UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

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MATHEMATICS **0580/31**

Paper 3 (Core) **May/June 2012**

2 hours

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator
Mathematical tables (optional)
Geometrical instruments
Tracing paper (optional)

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.
The total of the marks for this paper is 104.

This document consists of **15** printed pages and **1** blank page.

For Examiner's Use

1 **(a)** Vince and Wendy share \$2000 in the ratio Vince : Wendy = 19 : 21.

Calculate the amount of money that Vince receives.

Answer(a) \$ ..... [2]

(b) Wendy has \$265 to spend on some chairs.
The chairs cost \$37 each.

Work out the largest number of chairs she can buy.

Answer(b) ..... [2]

(c) Wendy shares \$200 between her three children Jake, Karl and Lana.
She gives 27% of the money to Jake and $\frac{2}{5}$ of the money to Karl.

Work out the amount of money she gives to Lana.

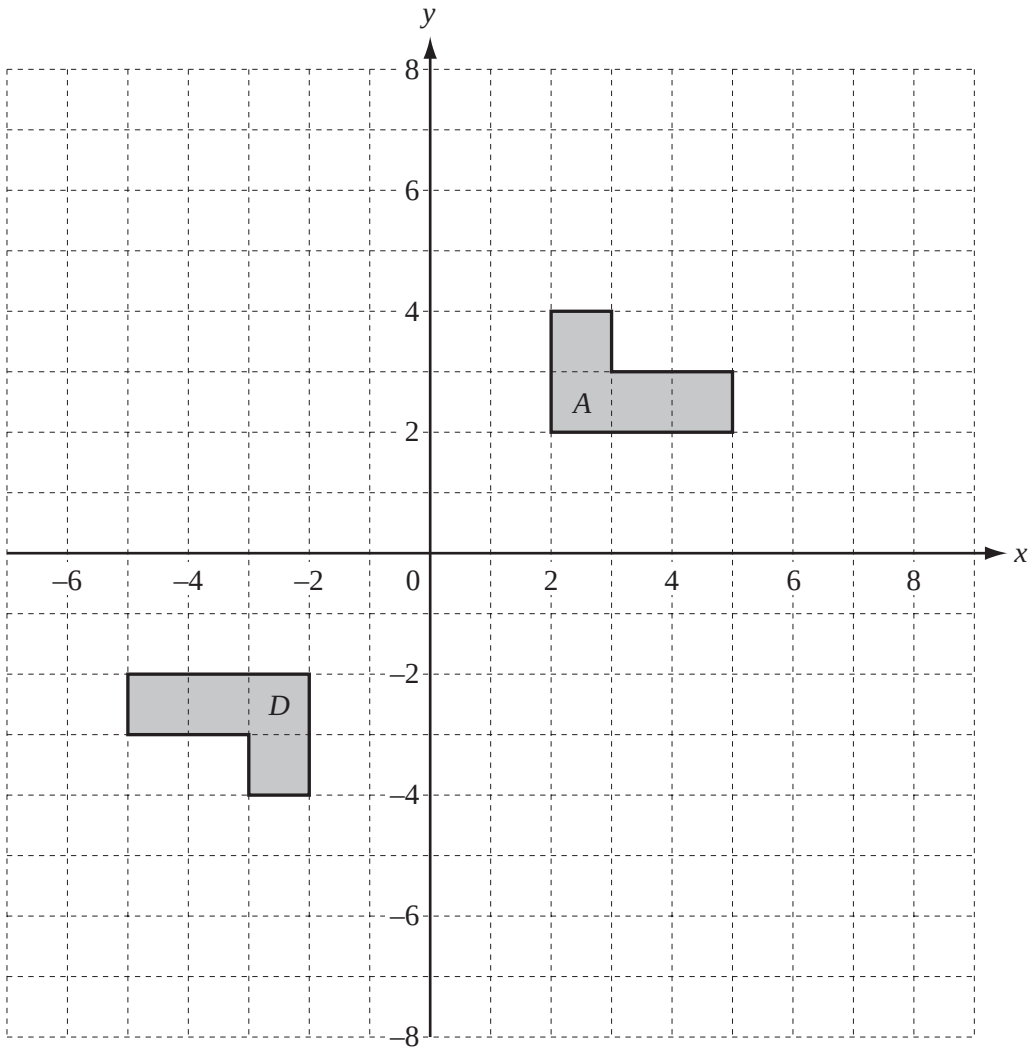
Answer(c) \$ ..... [3]

