Cambridge Assessment International Education

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CANDIDATE NAME									
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8881225793

MATHEMATICS **0580/41**

Paper 4 (Extended) **May/June 2023**

2 hours 30 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 calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- 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 either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 130.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages.

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1 **(a)** An orchard has 1250 trees.
The trees are in the ratio apple : pear : cherry = 12 : 9 : 4.

(i) Calculate the number of apple trees.

..... [2]

(ii) Last year in the orchard, the mean mass of fruit produced was 64 kg per tree.

Calculate the total mass of fruit produced last year.
Give your answer in tonnes.
[1 tonne = 1000 kg]

..... tonnes [2]

(iii) Last year, the mean mass of pears produced was 54 kg per tree.
This was a decrease of 10% on the mean mass of pears produced per tree from the year before.

Calculate the mean mass of pears produced by each pear tree the year before.

..... kg [2]

(iv) The orchard loses $\frac{1}{5}$ of its total number of trees in a storm.

Calculate the number of trees that remain.

..... [2]

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(b) Paulo buys some pears from a market.
Pears cost \$0.54 each or 0.51 euros each.

(i) Paulo pays **in dollars** for 12 pears.

Calculate the change he receives from \$10.

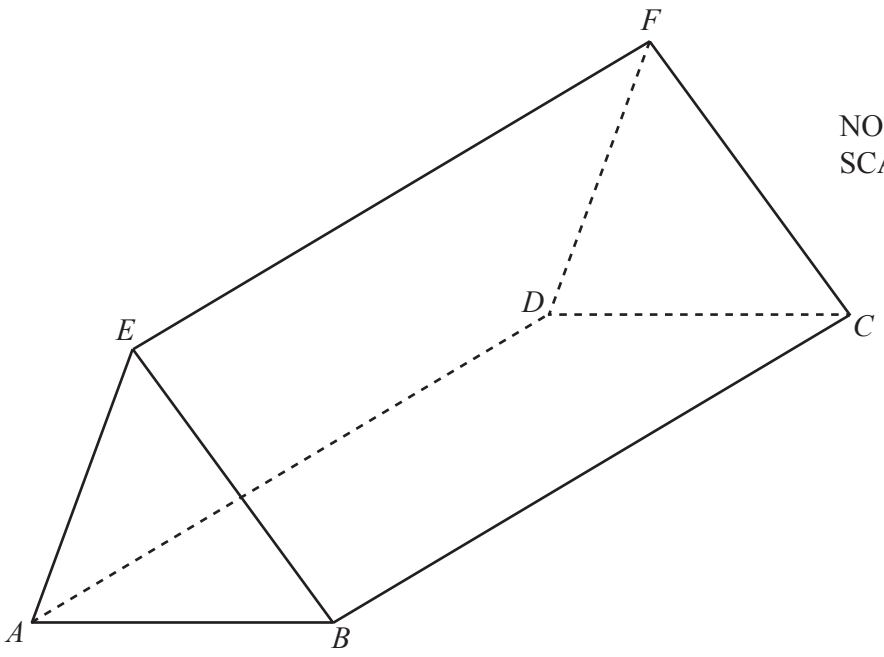
\$ ..... [2]

(ii) The exchange rate is \$1 = 0.826 euros.

Calculate how much more Paulo pays for **each** pear when he pays in euros.
Give your answer in dollars, correct to the nearest cent.

\$ ..... [3]

2



The diagram shows a solid triangular prism $ABCDEF$ of length 15 cm.
$AB = 6.4$ cm, $EB = 5.7$ cm and the volume of the prism is 145 cm^3.

(a) Show that angle $EBA = 32°$, correct to the nearest degree.

[3]

(b) Find the length of EA.

..... cm [3]

(c) Calculate the shortest distance from E to AB.

..... cm [3]

(d) Calculate the angle BF makes with the base, $ABCD$, of the prism.

..... [4]

(e) The prism is made of plastic with density $938\,kg/m^3$.

Calculate the mass of the prism in **grams**.
[Density = mass ÷ volume]

..... g [3]

3 **(a)** The table shows information about the mass of each of 1000 eggs.

Mass (m grams)	$40 < m \leqslant 50$	$50 < m \leqslant 56$	$56 < m \leqslant 64$	$64 < m \leqslant 70$
Frequency	126	520	154	200

(i) Calculate an estimate of the mean.

