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0607/42

May/June 2018

2 hours 15 minutes

Additional Materials: Geometrical Instruments
Graphics Calculator

READ THESE INSTRUCTIONS FIRST

DO **NOT** WRITE IN ANY BARCODES.

The total number of marks for this paper is 120.

This document consists of **20** printed pages.

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 . $A = \pi rl$

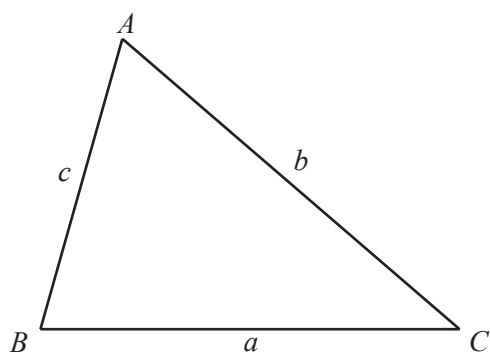
Curved surface area, A , of sphere of radius r . $A = 4\pi r^2$

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) Work out.

$$\frac{\sqrt[3]{402}}{3.15^2}$$

..... [1]

- (b) Write 130.47 correct to

- (i) one decimal place,

..... [1]

- (ii) one significant figure.

..... [1]

- (c) Work out 23% of \$76.80 .

\$ [2]

- (d) \$4200 is shared in the ratio 3 : 4 : 6 : 8 .

Find the difference between the largest share and the smallest share.

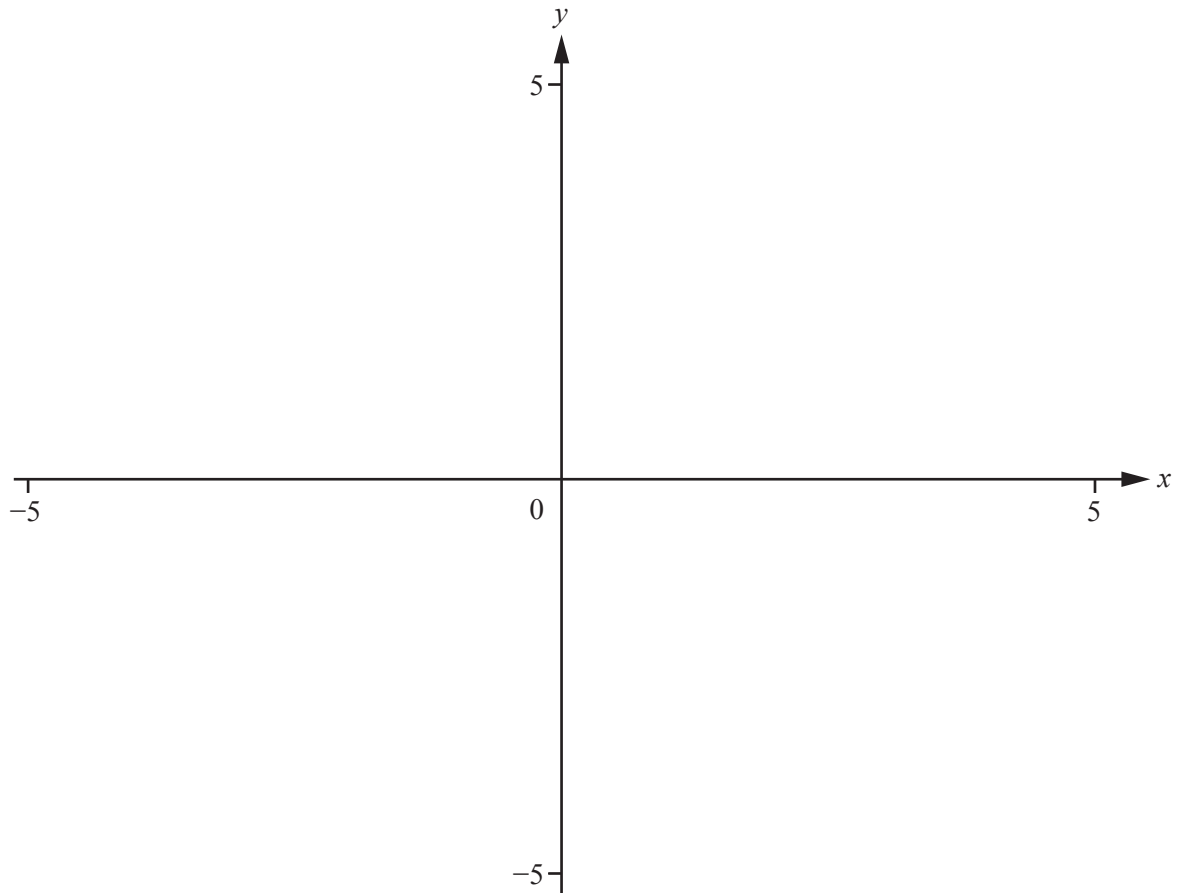
\$ [3]