(d) Wendy invests \$500 at a rate of 4% per year **compound** interest.

Calculate the total amount of **interest** she receives at the end of 2 years.
Give your answer correct to the nearest dollar.

Answer(d) \$ ..... [4]

2



Two shapes *A* and *D* are shown on the grid.

(a) (i) Reflect **shape *A*** in the line $x = 0$. Label this image ***B***. [2]

(ii) Rotate **shape *A*** through 180° about (2, 4). Label this image ***C***. [2]

(iii) Enlarge **shape *A*** with scale factor 2 and centre (3, 7). Label this image ***E***. [2]

(b) Describe fully the **single** transformation that maps **shape *D*** onto

(i) shape *B*,

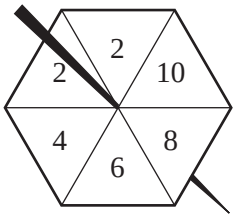
Answer(b)(i) ..... [2]

(ii) shape *C*.

Answer(b)(ii) ..... [2]

[Turn over

3 **(a)** Jon spins this 6-sided spinner.



The probability that the spinner lands on any of the six sides is equally likely.

Write down the probability that the spinner lands on

(i) the number 6,

Answer(a)(i) ..... [1]

(ii) a prime number,

Answer(a)(ii) ..... [1]

(iii) a number less than 11.

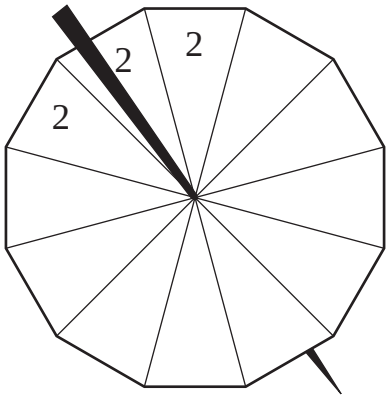
Answer(a)(iii) ..... [1]

(b) Felix has a 12-sided spinner with the numbers 2, 4, 5, 7 and 9 written on it.
It is equally likely to land on any side.
The table shows the probability of the spinner landing on each number.

Number on spinner	2	4	5	7	9
Probability	$\frac{1}{4}$	$\frac{1}{3}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{12}$

The diagram of the spinner has been completed for the number 2.

Complete the diagram for the numbers 4, 5, 7 and 9.



[3]

(c) Felix says that his spinner is more likely to land on a 2 than Jon's spinner.

Explain why he is wrong.

Answer(c) .....

..... [1]