..... g [4]

(ii) An egg is picked at random from the 1000 eggs.

Find the probability that this egg has a mass greater than 56 g.
Give your answer as a fraction in its simplest form.

..... [2]

(b) One year, a farmer makes a profit of $24 730 selling eggs.

Write this profit

(i) correct to 2 significant figures

$ ..... [1]

(ii) in standard form.

$ ..... [1]

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(c) On a farm, there are 500 hens, correct to the nearest 10.

(i) In one year, the mean number of eggs laid per hen was 320 eggs, correct to the nearest 20.

Calculate the upper bound for the total number of eggs all the hens lay in that year.

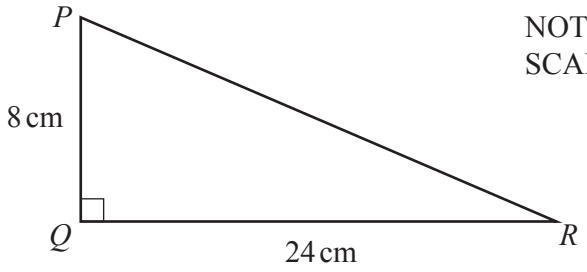
..... [3]

(ii) Another farm has 800 hens, correct to the nearest 20.

Calculate the lower bound for the difference between the number of hens on the two farms.

..... [2]

4 **(a)**



NOT TO SCALE

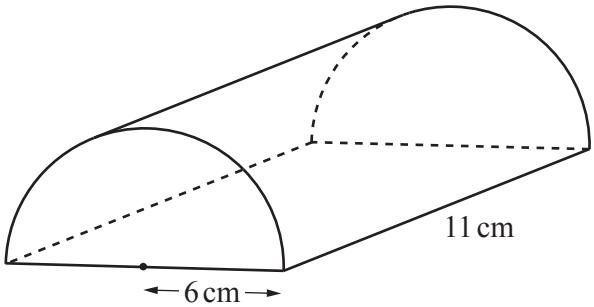
(i) Calculate the area of triangle PQR.

..... cm^2 [2]

(ii) Calculate angle PRQ.

Angle PRQ = ... [2]

(b)



NOT TO SCALE

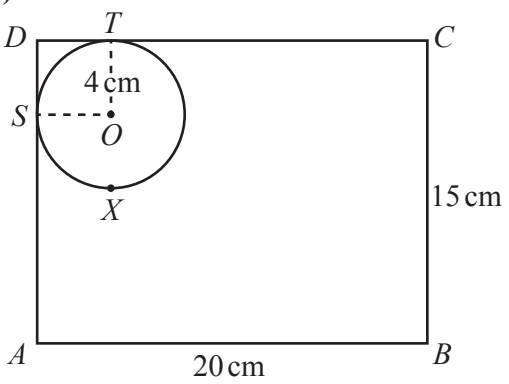
The diagram shows a half-cylinder of radius 6 cm and length 11 cm.

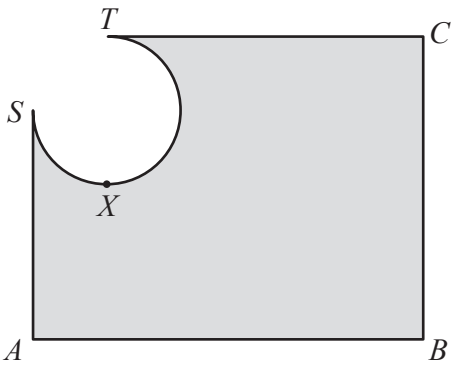
Calculate the volume of the half-cylinder.

..... cm^3 [2]

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(c)





NOT TO SCALE

(i) *ABCD* is a rectangle with $AB = 20$ cm and $BC = 15$ cm.
S, *X* and *T* are points on a circle centre *O*, such that *DSA* and *DTC* are tangents to the circle.
The radius of the circle is 4 cm and *TX* is a diameter of the circle.
The shape *DSXT* is removed from the corner of the rectangle, leaving the shaded shape shown in the second diagram.

