UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER		CANDIDATE NUMBER	

4306934856

MATHEMATICS **0580/43**

Paper 4 (Extended) **May/June 2010**

2 hours 30 minutes

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 130.

This document consists of **19** printed pages and **1** blank page.

IB10 06_0580_43/3RP
© UCLES 2010

UNIVERSITY *of* CAMBRIDGE
International Examinations

[Turn over

1 Daniella is 8 years old and Edward is 12 years old.

(a) Their parents give them some money in the ratio of their ages.

(i) Write the ratio Daniella's age : Edward's age in its simplest form.

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

(ii) Daniella receives \$30.
Show that Edward receives \$45.

Answer(a)(ii)

[1]

(iii) What percentage of the total amount of money given by their parents does Edward receive?

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

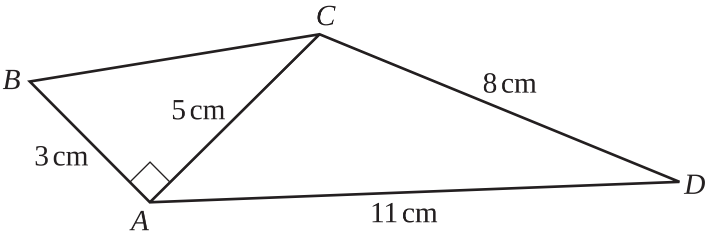
(b) Daniella invests her \$30 at 3% per year, **compound** interest.
Calculate the amount Daniella has after 2 years.
Give your answer correct to 2 decimal places.

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

(c) Edward also invests \$30.
He invests this money at a rate of r% per year, **simple** interest.
After 5 years he has a total amount of \$32.25.
Calculate the value of r.

Answer(c) $r =$ .... [2]

2



NOT TO SCALE

In the quadrilateral *ABCD*, *AB* = 3 cm, *AD* = 11 cm and *DC* = 8 cm.
The diagonal *AC* = 5 cm and angle *BAC* = 90°.

Calculate

(a) the length of *BC*,

Answer(a) BC = ... cm [2]

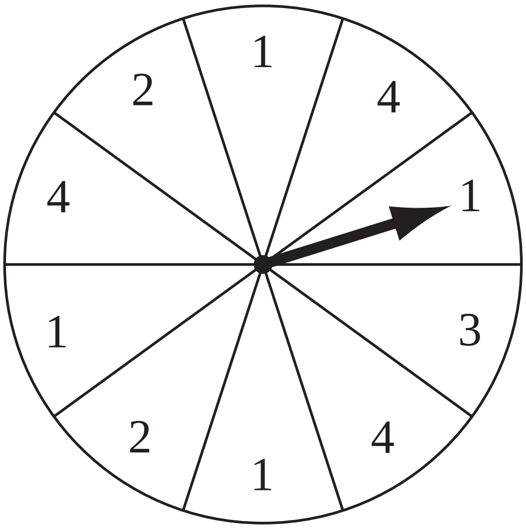
(b) angle *ACD*,

Answer(b) Angle *ACD* = ... [4]

(c) the area of the quadrilateral *ABCD*.

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

3



The diagram shows a circular board, divided into 10 numbered sectors.

When the arrow is spun it is equally likely to stop in any sector.

(a) Complete the table below which shows the probability of the arrow stopping at each number.

Number	1	2	3	4
Probability		0.2		0.3

[1]

(b) The arrow is spun once.

Find

(i) the most likely number,

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

(ii) the probability of a number less than 4.

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

© UCLES 2010

(c) The arrow is spun twice.

Find the probability that

(i) both numbers are 2,

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

(ii) the first number is 3 and the second number is 4,

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

(iii) the two numbers add up to 4.