- (e) Write down an irrational number less than 10.

..... [1]

- (f) Work out $7.31 \times 10^{-2} + 1.56 \times 10^{-1}$.
Give your answer in standard form.

..... [2]



$$f(x) = 1 - \frac{x}{(x^2 - 9)}$$

(a) On the diagram, sketch the graph of $y = f(x)$, for values of x between -5 and 5 . [3]

(b) Write down the equations of the three asymptotes.

.....,, [3]

(c) The line $y = x$ intersects the curve $y = 1 - \frac{x}{(x^2 - 9)}$ three times.

Find the values of the x co-ordinates of the points of intersection.

$x = \dots\dots\dots$ or $x = \dots\dots\dots$ or $x = \dots\dots\dots$ [3]

- 3 (a) y varies directly as the square root of x .
 $y = 32$ when $x = 16$.

(i) Find y in terms of x .

$$y = \dots\dots\dots [2]$$

(ii) Find the value of y when $x = 4$.

$$y = \dots\dots\dots [1]$$

(iii) Find x in terms of y .

$$x = \dots\dots\dots [2]$$

- (b) p varies inversely as $q + 2$.
 $p = 3$ when $q = 2$.

Find the value of p when $q = 4$.

$$p = \dots\dots\dots [3]$$

- 4 (a) The mass, x grams, of each of 100 oranges is found.
The results are shown in the table.

Mass (x grams)	Frequency
$0 < x \leq 100$	4
$100 < x \leq 140$	14
$140 < x \leq 180$	22
$180 < x \leq 250$	35
$250 < x \leq 300$	25

- (i) Calculate an estimate of the mean mass of the oranges.

..... g [2]

- (ii) Two of these oranges are chosen at random.

Calculate the probability that they both have a mass of 140 g or less.

..... [2]

- (iii) The oranges with a mass of 140 g or less are removed.
From the remaining oranges, two are chosen at random.

Calculate the probability that one orange has a mass of 250 g or less and the other has a mass of more than 250 g.

