

CANDIDATE NAME

**CENTRE** 

## UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS International General Certificate of Secondary Education

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| NUMBER |  |  | NUMBER |  |  |
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CANDIDATE

MATHEMATICS 0581/33

Paper 3 (Core) October/November 2011

2 hours

Candidates answer on the Question Paper.

Additional Materials: Electronic calculator Geometrical instruments

Mathematical tables (optional)

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.

## 1 Caroline goes to a shop.

The shopping bill shows the items she buys.

| o a shop.  oill shows the items she buys. | m         | w. PanaCambi |
|---|-----------|--------------|
| Item                                      | Cost (\$) |              |
| 1 packet of cereal                        | 1.20      |              |
| 3 bottles of water at \$0.45 each         | 1.35      |              |
| 2 cartons of milk at \$0.82 each          |           |              |
| 4 kg of rice at \$0.90 per kg             |           |              |
| 0.7 kg of apples at \$2.40 per kg         |           |              |

| (a) | Con  | nplete the shopping bill.                  |                         |      | [3] |
|-----|------|--|-------------------------|------|-----|
| (b) | (i)  | Calculate the total amount of money Caroli | ine spends at the s     | hop. |     |
|     |      |  |                         |      |     |
|     |      |  | 4 (2)(2)                |      | 547 |
|     | (ii) | Caroline pays with a \$10 note.            | <i>Answer(b)</i> (1) \$ |      | [1] |
|     |      | Calculate how much change she receives.    |                         |      |     |
|     |      |  |                         |      |     |
|     |      |  | Answer(b)(ii) \$        |      | [1] |

| (c) | She<br>She | oline arrived at the shop at 0948. was in the shop for 18 minutes. then took 5 minutes to walk to a café. was in the café for 20 minutes. |               |     | aCall. |
|-----|------------|---|---------------|-----|--------|
|     | (i)        | At what time did Caroline leave the café?   |               |     |        |
|     |            |   |               |     |        |
|     |            |   | Answer(c)(i)  |     | [2]    |
|     | (ii)       | Caroline then went to the library.<br>She was in the library for 45 minutes.  |               |     |        |
|     |            | Work out the ratio  |               |     |        |
|     |            | time in the shop: time in the   | ne library.   |     |        |
|     |            | Give your answer in its simplest form.  |               |     |        |
|     |            |   |               |     |        |
|     |            |   |               |     |        |
|     |            |   | Answer(c)(ii) | :   | [2]    |
| (d) |            | en Caroline left home she had \$36.50. returned home with \$12.74.  |               |     |        |
|     | Cal        | culate \$12.74 as a percentage of \$36.50.  |               |     |        |
|     |            |   |               |     |        |
|     |            |   |               |     |        |
|     |            |   |               |     |        |
|     |            |   | Answer(d)     | 9/0 | [1]    |

| James takes 12 science tests during one school term. These are his marks. |       |     |         |    |    |    |    | Cambr |                   |    |    |    |    |     |
|---|-------|-----|---------|----|----|----|----|-------|-------------------|----|----|----|----|-----|
|   | 18    | 3   | 11      | 20 | 15 | 15 | 12 | 15    | 9                 | 11 | 15 | 14 | 13 |     |
| (a)   | Finc  | i   |         |    |    |    |    |       |                   |    |    |    |    |     |
|   | (i)   | the | range,  |    |    |    |    |       |                   |    |    |    |    |     |
|   |       |     |         |    |    |    |    | Ans   | <i>wer(a)</i> (i  | )  |    |    |    | [1] |
|   | (ii)  | the | mode,   |    |    |    |    |       |                   |    |    |    |    |     |
|   |       |     |         |    |    |    |    | Ansv  | <i>ver(a)</i> (ii | )  |    |    |    | [1] |
|   | (iii) | the | median, |    |    |    |    |       |                   |    |    |    |    |     |
|   |       |     |         |    |    |    |    |       |                   |    |    |    |    |     |
|   |       |     |         |    |    |    |    | Answ  | er(a)(iii)        | )  |    |    |    | [2] |
|   | (iv)  | the | mean.   |    |    |    |    |       |                   |    |    |    |    |     |
|   |       |     |         |    |    |    |    |       |                   |    |    |    |    |     |