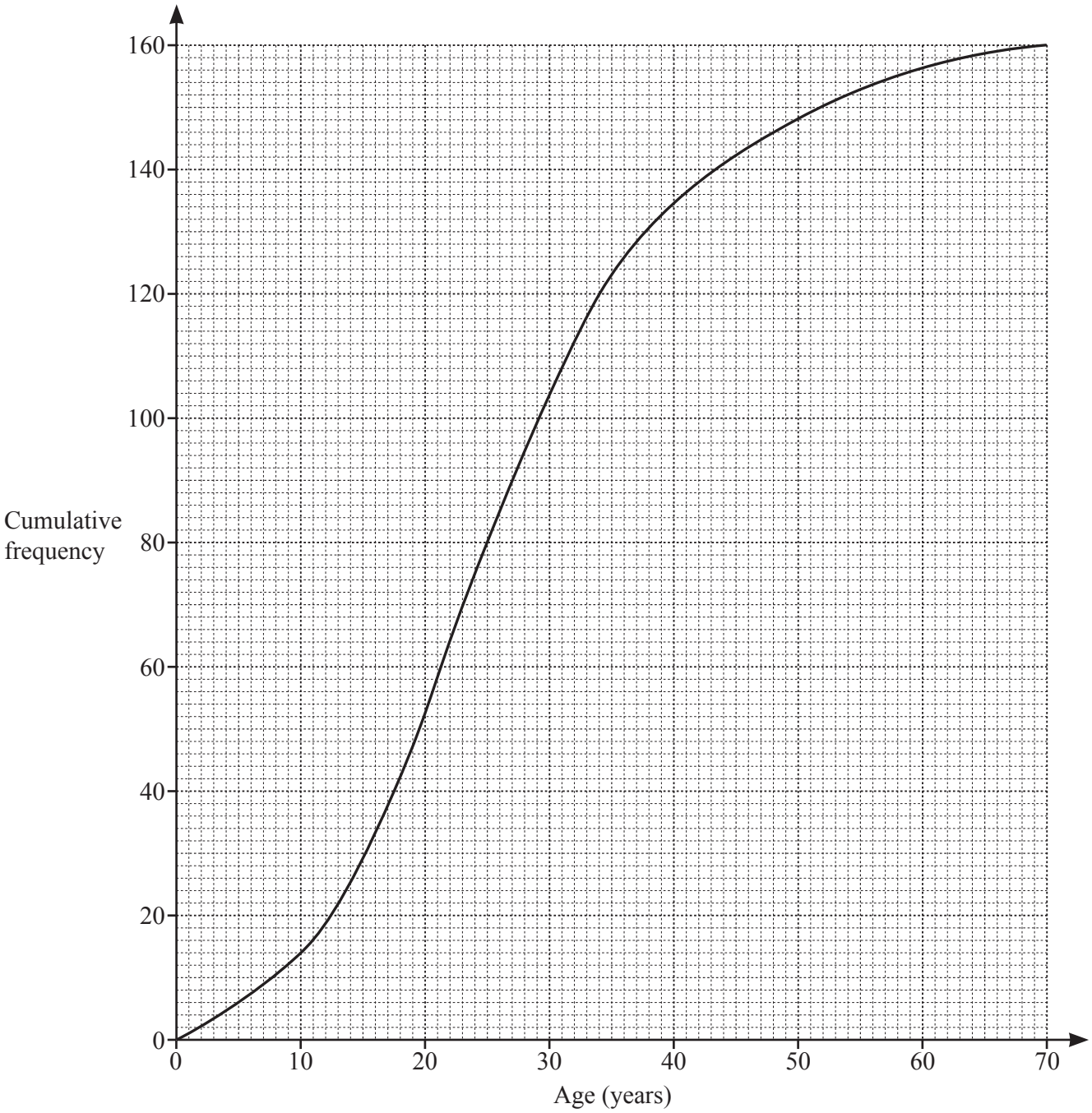
Calculate the area of the shaded shape.

..... cm^2 [5]

(ii) Calculate the perimeter of the shaded shape.

..... cm [3]

5 **(a)** There are 160 people in a village.
The cumulative frequency diagram shows information about their ages.



