Cambridge Assessment
International Education

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CANDIDATE NAME	

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CAMBRIDGE INTERNATIONAL MATHEMATICS **0607/41**

Paper 4 (Extended) **October/November 2022**

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.

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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. $\quad A = \pi rl$

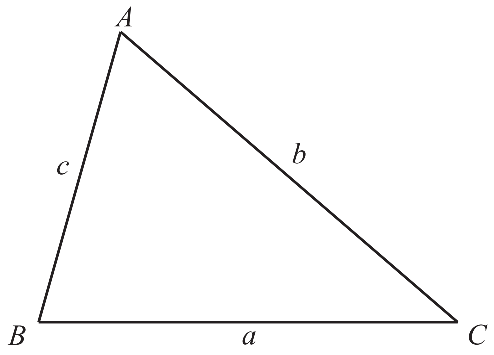
Curved surface area, A, of sphere of radius r. $\quad A = 4\pi r^2$

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. $\quad V = \frac{4}{3}\pi r^3$



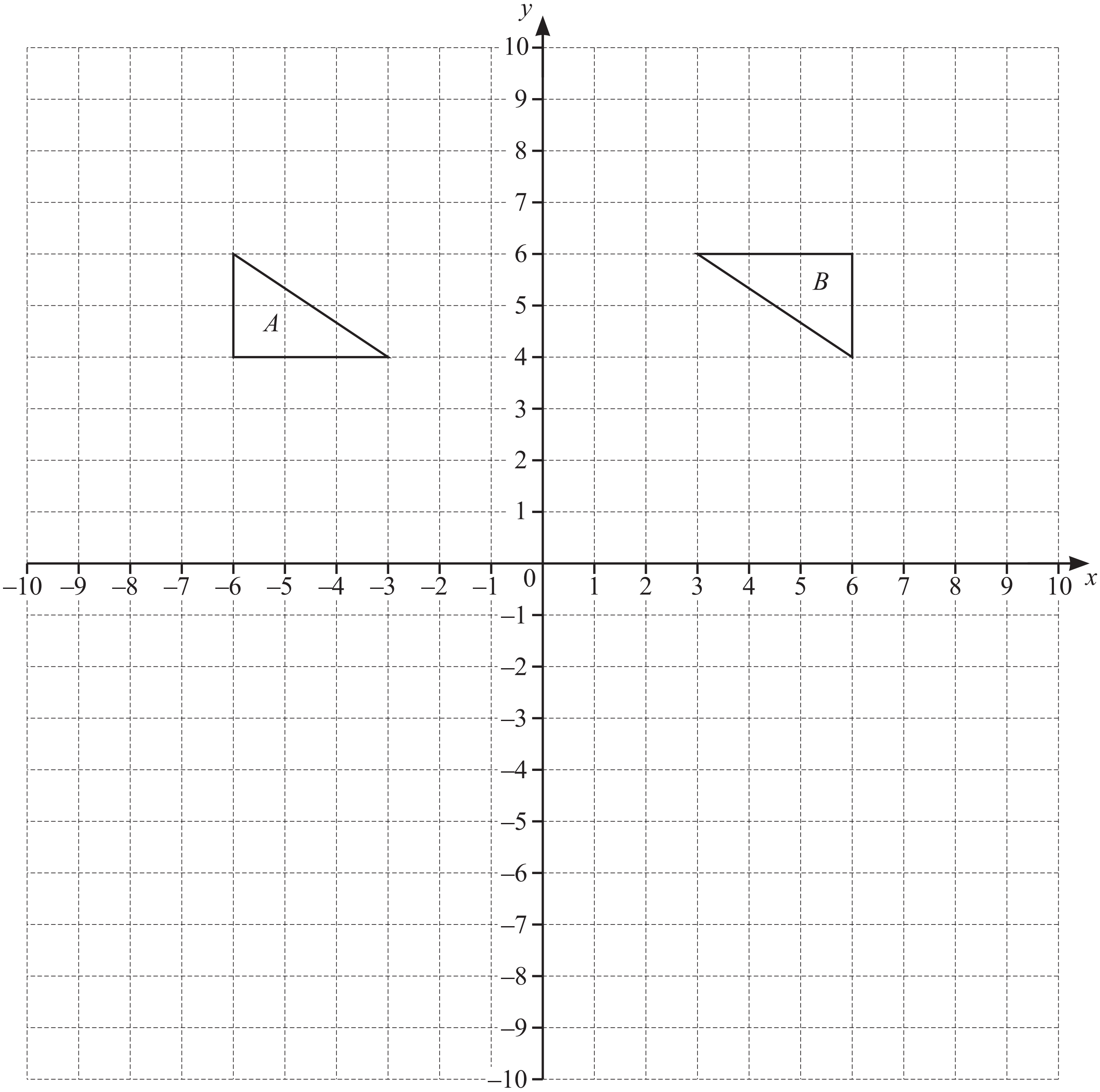
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