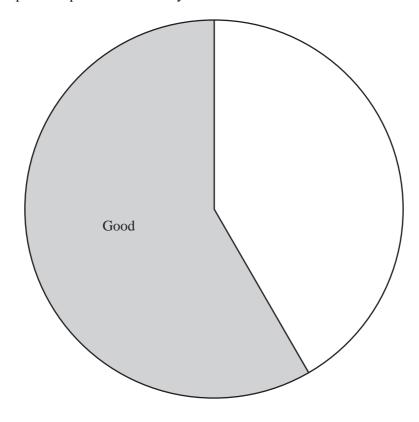
*Answer(a)*(iv) \_\_\_\_\_ [2]

[1]

**(b)** James sorts his marks into three levels.

|   |                                       | 5                                    |                       | WWW. P. D.         | For iner's |
|---|---------------------------------------|--------------------------------------|-----------------------|--------------------|------------|
|   | ts his marks into<br>are Satisfactory | three levels. (less than 12), Good ( | 12 to 16) and Excelle | nt (more than 16). | For iner's |
|   |                                       | cy table to show this in             |                       | ` '                | Oridie Con |
|   | Level                                 | Satisfactory                         | Good                  | Excellent          |            |
| F | requency                              |                                      | 7                     |                    | ]   ]      |

(ii) Complete the pie chart accurately and label each sector.

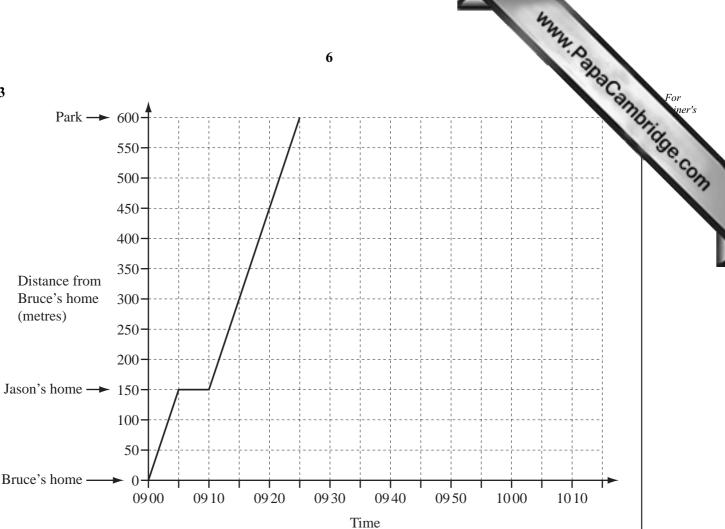


[2]

(c) What fraction of the marks were Satisfactory or Good? Give your answer in its lowest terms.

> Answer(c) [2]





One morning, Bruce walked from his home to Jason's home and the two boys walked to the park. The distance-time graph shows Bruce's journey.

| (0) | Harr |             | a rriag Den | una at Iaa  | an'a hama | ຸດ  |
|-----|------|-------------|-------------|-------------|-----------|-----|
| เลา | How  | many minute | es was Bri  | lice at Jas | on's nome | ٠,٠ |

Answer(a)

**(b)** How far **from the park** were Bruce and Jason at 09 20?

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

(c) Work out the speed at which Bruce and Jason walked to the park. Give your answer in km/h.

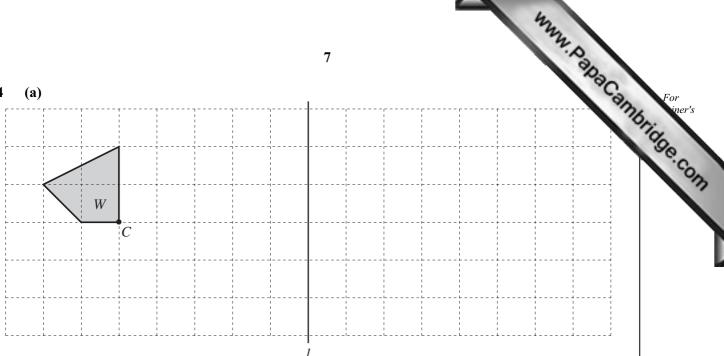
> Answer(c) km/h [3]

(d) Bruce stayed at the park for 35 minutes. He then walked home at a speed of 60 metres per minute.

Complete the graph to show Bruce's time at the park and his journey home.