(i) Find an estimate for

(a) the median age

..... [1]

(b) the lower quartile

..... [1]

(c) the number of people who are 50 or more years of age

..... [2]

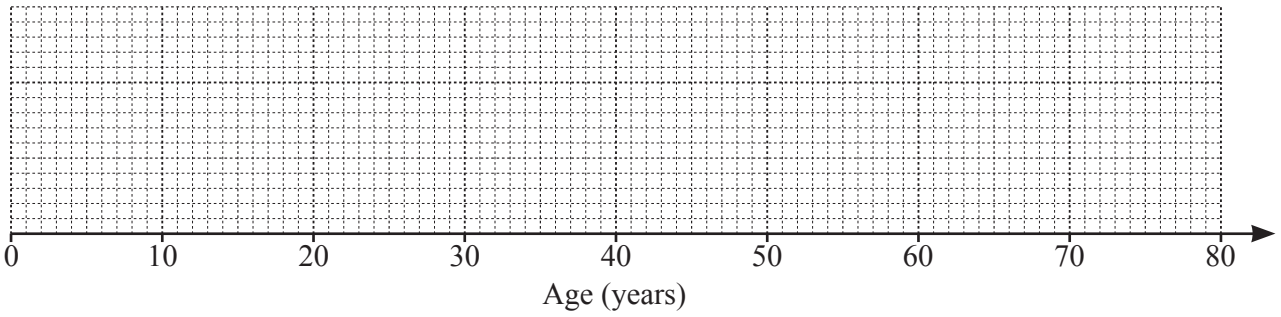
(d) the 65th percentile.

..... [2]

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(ii) The youngest person in the village is 1 year old and the oldest is 70 years old.

(a) Draw a box-and-whisker plot to show the distribution of ages in the village.



[3]

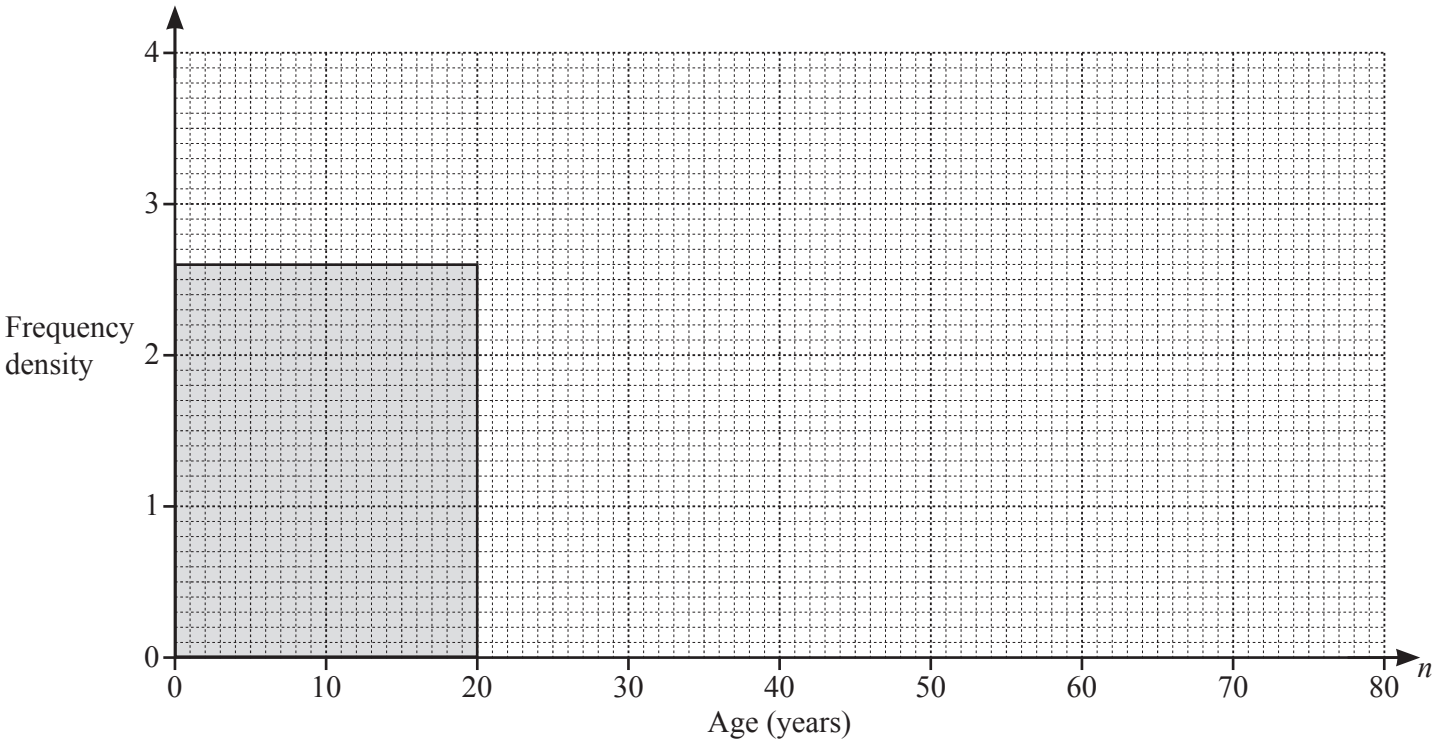
(b) Write down an estimate of the percentage of people in the village that are younger than the median age.

