



## Formula List

For the equation

$$ax^2 + bx + c = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Lateral surface area,  $A$ , of cylinder of radius  $r$ , height  $h$ .

$$A = 2\pi rh$$

Lateral surface area,  $A$ , of cone of radius  $r$ , sloping edge  $l$ .

$$A = \pi rl$$

Surface area,  $A$ , of sphere of radius  $r$ .

$$A = 4\pi r^2$$

Volume,  $V$ , of pyramid, base area  $A$ , height  $h$ .

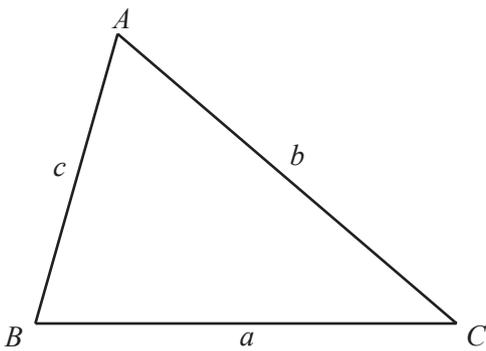
$$V = \frac{1}{3}Ah$$

Volume,  $V$ , of cone of radius  $r$ , height  $h$ .

$$V = \frac{1}{3}\pi r^2 h$$

Volume,  $V$ , of sphere of radius  $r$ .

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



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

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

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

- 1 30 students take a test.  
The table shows the results.

Score	4	5	6	7	8	9	10
Frequency	2	4	3	5	5	7	4

(a) Find

(i) the mode

..... [1]

(ii) the median

..... [1]

(iii) the mean.

..... [3]

(b) Find the percentage of students whose scores are at least 5.

..... % [1]

(c) 30% of the students score less than  $x$ .

Find the value of  $x$ .

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

(d) Two students are picked at random.

Find the probability that one student has a score of less than 6 and one student has a score of more than 6.

..... [3]

- 2 (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]

- (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.

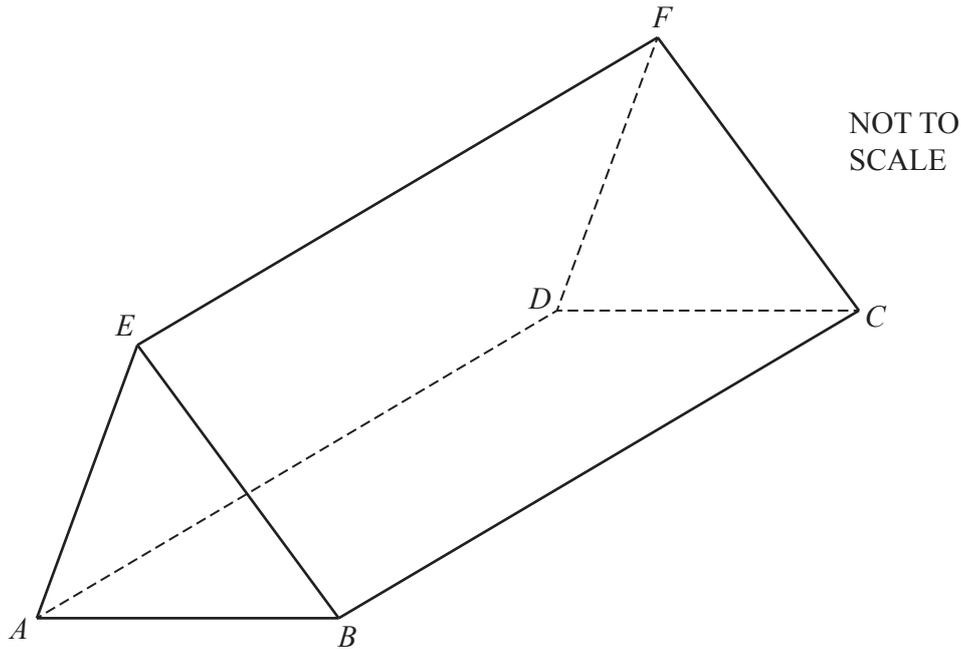
\$ ..... [2]

- (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]

3



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  $145 \text{ cm}^3$ .

