UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER



**MATHEMATICS** **0580/31**

Paper 3 (Core) **October/November 2010**

**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 $\pi$, 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)** Write down

**(i)** a multiple of 7 between 80 and 90,

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

**(ii)** a prime number between 30 and 40,

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

**(iii)** a square number between 120 and 130,

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

**(iv)** a cube number between 100 and 200.

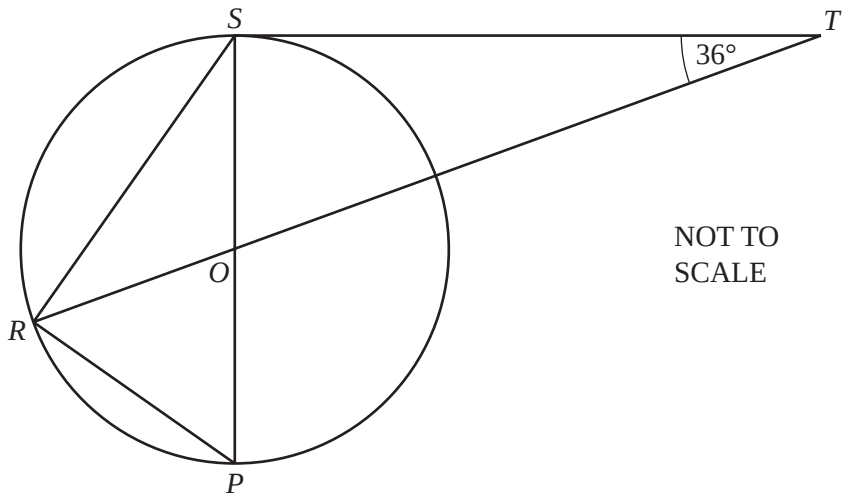
*Answer(a)*(iv) ..... [1]

**(b)** Write the following numbers in order, starting with the smallest.

$\sqrt{0.31}$ $\frac{5}{9}$ 55%

*Answer(b)* $<$ $<$ [2]

**2**




The points *P*, *R* and *S* lie on a circle, centre *O*.
*ROT* is a straight line and *TS* is a tangent to the circle at *S*.
Angle *STO* = 36°.

**(a)** Write down the size of angle *TSO*, giving a reason for your answer.

*Answer(a)* Angle *TSO* = ..... because .....

..... [2]

**(b) (i)** Calculate the size of angle *TOS*.

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

**(ii)** Show that angle *OPR* = 63°.

*Answer(b)*(ii)

[2]

**(c) (i)** Write down the size of angle *PRS*.

*Answer(c)*(i) Angle *PRS* = ..... [1]

**(ii)** Calculate the size of angle *PSR*.

*Answer(c)*(ii) Angle *PSR* = ..... [1]

*For Examiner's Use*

3

| Month | Total rainfall (mm) | Average daily sunshine (hours) |
|---|---|---|
| January | 79 | 6 |
| February | 84 | 7 |
| March | 62 | 4.5 |
| April | 46 | 1.5 |
| May | 53 | 3.5 |
| June | 54 | 1.5 |

The table shows some data about rainfall and sunshine.

**(a)** For the **rainfall**, calculate

**(i)** the mean,

*Answer(a)*(i) ..... mm [2]

**(ii)** the range.

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

**(b)** For the **sunshine**, find

**(i)** the mode,

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

**(ii)** the median.

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

**(c)** Dinesh draws a pie chart to display the **rainfall data**.

Calculate the sector angle for **February**.

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

*For Examiner's Use*

*For Examiner's Use*

**(d)** Amalia draws a pictogram to display the **sunshine data** for January and February.

| | |
|---|---|
| January | ☼ ☼ ☼ ☼ ☼ ☼ |
| February | ☼ ☼ ☼ ☼ ☼ ☼ ☼ |
| March | |

