Linear Programming 2

1)

Peter wants to plant x plum trees and y apple trees.

He wants at least 3 plum trees and at least 2 apple trees.

(a) Write down one inequality in x and one inequality in y to represent these conditions.

Answer(a) , [2]

(b) There is space on his land for no more than 9 trees.

Write down an inequality in x and y to represent this condition.

Answer(b) [1]

(c) Plum trees cost \$6 and apple trees cost \$14.

Peter wants to spend no more than \$84.

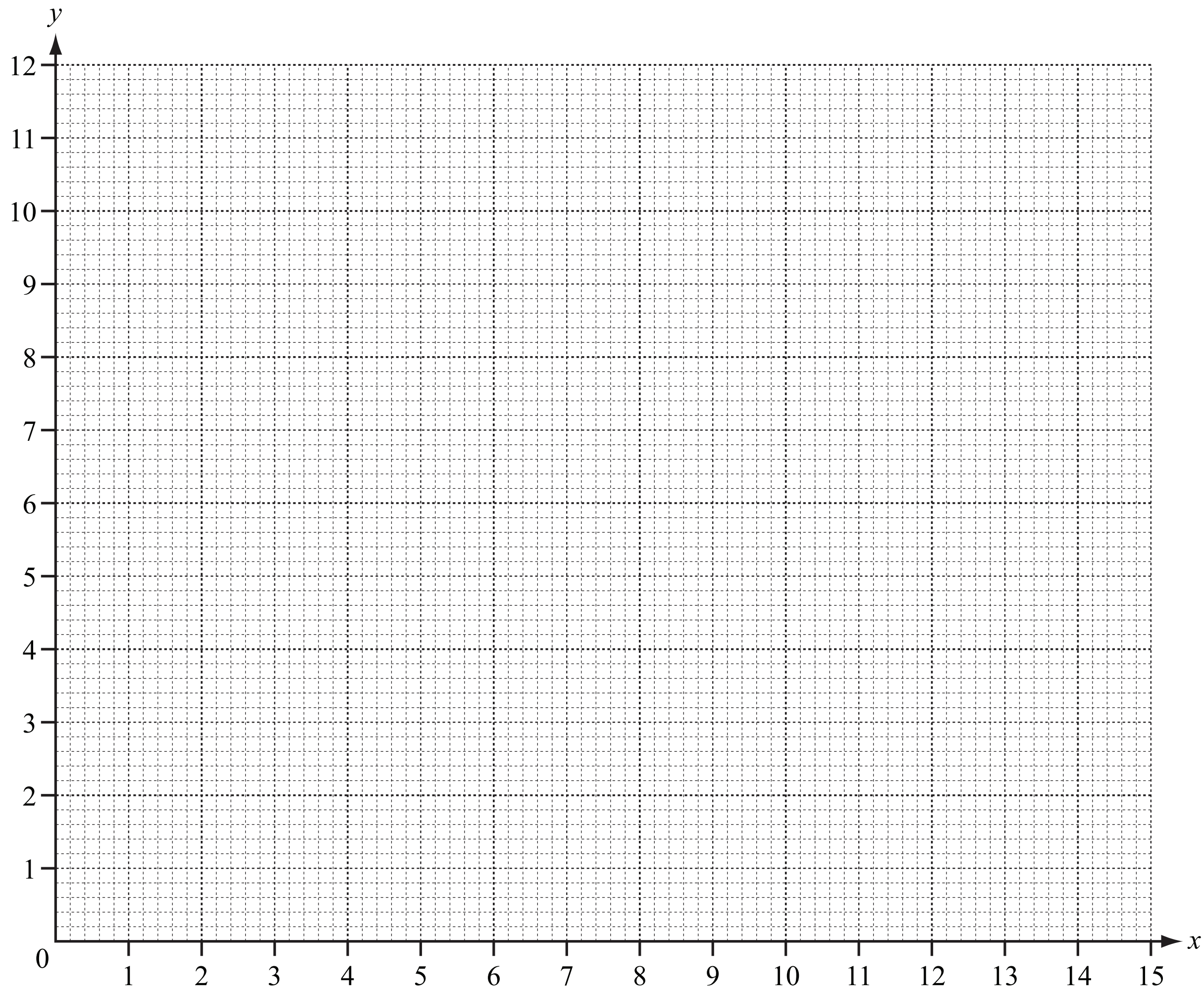
Write down an inequality in x and y, and show that it simplifies to $3x + 7y \leqslant 42$.

