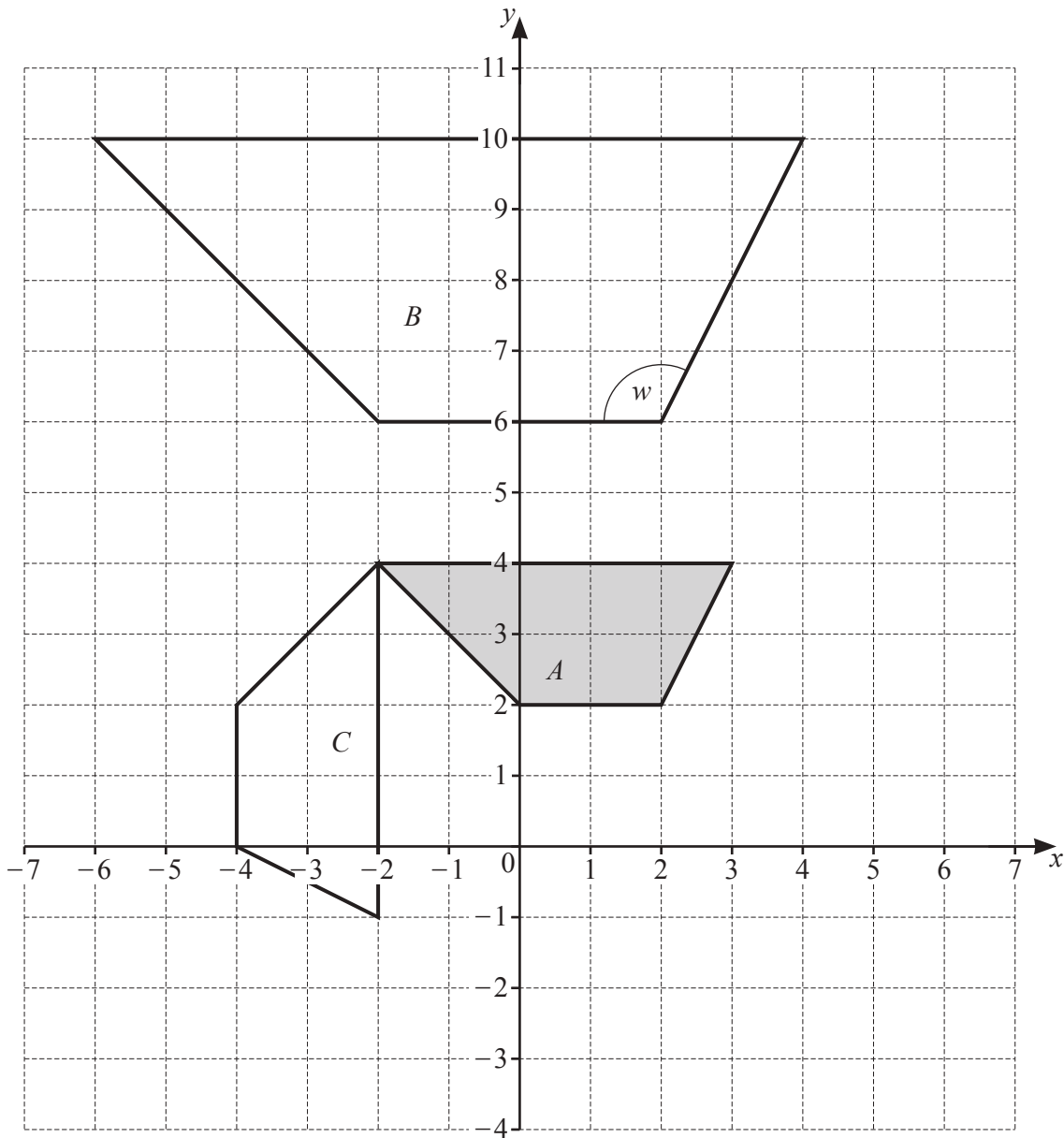
- (ii) Work out the value of y .
Give a geometrical reason for your answer.