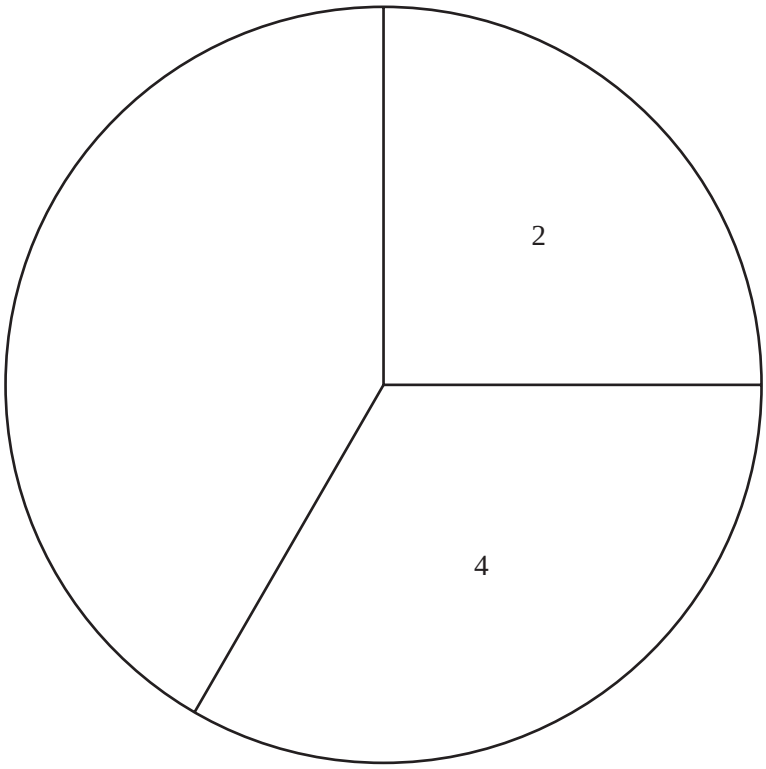
For Examiner's Use

(d) Felix spins his 12-sided spinner 60 times and records the results.

Number on spinner	Frequency	Pie chart sector angle
2	15	90°
4	20	120°
5	5	30°
7	12	
9	8	

(i) Complete the table by working out the sector angles for the numbers 7 and 9. [3]

(ii) Complete the pie chart.



[2]

(iii) Write down the mode.

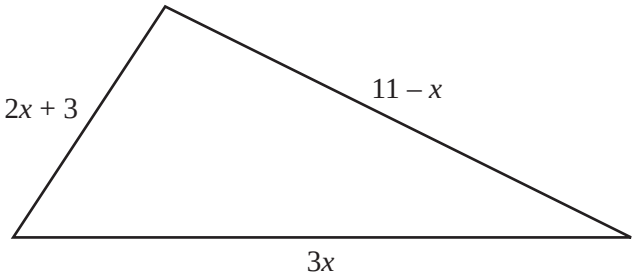
Answer(d)(iii) ..... [1]

(iv) Calculate the mean.

Answer(d)(iv) ..... [3]

For Examiner's Use

4 In this question all the measurements are in centimetres.



NOT TO SCALE

The diagram shows a triangle with sides of length $2x + 3$, $11 - x$ and $3x$.

(a) Explain why x must be less than 11.

Answer(a) .....

..... [1]

(b) Write down an expression, in terms of x, for the perimeter of the triangle.
Give your answer in its simplest possible form.

Answer(b) ..... [2]

(c) The perimeter of the triangle is 32 cm.

(i) Write down an equation in terms of x and solve it.

Answer(c)(i) x = ... [3]

(ii) Work out the length of the shortest side of the triangle.

Answer(c)(ii) ..... cm [2]

5

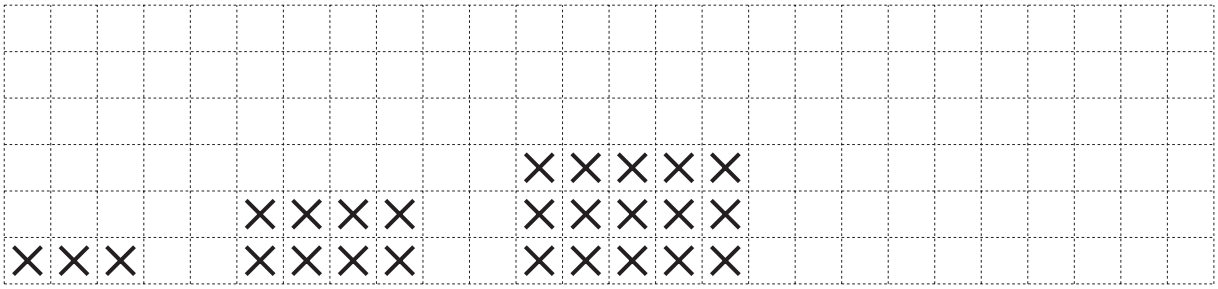


Diagram 1 Diagram 2 Diagram 3 Diagram 4

The number of crosses in each Diagram forms a sequence.