Answer(c)

[1]

2)

(d) On the grid, draw four lines to show the four inequalities and shade the **unwanted** regions.

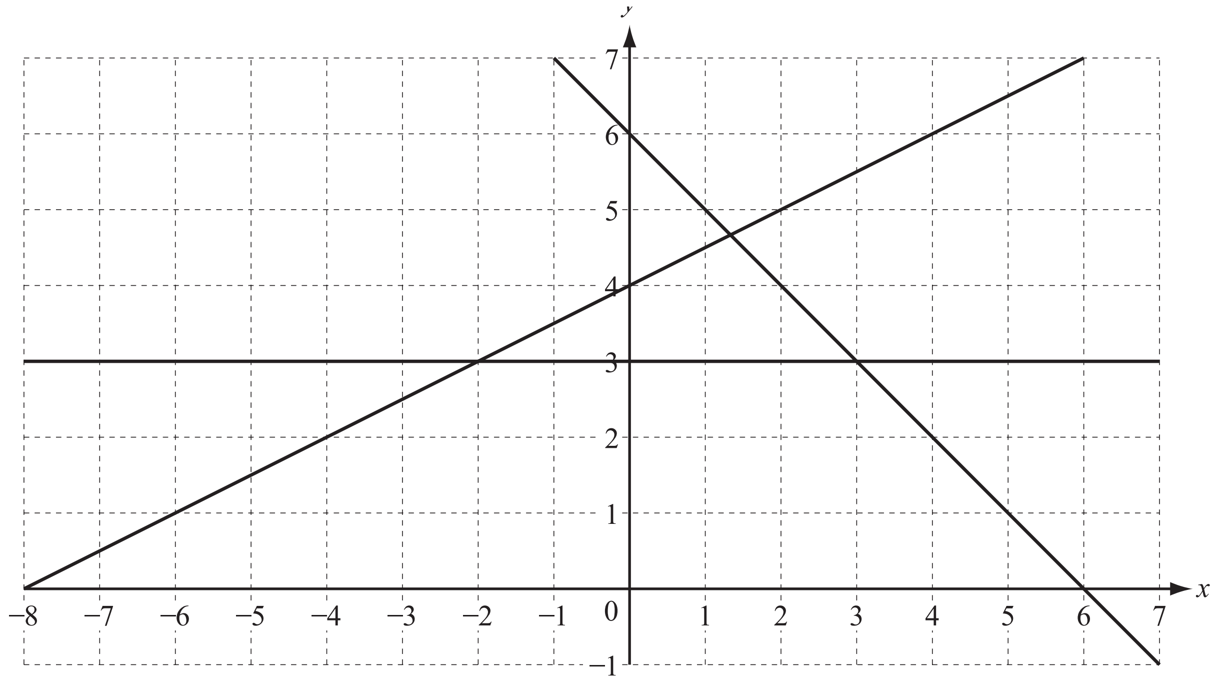


[7]

(e) Calculate the smallest cost when Peter buys a total of 9 trees.

Answer(e) \$ [2]

3)



The region ***R*** contains points which satisfy the inequalities

$$y \leqslant \frac{1}{2}x + 4, \qquad y \geqslant 3 \quad \text{and} \quad x + y \geqslant 6.$$

On the grid, label with the letter ***R*** the region which satisfies these inequalities.

You must shade the **unwanted** regions. [3]

4) Pablo plants x lemon trees and y orange trees.

(a) **(i)** He plants at least 4 lemon trees.

Write down an inequality in x to show this information.

Answer(a)(i) [1]

(ii) Pablo plants at least 9 orange trees.

Write down an inequality in y to show this information.

Answer(a)(ii) [1]

(iii) The greatest possible number of trees he can plant is 20.

Write down an inequality in x and y to show this information.

Answer(a)(iii) [1]

(b) Lemon trees cost \$5 each and orange trees cost \$10 each.

The maximum Pablo can spend is \$170.