**(i)** Complete the key for the pictogram.

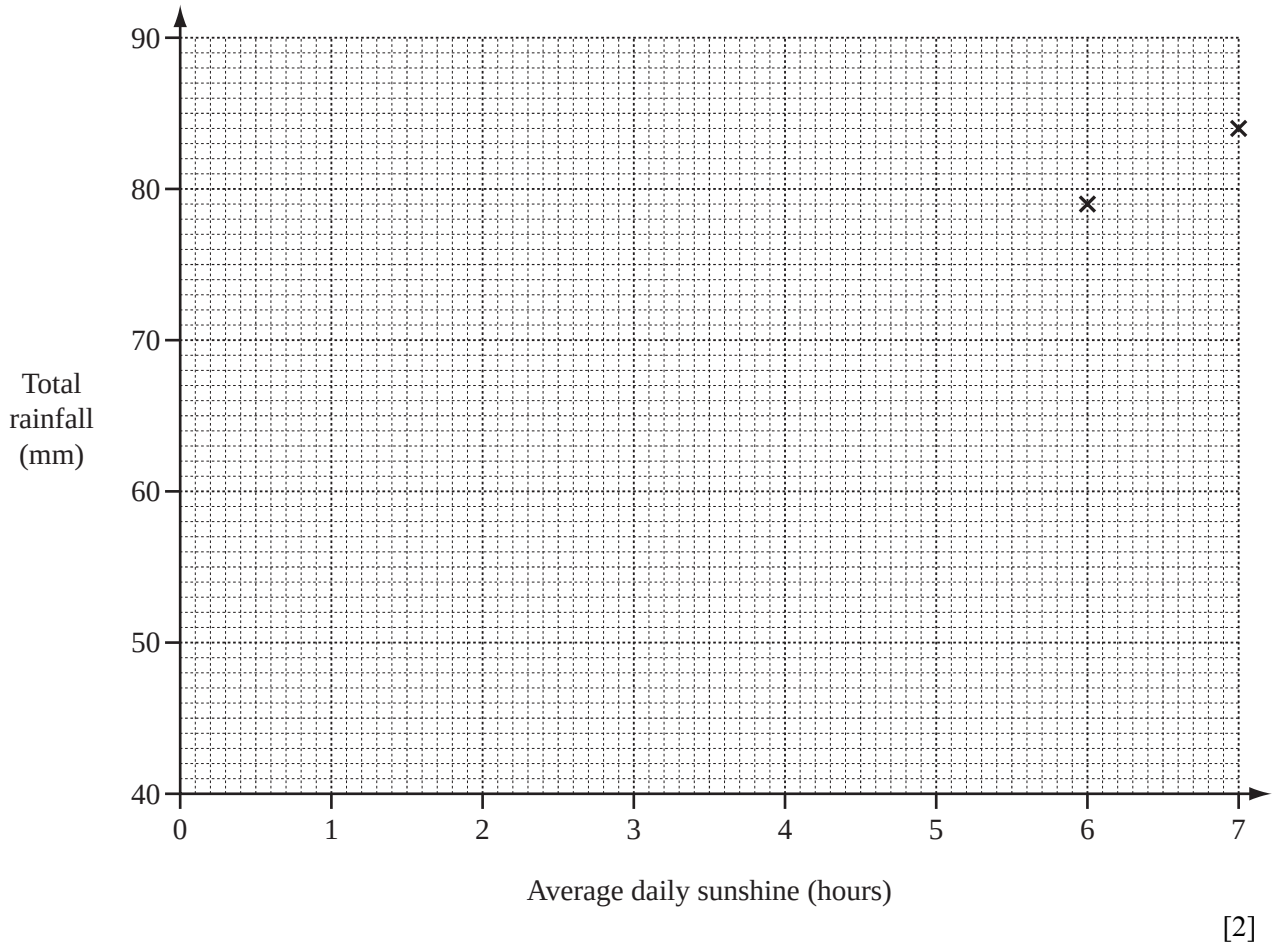
☼ represents .....

[1]

**(ii)** Complete the pictogram for March. [1]

**(e)** Priya draws a scatter diagram to find the correlation between rainfall and sunshine for January to June.

**(i)** Complete the scatter diagram below.
January and February are plotted for you.

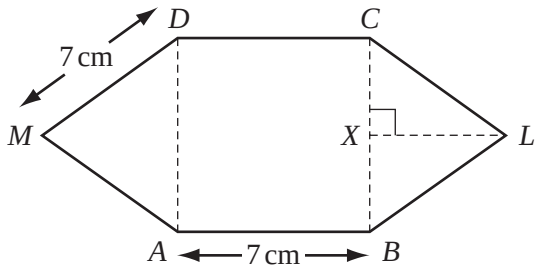



[2]

**(ii)** What type of correlation does the scatter diagram show?

*Answer(e)*(ii) ..... [1]

**4**




NOT TO SCALE

*For Examiner's Use*

In the diagram, *ABCD* is a square of side 7 cm.
*BLC* and *DMA* are **equilateral** triangles.