$y = \dots\dots\dots$ because $\dots\dots\dots$
 $\dots\dots\dots$ [3]

- (iii) Find the ratio $x : y$.
Give your answer in its simplest form.

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

3 (a) The diagram shows three quadrilaterals, A , B and C , on a 1 cm^2 grid.



(i) (a) Write down the mathematical name for quadrilateral B .

..... [1]

(b) Work out the area of quadrilateral B .
Give the units of your answer.

..... [3]

(ii) Measure angle w .

Angle $w =$ [1]

(iii) Describe fully the **single** transformation that maps

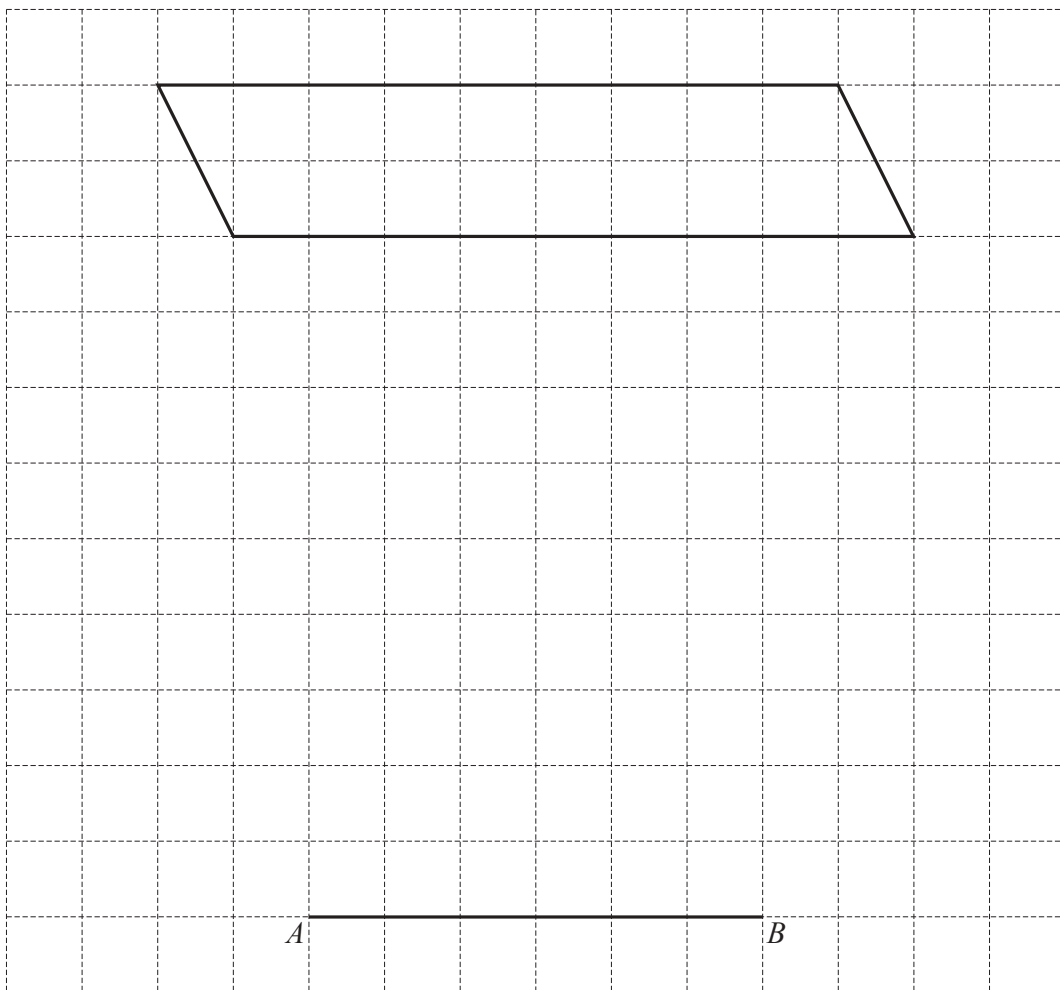
(a) quadrilateral A onto quadrilateral B ,

.....
 [3]

(b) quadrilateral A onto quadrilateral C .

