



# Cambridge IGCSE™

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**CAMBRIDGE INTERNATIONAL MATHEMATICS**

**0607/42**

Paper 4 (Extended)

**October/November 2021**

**2 hours 15 minutes**

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 graphic display calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly and you will be given marks for correct methods, including sketches, even if your answer is incorrect.
- 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  $\pi$ , use your calculator value.

## INFORMATION

- The total mark for this paper is 120.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

## Formula List

For the equation  $ax^2 + bx + c = 0$   $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Curved surface area,  $A$ , of cylinder of radius  $r$ , height  $h$ .  $A = 2\pi rh$

Curved surface area,  $A$ , of cone of radius  $r$ , sloping edge  $l$ .  $A = \pi rl$

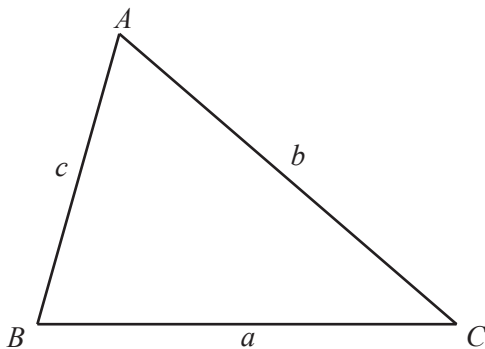
Curved surface area,  $A$ , of sphere of radius  $r$ .  $A = 4\pi r^2$

Volume,  $V$ , of pyramid, base area  $A$ , height  $h$ .  $V = \frac{1}{3}Ah$

Volume,  $V$ , of cylinder of radius  $r$ , height  $h$ .  $V = \pi r^2 h$

Volume,  $V$ , of cone of radius  $r$ , height  $h$ .  $V = \frac{1}{3}\pi r^2 h$

Volume,  $V$ , of sphere of radius  $r$ .  $V = \frac{4}{3}\pi r^3$



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$\text{Area} = \frac{1}{2}bc \sin A$$

Answer **all** the questions.

1 (a) Stella and Tomas share \$200 in the ratio 11 : 14.

(i) Show that Stella receives \$88.

[1]

(ii) Stella invests her \$88 at a rate of 1.5% per year simple interest.

Calculate the amount of interest Stella has at the end of 6 years.

\$ ..... [2]

(b) Urs buys some clothes in a sale.

(i) He buys a jacket for \$22.  
The original price of the jacket was \$25.

Calculate the percentage reduction in the price of the jacket.

..... % [3]

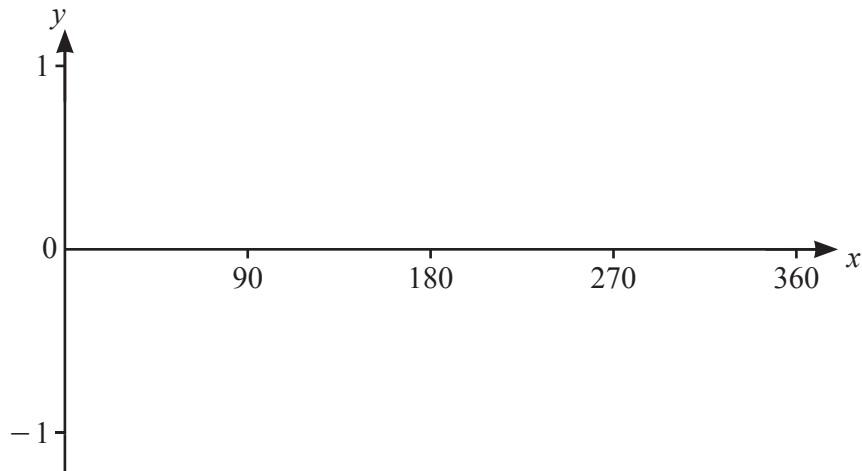
(ii) Urs buys a shirt for \$13.50 .  
This is the price after a reduction of 10% of the original price.

Calculate the original price of the shirt.

\$ ..... [2]

2  $f(x) = \sin x$  for  $0^\circ \leq x \leq 360^\circ$

$g(x) = (\sin x)^2$  for  $0^\circ \leq x \leq 360^\circ$



(a) On the diagram, sketch the graph of  $y = f(x)$ . [2]

(b) Write down the coordinates of the local minimum point on the graph of  $y = f(x)$ .

( ..... , ..... ) [1]

(c) Write down the period and amplitude of the graph of  $y = f(x)$ .

Period = .....

Amplitude = ..... [2]

(d) On the same diagram, sketch the graph of  $y = g(x)$ . [2]

(e) Write down the range of

(i)  $f(x)$ ,

..... [1]

(ii)  $g(x)$ .