- (a) The prism is made of plastic with density  $938 \text{ kg/m}^3$ .

Calculate the mass of the prism in **grams**.

[Density = mass  $\div$  volume]

..... g [3]

- (b)  $M$  is the point on  $AB$  that is vertically below  $E$ .

Calculate  $EM$ .

$$EM = \dots\dots\dots \text{ cm [3]}$$

- (c) Calculate angle  $EBA$ .

$$\text{Angle } EBA = \dots\dots\dots [2]$$

- (d) Calculate  $EA$ .

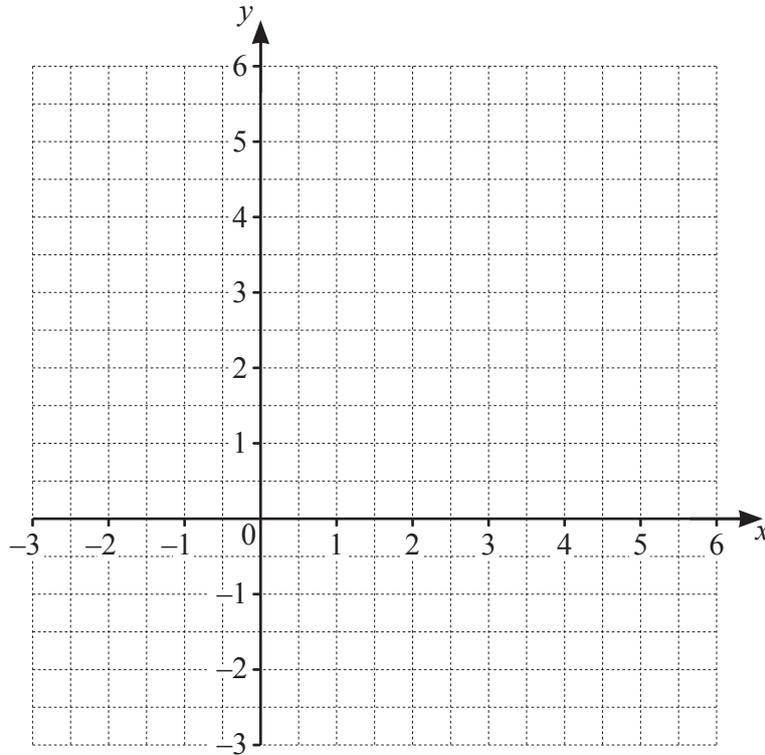
$$EA = \dots\dots\dots \text{ cm [3]}$$

- (e) Calculate the total surface area of the prism.

$$\dots\dots\dots \text{ cm}^2 [3]$$

- 4 (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 slope of  $PQ$ .

..... [2]

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

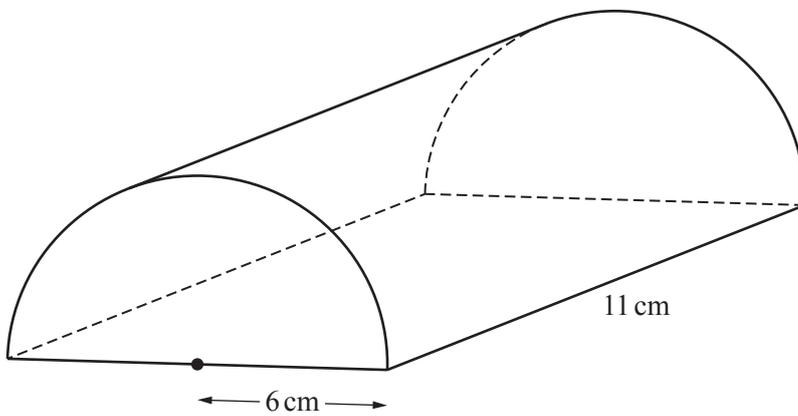
..... [3]

5 (a) A cone has a base radius of 5 cm and a perpendicular height of 12 cm.