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

Answer **all** the questions.

1



(a) Describe fully the **single** transformation that maps triangle *A* onto triangle *B*.

....

.... [3]

(b) Translate triangle *A* by vector $\begin{pmatrix} 3 \\ -6 \end{pmatrix}$. Label the image *C*. [2]

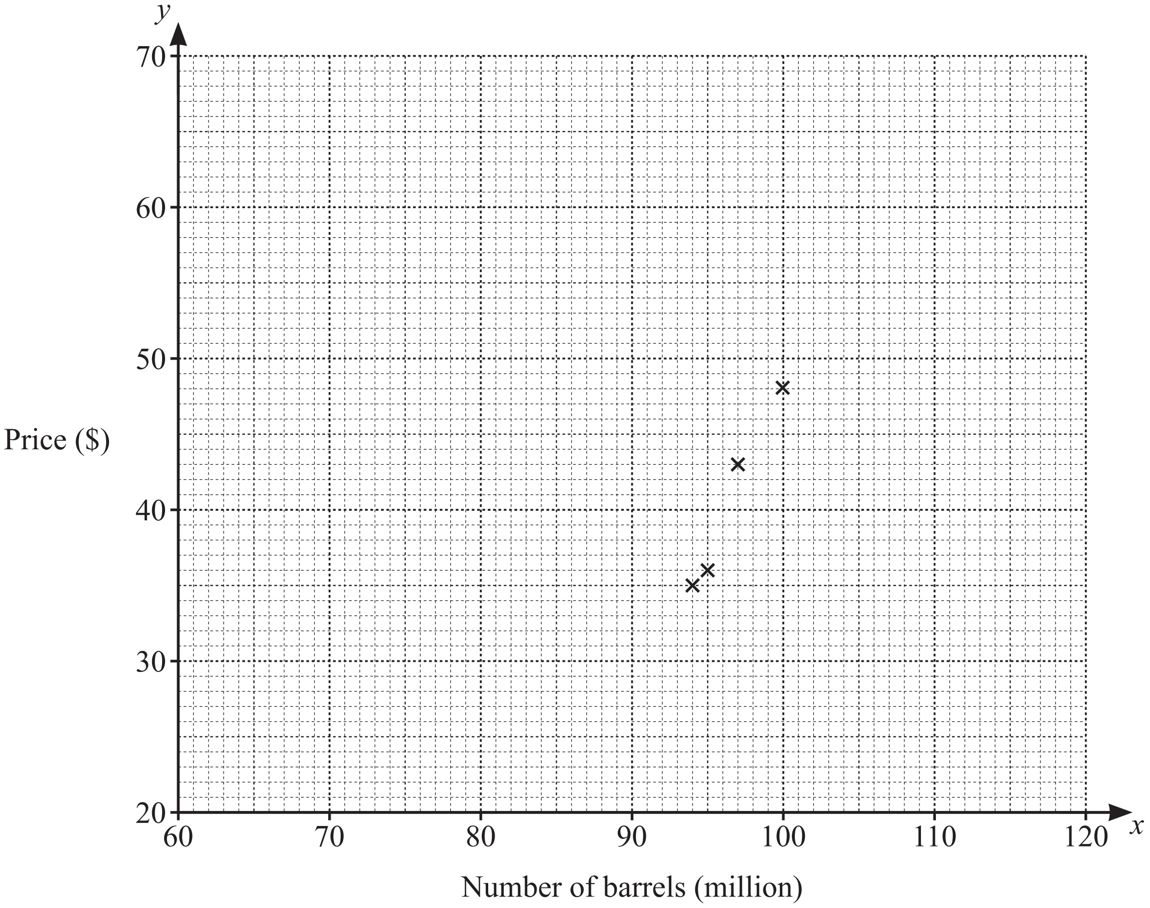
(c) Rotate triangle *B* through 90° clockwise about (3, 6). Label the image *D*. [2]