..... [1]

(f) On the diagram, shade the regions where  $\sin x \geq (\sin x)^2$ . [1]

- 3 (a) The number of members in a social media group increases exponentially at a rate of 5% per month. At the start of the first month there are 882 members.

- (i) Calculate the number of members at the end of 10 months.  
Give your answer correct to the nearest integer.

..... [3]

- (ii) Calculate the number of complete months from the start until the group has 2000 members.

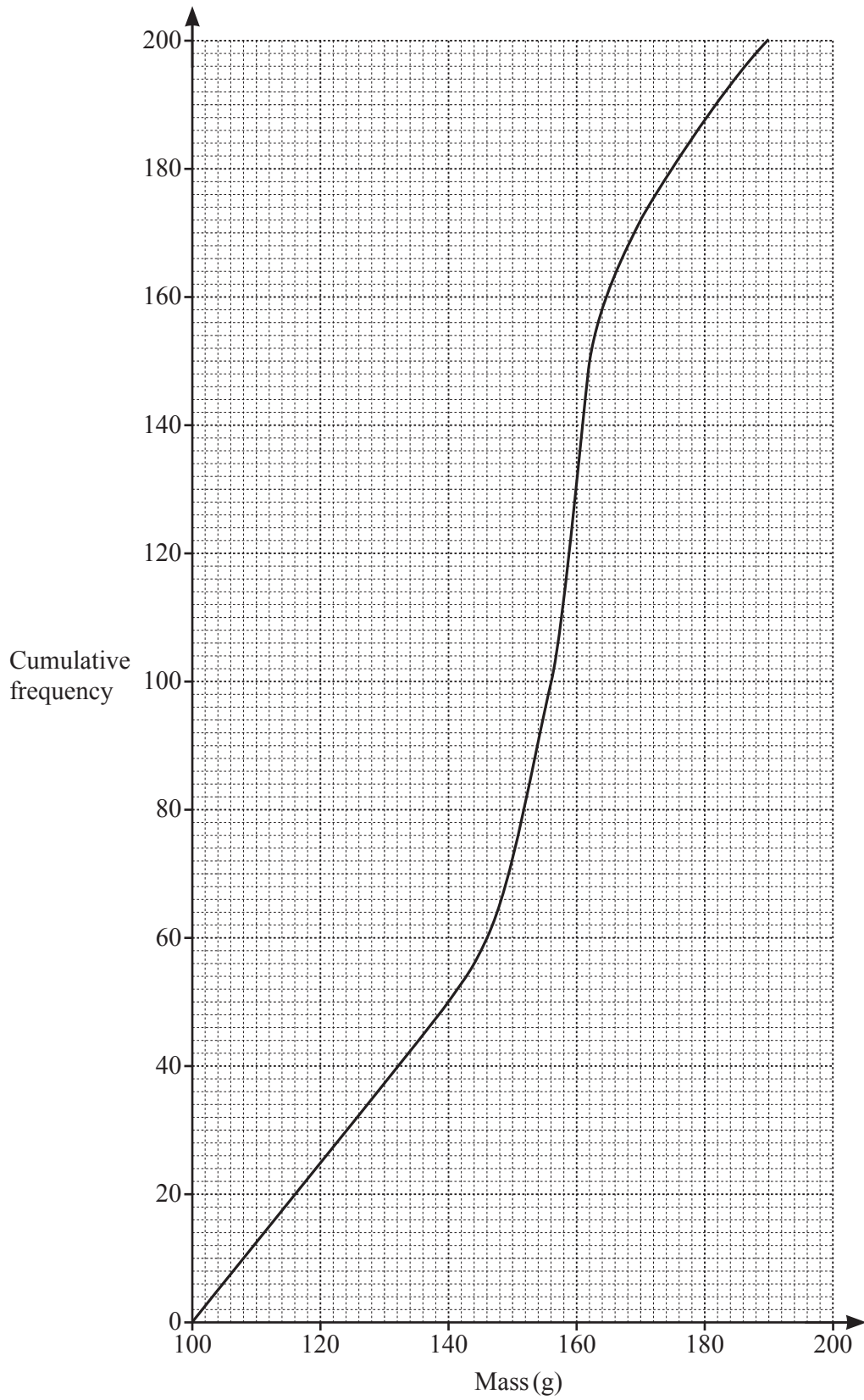
..... [4]

- (b) The mass of a radioactive substance decreases exponentially at a rate of  $r\%$  per month. At the end of 10 months, its mass has decreased from 500 g to 242 g.

Find the value of  $r$ .