..... % [1]

(b) The frequency table shows information about the age of each person in another village.

Age (n years)	$0 < n \leqslant 20$	$20 < n \leqslant 30$	$30 < n \leqslant 50$	$50 < n \leqslant 80$
Frequency	52	37	24	60

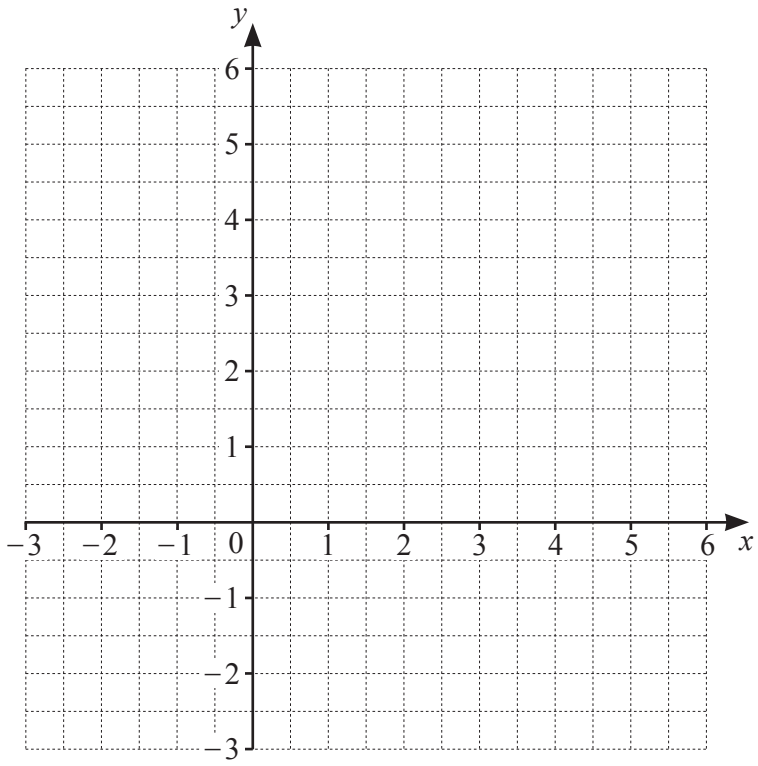
On the grid, complete the histogram to show this information.
The first block has been drawn for you.



[3]

6 **(a)** In the square $ABCD$, A has coordinates $(-2, 1)$ and B has coordinates $(1, 5)$.
C has coordinates (a, b), where a and b are both positive integers.

Find the coordinates of C and the coordinates of D.
You may use the grid to help you.



C (..... , ...)

D (..... , ...) [4]

(b) P has coordinates $(-1, 3)$ and Q has coordinates $(6, 4)$.

(i) Find the coordinates of the midpoint of PQ.

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

(ii) Find the length PQ.

..... [3]

(iii) Find the gradient of PQ.

..... [2]

(iv) Find the equation of the line parallel to PQ that crosses the x-axis at $x = 2$.

..... [3]

7 **(a)** Factorise fully.

(i) $27y^2 - 3$

..... [3]

(ii) $2m - pk + 2k - pm$

..... [2]

(b) Solve $\frac{x-1}{x+1} - \frac{6}{x-1} = 1$.

$x =$ ..... [5]

(c) Solve $4x^2 - 3x - 2 = 0$.
You must show all your working and give your answers correct to 2 decimal places.