(d) Reflect triangle *B* in the line $y = 1$. Label the image *E*. [2]

2 The number of barrels of oil produced and the price of one barrel of oil on ten consecutive Mondays are shown in the table.

Number of barrels, *x* million	100	97	94	95	86	84	77	76	82	83
Price, $*y*	48	43	35	36	44	48	54	58	58	62

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



[2]

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

.... [1]

(b) Find the mean price of one barrel of oil.

$ .... [1]

(c) Find the equation of the regression line for y in terms of x.

$y =$ .... [2]

(d) Use your answer to **part (c)** to estimate

(i) the price of one barrel of oil when the number of barrels produced is 90 million,

$ .... [1]

(ii) the price of one barrel of oil when the number of barrels produced is 120 million.

$ .... [1]

(e) Which of your two answers to **part (d)** is likely to be more reliable?
Give a reason for your answer.

Part .... because ....

.... [1]

3 Alana, Bev and Cara work as decorators.

(a) The total amount of money they earn is shared in the ratio of the time each person works.
During one week Alana works for 16 hours 40 minutes, Bev works for 30 hours and Cara works for 1200 minutes.

They earn a total of \$1680.80 .

Change all the times into minutes and find the amount of money each person earns.

Alana \$ ....

Bev \$ ....

Cara \$ .... [4]

(b) **(i)** Alana pays a weekly rent of \$255 for her apartment.
The price of this weekly rent is 2% higher than one year ago.

Find the price of her weekly rent one year ago.

\$ .... [2]

(ii) Alana can pay one full year's rent in advance.
One year is 52 weeks.
She will receive a discount of 3% on each weekly rent of \$255.

Calculate the cost of paying the full year's rent in advance.

\$ .... [2]

(c) One week Bev earns $\$x$.

She spends $\frac{1}{4}$ of these earnings on rent and $\frac{2}{9}$ on food.

She spends $\frac{1}{3}$ **of the remaining money** on clothes and saves the rest.

She saves \$152.

Find the value of x.

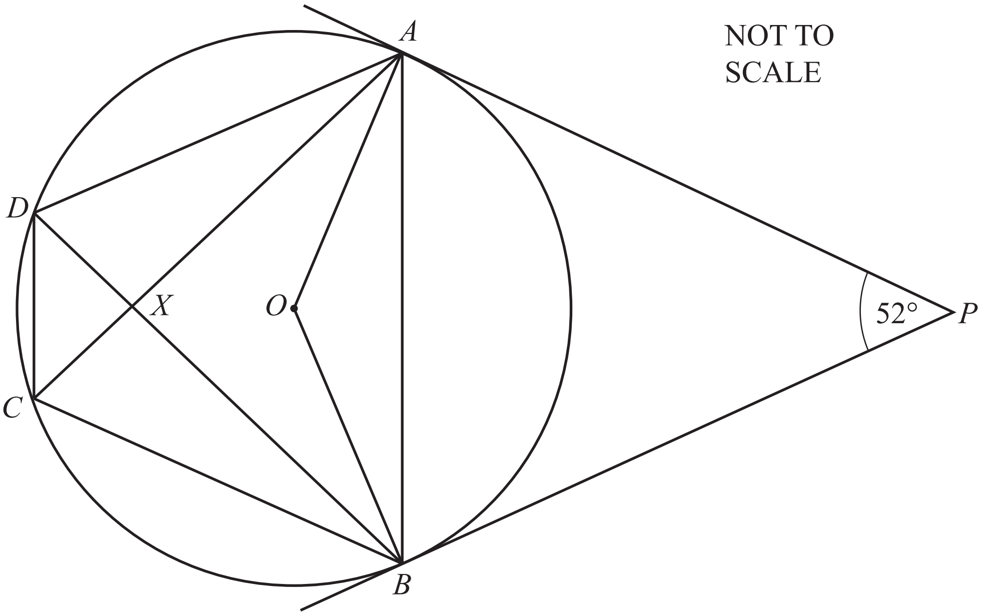
$x =$ .... [3]