(a) On the grid draw Diagram 4. [1]

(b) Write down the number of crosses needed to draw Diagram 5.

Answer(b) ..... [1]

(c) Diagram 1 has 1 row of 3 crosses.
Diagram 2 has 2 rows of 4 crosses.

(i) Complete this statement for Diagram *n*.

Diagram *n* has *n* rows of ..... crosses. [1]

(ii) Write down, in terms of *n*, how many crosses are needed to draw Diagram *n*.

Answer(c)(ii) ..... [1]

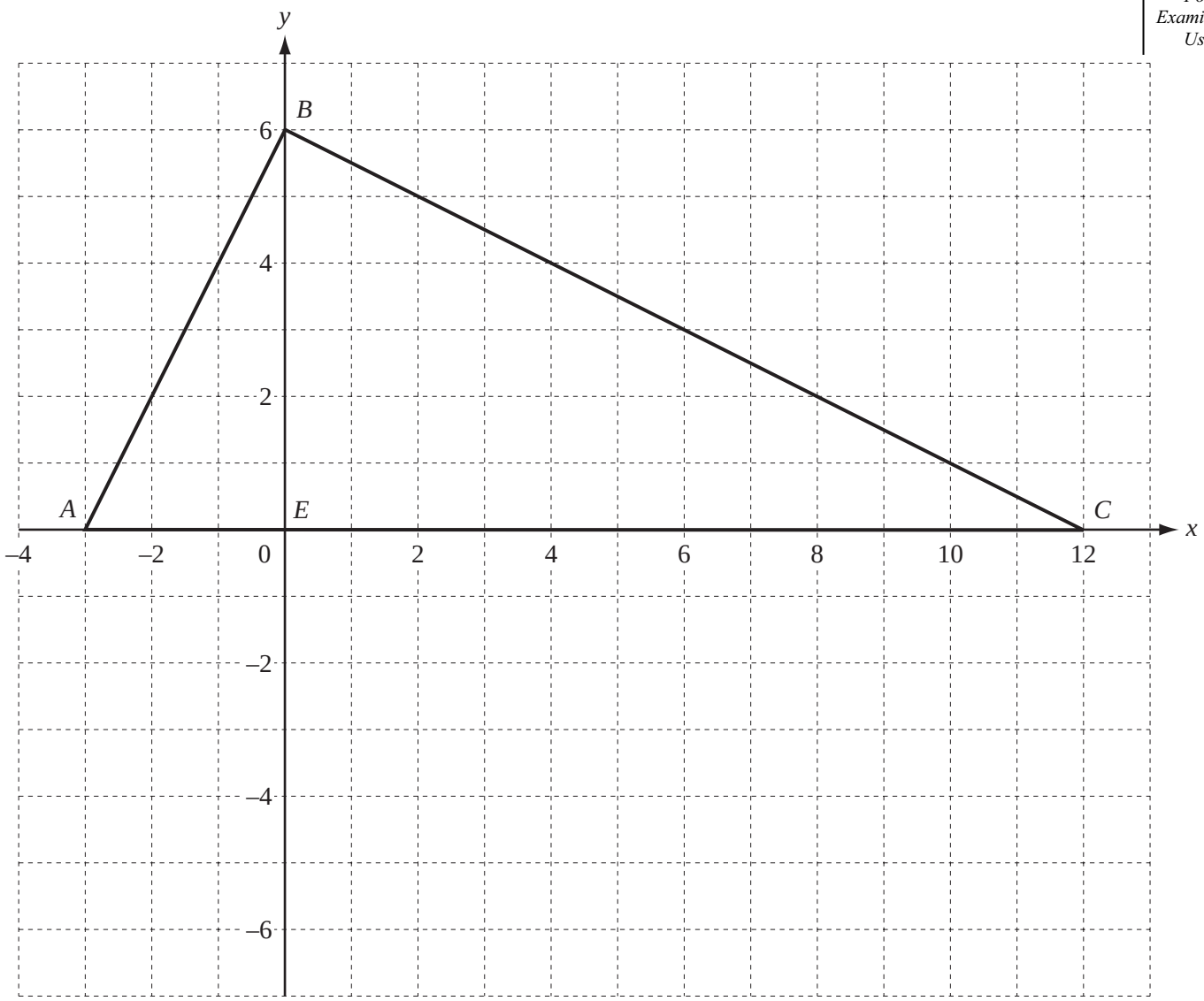
(iii) Find the number of crosses needed to draw Diagram 20.

