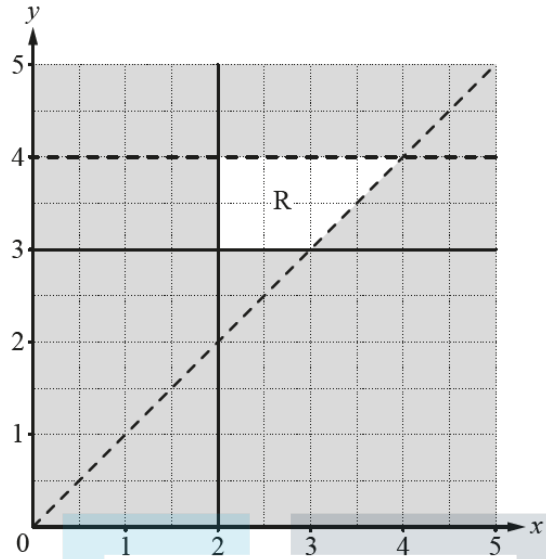# EXAM PAPERS PRACTICE

Graphical Inequalities

Model Answers

Question 1

Find four inequalities that define the region, R, on the grid.

[4]

Four inequalities that define the region, R, on the grid are:

$y >= x + 1$ (or $x <= y - 1$)

$y < x + 3$

$y > -x - 1$

$y <= 2x - 2$

or alternatively, R can be expressed by the following inequalities:

$x >= -1$

$x <= 3$
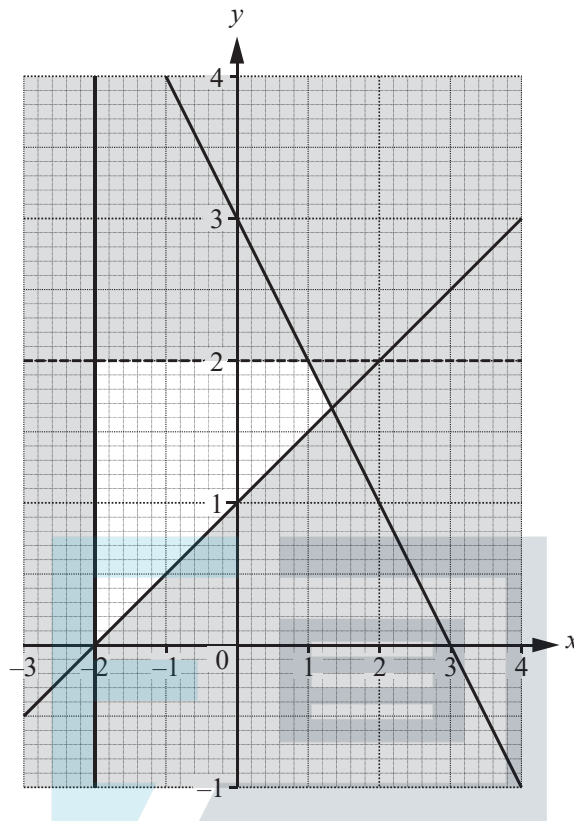
$y >= -1$

$y <= 2x - 2$

Question 2

Find the four inequalities that define the region that is **not** shaded. [5]

The four inequalities that define the region that is not shaded in the image are:

$y < x + 1$

$y > x + 3$

$y < -x - 1$

$y > 2x - 2$

These inequalities can be derived by considering the four lines that bound the shaded region:

- The line $y = x + 1$
- The line $y = x + 3$
- The line $y = -x - 1$
- The line $y = 2x - 2$