(d) Cara invests \$500 for 5 years at a rate of y% per year simple interest.
The value of Cara's investment at the end of 5 years is \$530.75 .

Find the value of y.

$y =$ .... [3]

4



NOT TO SCALE

A, *B*, *C* and *D* lie on a circle, centre *O*.
AP and *BP* are tangents to the circle.
AC and *BD* intersect at *X*.
Angle $APB = 52°$.

(a) Complete the statement.

Angle $OAP = 90°$ because ....

.... [1]

(b) Find

(i) angle *AOB*,

Angle $AOB =$ .... [1]

(ii) angle *OAB*,

Angle $OAB =$ .... [1]

(iii) angle *ACB*.

Angle $ACB =$ .... [1]

(c) *ABCD* is a trapezium with *AB* parallel to *DC*.

(i) Write down a triangle that is similar to triangle *ABX*.

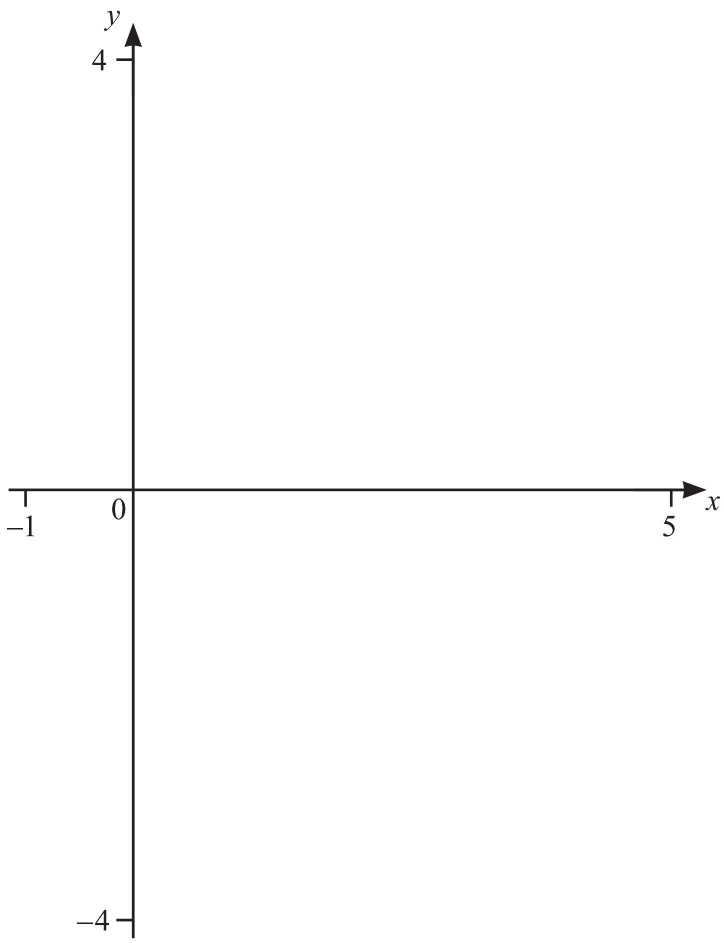
Triangle .... [1]

(ii) The length $CD = 4\,\text{cm}$ and the length $AB = 12\,\text{cm}$.

