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1059670861

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 π, 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.

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Formula List

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

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

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

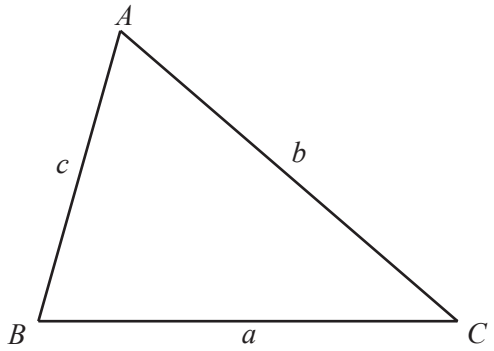
Curved surface area, A, of sphere of radius r. $\quad A = 4\pi r^2$

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

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

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

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



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

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

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

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]

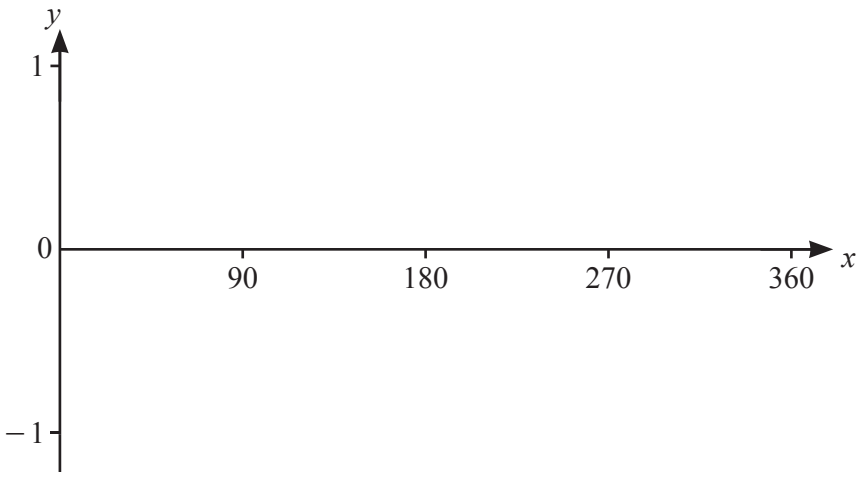
(ii) Urs buys a shirt for \$13.50 .
This is the price after a reduction of 10% of the original price.

Calculate the original price of the shirt.

\$ ..... [2]

2 $f(x) = \sin x$ for $0° \leqslant x \leqslant 360°$

$g(x) = (\sin x)^2$ for $0° \leqslant x \leqslant 360°$



(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 $\sin x \geqslant (\sin x)^2$. [1]

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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.