.....
 [3]

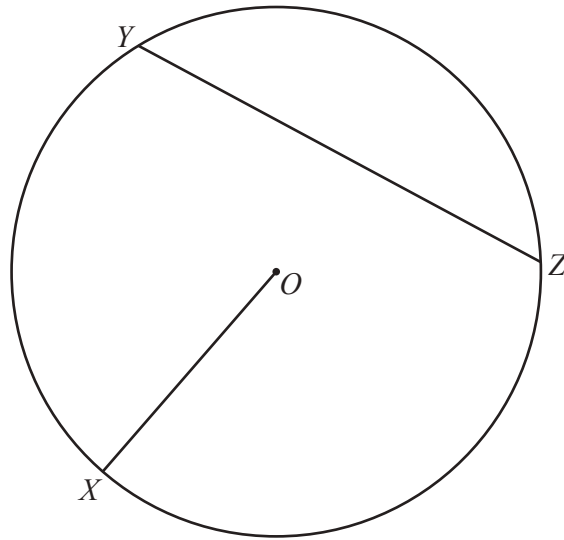
(b) The diagram shows a parallelogram and a line AB on a 1cm^2 grid.



On the grid, complete a triangle, ABC , that has the same area as the parallelogram.

[2]

4 (a)



X , Y and Z lie on a circle, centre O .

(i) Write down the mathematical name of the line

(a) OX ,

..... [1]

(b) YZ .

..... [1]

(ii) Measure the length of OX .

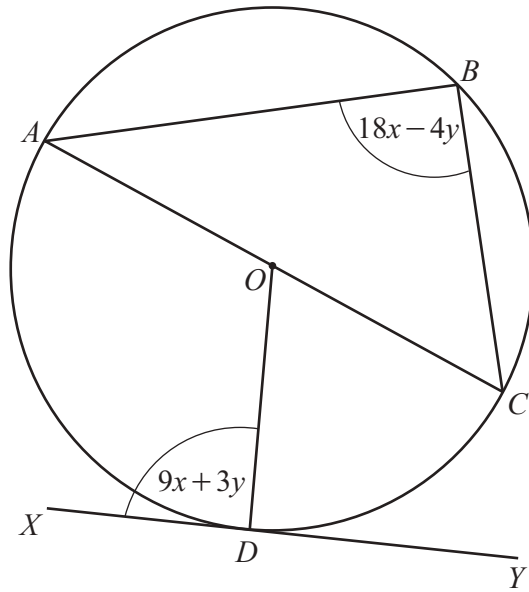
..... cm [1]

(b) Another circle has a radius of 18 cm.

Calculate the circumference of this circle.

..... cm [2]

(c) In this part, all angles are in degrees.



NOT TO SCALE

A, B, C and D lie on a circle, centre O , diameter AC .
 XY is a tangent to the circle at D .

(i) Use the information in the diagram to complete these two simultaneous equations.

$$9x + 3y = \dots\dots\dots$$

$$18x - 4y = \dots\dots\dots$$

[2]