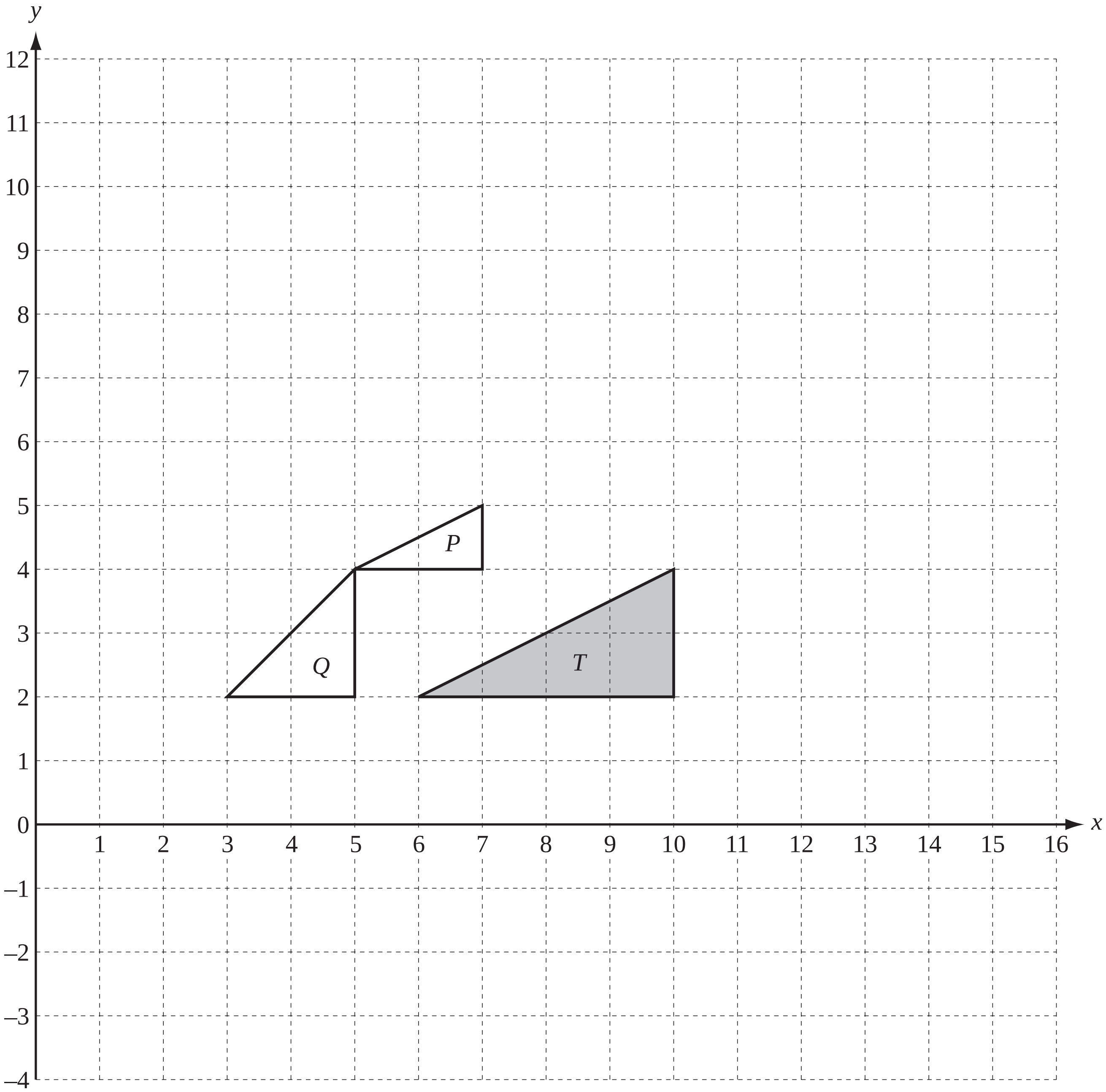
Answer(c)(iii) .... [3]

(d) The arrow is spun several times until it stops at a number 4.

Find the probability that this happens on the third spin.

Answer(d) .... [2]

4


y
12
11
10
9
8
7
6
5
4
3
2
1
0
–1
–2
–3
–4
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
x
P
Q
T

(a) Draw the reflection of triangle T in the line $y = 6$.

Label the image A. [2]

(b) Draw the translation of triangle T by the vector $\begin{pmatrix} -4 \\ 6 \end{pmatrix}$.

Label the image B. [2]

(c) Describe fully the **single** transformation which maps triangle B onto triangle T.

Answer(c) .... [2]

(d) **(i)** Describe fully the **single** transformation which maps triangle T onto triangle P.