Calculate the lateral surface area of this cone.

..... cm<sup>2</sup> [3]

(b)

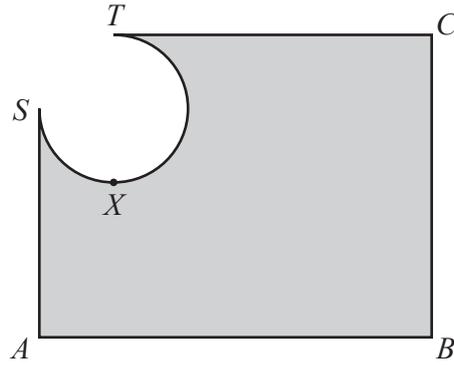
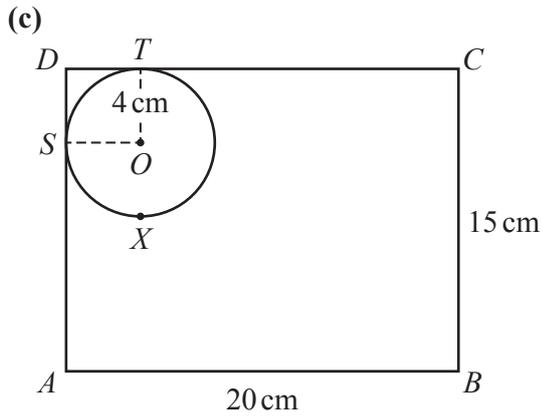


NOT TO SCALE

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

Calculate the volume of the half-cylinder.

..... cm<sup>3</sup> [2]



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 center  $O$ , 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.

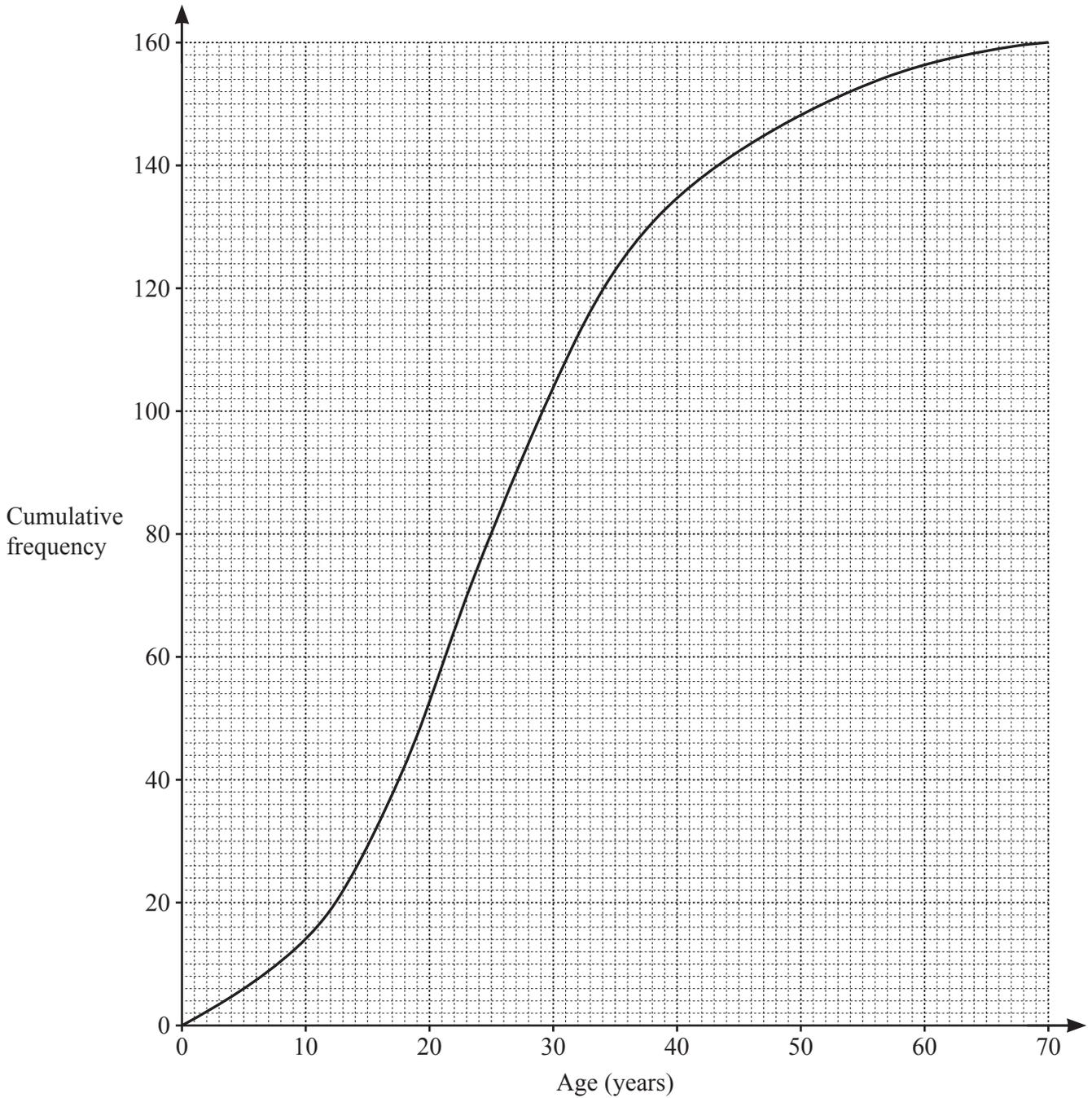
Calculate the area of the shaded shape.