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

(d) Make k the subject of the formula.

$$\frac{k}{m} = 4 + kp$$

$k =$ ..... [4]

8 A tailor makes x dresses and y shirts in one week.
In one week

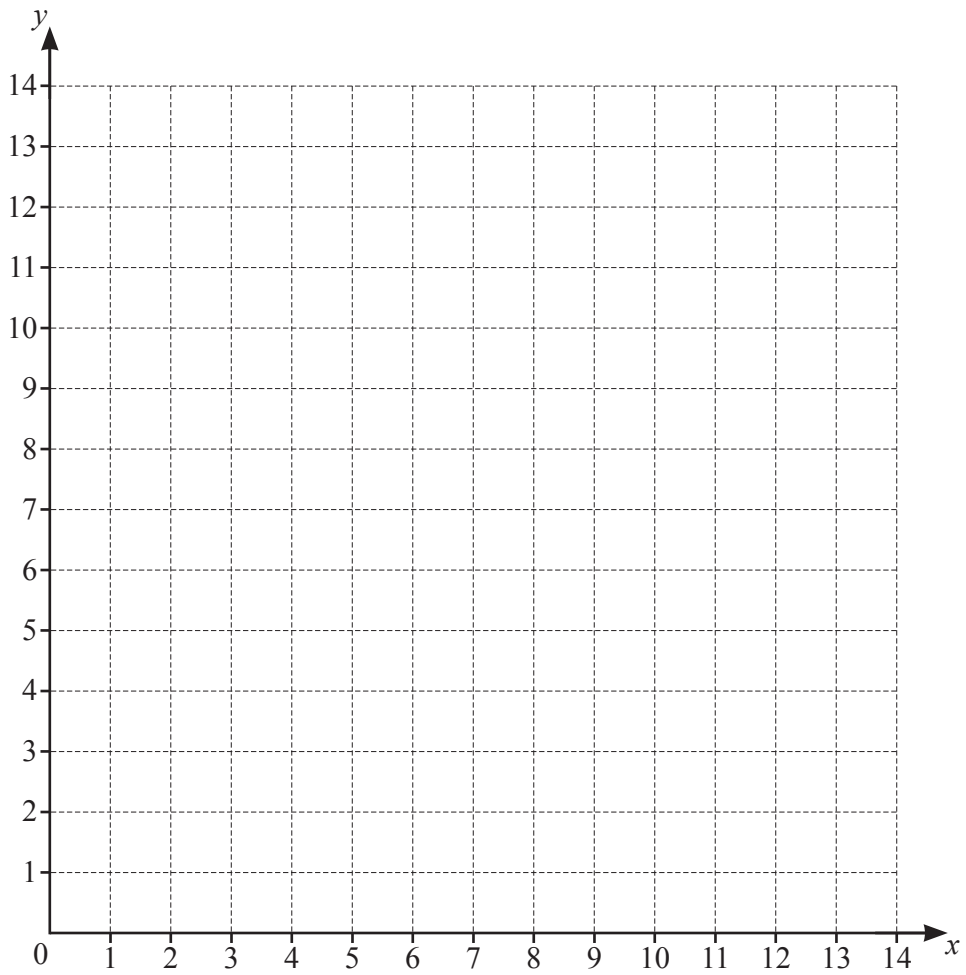
- he makes at least 4 dresses
- he makes no more than 7 shirts
- he makes less than 14 dresses and shirts altogether
- the number of shirts he makes is more than $\frac{2}{3}$ of the number of dresses.

One of the inequalities that shows this information is $x \geqslant 4$.

(a) Write down the other three inequalities in x and/or y.

.... [3]

(b)



On the grid, draw 4 straight lines and shade the unwanted regions to show these inequalities.
Label the region R that satisfies the 4 inequalities. [6]

(c) Use your diagram to find the smallest number of dresses and the smallest number of shirts the tailor makes in one week.

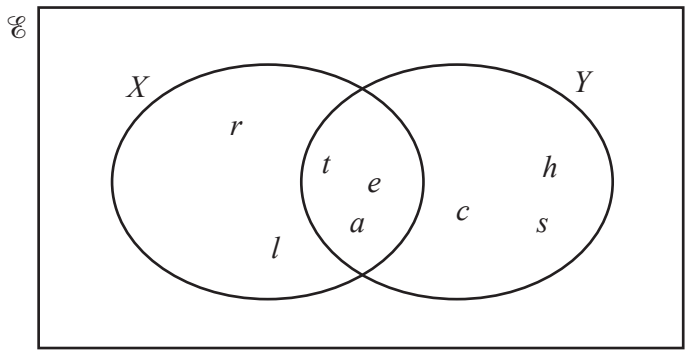
..... dresses and ..... shirts [1]

(d) The profit the tailor makes on one dress is $10 and the profit on one shirt is $6.

Use your diagram to find the largest profit the tailor can make in one week.

$ ..... [2]

9 **(a)** The Venn diagram shows set X and set Y.