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

(ii) Complete the following statement.

Area of triangle P = ... × Area of triangle T [1]

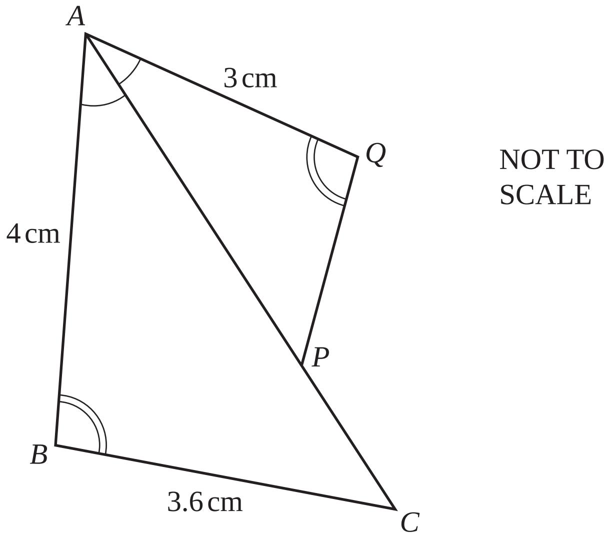
(e) **(i)** Describe fully the **single** transformation which maps triangle T onto triangle Q.

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

(ii) Find the 2 by 2 matrix which represents the transformation mapping triangle T onto triangle Q.

Answer(e)(ii) $\begin{pmatrix} & \\ & \end{pmatrix}$ [2]

5 **(a)**



The diagram shows two triangles *ACB* and *APQ*.

Angle *PAQ* = angle *BAC* and angle *AQP* = angle *ABC*.

AB = 4 cm, *BC* = 3.6 cm and *AQ* = 3 cm.

(i) Complete the following statement.

Triangle *ACB* is .... to triangle *APQ*. [1]

(ii) Calculate the length of *PQ*.

Answer(a)(ii) *PQ* = ... cm [2]

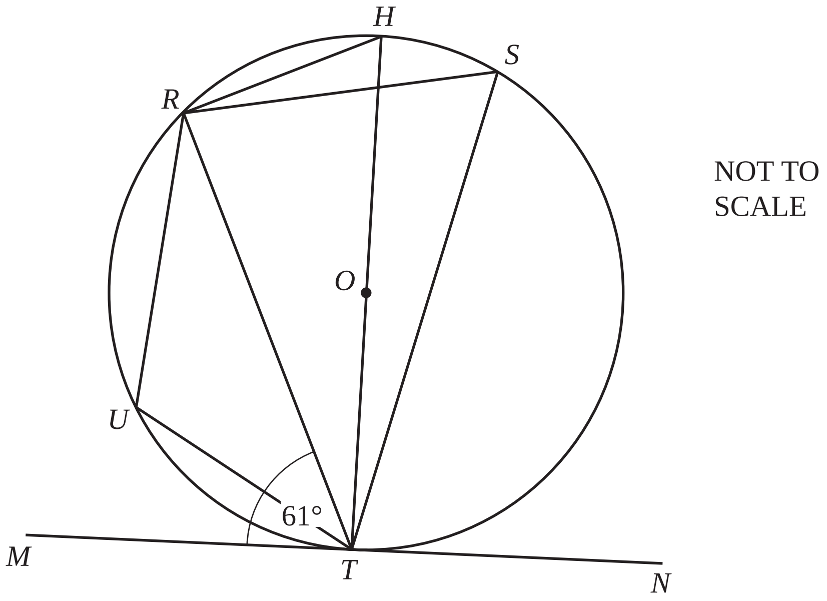
(iii) The area of triangle *ACB* is 5.6 cm^2.

Calculate the area of triangle *APQ*.

Answer(a)(iii) .... cm^2 [2]

© UCLES 2010

(b)



R, *H*, *S*, *T* and *U* lie on a circle, centre *O*.
HT is a diameter and *MN* is a tangent to the circle at *T*.
Angle *RTM* = 61°.

Find

(i) angle *RTH*,

Answer(b)(i) Angle *RTH* = ... [1]

(ii) angle *RHT*,

Answer(b)(ii) Angle *RHT* = ... [1]

(iii) angle *RST*,

Answer(b)(iii) Angle *RST* = ... [1]

(iv) angle *RUT*.

