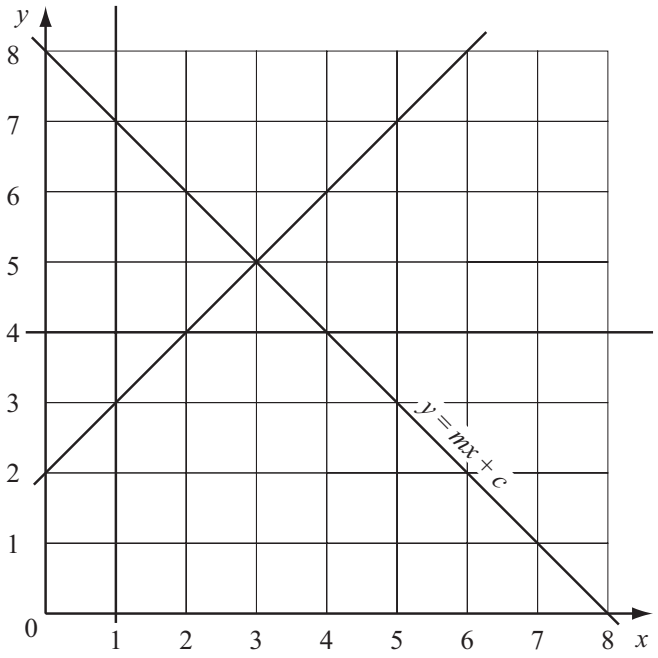
Linear Programming 1

1)



(a) One of the lines in the diagram is labelled $y = mx + c$.
Find the values of m and c.

Answer(a) m=..... [1]

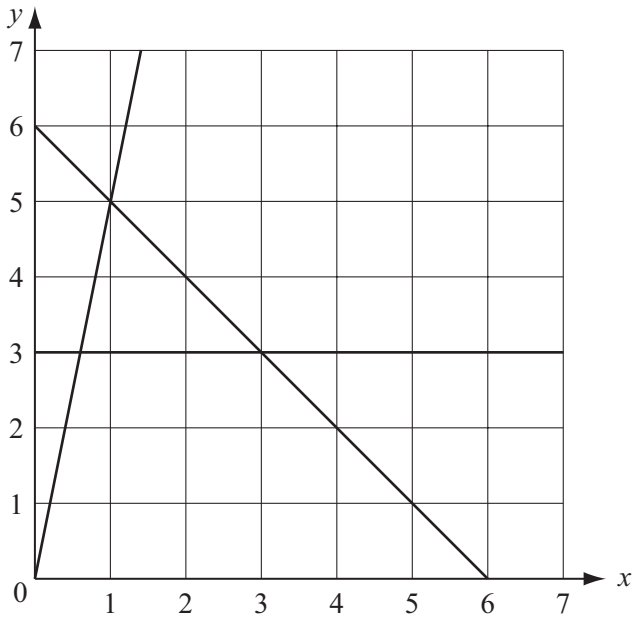
c=..... [1]

(b) Show, by shading all the **unwanted** regions on the diagram, the region defined by the inequalities

$$x \geqslant 1, \quad y \leqslant mx + c, \quad y \geqslant x+2 \quad \text{and} \quad y \geqslant 4.$$

Write the letter **R** in the region required. [2]

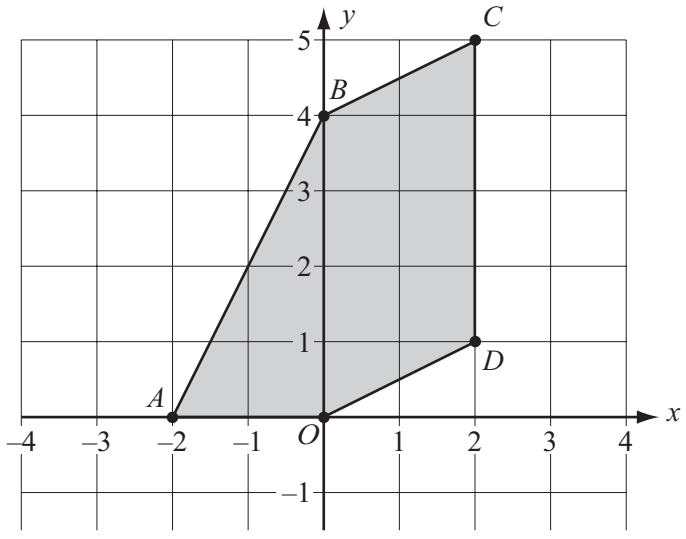
2)



By shading the **unwanted** parts of the grid above, find and label the region R which satisfies the following three inequalities

$y \geqslant 3$, $y \geqslant 5x$ and $x + y \leqslant 6$. [3]

3)



(a) The shaded area inside the pentagon is defined by 5 inequalities.