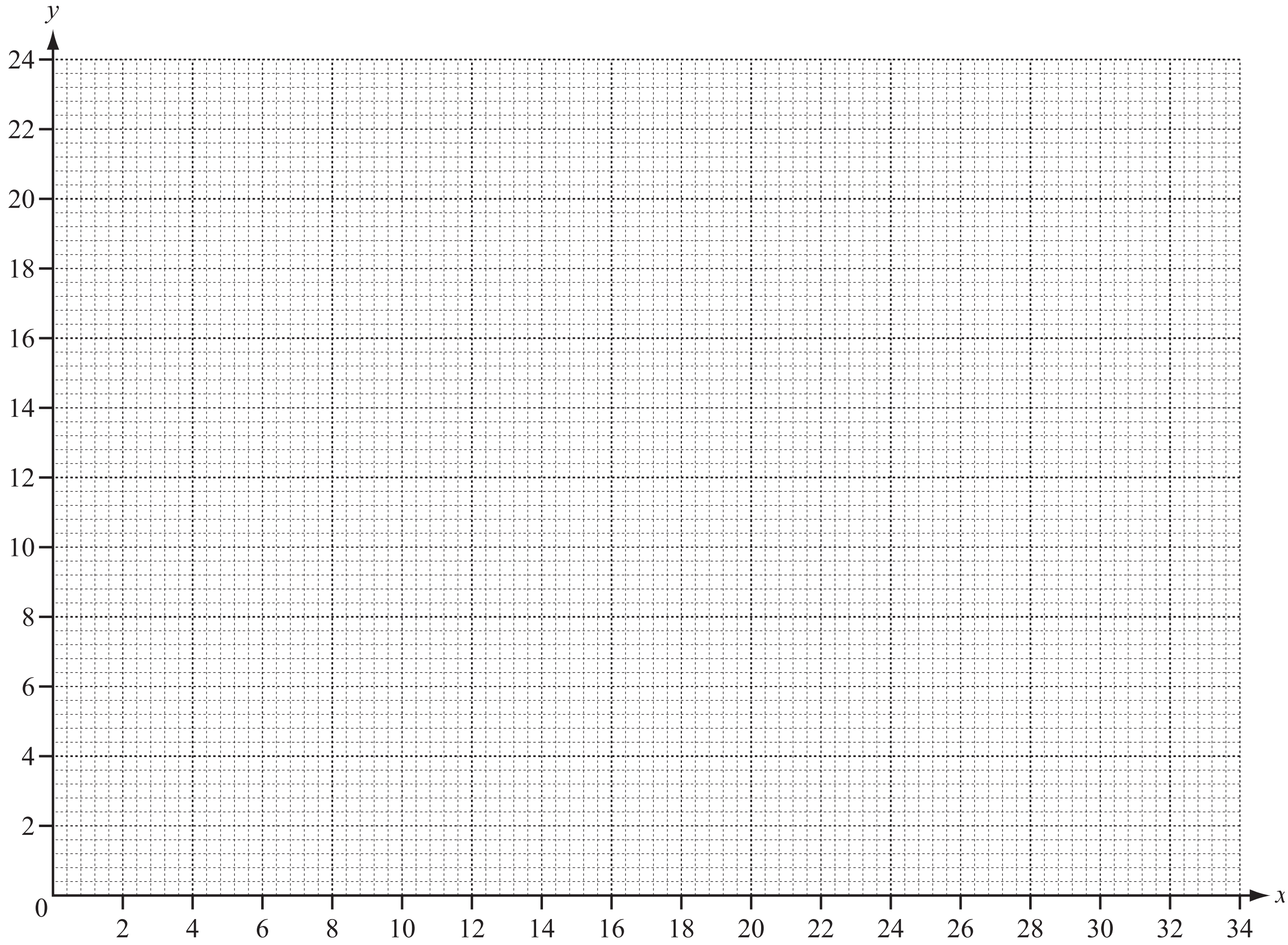
Write down an inequality in x and y and show that it simplifies to $x + 2y \leqslant 34$.

Answer (b)

[1]

(c) **(i)** On the grid opposite, draw four lines to show the four inequalities and shade the **unwanted** region.