Answer(b)(iv) Angle *RUT* = ... [1]

(c) *ABCDEF* is a hexagon.
The interior angle *B* is 4° greater than interior angle *A*.
The interior angle *C* is 4° greater than interior angle *B*, and so on, with each of the next interior angles 4° greater than the previous one.

(i) By how many degrees is interior angle *F* greater than interior angle *A*?

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

(ii) Calculate interior angle *A*.

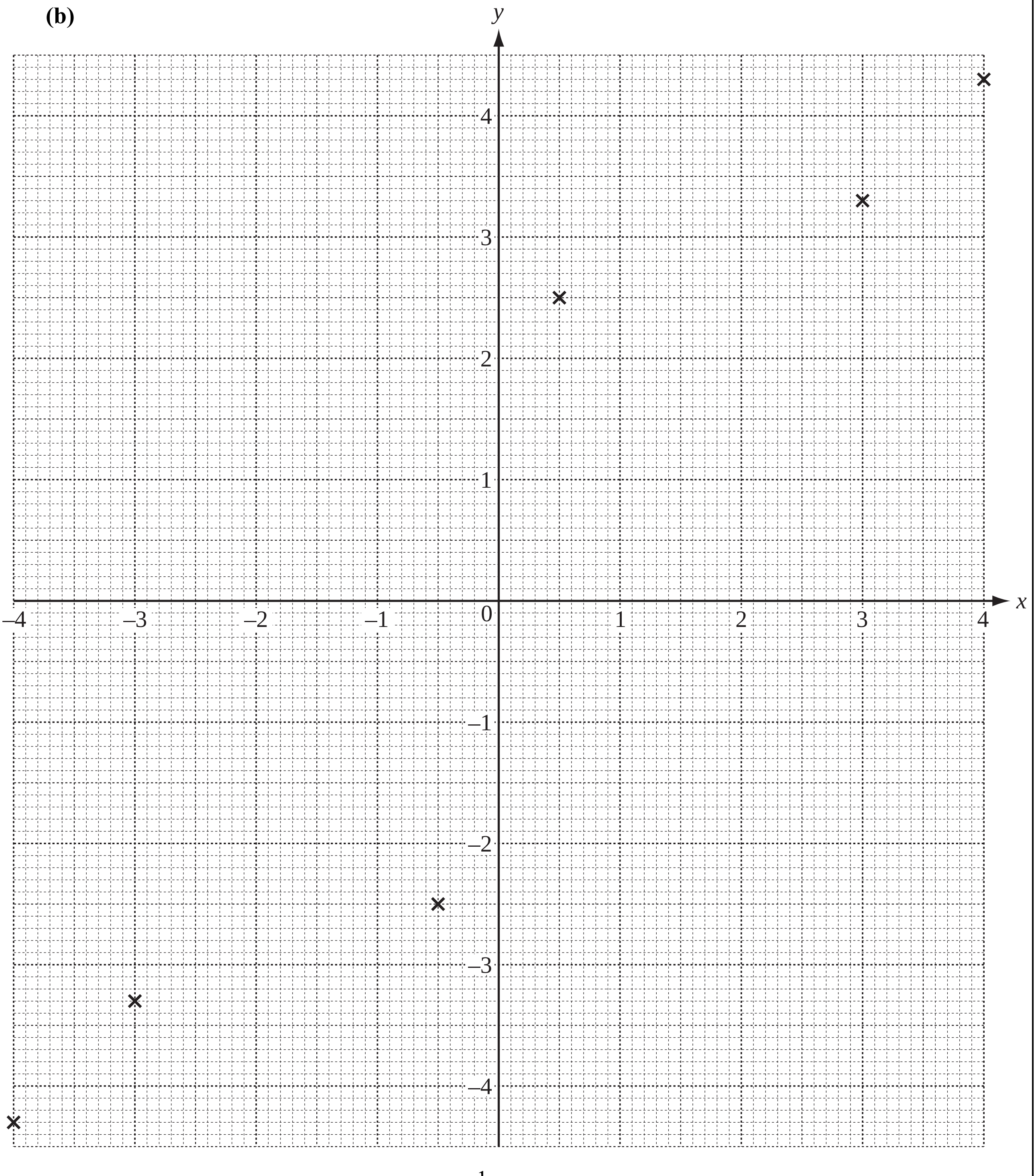
Answer(c)(ii) .... [3]