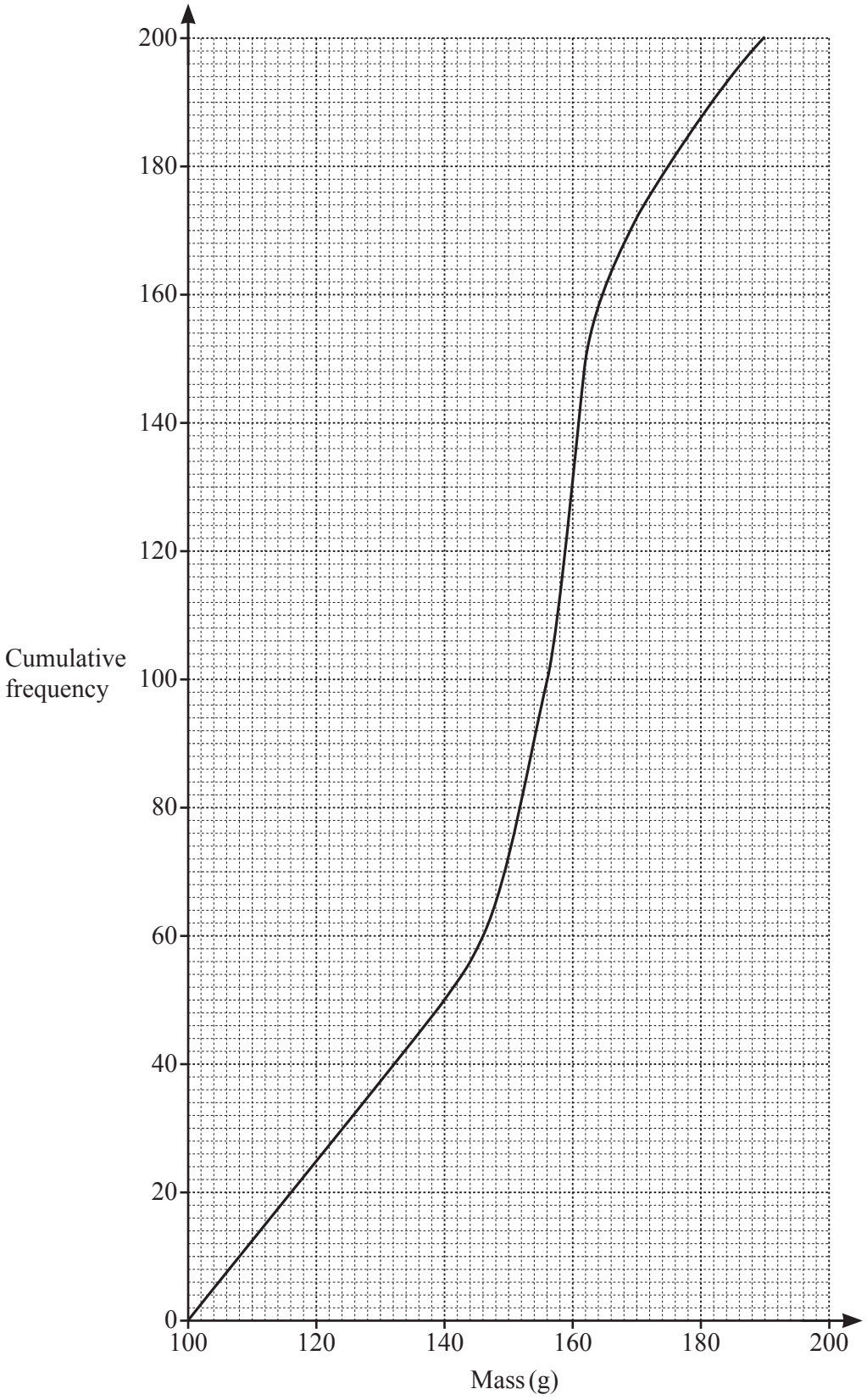
..... [4]

(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]