4) continued

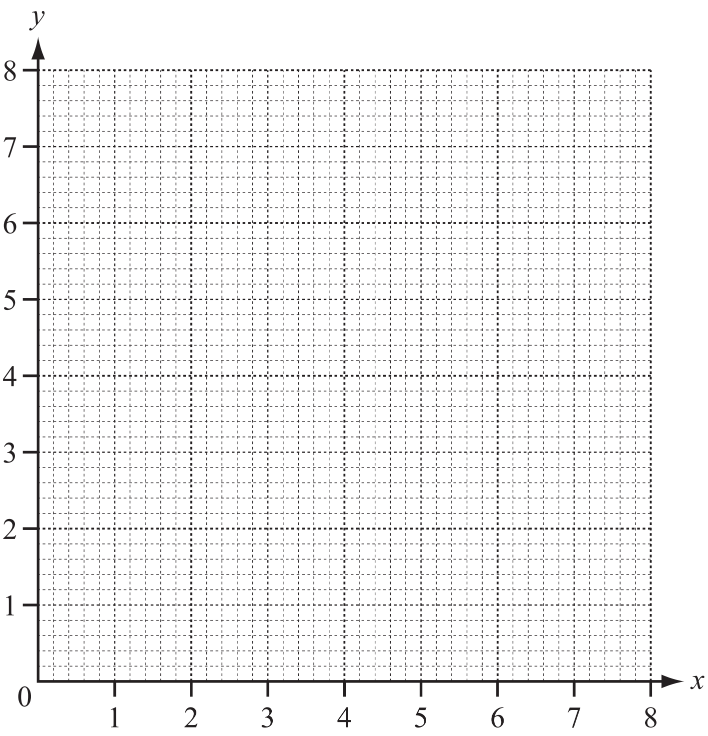


[7]

(ii) Calculate the smallest cost when Pablo buys a total of 20 trees.

Answer(c)(ii) $ [2]

5)