6 **(a)** Complete the table of values for $y = x + \frac{1}{x}$.

x	–4	–3	–2	–1	–0.5	0.5	1	2	3	4
y	–4.3	–3.3			–2.5	2.5			3.3	4.3

[2]

(b)



On the grid, draw the graph of $y = x + \frac{1}{x}$ for $-4 \leqslant x \leqslant -0.5$ and $0.5 \leqslant x \leqslant 4$.

Six of the ten points have been plotted for you. [3]

(c) There are three integer values of k for which the equation $x + \frac{1}{x} = k$ has **no** solutions.

Write down these three values of k.

Answer(c) $k =$ .... or $k =$ .... or $k =$ .... [2]

(d) Write down the ranges of x for which the gradient of the graph of $y = x + \frac{1}{x}$ is positive.

Answer(d) .... [2]

(e) To solve the equation $x + \frac{1}{x} = 2x + 1$, a straight line can be drawn on the grid.

(i) Draw this line on the grid for $-2.5 \leqslant x \leqslant 1.5$. [2]

(ii) On the grid, show how you would find the solutions. [1]

(iii) Show how the equation $x + \frac{1}{x} = 2x + 1$ can be rearranged into the form $x^2 + bx + c = 0$ and find the values of b and c.

Answer(e)(iii) $b =$ ....

$c =$ .... [3]

7 **(a)** The table shows how many books were borrowed by the 126 members of a library group in a month.

Number of books	11	12	13	14	15	16
Number of members (frequency)	35	28	22	18	14	9

Find the mode, the median and the mean for the number of books borrowed.

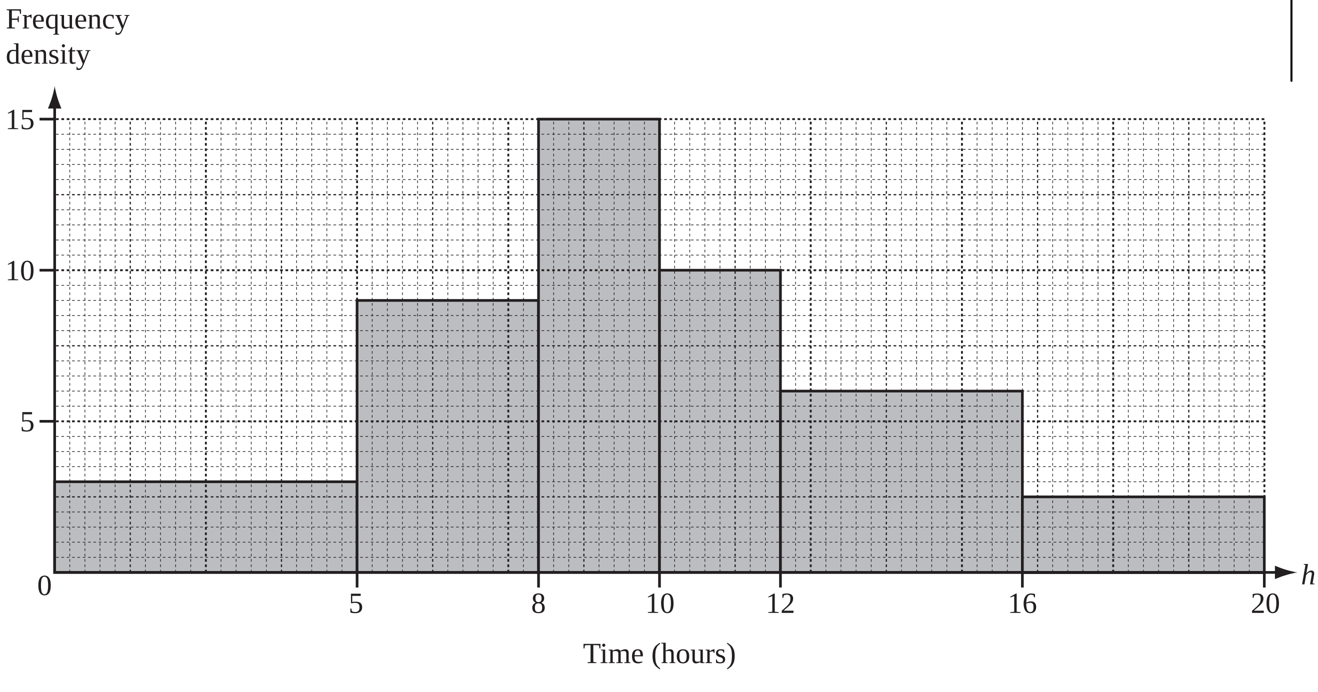
Answer(a) mode = ...