[3]

(a)



On the grid,

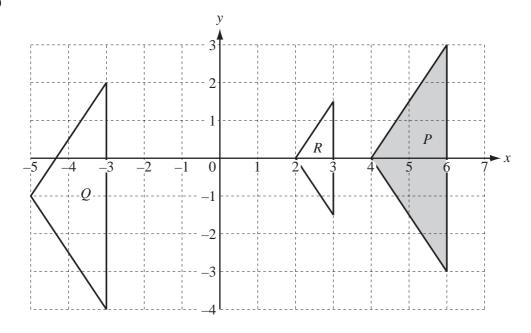
(i) draw the reflection of W in the line l,

[2]

(ii) rotate W anticlockwise through 90°, about the point C.

[2]

**(b)** 



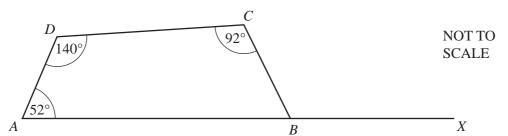
(i) Describe fully the **single** transformation that maps P onto Q.

Answer(b)(i) [2]

(ii) Describe fully the **single** transformation that maps P onto R.

[3]

5 (a)



In the quadrilateral ABCD, angle  $BAD = 52^{\circ}$ , angle  $ADC = 140^{\circ}$  and angle  $DCB = 92^{\circ}$ . AB is extended to X.

(i) Calculate angle *CBX*.

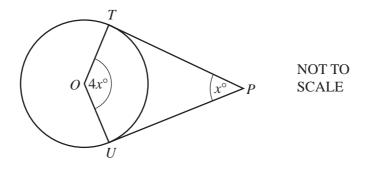
| Answer(a)(i) Angle $CBX =$ | [2] |
|----------------------------|-----|
|                            |     |

(ii) The line *BY* bisects angle *CBX*. Complete the statement.

| The lines $BY$ and $AD$ are |  |
|-----------------------------|--|
| The lines $BY$ and $AD$ are |  |

| because | [2    | 2 |
|---------|-------|---|
|         | <br>_ |   |

**(b)** 



The diagram shows a circle, centre O. PT and PU are tangents to the circle at T and U. Angle  $TPU = x^{\circ}$  and angle  $TOU = 4x^{\circ}$ .

Calculate the value of *x*.

$$Answer(b) x = [3]$$

(c) The exterior angle of a regular polygon is 20°.

Calculate the number of sides of the polygon.

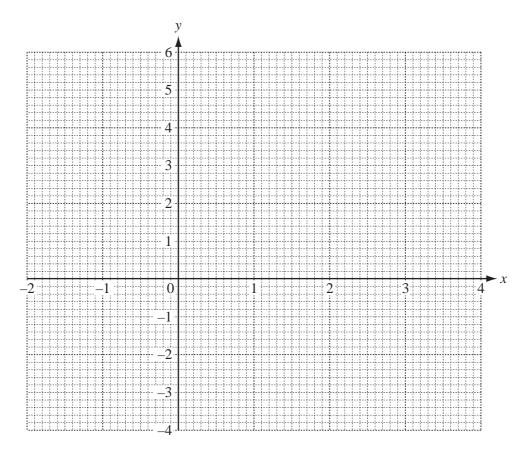
$$Answer(c)$$
 [2]

(a) Complete the table for  $y = 4 + 2x - x^2$ .

| ete | e the tabl | e for <i>y</i> = | = 4 + 2 <i>x</i> - |   | • |   |   | m | For iner's |
|-----|------------|------------------|--------------------|---|---|---|---|---|------------|
|     | X          | -2               | -1                 | 0 | 1 | 2 | 3 | 4 | Made C     |
|     | у          |                  | 1                  |   | 5 |   | 1 |   | 137        |

[2]

**(b)** On the grid, draw the graph of  $y = 4 + 2x - x^2$  for  $-2 \le x \le 4$ .



[4]

(c) (i) Draw the line of symmetry of the graph.

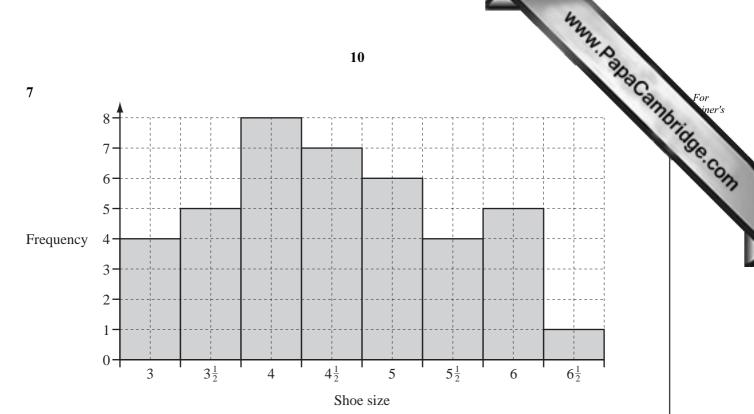
[1]

(ii) Write down the equation of this line of symmetry.