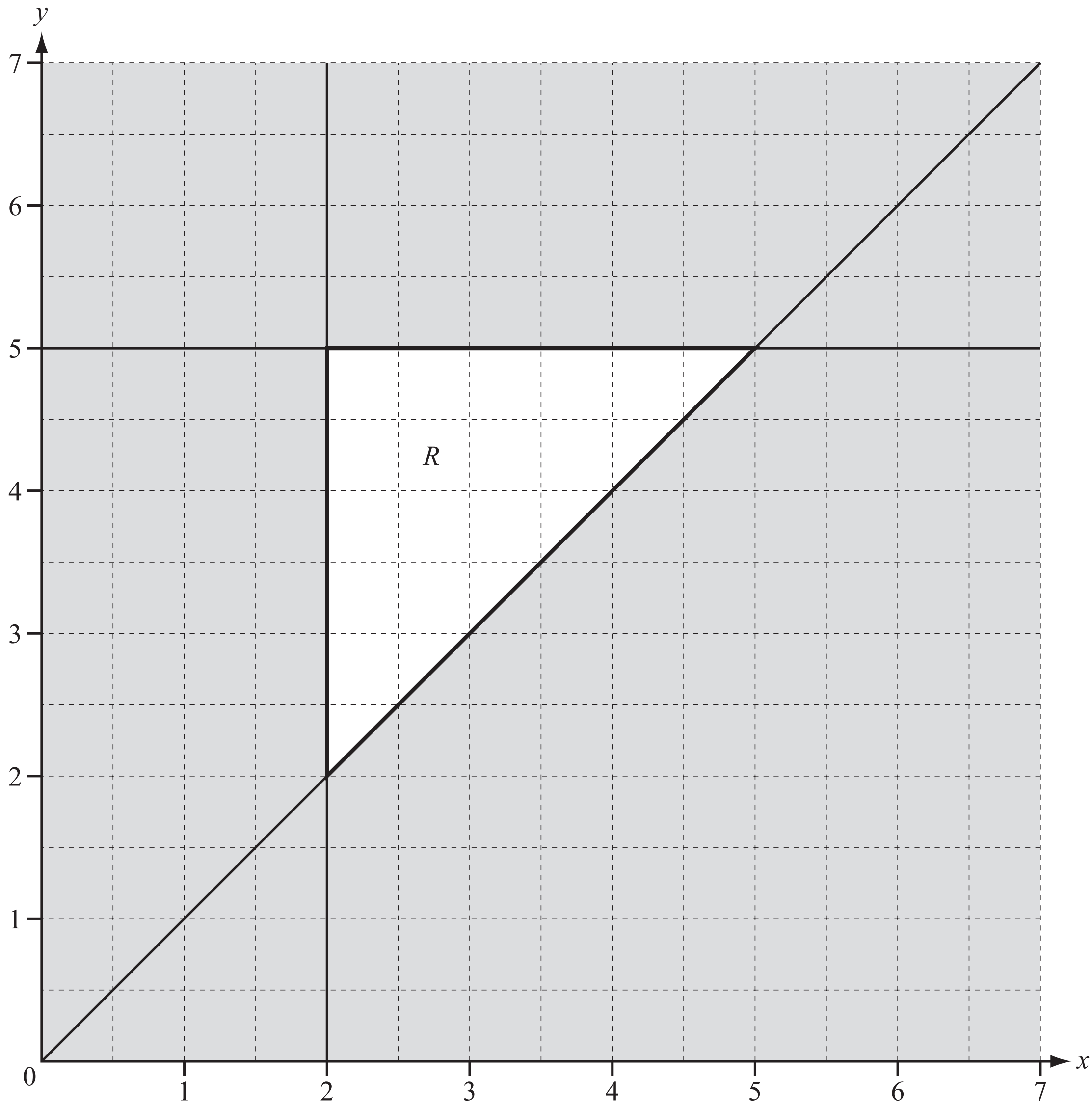


(a) Draw the lines $y = 2$, $x + y = 6$ and $y = 2x$ on the grid above. [4]

(b) Label the region R which satisfies the three inequalities

$x + y \geqslant 6$, $y \geqslant 2$ and $y \leqslant 2x$. [1]

6)



The region R is bounded by three lines.

Write down the three inequalities which define the region R.

Answer

[4]

Linear Programming 2

7)

Mr Chang hires x large coaches and y small coaches to take 300 students on a school trip.
Large coaches can carry 50 students and small coaches 30 students.
There is a maximum of 5 large coaches.

(a) Explain clearly how the following two inequalities satisfy these conditions.

(i) $x \leqslant 5$

Answer(a)(i) [1]

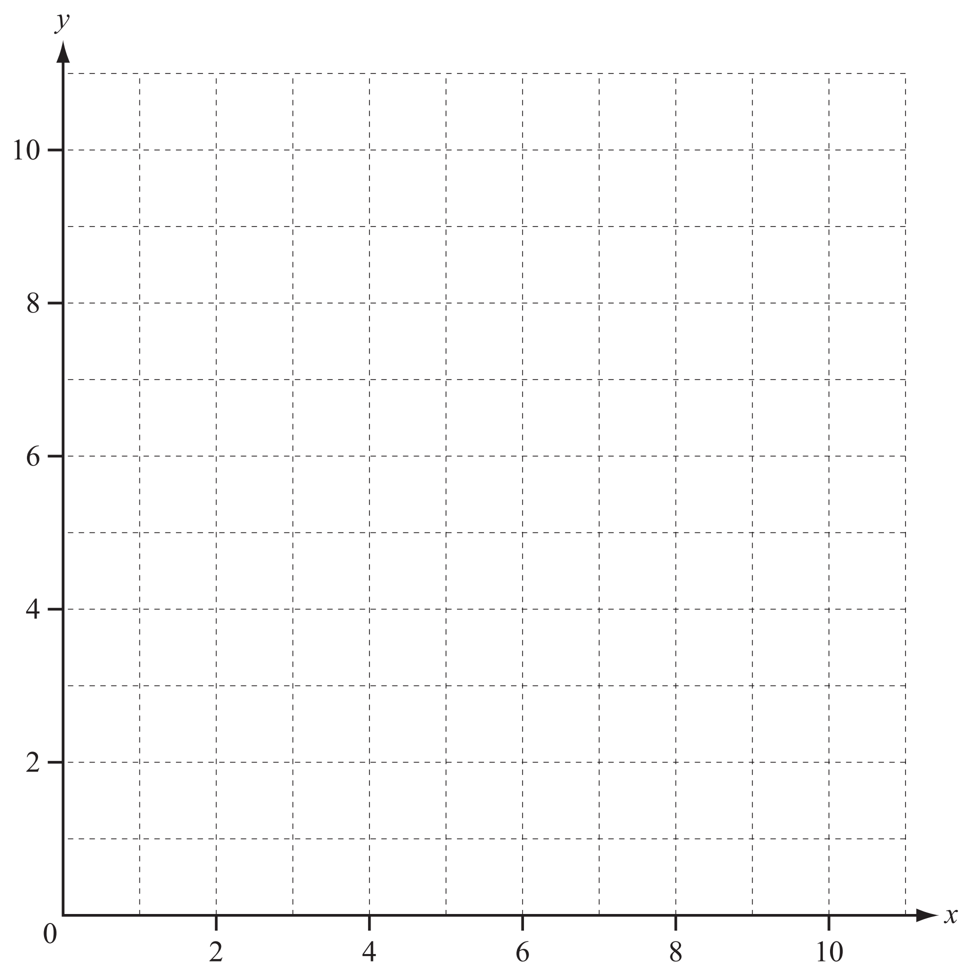
(ii) $5x + 3y \geqslant 30$

Answer(a)(ii)

[2]

Mr Chang also knows that $x + y \leqslant 10$.