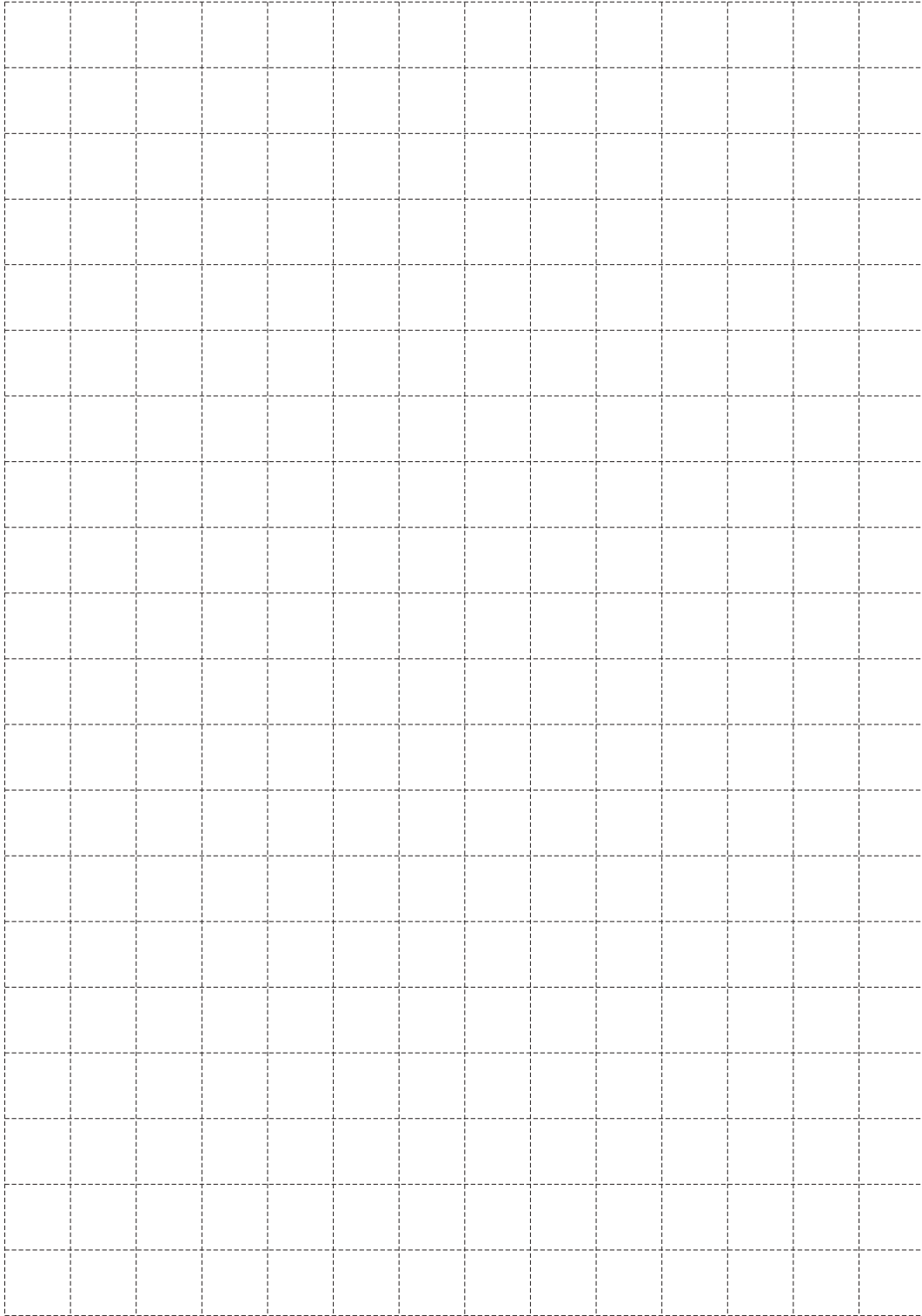
(ii) Solve your simultaneous equations.
 You must show all your working.

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

$$y = \dots\dots\dots [3]$$

5 (a) A closed box, in the shape of a cuboid, has length 5 cm, width 4 cm and height 2 cm.

(i) Draw a net of the box on the 1cm^2 grid.