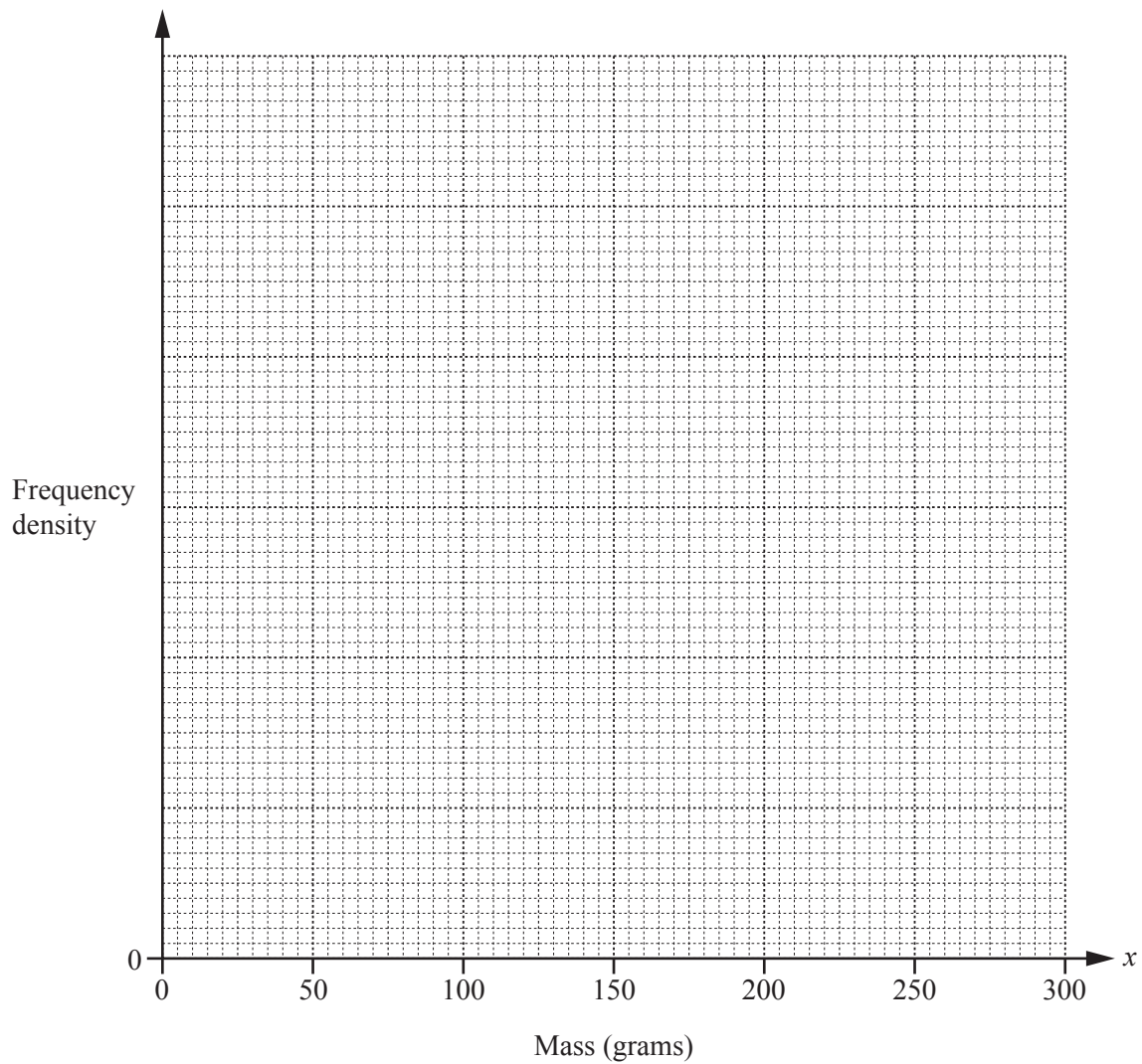
..... [3]

(b) (i) Complete the frequency density column in this table.

Mass (x grams)	Frequency	Frequency density
$0 < x \leq 100$	4	
$100 < x \leq 140$	14	
$140 < x \leq 180$	22	
$180 < x \leq 250$	35	
$250 < x \leq 300$	25	

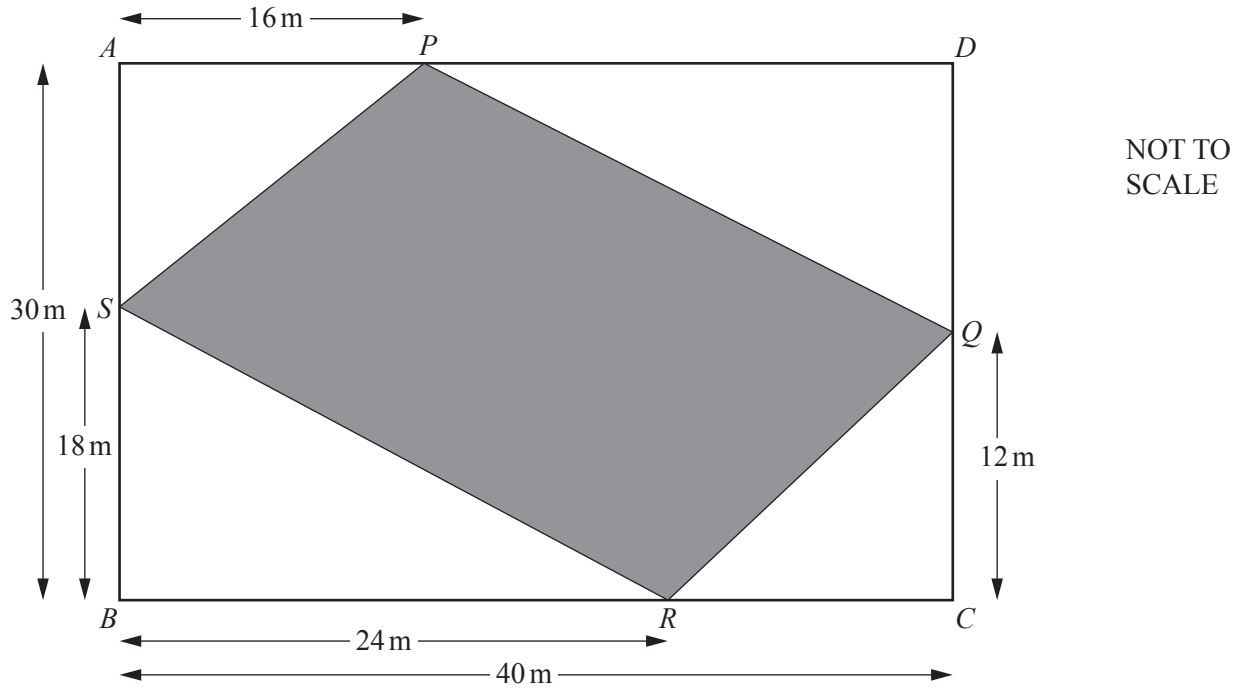
[2]