One of these inequalities is $y \leqslant \frac{1}{2}x + 4$.

Find the other 4 inequalities. [5]

4)

A new school has x day students and y boarding students.

The fees for a day student are \$600 a term.
The fees for a boarding student are \$1200 a term.
The school needs at least \$720 000 a term.

(a) Show that this information can be written as $x + 2y \geqslant 1200$.

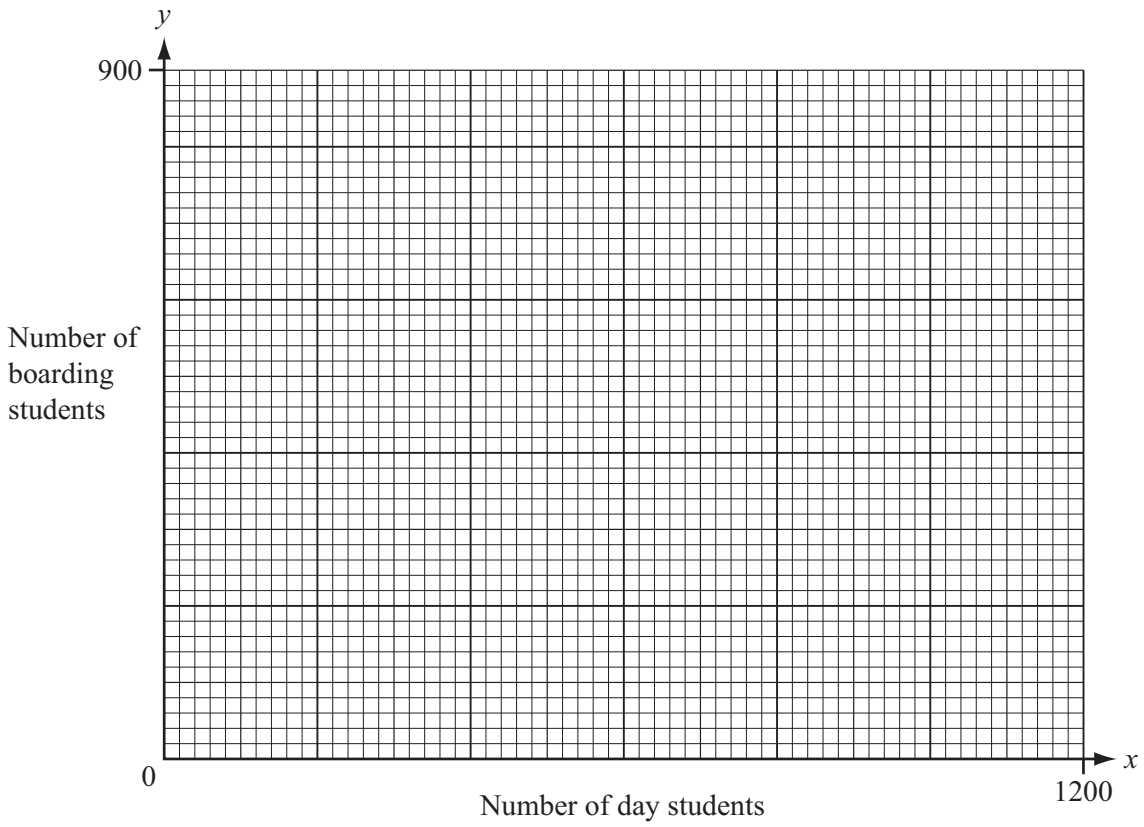
Answer (a)

[1]

(b) The school has a maximum of 900 students.
Write down an inequality in x and y to show this information.

Answer(b) [1]

(c) Draw two lines on the grid below and write the letter **R** in the region which represents these two inequalities.