**(a)** Find the perimeter of the shape *ABLCDM*.

*Answer(a)* ..... cm [1]

**(b) (i)** Write down the size of angle *CBL*.

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

**(ii)** Calculate the length of *LX*.

*Answer(b)*(ii) *LX* = ..... cm [2]

**(c) (i)** Calculate the area of triangle *BLC*.

*Answer(c)*(i) ..... $cm^2$ [2]

**(ii)** Calculate the area of the shape *ABLCDM*.

*Answer(c)*(ii) ..... $cm^2$ [2]

*For Examiner's Use*

**5** A shopkeeper buys cheese for \$3.75 per kilogram and sells it for \$5.10 per kilogram.

**(a)** Calculate his percentage profit.

*Answer(a)* ..... % [3]

**(b)** Mrs Garcia buys cheese from the shopkeeper.

Calculate the number of **grams** of cheese she can buy for \$2.04 .

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

**(c)** The shopkeeper sells 7 kg of cheese and has 3 kg left.

**(i)** He reduces his selling price of \$5.10 per kilogram by 70%.

Calculate the reduced price.

*Answer(c)*(i) \$ ..... [2]

**(ii)** He sells the 3kg of cheese at the reduced price.

Calculate the **total** amount of money he receives by selling all the cheese.

*Answer(c)*(ii) \$ ..... [2]