(ii) On the grid, draw a histogram to show this information.



[4]

5



In the diagram, $ABCD$ is a rectangle.

(a) Find PS .

$PS = \dots\dots\dots \text{ m [2]}$

(b) Find angle BRS .

Angle $BRS = \dots\dots\dots [2]$

(c) Find the perimeter of $PQRS$.

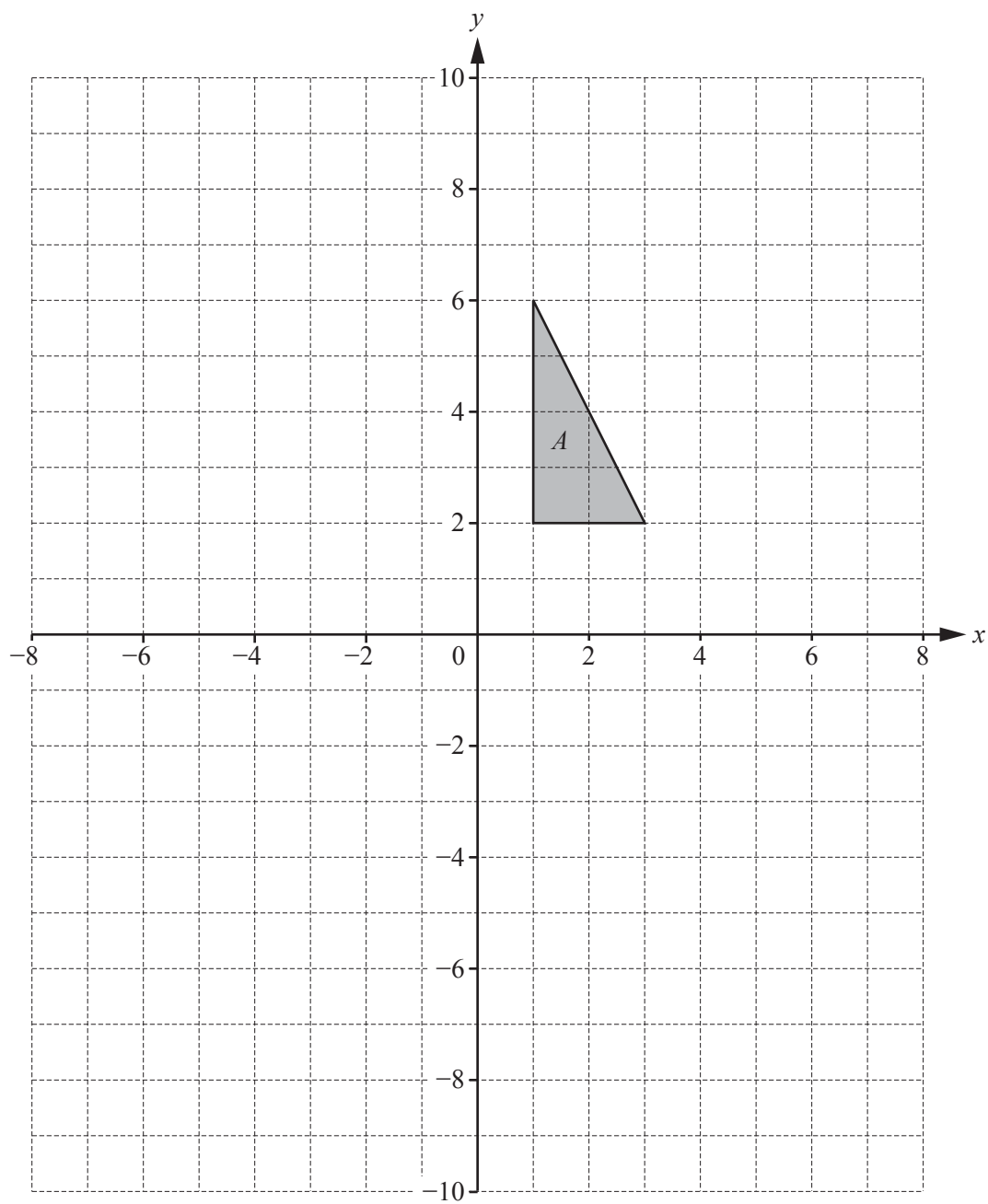
$\dots\dots\dots \text{ m [3]}$

(d) Find the shaded area.

..... m^2 [3]

(e) Explain why triangle ASP is similar to triangle BSR .

.....
..... [2]



(a) Translate triangle A with vector $\begin{pmatrix} -7 \\ -3 \end{pmatrix}$. Label the image B . [2]

(b) Rotate triangle A through 90° anti-clockwise about $(-1, 2)$. Label the image C . [2]

(c) Describe fully the **single** transformation that maps triangle C onto triangle B .

.....
..... [3]

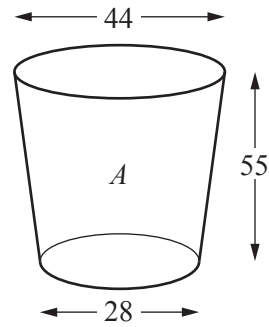
(d) Enlarge triangle A scale factor -2 with centre $(3, 1)$. Label the image D . [2]