.....  $\text{cm}^2$  [5]

- (ii) Calculate the perimeter of the shaded shape.

..... cm [3]

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



Find an estimate for

- (i) the median age ..... [1]
- (ii) the lower quartile ..... [1]
- (iii) the number of people who are 50 or more years of age ..... [2]
- (iv) the 65th percentile. ..... [2]

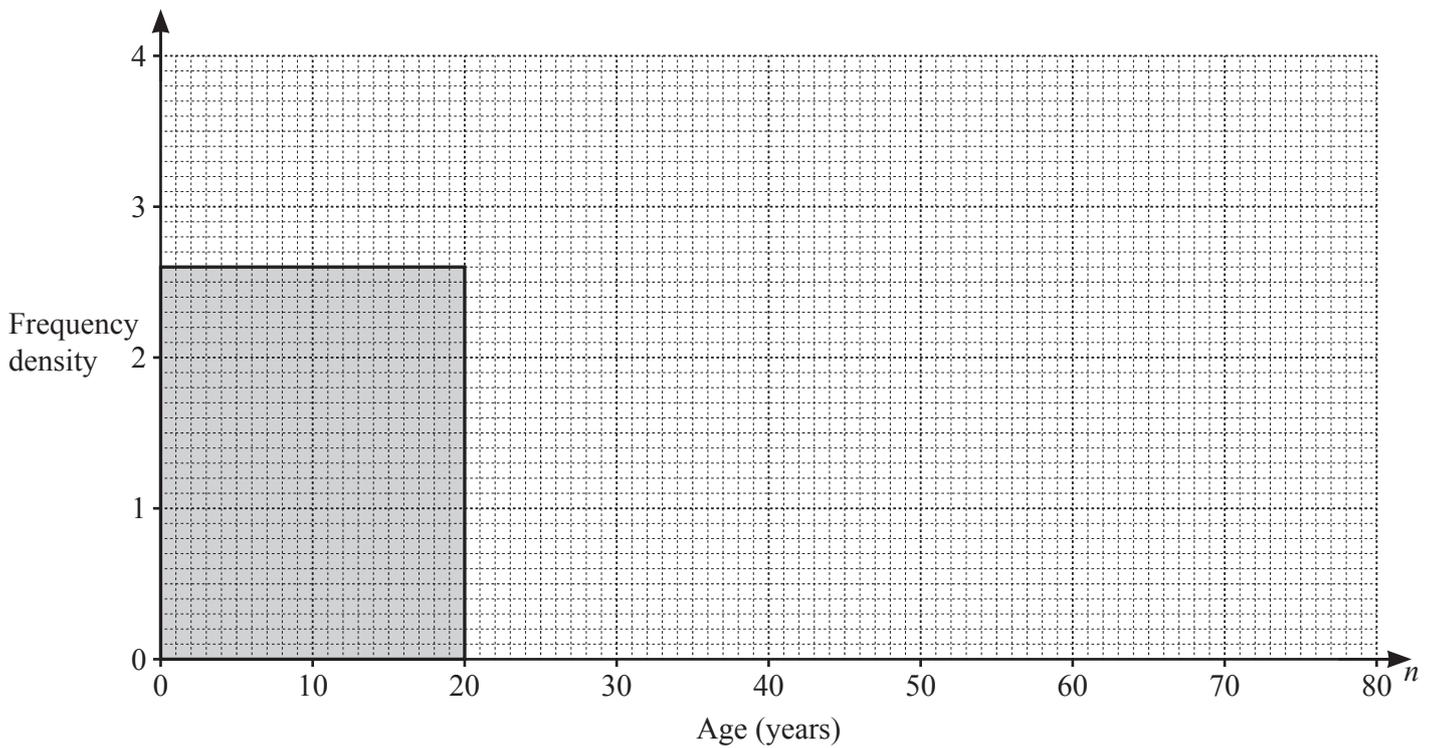
(b) The frequency table shows information about the age of each person in another village.

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

(i) Calculate an estimate of the mean age.

..... [4]

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



[3]

7

$f(x) = x - 4$

$g(x) = 2x + 5$

$h(x) = 3^x$

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

..... [1]

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

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