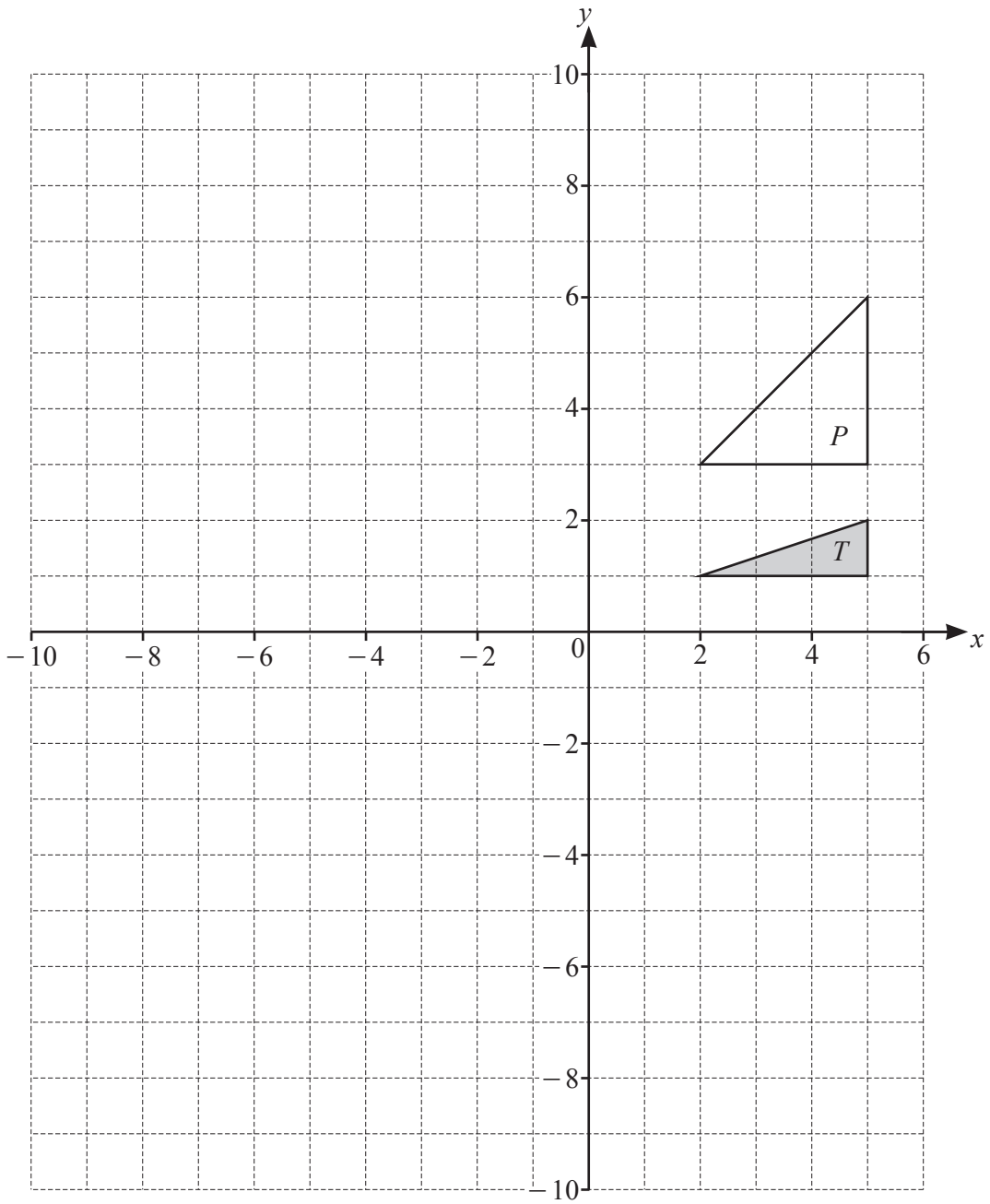
(b) This frequency table also shows information about the masses of the 200 potatoes.

Mass (m g)	$100 < m \leqslant 140$	$140 < m \leqslant 146$	$146 < m \leqslant 162$	$162 < m \leqslant 190$
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° 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]

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(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.

$g(x) =$ ..... [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.

$h(x) =$ ..... [1]

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

$\begin{pmatrix}\quad\\\quad\end{pmatrix}$ [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.

$\begin{pmatrix}\quad\\\quad\end{pmatrix}$ [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]

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(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 $\$m$.

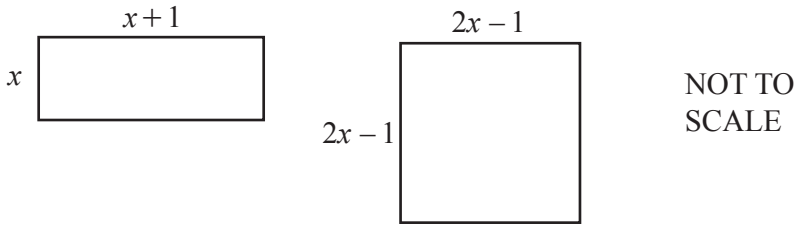
The total cost of 3 newspapers and 5 magazines is \$13.30 .
The total cost of 1 newspaper and 7 magazines is \$15.90 .

Find the value of p and the value of m.