median = ...

mean = ... [6]

(b) The 126 members record the number of hours they read in one week.

The histogram shows the results.



(i) Use the information from the histogram to complete the frequency table.

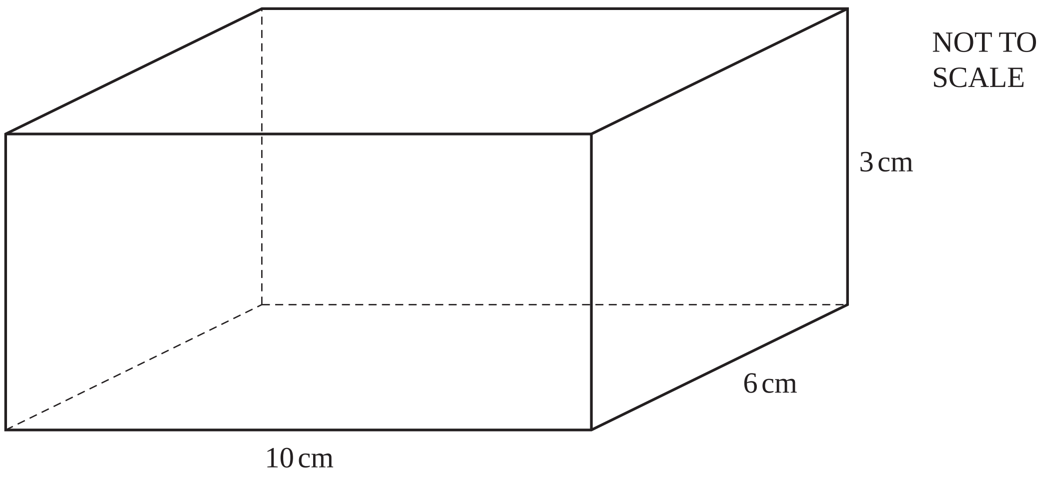
Number of hours (h)	$0 < h \leqslant 5$	$5 < h \leqslant 8$	$8 < h \leqslant 10$	$10 < h \leqslant 12$	$12 < h \leqslant 16$	$16 < h \leqslant 20$
Frequency				20	24	10

[3]

(ii) Use the information in this table to calculate an estimate of the mean number of hours.
Show your working.

Answer(b)(ii) .... hours [4]

8



A solid metal cuboid measures 10 cm by 6 cm by 3 cm.

(a) Show that 16 of these solid metal cuboids will fit exactly into a box which has internal measurements 40 cm by 12 cm by 6 cm.

Answer(a)

[2]

(b) Calculate the volume of **one** metal cuboid.

Answer(b) .... cm^3 [1]

(c) One cubic centimetre of the metal has a mass of 8 grams.
The box has a mass of 600 grams.

Calculate the **total** mass of the 16 cuboids **and** the box in

(i) grams,

Answer(c)(i) .... g [2]

(ii) kilograms.

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

(d) **(i)** Calculate the surface area of **one** of the solid metal cuboids.

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

(ii) The surface of each cuboid is painted. The cost of the paint is \$25 per **square metre**.

Calculate the cost of painting all **16** cuboids.

Answer(d)(ii) \$ .... [3]

(e) **One** of the solid metal cuboids is melted down.
Some of the metal is used to make 200 identical solid spheres of radius 0.5 cm.

Calculate the volume of metal from this cuboid which is **not** used.