Answer(c)(iii) ..... [1]

For Examiner's Use

6

For Examiner's Use



Triangle ABC is drawn on a 1cm^2 grid.
E is the point (0, 0).

(a) Write down the gradient of the line AB.

Answer(a) ..... [2]

(b) The gradient of BC is -0.5.

Write down the equation of the line BC in the form $y = mx + c$.

Answer(b) $y =$ ..... [2]

For Examiner's Use

(c) Write down the ratio $AE : EC$.
Give your answer in its simplest form.

Answer(c) ..... : ..... [2]

(d) Measure angle ABE.

Answer(d) Angle ABE = ... [1]

(e) Triangle ABE is **similar** to triangle BCE.

Explain what the word **similar** tells you about the triangles ABE and BCE.

Answer(e) .....

..... [2]

(f) Calculate the area of triangle ABC.

Answer(f) ..... cm^2 [3]

(g) $ABCD$ is a rectangle.

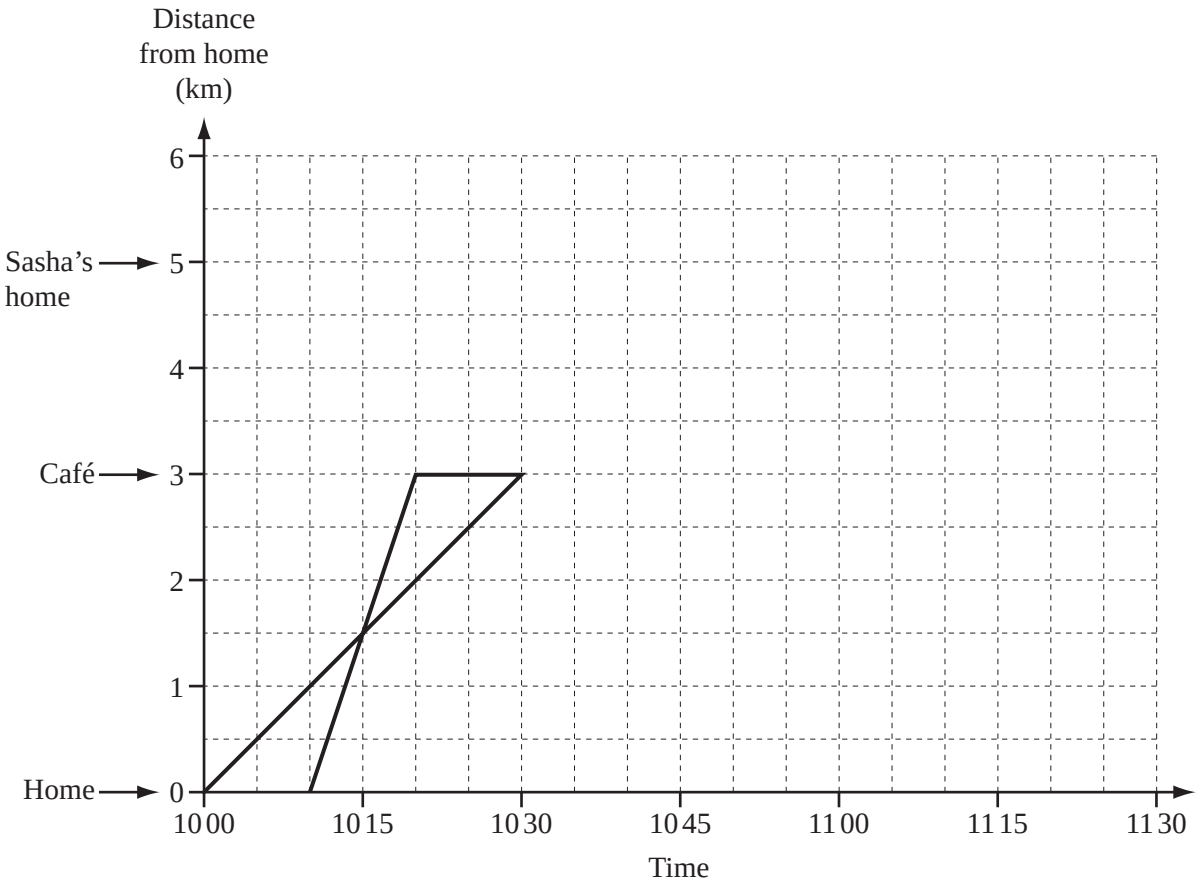
(i) Mark point D on the grid. [1]