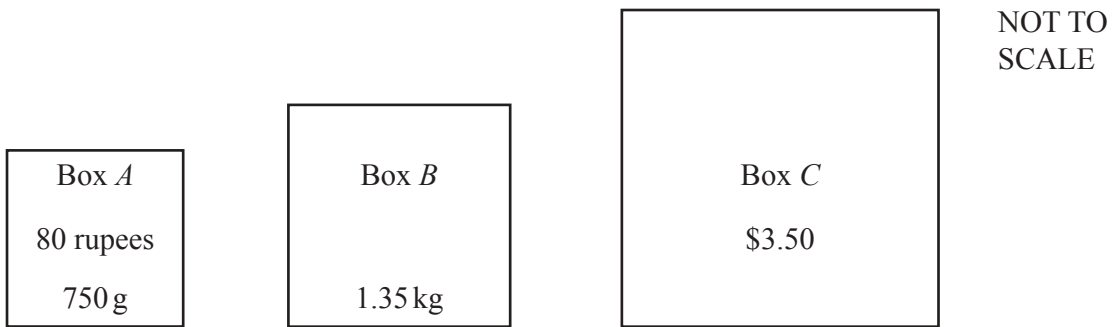
[3]

- (ii) A container is a cube with volume 1 m^3 .

Work out the maximum number of these boxes that can be packed into this container.

..... [3]

- (b) A shop sells three different sized boxes of rice.
The boxes all have the same cost per kilogram.



- (i) Work out the cost in rupees of box *B*.

..... rupees [2]

- (ii) \$1 = 64 rupees.

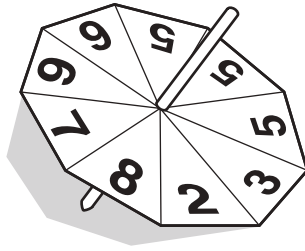
Calculate the mass of box *C*.
Give your answer in kilograms.

..... kg [3]

- (c) Change 75 cm^3 into litres.
Give your answer in standard form.

..... litres [2]

6 (a)



The diagram shows a fair 9-sided spinner.
The numbers on the spinner are 2, 3, 5, 5, 5, 6, 6, 7 and 8.

(i) The spinner is spun once.

Write down the probability that the spinner lands on

(a) the number 8,

..... [1]

(b) a number less than 7.

..... [1]

(ii) The spinner is spun 135 times.

Work out the expected number of times the spinner lands on the number 6.

..... [1]

- (b) Hitesh throws a dice 80 times.
The results are shown in the table.

Number thrown	Frequency
1	15
2	16
3	14
4	11
5	9
6	15

- (i) Write down the mode.

..... [1]

- (ii) Work out the range.

..... [1]

- (iii) Work out the median.

..... [1]

- (iv) Calculate the mean.

..... [3]

- 7 (a) 1 mile = 1.609344 kilometres

Change 6 miles into **metres**.

Give your answer correct to the nearest metre.

..... m [3]

- (b) (i) The bearing of a boat from a harbour is 322° .

Work out the bearing of the harbour from the boat.

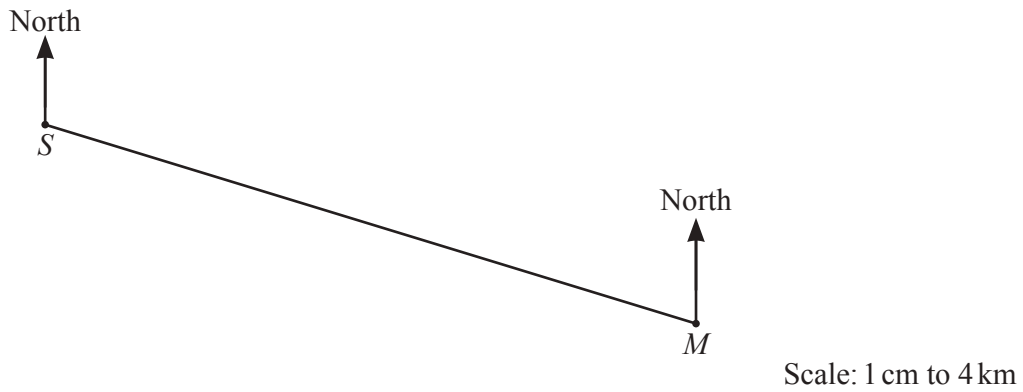
..... [2]

- (ii) The boat is 12 km from the harbour.
At 2.30 pm the boat starts to sail to the harbour.
The speed of the boat is 5 km/h.