$r =$  ..... [3]

- 4 The mass of each of 200 potatoes is measured.  
The cumulative frequency curve shows the results.



(a) (i) Write down the mass of the heaviest potato.

..... g [1]

(ii) Find the median.

..... g [1]

(iii) Find the interquartile range.

..... g [2]

(iv) Find the number of potatoes with a mass greater than 170 g.

..... [2]

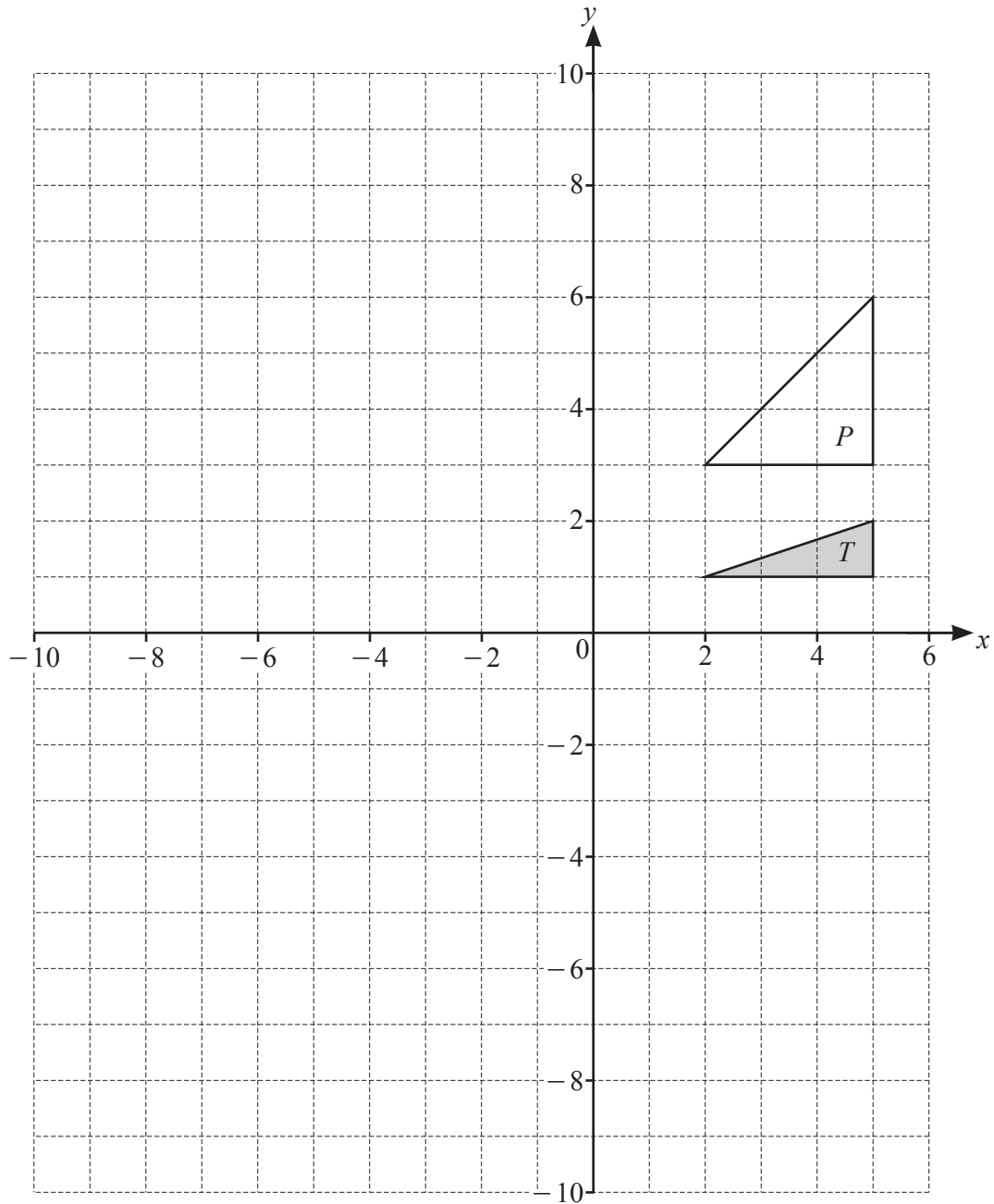
(b) This frequency table also shows information about the masses of the 200 potatoes.

Mass ( $m$ g)	$100 < m \leq 140$	$140 < m \leq 146$	$146 < m \leq 162$	$162 < m \leq 190$
Frequency	50	10	90	50

Calculate an estimate of the mean mass.