(e) Describe fully the **single** transformation that maps triangle D onto triangle A .

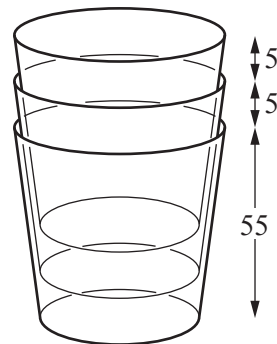
.....
..... [2]

7 In this question, all lengths are measured in millimetres.

A small plastic cup, A , is shown in this diagram.



These plastic cups are stacked as shown in the diagram.



(a) Find the height of a stack of 8 of these cups.

..... mm [2]

(b) Find the number of these cups in a stack that has a total height of 105 mm.

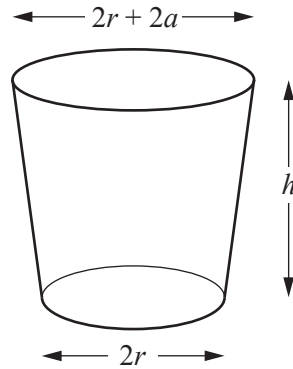
..... [2]

(c) A similar cup, B , has base diameter 42 mm.

Find the height of this cup.

..... mm [2]

(d)



The formula for the volume of a similar cup is $V = \frac{\pi h(3r^2 + 3ar + a^2)}{3}$.

(i) For cup A , show that $a = 8$ mm.

[2]

(ii) Find the volume of cup A .

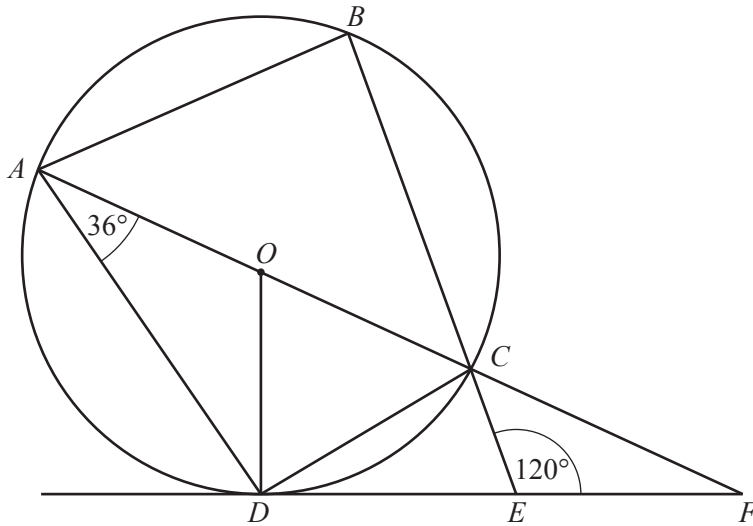
..... mm³ [2]