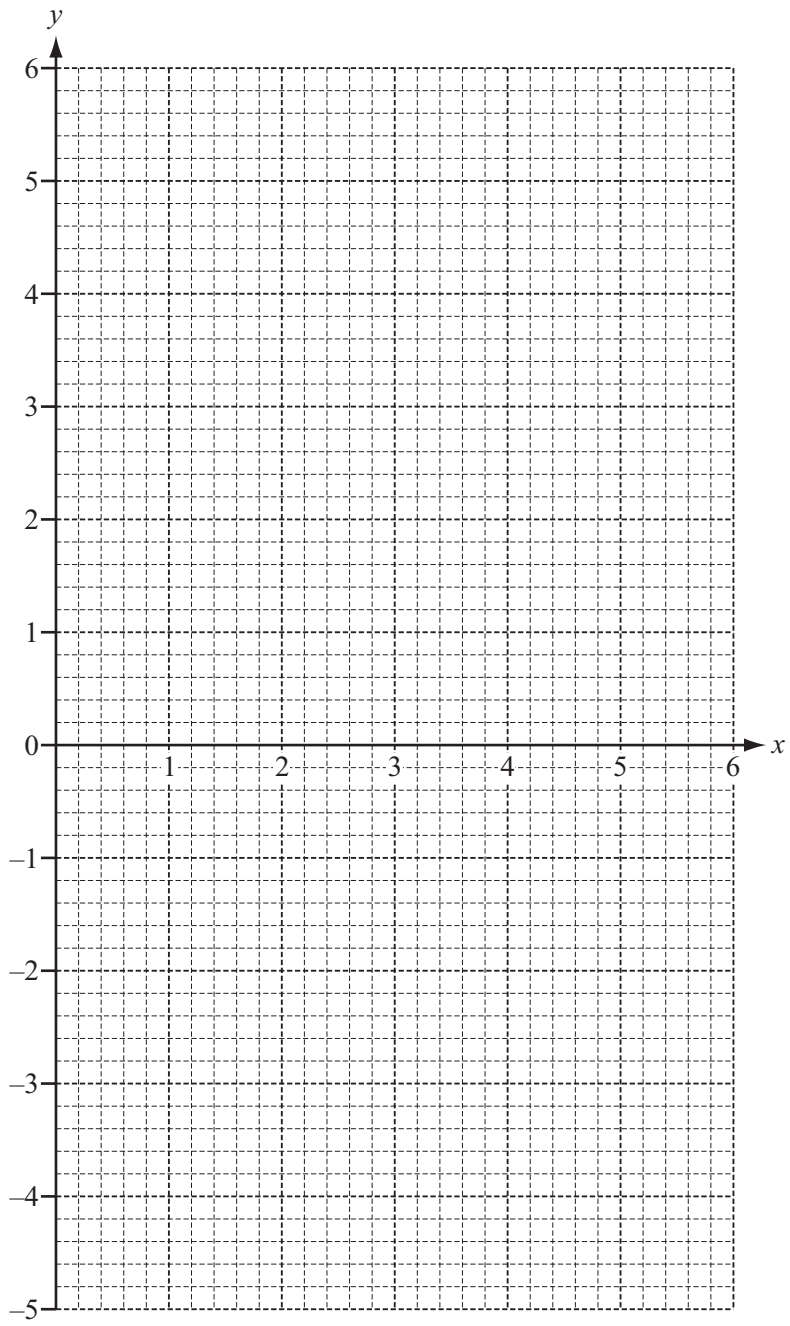


[4]

(d) What is the least number of **boarding** students at the school?

Answer(d) [1]

5)