(b) On the grid, show the information above by drawing three straight lines and shading the **unwanted** regions.



[5]

(c) A large coach costs \$450 to hire and a small coach costs \$350.

(i) Find the number of large coaches and the number of small coaches that would give the minimum hire cost for this school trip.

Answer(c)(i) Large coaches

Small coaches [2]

(ii) Calculate this minimum cost.

Answer(c)(ii) \$ [1]

Linear Programming 2

8) Hassan stores books in large boxes and small boxes.
Each large box holds 20 books and each small box holds 10 books.
He has x large boxes and y small boxes.

(a) Hassan must store at least 200 books.

Show that $2x + y \geqslant 20$.

Answer(a)

[1]

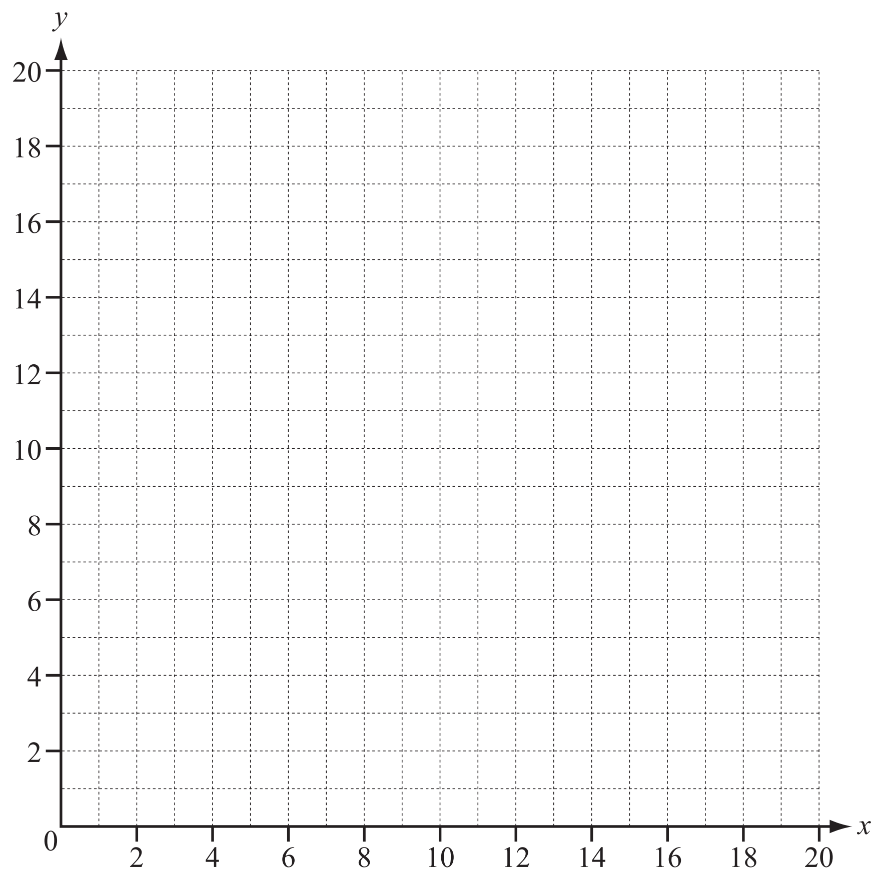
(b) Hassan must not use more than 15 boxes.
He must use at least 3 small boxes.
The number of small boxes must be less than or equal to the number of large boxes.

Write down three inequalities to show this information.

Answer(b)

[3]

(c) On the grid, show the information in **part (a)** and **part (b)** by drawing four straight lines and shading the **unwanted** regions.



[6]

8) continued

(d) A large box costs \$5 and a small box costs \$2.

(i) Find the least possible total cost of the boxes.

Answer(d)(i) \$ [1]

(ii) Find the number of large boxes and the number of small boxes which give this least possible cost.

Answer(d)(ii) Number of large boxes =

Number of small boxes = [2]