The region that is not shaded lies below the line $y = x + 1$, above the line $y = x + 3$, below the line $y = -x - 1$, and above the line $y = 2x - 2$.
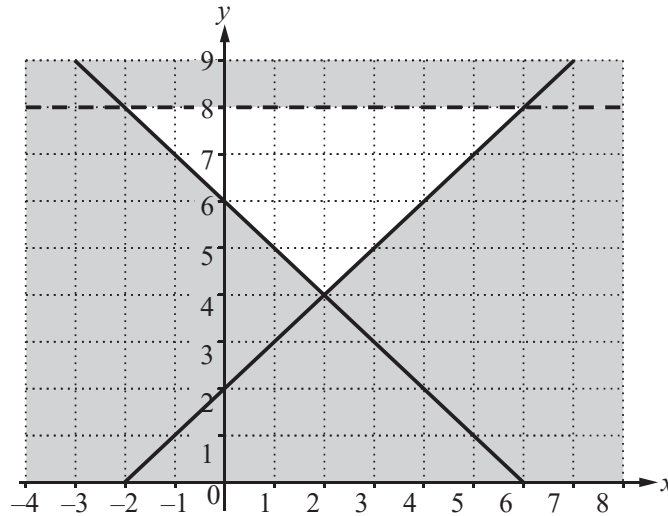
Answer:

$y < x + 1$

$y > x + 3$

$y < -x - 1$

$y > 2x - 2$

Question 3

Write down the 3 inequalities which define the unshaded region.

[4]

The 3 inequalities which define the unshaded region in the image are:

$y <= x + 2$

$y >= -x + 3$

$x > 0$

We can see this by considering the three lines that bound the unshaded region:

- The line $y = x + 2$

- The line $y = -x + 3$

- The line $x = 0$

The unshaded region lies below the line $y = x + 2$, above the line $y = -x + 3$, and to the right of the line $x = 0$.
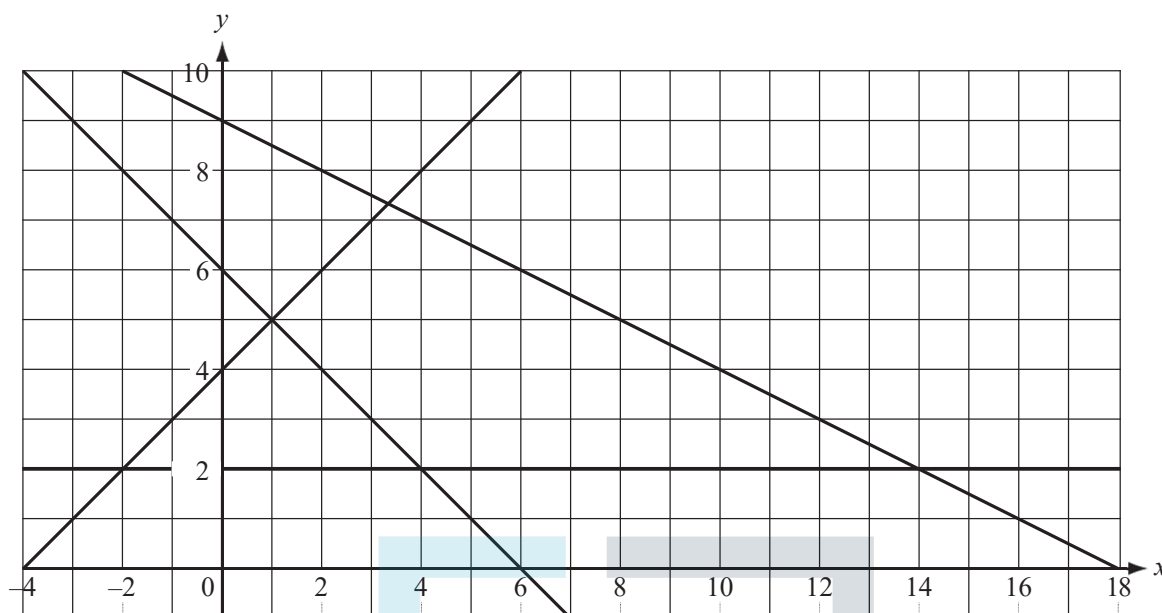
Answer:

$y <= x + 2$

$y >= -x + 3$

$x > 0$

Question 4

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

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

To find region R, let's consider each inequality separately.