Answer(c)(ii) [1]

(d) Use your graph to solve the equation  $4 + 2x - x^2 = 0$ .

[2]



The bar chart shows the frequencies of the shoe sizes for a group of students.

(a) Use the information in the bar chart to complete the frequency table.

| Shoe size | 3 | $3\frac{1}{2}$ | 4 | $4\frac{1}{2}$ | 5 | $5\frac{1}{2}$ | 6 | $6\frac{1}{2}$ |
|-----------|---|----------------|---|----------------|---|----------------|---|----------------|
| Frequency | 4 |                |   |                |   |                |   | 1              |

[2]

|    |    |    | TT    |         | . 1 .    |     | •   | . 1 |        | 0   |
|----|----|----|-------|---------|----------|-----|-----|-----|--------|-----|
| 1  | h  | ١. | HOW   | many    | ctudente | ara | 111 | tho | OTOLII | n'  |
| ı  | 1, | ,  | 11000 | IIIaiiv | students | aic | 111 | uic | צוטעו  |     |
| ٠, | ,  | ,  |       |         |          |     |     |     | 0      | ~ . |

| Answer(b) | [1] |  |
|-----------|-----|--|
| Answerth  |     |  |

(c) Calculate the mean shoe size.

| Answer(c)  | <br>[3] |
|------------|---------|
| 1111511111 | <br>L   |

For iner's

[1]

| A |  | В |
|---|--|---|

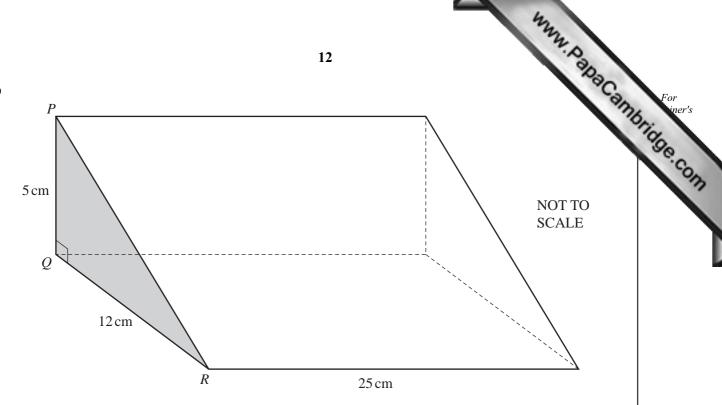
| (a) |      | astruct triangle $ABC$ accurately, with $AC = 10 \text{ cm}$ and $BC = 8 \text{ cm}$ . Fine $AB$ has been drawn for you. | [2] |
|-----|------|--|-----|
| (b) | (i)  | Using a straight edge and compasses only, construct the bisector of angle $A$ .  | [2] |
|     | (ii) | The bisector of angle $A$ meets $BC$ at $X$ .  |     |
|     |      | Measure the length of $BX$ . $Answer(b)(ii) BX =                                  $                                      | [1] |
| (c) | (i)  | Using a straight edge and compasses only, construct the perpendicular bisector of AB.                                    | [2] |
|     | (ii) | The perpendicular bisector of $AB$ meets $AC$ at $Y$ and $AX$ at $Z$ .   |     |
|     |      | Measure angle $CYZ$ .  Answer(c)(ii) Angle $CYZ =$   | [1] |
| (d) | Sha  | de the region inside triangle ABC which is   |     |

nearer to AB than to AC

nearer to B than to A.

and

9



The diagram shows a solid triangular prism of length 25 cm. The cross-section of the prism is triangle PQR. PQ = 5 cm, QR = 12 cm and angle  $PQR = 90^{\circ}$ .

(a) (i) Calculate the volume of the prism.

| Answer(a)(i) | $cm^3$              | [3] |
|--------------|---------------------|-----|
| Answer(a)(i) | <br>cm <sup>3</sup> | [3] |

(ii) The prism is made from wood.