(c) The domain of  $h(x)$  is  $-3 \leq x \leq 5$ .

Find the range of  $h(x)$ .

.....  $\leq h(x) \leq$  ..... [2]

(d) Find  $f(x) \times g(x) - f(g(x))$ .

Give your answer in the form  $ax^2 + bx + c$ .

..... [4]

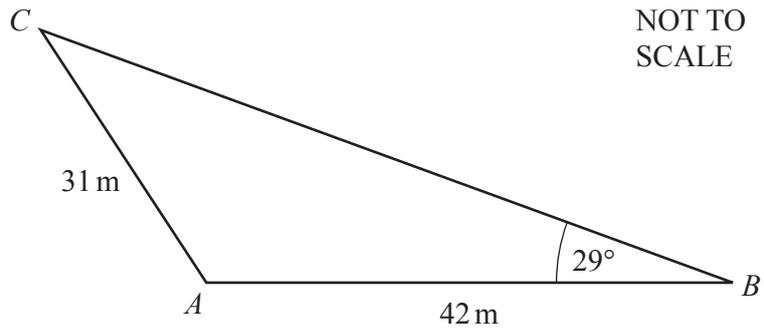
(e) Find  $x$  when  $h(x) = g(f(2))$ .

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

(f) Find  $x$  when  $h^{-1}(x) = -2$ .

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

8



(a)  $B$  is due east of  $A$ .

Find the bearing of

(i)  $C$  from  $B$

..... [1]

(ii)  $B$  from  $C$ .

..... [2]

(b) Calculate obtuse angle  $BAC$ .

Angle  $BAC =$  ..... [4]

9 (a) Factor fully.

(i)  $27y^2 - 3$

..... [3]

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

..... [2]

(b) Write  $\frac{x-1}{x+1} + \frac{5}{x-1} - 1$  as a single fraction in its simplest form.