Find the ratio area *CDX* : area *ABX*.

area *CDX* : area *ABX* = ... : .... [1]

5



(a) On the diagram, sketch the graph of $y = f(x)$, where

$$f(x) = \frac{1}{(x-1)(x-2)(x-3)}$$ for values of x between -1 and 5. [3]

(b) Write down the y-coordinate of the point where the curve meets the y-axis.

$y =$ .... [1]

(c) Write down the equations of all the asymptotes to the graph of $y = f(x)$.

.... [3]

(d) On the diagram, sketch the graph of $y = g(x)$, where

$g(x) = x - 1$, for values of x between -1 and 5. [1]

(e) Find the x-coordinate of each point of intersection of the two graphs.

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

(f) Solve the inequality $f(x) > g(x)$.

.... [3]

6 y varies inversely as $(2x-1)^2$.
$y = 4$ when $x = 3$.

(a) Find the value of y when $x = 2.5$.

$y =$ .... [3]

(b) Find the values of x when $y = 16$.

$x =$ .... or $x =$ .... [4]

7 **(a)** Solve the simultaneous equations.
You must show all your working.

$$4x + 3y = -21$$
$$6x - 2y = 1$$

$x =$ ....

$y =$ .... [4]

(b) $f(x) = 5x - 2$ $\quad g(x) = \dfrac{1}{2x-1}\,, \quad x \neq 0.5$ $\quad h(x) = (x-1)^3$

(i) Find $f(3)$.

.... [1]

(ii) Find $h(f(2))$.

.... [2]

(iii) Solve $f(h(x)) = -7$.

$x =$ .... [3]

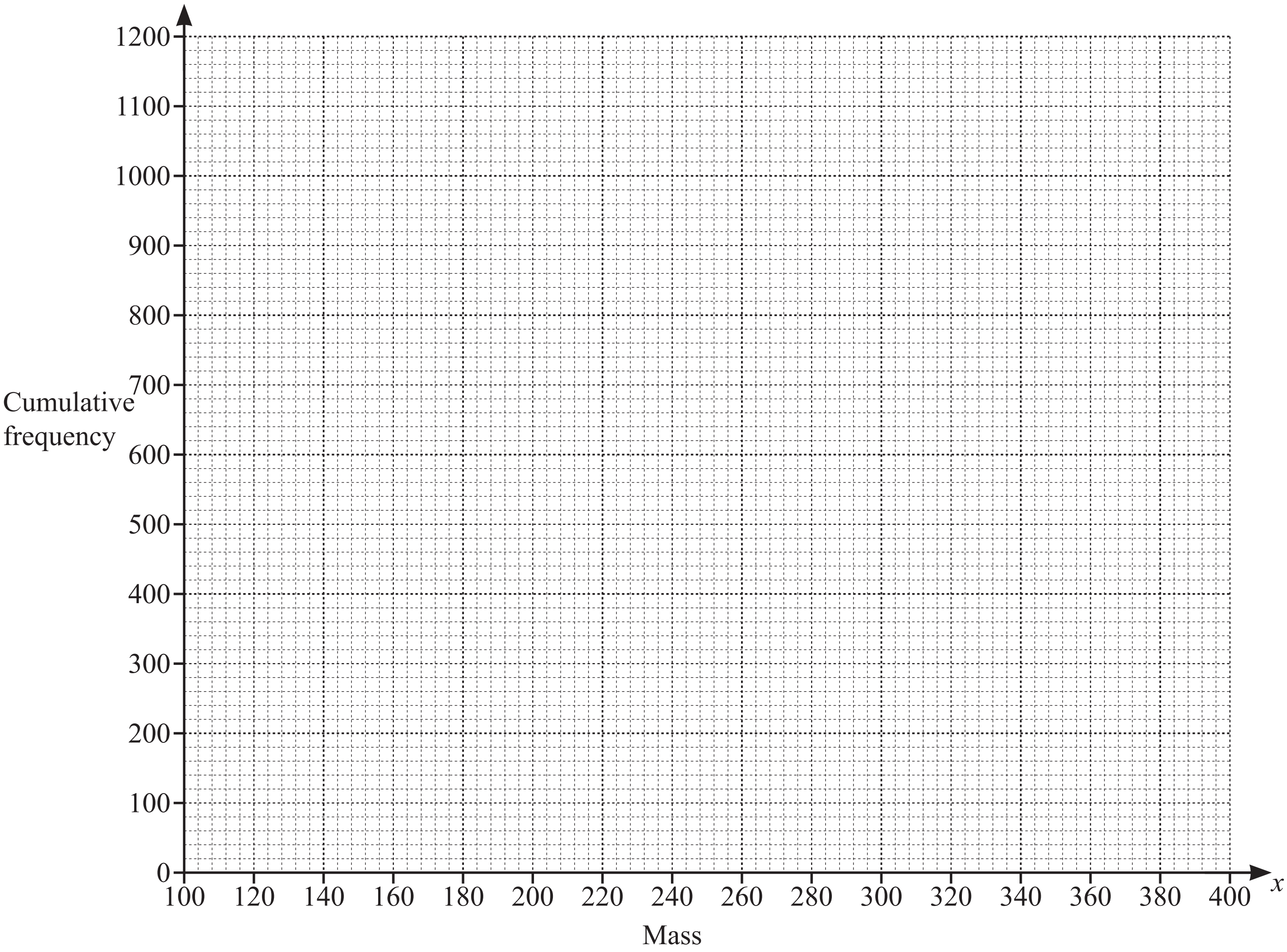
(iv) Find $g(g(x))$ in terms of x.
Give your answer in its simplest form.