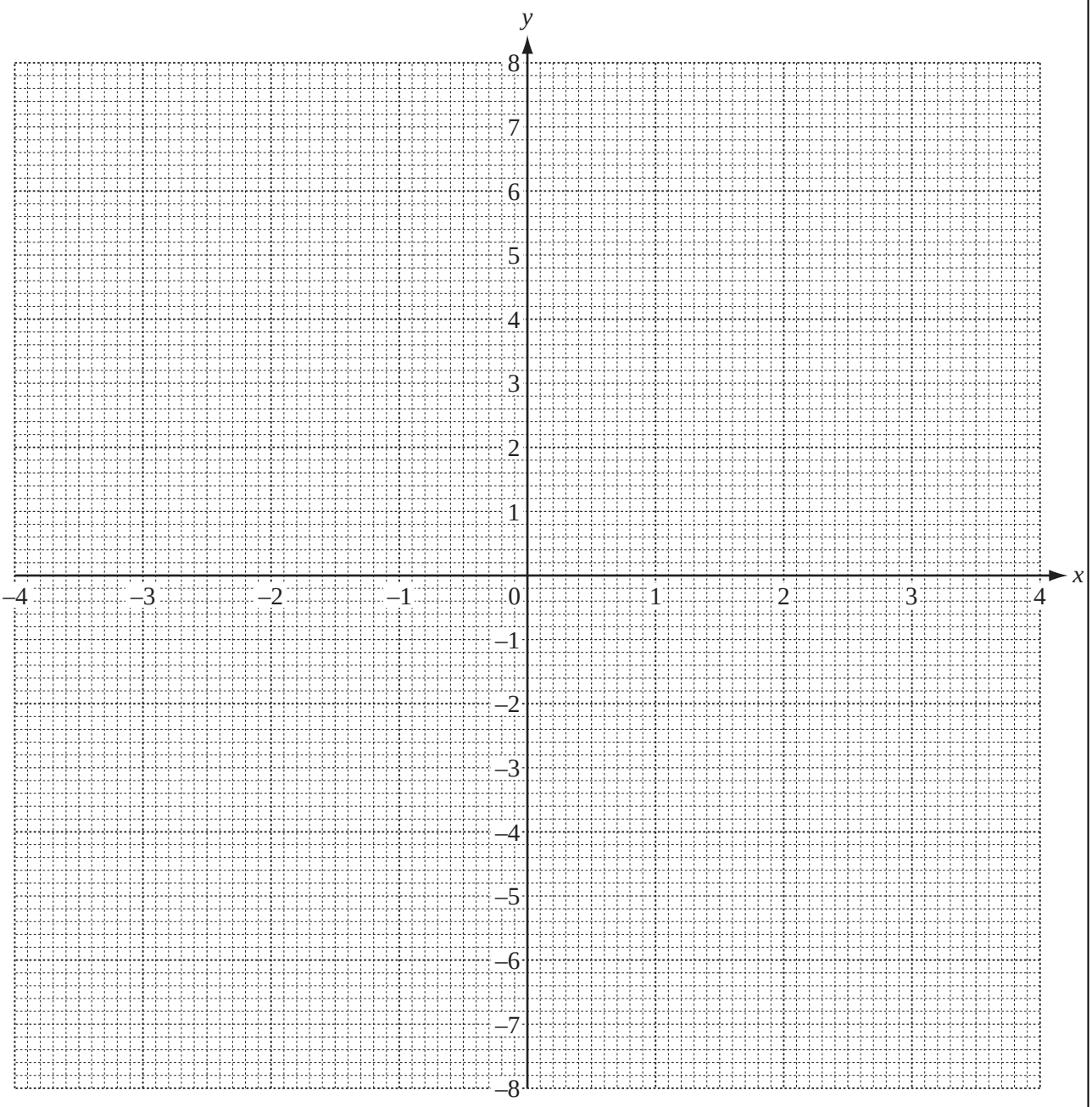
*For Examiner's Use*

**6** **(a)** Complete the table of values for $y = \frac{4}{x}$, $x \neq 0$.

| $x$ | –4 | –3 | –2 | –1 | – 0.5 | | 0.5 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| $y$ | | –1.3 | –2 | | –8 | | 8 | 4 | 2 | | |

[2]

**(b)** On the grid below, draw the graph of $y = \frac{4}{x}$, for $-4 \leqslant x \leqslant -0.5$ and $0.5 \leqslant x \leqslant 4$.




[4]

**(c)** Complete the following statement.

*For Examiner's Use*

The point (–2.5, ..... ) lies on the graph of $y = \frac{4}{x}$. [1]

**(d) (i)** On the grid, draw the line $y = 5$. [1]

**(ii)** Use your graphs to solve the equation $\frac{4}{x} = 5$.

*Answer(d)*(ii) $x =$ ..... [1]

**(e) (i)** On the grid, draw the straight line joining the points (– 0.5 , – 8 ) and ( 2 , 2 ). [2]

**(ii)** Find the gradient of this line.

*Answer(e)*(ii) ..... [1]

**(iii)** Write down the equation of this line in the form $y = mx + c$.

*Answer(e)*(iii) $y =$ ..... [2]

**7** **(a)** Solve the equation.

$$4x + 3 = 2 + 6x$$

*For Examiner's Use*

*Answer(a)* $x =$ ..... [2]