Work out the time the boat arrives at the harbour.

..... [3]

- (c) The scale drawing shows the positions of Shakti’s house, *S*, and Mairi’s house, *M*, on a map. The scale is 1 cm represents 4 km.



- (i) Measure the bearing of *M* from *S*.

..... [1]

- (ii)



Scale: 1 cm to 5 km

This scale drawing shows another map with Shakti’s house, *S*, marked on it. The scale of this map is 1 cm represents 5 km.

Mark the position of Mairi’s house, *M*, on this map.

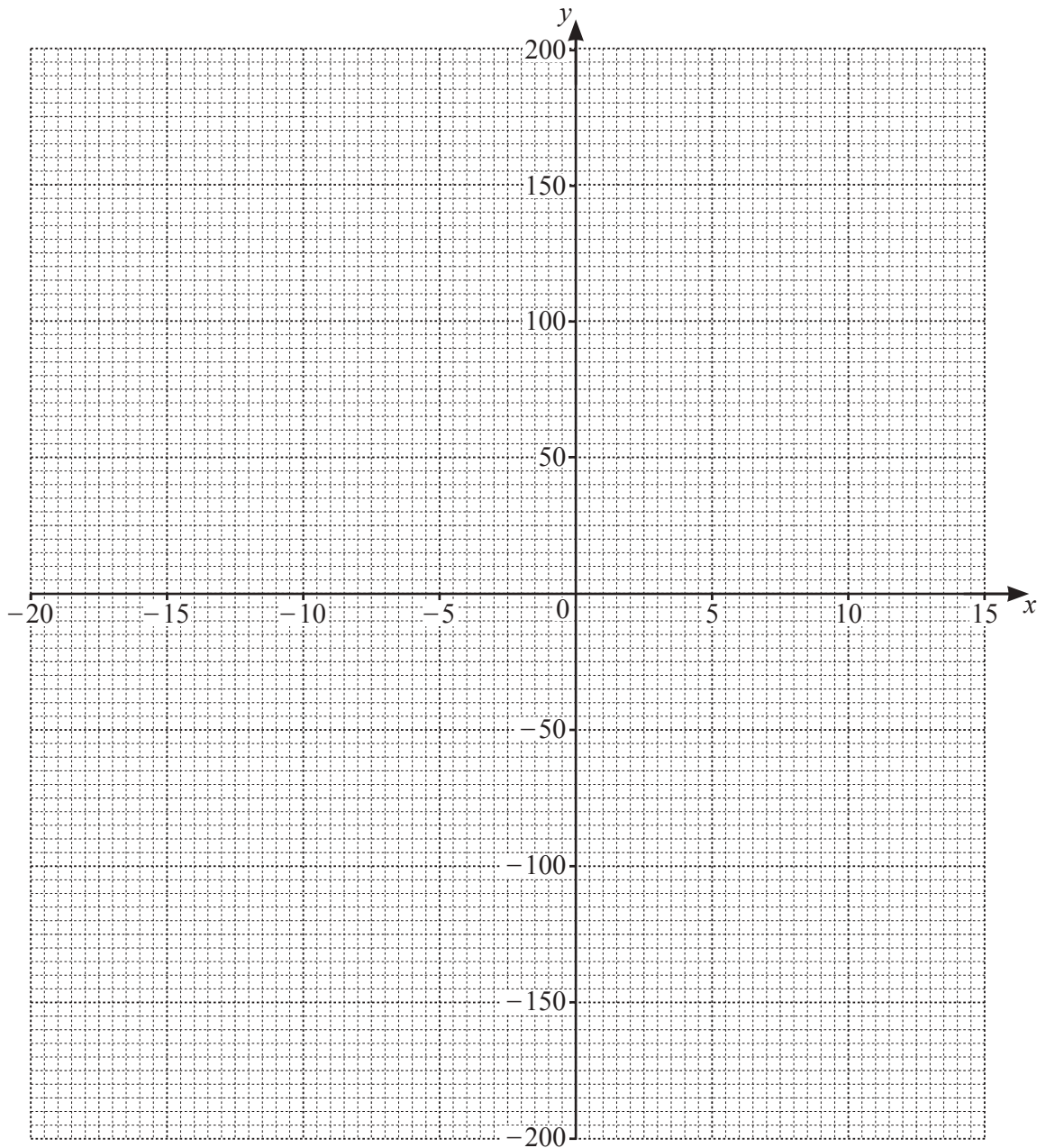
[4]