(ii) Write down the co-ordinates of D.

Answer(g)(ii) (..... , ...) [1]

[Turn over

7



Poppy and Toni go to a café which is 3 km from their home.
They take the same route.

Poppy leaves home at 10 00 and walks.
Toni leaves home at 10 10 and cycles.
These journeys are shown on the travel graph.

(a) (i) How long does Toni wait at the café before Poppy arrives?

Answer(a)(i) ..... min [1]

(ii) The graphs cross at 10 15.
Describe what this means.

Answer(a)(ii) .....

.....

[1]

(iii) Calculate Toni's average speed from home to the café in kilometres per hour.

Answer(a)(iii) ..... km/h [2]

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(b) Poppy and Toni stay at the café until 10 50.

(i) At 10 50 Poppy walks to visit her friend Sasha.
Sasha's home is 5 km from Poppy's home.
Poppy walks at the same speed as before.

Complete the travel graph for Poppy. [2]

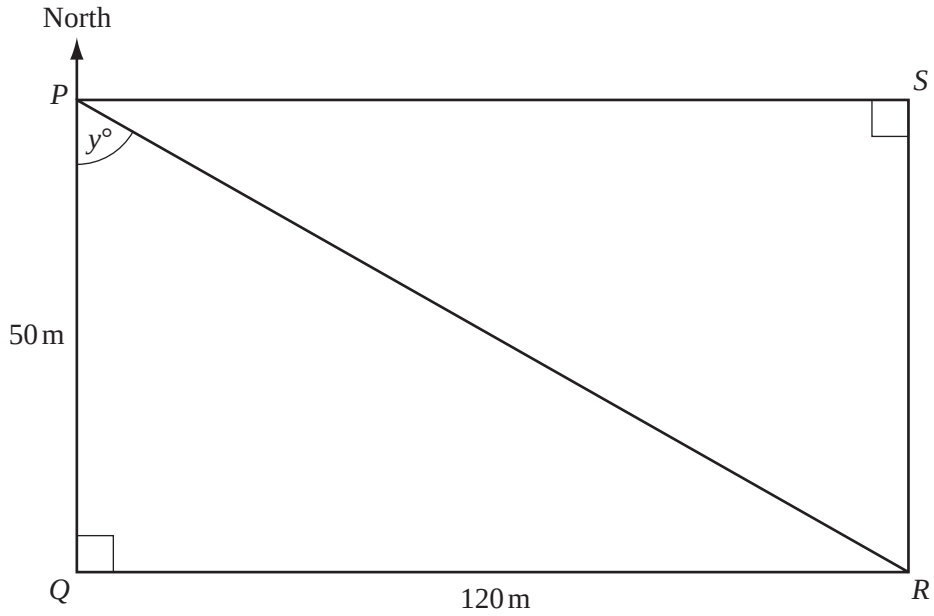
(ii) At 10 50 Toni starts to cycle home.
At 10 55, when she has travelled half the distance home, her bicycle has a puncture.
She then walks the rest of the way home at 4.5 km/h.