**(b)** Simplify.

$$7(3x - 4y) - 3(5x + 2y)$$

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

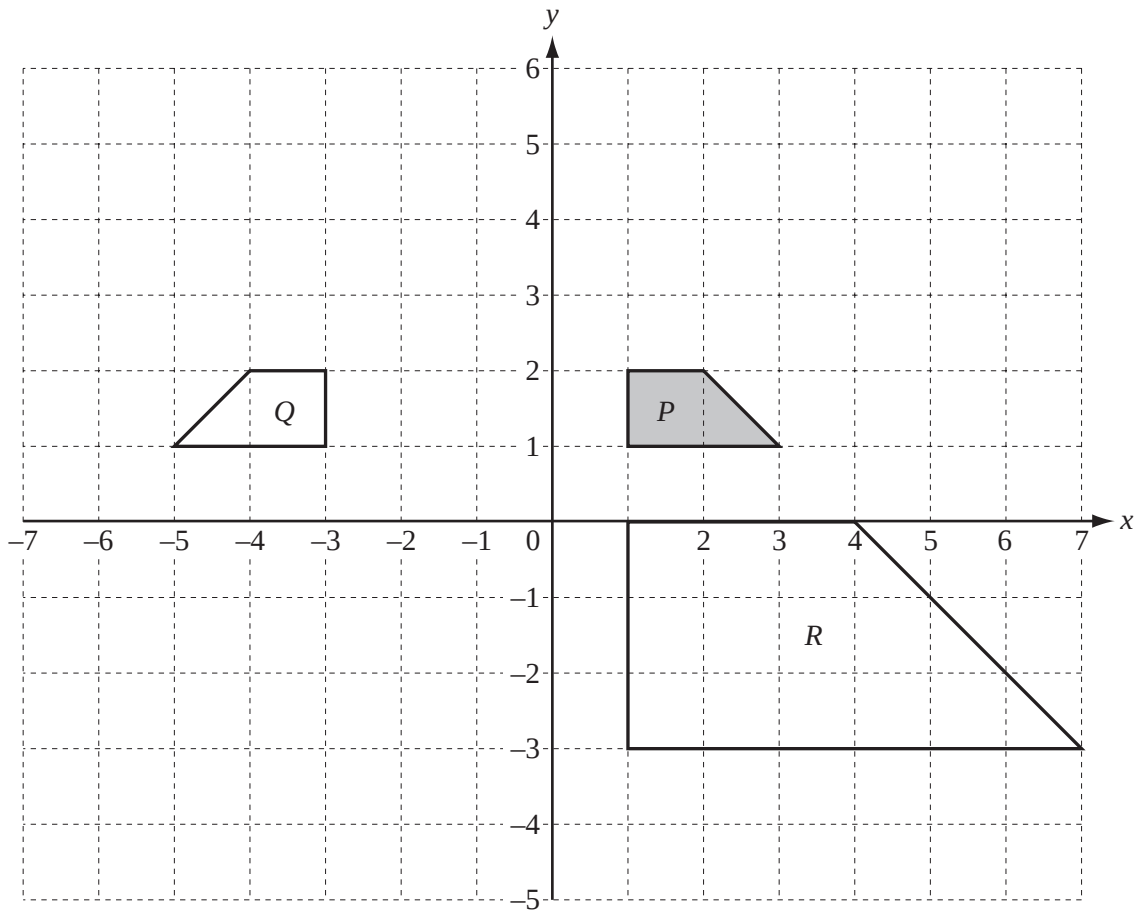
**(c)** Factorise completely.

$$6g^2 - 3g^3$$

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

**8**

For Examiner's Use




Shapes $P$, $Q$, and $R$ are shown on the grid.

**(a)** On the grid, draw the image of **shape *P*** after

**(i)** a rotation through 180° about the origin, [2]

**(ii)** a reflection in the line $y = 3$, [2]

**(iii)** a translation by the vector $\begin{pmatrix} -5 \\ 3 \end{pmatrix}$. [2]

**(b)** Describe fully the **single** transformation which maps

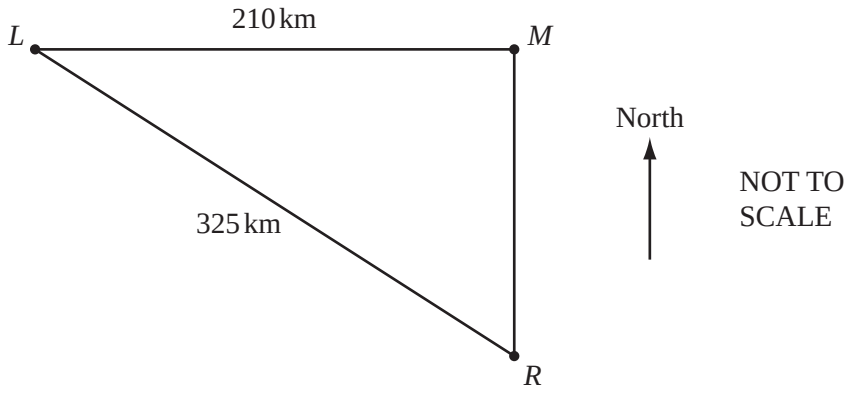
**(i)** shape $P$ onto shape $Q$,

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

**(ii)** shape $P$ onto shape $R$.

*Answer(b)*(ii) ..... [3]

**9**




The diagram shows three islands, $L$, $M$ and $R$.