.... [3]

8 The cumulative frequency table shows the masses, in grams, of 1200 potatoes.

Mass (x grams)	Cumulative frequency
$x \leqslant 150$	22
$x \leqslant 180$	160
$x \leqslant 200$	480
$x \leqslant 250$	860
$x \leqslant 300$	1120
$x \leqslant 400$	1200

(a) On the grid below, draw a cumulative frequency curve.



[3]

(b) Use your curve to estimate

(i) the median mass,

.... g [1]

(ii) the interquartile range.

.... g [2]

(c) Find the percentage of potatoes that have a mass of at least 280 grams.

.... % [2]

(d) Complete the table to show the masses of the 1200 potatoes.

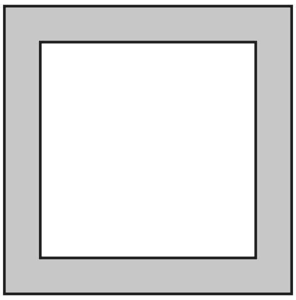
Mass (x grams)	Frequency
$100 < x \leqslant 150$	22
$150 < x \leqslant 180$	
$180 < x \leqslant 200$	
$200 < x \leqslant 250$	
$250 < x \leqslant 300$	
$300 < x \leqslant 400$	80

[1]

(e) Calculate an estimate of the mean mass of a potato.

.... g [2]

9



NOT TO SCALE

The diagram shows a square of side $2a$ cm inside a square of side $(2a+2x)$ cm.

(a) **(i)** Find an expression, in terms of a and x, for the area of the shaded region.
Give your answer in the form px^2+qax, where p and q are integers.

.... [2]

(ii) Calculate the area of the shaded region when $a = 6$ and $x = 1$.

.... cm^2 [1]

(b) Find an expression, in terms of a and x, for the total perimeter of the shaded region.
Give your answer in its simplest form.

.... [2]

(c) The numerical value of the shaded area is equal to the numerical value of the perimeter of the shaded region.

Find x when $a = 10$.
You must show all your working.

$x =$ .... [4]

10 A bag contains 5 red balls, 3 blue balls and 2 green balls.

(a) Rosa chooses a ball at random from the bag, notes its colour and replaces it.
She then chooses a ball at random from the bag a second time, notes its colour and replaces it.