..... g [2]

5 (a)



- (i) Reflect shape  $T$  in the  $y$ -axis. [1]
- (ii) Translate shape  $T$  by the vector  $\begin{pmatrix} -10 \\ 5 \end{pmatrix}$ . [2]
- (iii) Rotate shape  $T$  through  $90^\circ$  clockwise about the point  $(2, 0)$ . [2]
- (iv) Enlarge shape  $T$  with scale factor  $-2$  and centre  $(0, 0)$ . [2]
- (v) Describe fully the **single** transformation that maps shape  $T$  onto shape  $P$ .

..... [3]

.....



(b)  $f(x) = x^2$

- (i) The graph of  $y = f(x)$  is mapped onto the graph of  $y = g(x)$  by a translation with vector  $\begin{pmatrix} 0 \\ 2 \end{pmatrix}$ .

Find  $g(x)$  in terms of  $x$ .

$$g(x) = \dots\dots\dots [1]$$

- (ii) The graph of  $y = f(x)$  is mapped onto the graph of  $y = h(x)$  by a stretch with factor 2 and the  $x$ -axis invariant.

Find  $h(x)$  in terms of  $x$ .

$$h(x) = \dots\dots\dots [1]$$

6 (a) (i) Work out  $\begin{pmatrix} 3 \\ 5 \end{pmatrix} - 2\begin{pmatrix} -1 \\ -2 \end{pmatrix}$ .

$$\begin{pmatrix} \phantom{0} \\ \phantom{0} \end{pmatrix} \quad [2]$$

(ii)  $A$  is the point  $(3, 5)$  and  $C$  is the point  $(4, 3)$ .

Find the column vector that maps the point  $A$  onto the point  $C$ .

$$\begin{pmatrix} \phantom{0} \\ \phantom{0} \end{pmatrix} \quad [2]$$

(iii)  $D$  is the point  $(1, 3)$  and the vector from  $D$  to  $E$  is  $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ .

Find the coordinates of  $E$ .

( ..... , ..... ) [1]

(iv) Find the magnitude of the vector  $\begin{pmatrix} -3 \\ -4 \end{pmatrix}$ .

..... [2]

- (b) (i)  $P$  is the point  $(-1, 6)$  and  $Q$  is the point  $(3, 4)$ .

Find the equation of the perpendicular bisector of the line  $PQ$ .

..... [5]

- (ii) Find the coordinates of the point where the perpendicular bisector in **part(b)(i)** crosses the  $x$ -axis.

( ..... , ..... ) [2]

- 7 (a) The cost of a newspaper is  $\$p$ .  
The cost of a magazine is  $\$m$ .

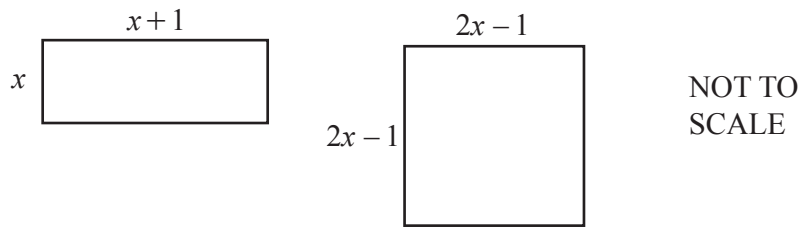
The total cost of 3 newspapers and 5 magazines is  $\$13.30$  .  
The total cost of 1 newspaper and 7 magazines is  $\$15.90$  .

Find the value of  $p$  and the value of  $m$ .

$$p = \dots\dots\dots$$

$$m = \dots\dots\dots [5]$$

(b)



The area of the rectangle is equal to the area of the square.

Find the value of  $x$ .

$$x = \dots\dots\dots [7]$$

8 (a)  $f(x) = 3x - 2$        $g(x) = 5x - 1$        $h(x) = \frac{1}{x+1}, x \neq -1$

(i) Find

(a)  $f(3)$ ,

..... [1]

(b)  $h(f(3))$ .

..... [1]

(ii) Find  $f(g(x))$  in its simplest form.

..... [2]

(iii) Solve  $f(x) = g(x)$ .

$x =$  ..... [2]

(iv) Find  $g^{-1}(x)$ .

$g^{-1}(x) =$  ..... [2]

(v) Simplify  $2h(x) + h(x+1)$ .

Give your answer as a single fraction, in terms of  $x$ , in its simplest form.

..... [4]

(b)  $j(x) = 5^x$

(i) Find the value of  $x$  when  $j(x) = \frac{1}{5\sqrt{5}}$ .

$x =$  ..... [1]

(ii) Find  $j^{-1}(x)$ .

$j^{-1}(x) =$  ..... [2]

9 (a) Complete the table for each sequence.