(iii) Find the volume of cup B .

..... mm³ [3]

(iv) Rearrange $V = \frac{\pi h(3r^2 + 3ar + a^2)}{3}$ to make h the subject.

$h =$ [2]



NOT TO
SCALE

A , B , C and D lie on a circle, centre O .
 DEF is a tangent to the circle at D .
 $AOCF$ and BCE are straight lines.

(a) Complete the statement.

Angle $ODE = 90^\circ$ because

..... [1]

(b) Find the value of

(i) angle AOD ,

Angle $AOD = \dots\dots\dots$ [2]

(ii) angle ODC ,

Angle $ODC = \dots\dots\dots$ [2]

(iii) angle ABC ,

Angle $ABC = \dots\dots\dots$ [1]

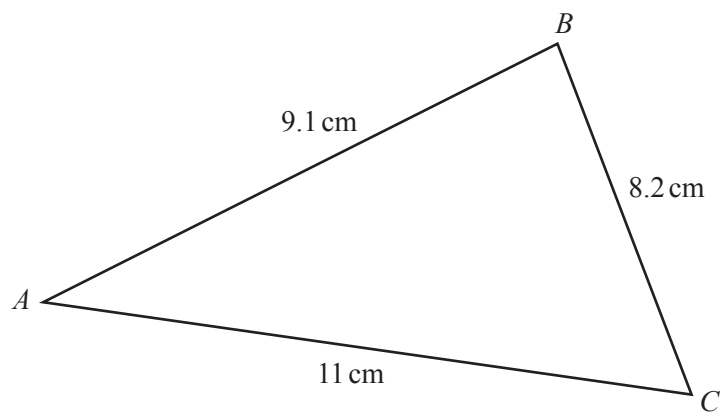
(iv) angle CFD ,

Angle $CFD = \dots\dots\dots$ [1]

(v) angle CAB .

Angle $CAB = \dots\dots\dots$ [1]

9

NOT TO
SCALE

- (a) Show that angle $BAC = 47.0^\circ$, correct to 1 decimal place.

[3]

- (b) Use the sine rule to find angle ABC .

Angle $ABC = \dots\dots\dots$ [3]

(c) Find the area of triangle ABC .

..... cm^2 [2]