Find the probability that the two balls chosen are

(i) both green,

.... [2]

(ii) the same colour.

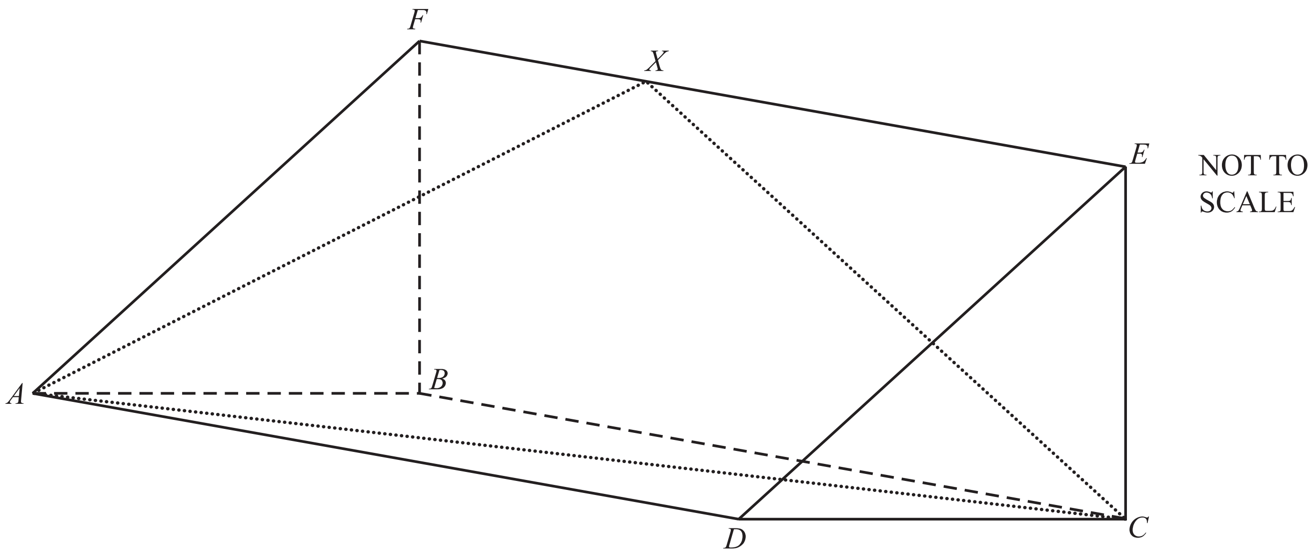
.... [2]

(b) Savio chooses a ball at random from the bag and does not replace it.
He then chooses another ball from the bag.

Find the probability that the two balls chosen are different colours.

.... [3]

11



The diagram shows a triangular prism $ABCDEF$.
X is a point on FE.
$AB = 8\,\text{m}$, $AD = 15\,\text{m}$, $AF = 10\,\text{m}$, $EC = 6\,\text{m}$ and $FX = 5\,\text{m}$.
Angle $ABF = 90°$ and angle $DCE = 90°$.

(a) Calculate angle CDE.

Angle CDE = ... [2]

(b) Calculate AC.

AC = ... m [2]

(c) Calculate angle *CXA*.

Angle *CXA* = ... [5]

(d) Calculate the area of triangle *CXA*.

.... m^2 [2]

Question 12 is printed on the next page.

12 **(a)** $a^b = 1$ where $a > 0$

(i) When $b = 13$, write down the value of a.

$a =$ .... [1]

(ii) When $a = 17$, write down the value of b.

$b =$ .... [1]

(b) Write down the solution to each equation.

(i) $3^{x-5} = 1$

$x =$ .... [1]

(ii) $(x-5)^3 = 1$

$x =$ .... [1]

(c) Use **part (a)** to find all the solutions to the following equations.

(i) $(4x-1)^{(x-3)} = 1$

.... [3]

(ii) $(x^2-4x+4)^{(x^2-9x+20)} = 1$

.... [4]

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