..... [4]

(c) Solve  $4x^2 - 3x - 2 = 0$ .

You must show all your work and give your answers correct to 2 decimal places.

$x = \dots\dots\dots$  or  $x = \dots\dots\dots$  [4]

10 (a) Solve for  $k$ .

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

$$k = \dots\dots\dots [4]$$

(b) Solve  $\sqrt{x^2 + 64} = 10$ .

$$\dots\dots\dots [3]$$

(c) (i) Write  $x^2 + 10x - 3$  in the form  $(x + a)^2 + b$ .

$$\dots\dots\dots [2]$$

(ii) Write down the minimum value of  $x^2 + 10x - 3$ .

$$\dots\dots\dots [1]$$

11 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.

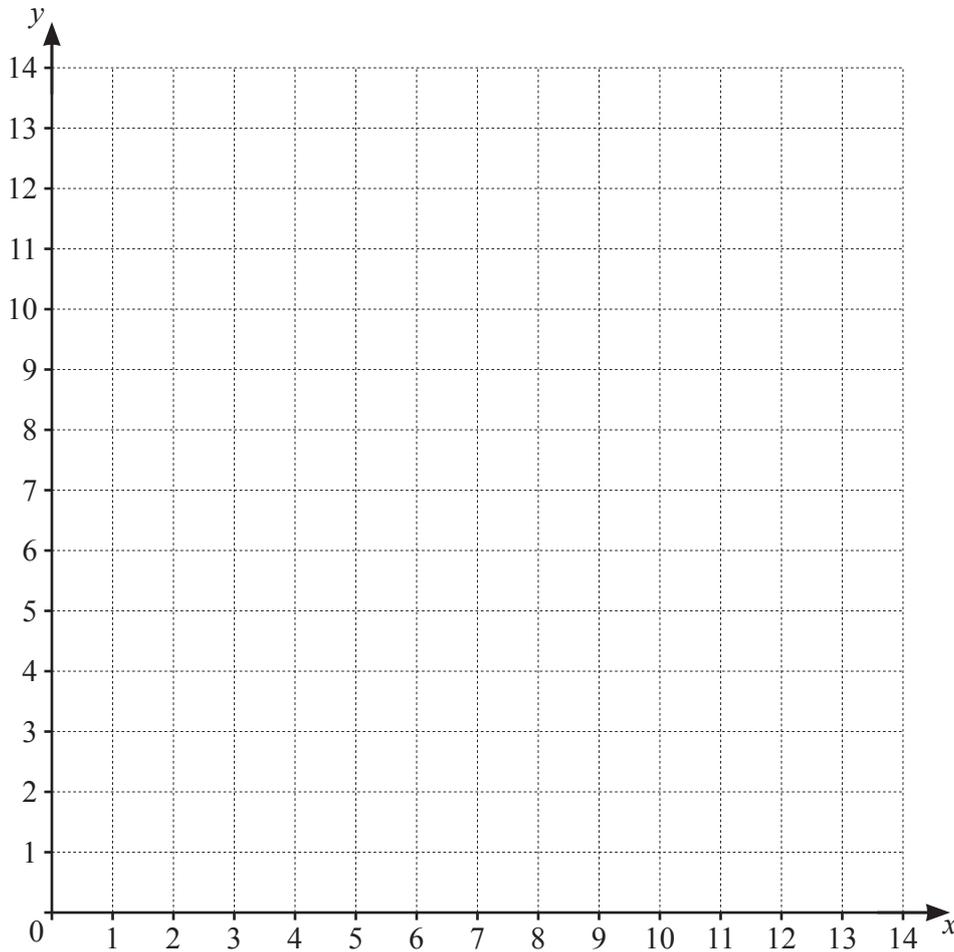
One of the inequalities that shows this information is  $x \geq 4$ .

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

.....

[3]

(b)



On the grid, show the four inequalities by drawing four straight lines.  
Label the region R that satisfies the 4 inequalities.

[6]

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