$p =$ .....

$m =$ ..... [5]

(b)



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

Find the value of x.

$x =$ ..... [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]

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(v) Simplify $2\mathrm{h}(x)+\mathrm{h}(x+1)$.

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

..... [4]

(b) $\mathrm{j}(x)=5^x$

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

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

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

$\mathrm{j}^{-1}(x)=$ ..... [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.

$z =$ ..... [4]

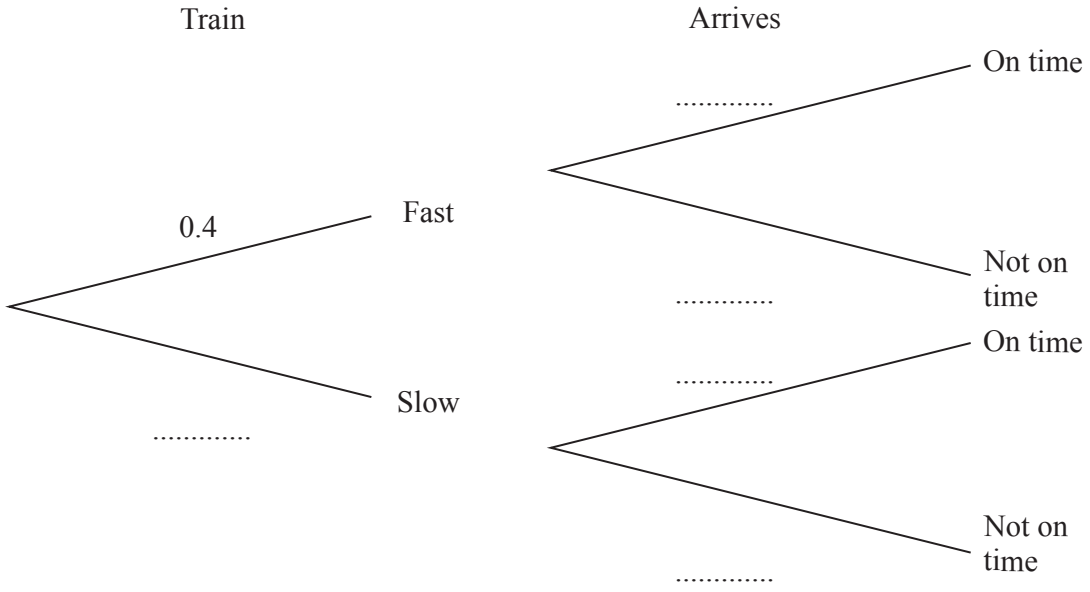
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10 Fast trains and slow trains travel from City A to City B.
40% of the trains from City A to City B are fast trains.

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.

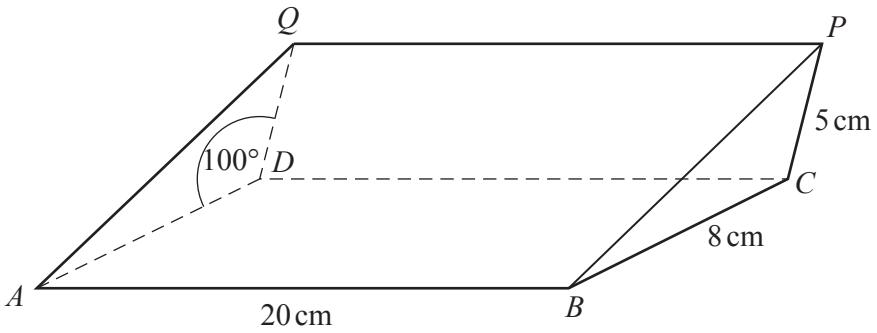


[3]

(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 = angle $BCP = 100°$.

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

..... cm^2 [7]

(b) (i) On the diagram of the prism, draw two straight lines and mark angle PAC. [1]

(ii) Angle $APC = 73.45°$.

Calculate angle PAC.

Angle $PAC =$ ..... [4]

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