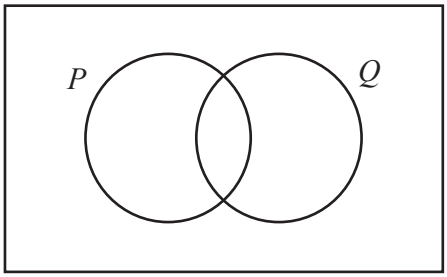
(i) List the elements of X.

..... [1]

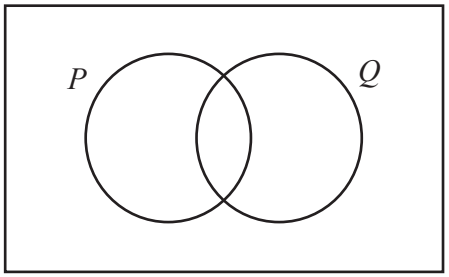
(ii) Find $n(Y')$.

..... [1]

(b) In each Venn diagram, shade the required region.



$P \cup Q$



$P' \cap Q$

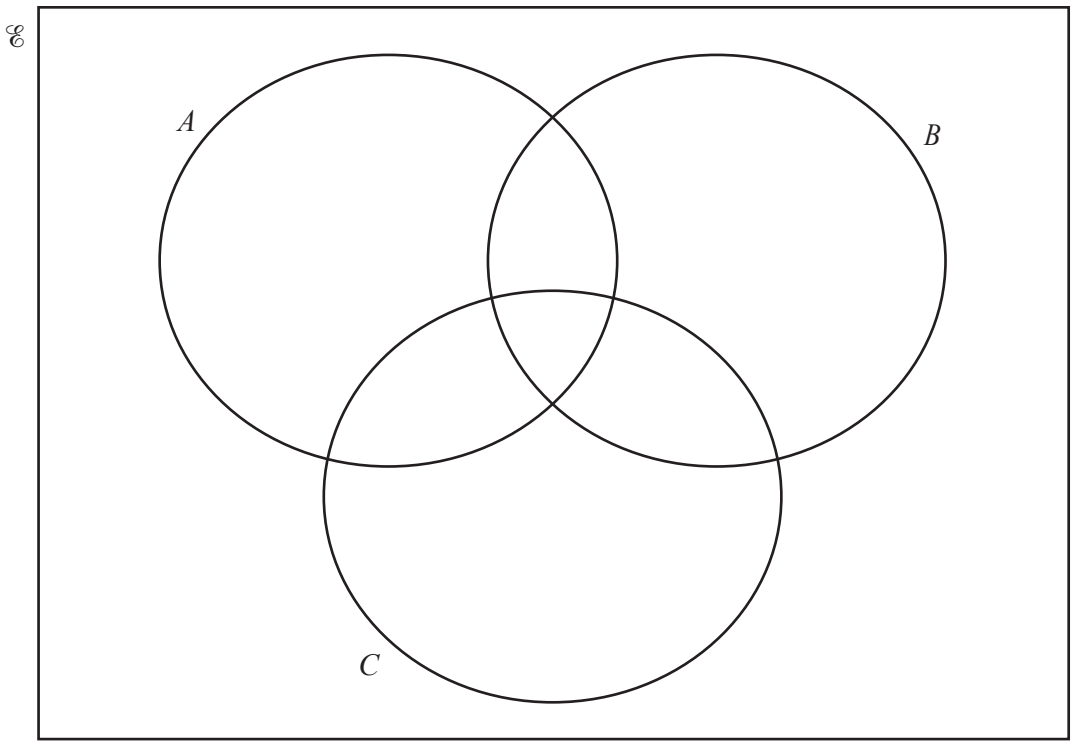
[2]

(c) $\mathscr{E} = \{\text{positive integers} < 13\}$

$A = \{x : x < 9\}$

$B = \{x : x \text{ is even}\}$

$C = \{x : x \text{ is a multiple of } 3\}$



(i) Complete the Venn diagram. [3]

(ii) Find $\text{n}(A' \cup (B \cap C))$.

..... [1]

Question 10 is printed on the next page.

10 $f(x) = x - 4$ $g(x) = 2x + 5$ $h(x) = 3^x$

(a) Find

(i) $f(-3)$

..... [1]

(ii) $g^{-1}(x)$

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

(iii) $f(x) \times g(x) \times f(x)$.

..... [4]

(b) Find x when $h(x) = g(f(2))$.

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

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