[The volume, V, of a sphere of radius r is $V = \frac{4}{3}\pi r^3$.]

Answer(e) .... cm^3 [3]

(f) 50 cm^3 of metal is used to make 20 identical solid spheres of radius r.

Calculate the radius r.

Answer(f) $r =$ .... cm [3]

9 **(a)** The cost of a bottle of water is \$$w$.

The cost of a bottle of juice is \$$j$.

The total cost of 8 bottles of water and 2 bottles of juice is \$12.

The total cost of 12 bottles of water and 18 bottles of juice is \$45.

Find the cost of a bottle of water and the cost of a bottle of juice.

Answer(a) Cost of a bottle of water = \$ ....

Cost of a bottle of juice = \$ .... [5]

(b) Roshni cycles 2 kilometres at y km/h and then runs 4 kilometres at (y – 4) km/h.
The whole journey takes 40 **minutes**.

(i) Write an equation in y and show that it simplifies to $y^2 - 13y + 12 = 0$.

Answer(b)(i)

[4]

(ii) Factorise $y^2 - 13y + 12$.

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

(iii) Solve the equation $y^2 - 13y + 12 = 0$.

Answer(b)(iii) $y =$ .... or $y =$ .... [1]

(iv) Work out Roshni's running speed.

Answer(b)(iv) .... km/h [1]

(c) Solve the equation

$$u^2 - u - 4 = 0.$$

Show all your working and give your answers correct to 2 decimal places.

Answer(c) $u =$ .... or $u =$ .... [4]

10

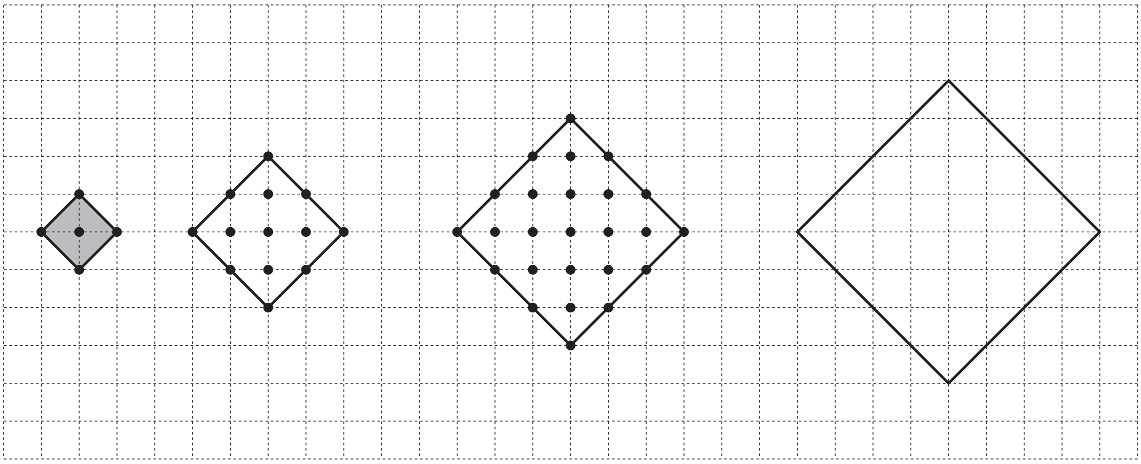


Diagram 1 Diagram 2 Diagram 3 Diagram 4

The diagrams show squares and dots on a grid.

Some dots are on the sides of each square and other dots are inside each square.

The area of the square (shaded) in Diagram 1 is 1 unit^2.

(a) Complete Diagram 4 by marking all the dots. [1]

(b) Complete the columns in the table below for Diagrams 4, 5 and *n*.

Diagram	1	2	3	4	5	-------	*n*
Number of units of area	1	4	9			-------	
Number of dots inside the square	1	5	13			-------	$(n-1)^2 + n^2$
Number of dots on the sides of the square	4	8	12			-------	
Total number of dots	5	13	25			-------	

[7]

(c) For Diagram 200, find the number of dots

(i) inside the square,

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

(ii) on the sides of the square.

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

(d) Which diagram has 265 dots inside the square?

Answer(d) .... [1]

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.

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

© UCLES 2010