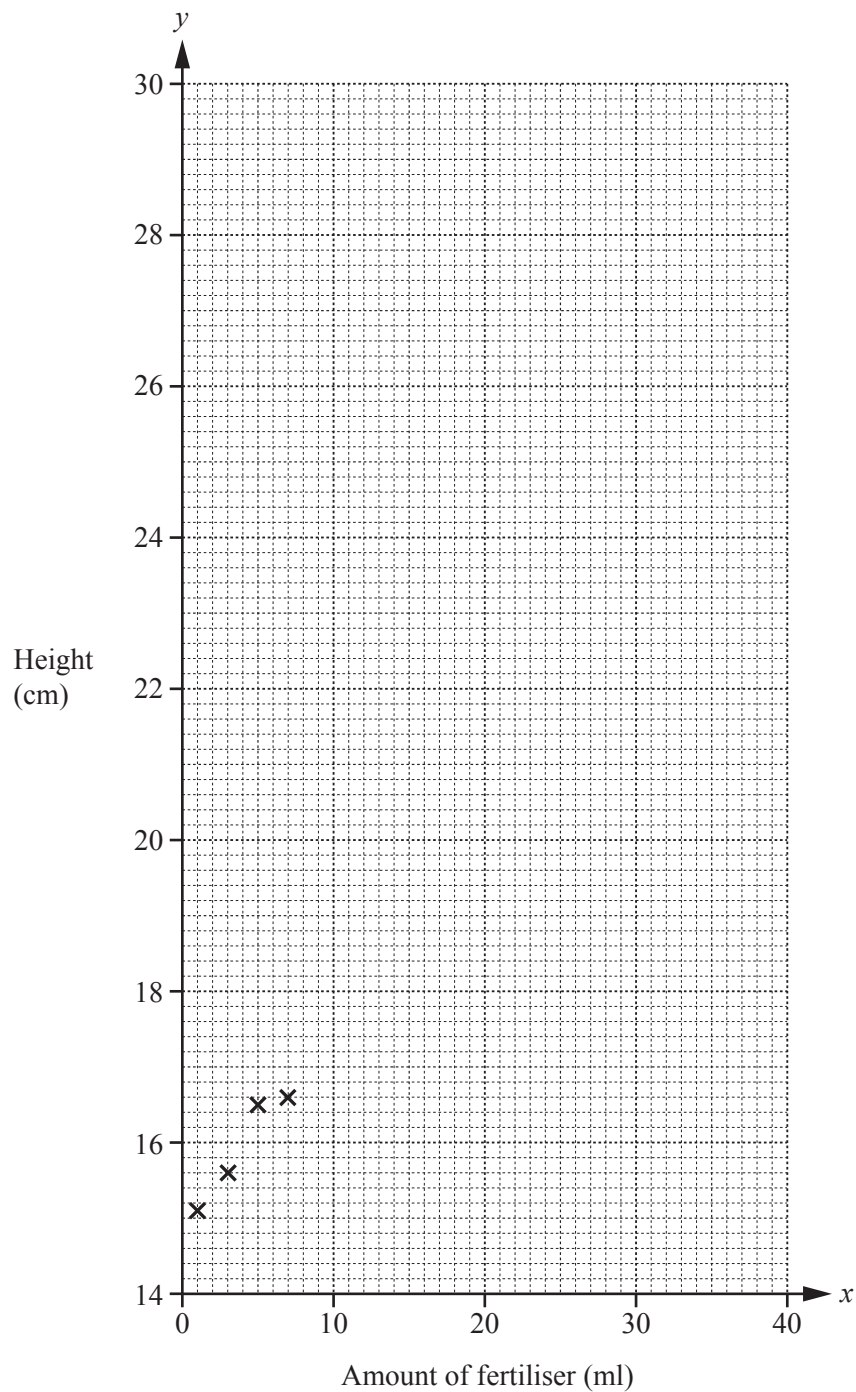
(d) Find the length of the perpendicular from B to AC .

..... cm [2]

- 10** Wasim sprays different amounts of fertiliser on some seedlings. He measures the amount, x millilitres, sprayed on each seedling. A week later he measures the height, y centimetres, of each seedling. His results are shown in the table.

Amount of fertiliser (x ml)	1	3	5	7	10	14	18	25	30	35	40
Height (y cm)	15.1	15.6	16.5	16.6	17	19.8	21	25.1	28.8	28.6	29.1

- (a) (i)** Complete the scatter diagram.
The first four points have been plotted for you.



- (ii) What type of correlation is shown by the scatter diagram?

..... [1]

- (b) Find

- (i) the mean amount of fertiliser,

..... ml [1]

- (ii) the mean height.

..... cm [1]

- (c) (i) Find the equation of the regression line in the form $y = mx + c$.

$y =$ [2]

- (ii) Use your answer to **part (c)(i)** to estimate the height of a seedling when the amount of fertiliser is 20 ml.

..... cm [1]

- (iii) Write down the units of m in the equation of the regression line, $y = mx + c$.

..... [1]

Question 11 is printed on the next page.

11 $f(x) = 2x - 7$ $g(x) = \sqrt{x}$ $h(x) = \frac{1}{x}, x \neq 0$

(a) (i) Find $f(3)$.

..... [1]

(ii) Solve $f(x) = 1$.

$x =$ [2]

(b) Find $f^{-1}(x)$.

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

(c) (i) Find $f(g(x))$ in terms of x .

..... [1]

(ii) Solve $f(g(x)) = 5$.

$x =$ [3]

(d) (i) Find $h(g(f(x)))$ in terms of x .

..... [2]

(ii) Find an inequality in terms of x for which $h(g(f(x)))$ exists.

..... [2]

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