The mass of 1 cm<sup>3</sup> of the wood is 0.96 g.

Calculate the mass of the prism. Give your answer in kilograms.

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

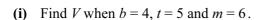
| (b) | (1)  | Show that $PR = 13  \text{cm}$ .   | m.  |
|-----|------|--|-----|
|     |      | Show that $PR = 13 \text{ cm}$ .  Answer(b)(i)   | 10  |
|     |      |  |     |
|     |      |  | ľ   |
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|     |      |  |     |
|     |      |  |     |
|     |      |  | ,   |
|     | (ii) | The prism is completely covered with plastic at a cost of \$0.08 per square centimetre.                                |     |
|     | (11) |  |     |
|     |      | By finding the total area of the two triangles and the three rectangles, calculate the total cost of the plastic used. | 1   |
|     |      |  |     |
|     |      |  |     |
|     |      |  |     |
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|     |      |  |     |
|     |      |  |     |
|     |      | $Answer(b)(ii) \$ \qquad [4]$  | ,   |
|     |      |  | _   |
|     |      |  | - 1 |

| •   |
|-----|
| 2   |
| OA. |
| 1/2 |
| V,  |
| 10  |

| 10 ( | (a) | Tatiana  | goes | for | а | walk  |
|------|-----|----------|------|-----|---|-------|
| 10 ( | (a) | 1 attana | 2000 | 101 | а | want. |

|     |       | ana goes for a walk.  She walks for 15 minutes at a speed of 80 metres per minute.                         |
|-----|-------|--|
|     |       | 14   |
| (a) | Tati  | ana goes for a walk.   |
|     | (i)   | She walks for 15 minutes at a speed of 80 metres per minute.   |
|     |       | Calculate the distance she walks.  |
|     |       |  |
|     |       |  |
|     |       | Answer(a)(i) m[1]  |
|     | (ii)  | She then walks for a further <i>p</i> minutes at <i>w</i> metres per minute.                               |
|     |       | Write down an expression, in terms of <i>p</i> and <i>w</i> , for the <b>total</b> distance Tatiana walks. |
|     |       |  |
|     |       |  |
|     |       |  |
|     |       |  |
|     |       | Answer(a)(ii) $m[1]$   |
|     | (iii) | Write down an expression, in terms of $p$ and $w$ , for Tatiana's average speed, in metres per minute.     |
|     |       |  |
|     |       |  |
|     |       |  |
|     |       |  |
|     |       | Answer(a)(iii) m/min [2]   |

$$V = 3b(t + \frac{1}{2}m)$$



$$Answer(b)(i) V =$$
 [2]

(ii) Find *b* when t = 3, m = 2 and V = 84.

$$Answer(b)(ii) b =$$
 [3]

11

| (a)        | (a) Write down the next term in each of the following sequences. |                                       |                         |            |            |      |  |     |  |
|------------|--|---------------------------------------|-------------------------|------------|------------|------|--|-----|--|
|            | (i)  | 8,                                    | 15,                     | 22,        |            | 29,  |  | [1] |  |
|            | (ii)   | 3,                                    | 6,                      | 12,        |            | 24,  |  | [1] |  |
| (          | (iii)  | 1,                                    | 4,                      | 9,         |            | 16,  |  | [1] |  |
|            | (iv)   | 0,                                    | 3,                      | 8,         |            | 15,  |  | [1] |  |
| <b>(b)</b> | Wri  | te down an express                    | sion, in terms of $n$ , | for the nt | h term of  |      |  |     |  |
|            | (i)  | the sequence in <b>p</b>              | art(a)(iii),            |            |            |      |  |     |  |
|            | (ii)   | the sequence in <b>p</b>              | art(a)(iv).             |            | Answer(b)  | (i)  |  | [1] |  |
|            |  |                                       |                         |            | Answer(b)( | ii)  |  | [1] |  |
| (c)        | The  | <i>n</i> th term of a sequ            | ence is $7n-3$ .        |            |            |      |  |     |  |
|            | (i)<br>(ii)  | Write down the value which term has a | alue of the 4th term    | l <b>.</b> | Answer(c)( | (i)  |  | [1] |  |
|            |  |                                       |                         |            | Answer(c)( | ii)  |  | [2] |  |
| (d)        |  |                                       | terms of this seque     |            | 32,        | 256, |  |     |  |
|            |  |                                       |                         |            |            |      |  |     |  |

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[2]

Answer(d)