Complete the travel graph for Toni. [2]

(iii) Calculate the average speed for Toni's journey home from the café.

Answer(b)(iii) ..... km/h [3]

8



NOT TO SCALE

The diagram shows a rectangular field, *PQRS*.
QR = 120 m, *PQ* = 50 m and *P* is due North of *Q*.

Bill and Said run from *P* to *R*.
Bill runs along the sides *PQ* and *QR*.
Said runs directly from *P* to *R*.

(a) Calculate how far

(i) Bill runs,

Answer(a)(i) ..... m [1]

(ii) Said runs.

Answer(a)(ii) ..... m [2]

(b) Bill takes 34 seconds to reach *R*.

Calculate Bill's average speed.

Answer(b) ..... m/s [1]

For Examiner's Use

For Examiner's Use

(c) Said runs at 4 m / s.

Who arrives at *R* first and by how many seconds?

Answer(c) ..... arrives at *R* first by ..... seconds. [3]

(d) **(i)** Use trigonometry to calculate the size of the angle marked *y*.

Answer(d)(i) ..... [2]

(ii) Find the bearing of *R* from *P*.

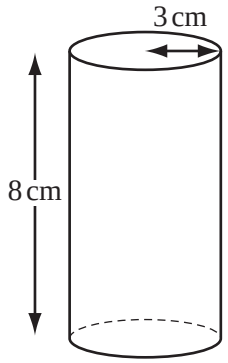
Answer(d)(ii) ..... [1]

(e) Calculate the area of the field in **square kilometres**.
Give your answer in standard form.

Answer(e) ..... km^2 [4]

[Turn over

9 (a)



NOT TO SCALE

A cylindrical drinking glass has radius 3 cm and height 8 cm.

(i) Calculate the volume of water the glass holds when it is filled to the top.
Give the units of your answer.

Answer(a)(i) .... [3]

(ii) Water is poured into a number of these glasses from a jug containing 1.5 litres.
Each glass has a horizontal line 2 cm from the top.

Calculate how many of these glasses can be filled up to the line from the jug.

Answer(a)(ii) ..... [4]

(b) A cylindrical pipe has a circumference of 16 cm.

Calculate the diameter of the pipe.

Answer(b) ..... cm [2]

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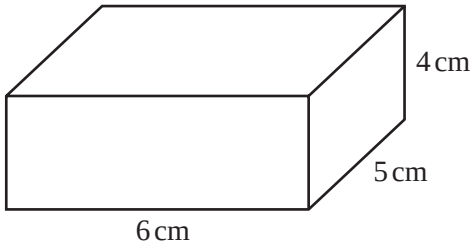
(c) A cuboid measures 6 cm by 5 cm by 4 cm.



NOT TO SCALE

Work out the surface area of the cuboid.

Answer(c) ..... cm^2 [3]

(d) $1 m^3$ of copper has a mass of m kg.
The volume of one copper sphere is v m^3.

Write down an expression for

(i) the mass, in kilograms, of one sphere,

Answer(d)(i) ..... kg [1]

(ii) the mass, in kilograms, of s spheres,

Answer(d)(ii) ..... kg [1]

(iii) the mass, in grams, of s spheres.

Answer(d)(iii) ..... g [1]

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