$L$ is due west of $M$ and $R$ is due south of $M$.

$LM = 210$ km and $LR = 325$ km.

**(a)** Calculate the distance $RM$.

*Answer(a)* $RM =$ ..... km [3]

**(b) (i)** Use trigonometry to calculate angle $LRM$.

*Answer(b)*(i) Angle $LRM =$ ..... [2]

**(ii)** Find the bearing of $L$ from $R$.

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

*For Examiner's Use*

*For Examiner's Use*

**(c) (i)** A ferry travels directly from *M* to *L*.
It leaves *M* at 06 15 and arrives at *L* at 13 45.

Calculate the average speed of the ferry in kilometres per hour.

*Answer(c)*(i) ..... km/h [2]

**(ii)** The ferry then travels the 325 km from *L* to *R* at an average speed of 37 km/h.

Calculate the time taken.
Give your answer in hours and minutes, to the nearest minute.

*Answer(c)*(ii) ..... h ..... min [3]

**(iii)** The ferry leaves *L* at 14 00.

Use your answer to **part (c)(ii)** to find the time it arrives at *R*.

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

**10**

*For Examiner's Use*

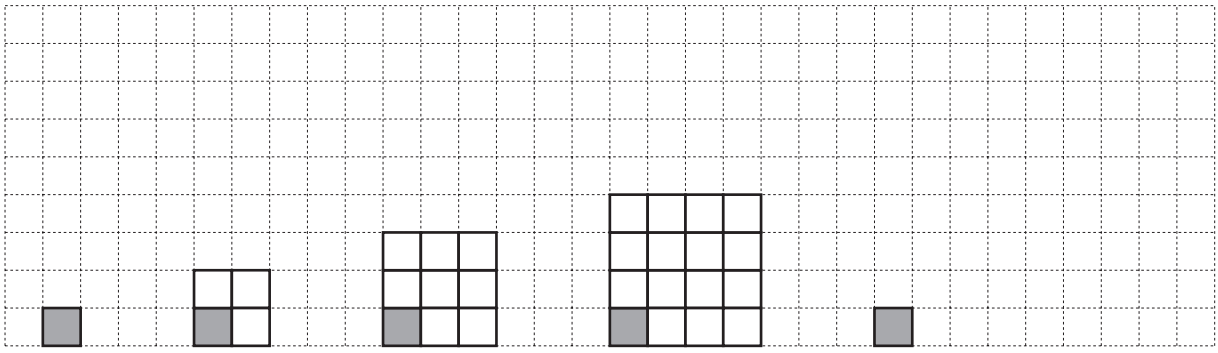


Diagram 1 Diagram 2 Diagram 3 Diagram 4 Diagram 5

Each of the diagrams above shows one small shaded square and a number of small unshaded squares. The diagrams form a sequence.

**(a)** Complete Diagram 5. [1]

**(b)** Complete the table.

| Diagram | 1 | 2 | 3 | 4 | 5 | | 50 | | *n* |
|---|---|---|---|---|---|---|---|---|---|
| Total number of small squares | 1 | 4 | 9 | 16 | | | | | |
| Number of small shaded squares | 1 | 1 | 1 | 1 | | | | | |
| Number of small unshaded squares | 0 | 3 | 8 | 15 | | | | | |

[7]

**(c)** Diagram $p$ has 9999 small unshaded squares.
Find $p$.

*Answer(c)* $p =$ ..... [1]

**11** Roberto earns a total of $\$p$ per week.
He works for $t$ hours each week and is paid a fixed amount per hour.
He also receives a bonus of $\$k$ every week.

*For Examiner's Use*

The formula for $p$ is

$$p = 8t + k.$$

**(a)** Write down how much Roberto is paid per hour.

*Answer(a)* \$ ..... [1]

**(b) (i)** Find how much Roberto earns in a week when he works for 40 hours and his bonus is \$35.

*Answer(b)*(i) \$ ..... [2]

**(ii)** Find how many hours Roberto works in a week when he earns \$288 and his bonus is \$24.

*Answer(b)*(ii) ..... h [3]

**(c)** Make $t$ the subject of the formula.

*Answer(c)* $t =$ [2]

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