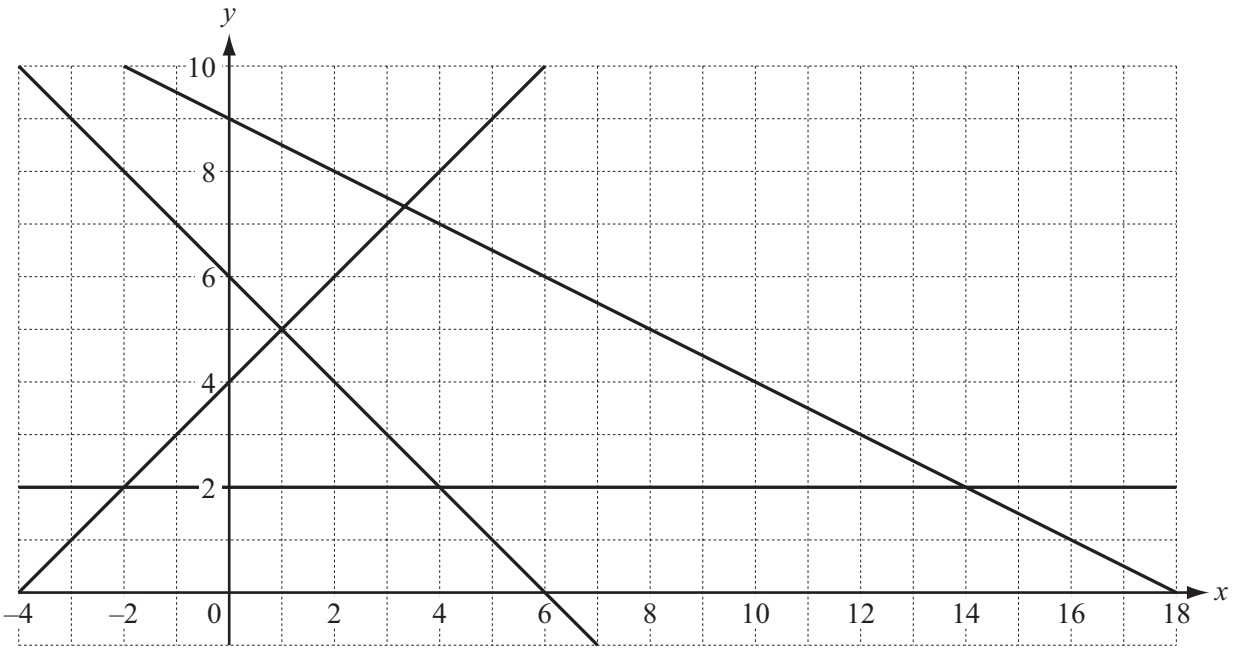


(a) Draw the three lines $y = 4$, $2x - y = 4$ and $x + y = 6$ on the grid above. [4]

(b) Write the letter R in the region defined by the three inequalities below.

$y \leqslant 4$ $2x - y \geqslant 4$ $x + y \geqslant 6$ [1]

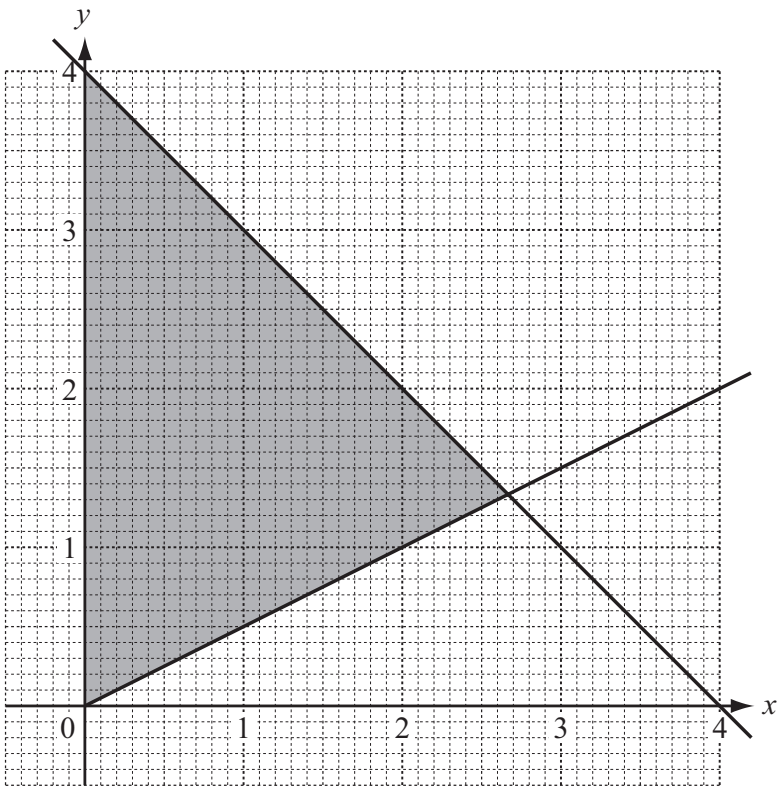
6)



By shading the **unwanted** regions of the grid above, find and label the region *R* which satisfies the following four inequalities.

$y \geqslant 2$ $x + y \geqslant 6$ $y \leqslant x + 4$ $x + 2y \leqslant 18$ [4]

7)



Find the three inequalities which define the shaded region on the grid.

Answer [5]

8) A company has a vehicle parking area of 1200 m^2 with space for x cars and y trucks.

Each car requires 20 m^2 of space and each truck requires 100 m^2 of space.