- 8 (a) (i) Complete the table of values for $y = x^2 + 6x - 160$.

x	-20	-15	-10	-5	0	5	10	15
y	120		-120	-165	-160	-105		

[3]

- (ii) On the grid, draw the graph of $y = x^2 + 6x - 160$ for $-20 \leq x \leq 15$.



[4]

(iii) (a) Write down the equation of the line of symmetry of the graph.

..... [1]

(b) Find the coordinates of the lowest point on the graph.

(.....,) [1]

(iv) Use your graph to solve the equation $x^2 + 6x - 160 = 0$.

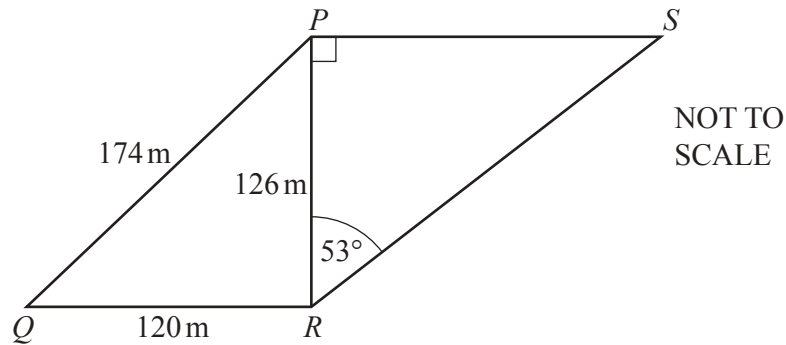
$x = \dots\dots\dots$ or $x = \dots\dots\dots$ [2]

(b) Rearrange the formula $y = mx + c$ to make x the subject.

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

- 9 Tarak has two fields.
He grows wheat, barley and corn in his fields.

(a)



The diagram shows Tarak's two triangular fields, PQR and PRS .
Angle $RPS = 90^\circ$ and angle $PRS = 53^\circ$.
 $PQ = 174\text{ m}$, $QR = 120\text{ m}$ and $PR = 126\text{ m}$.

- (i) Show that angle $PRQ = 90^\circ$.

[2]

- (ii) Calculate the area of the quadrilateral $PQRS$.
Give your answer correct to 4 significant figures.

..... m^2 [5]

- (b) (i) The mass, m tonnes, of wheat grown in 2021 is 4.3 tonnes, correct to 1 decimal place.

Complete this statement about the value of m .

..... $\leq m <$ [2]

- (ii) In 2020, 2.6 tonnes of barley is grown.
In 2021, 3.25 tonnes of barley is grown.

Show that the percentage increase in barley grown from 2020 to 2021 is 25%.

[1]

- (iii) In 2019, 2.4 tonnes of corn is grown.
In 2020, 20% more corn is grown than in 2019.
In 2021, 20% less corn is grown than in 2020.

Calculate the amount of corn grown in 2021.

..... tonnes [3]

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