Sequence	1st term	2nd term	3rd term	4th term	5th term		$n$ th term
A	7	5	3	1			
B	16	25	36	49			
C	$\frac{1}{2}$	1	2	4			

[9]

(b)  $y \propto \frac{1}{\sqrt{x}}$  and  $z \propto y^3$ .

When  $x = 36$ ,  $y = 2$  and  $z = 24$ .

Find  $z$  in terms of  $x$ .

$z = \dots\dots\dots$  [4]

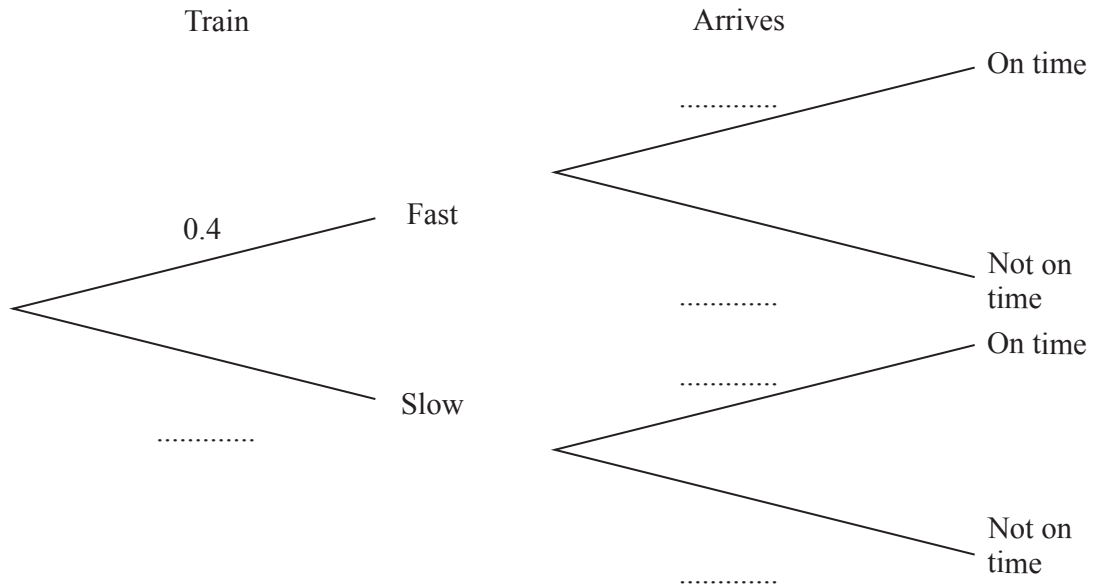


- 10 Fast trains and slow trains travel from City A to City B.  
40% of the trains from City A to City B are fast trains.

The probability that a fast train arrives in City B on time is 0.9 .  
The probability that a slow train arrives in City B on time is 0.95 .

Manuela goes to the station in City A and takes the next train to City B.

- (a) Complete the tree diagram.

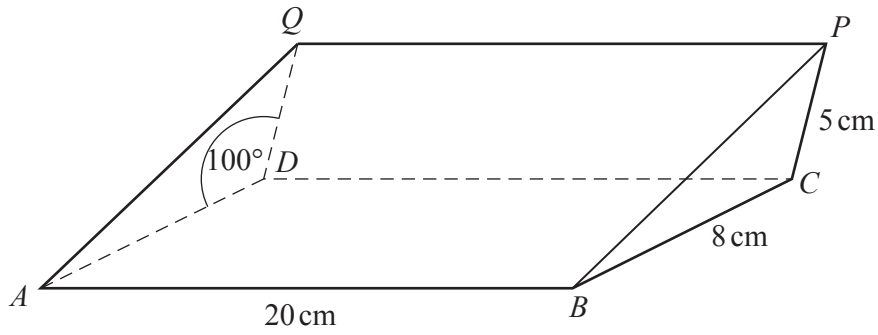


[3]

- (b) Find the probability that Manuela arrives in City B on time.

..... [3]

11



NOT TO SCALE

The diagram shows a solid triangular prism of length 20 cm.  
 The cross-section of the prism is triangle  $BCP$  and three faces are rectangles.  
 $BC = 8$  cm,  $CP = 5$  cm and angle  $ADQ = \text{angle } BCP = 100^\circ$ .

(a) Calculate the total surface area of the prism.

.....  $\text{cm}^2$  [7]

- (b) (i) On the diagram of the prism, draw two straight lines and mark angle  $PAC$ . [1]
- (ii) Angle  $APC = 73.45^\circ$ .  
Calculate angle  $PAC$ .

Angle  $PAC = \dots\dots\dots$  [4]

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