(a) Show that $x + 5y \leqslant 60$.

Answer(a)

[1]

(b) There must also be space for

(i) at least 40 vehicles,

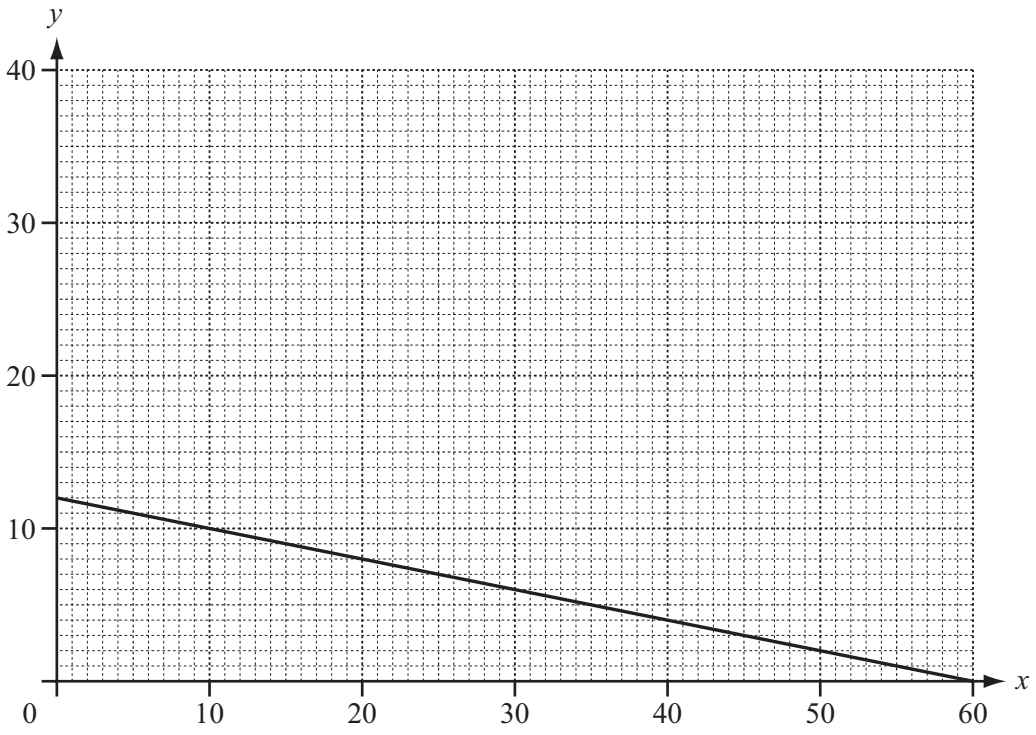
(ii) at least 2 trucks.

Write down two more inequalities to show this information.

Answer(b)(i) [1]

Answer(b)(ii) [1]

(c) One line has been drawn for you.
On the grid, show the three inequalities by drawing the other two lines and shading the **unwanted** regions.



[4]

(d) Use your graph to find the largest possible number of trucks.

Answer(d) [1]

(e) The company charges \$5 for parking each car and \$10 for parking each truck.
Find the number of cars and the number of trucks which give the company the greatest possible income.

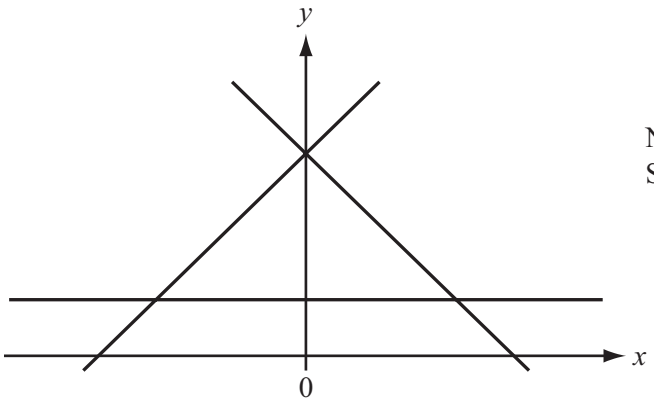
Calculate this income.

Answer(e) Number of cars =

Number of trucks =

Greatest possible income = \$ [3]

9)



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The diagram shows the lines $y = 1$, $y = x + 4$ and $y = 4 - x$.

On the diagram, **label the region R** where $y \geqslant 1$, $y \geqslant x + 4$ and $y \leqslant 4 - x$. [3]