Inequality 1 : $y \geqslant 2$

This inequality means that all points in R must lie above the line $y = 2$.

Inequality 2 : $x + y \geqslant 6$

This inequality means that all points in R must lie to the right of the line $x + y = 6$.

Inequality 3 : $y \leqslant x + 4$

This inequality means that all points in R must lie below the line $y = x + 4$.

Inequality 4 : $x + 2y \leqslant 18$

This inequality means that all points in R must lie below the line $x + 2y = 18$.

Answer:

Region R is the triangle bounded by the lines $y = 2$, $x + y = 6$, and $x + 2y = 18$.

EXAM PAPERS PRACTICE

Question 5

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

The line $y = 4$ is a horizontal line that passes through the point $(0, 4)$.
The line $2x - y = 4$ can be rewritten as $y = 2x - 4$. This is a line with a slope of 2 and a y-intercept of -4 .
The line $x + y = 6$ can be rewritten as $y = -x + 6$. This is a line with a slope of -1 and a $y-$ intercept of 6 .
The three lines intersect at the points $(2, 2)$ and $(4, 2)$.
The shaded region is the region that satisfies all three inequalities:
$y >= 4$
$2x - y >= 4$
$x + y >= 6$
This region is a triangle with vertices at $(2, 2), (4, 2)$, and $(4, 4)$.
Answer:
The shaded region is the triangle with vertices at $(2, 2), (4, 2)$, and $(4, 4)$.

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

$y \leqslant 4$ $\qquad$ $2x - y \geqslant 4$ $\qquad$ $x + y \geqslant 6$

To find region R, let's consider each inequality separately.
Inequality 1 : $y \leqslant 4$
This inequality means that all points in R must lie below the line $y = 4$.
Inequality 2 : $2x - y \geqslant 4$
This inequality can be rewritten as $y \leqslant 2x - 4$. This inequality means that all points in R must lie below the line $2x - y = 4$.
Inequality 3 : $x + y \geqslant 6$
This inequality can be rewritten as $y \geqslant -x + 6$. This inequality means that all points in R must lie above the line $x + y = 6$.

Answer:
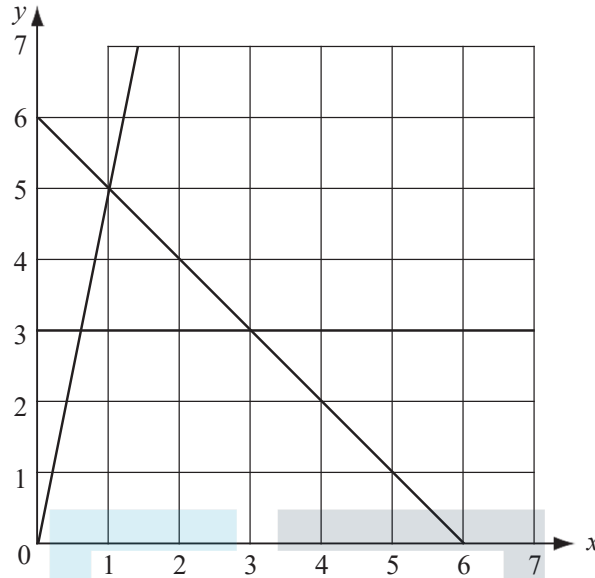Region R is the triangle bounded by the lines $y = 4, x + y = 6$, and $2x - y = 4$.
The answer is R.

[1]

Question 6

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

$$y \geqslant 3, \qquad y \geqslant 5x \qquad \text{and} \qquad x + y \leqslant 6. \qquad\qquad [3]$$

To find region R, let's consider each inequality separately.

Inequality 1 : $y \geqslant 3$

This inequality means that all points in R must lie above the line $y = 3$.

Inequality 2 : $y \geqslant 5x$

This inequality means that all points in R must lie above the line $y = 5x$.

Inequality 3 : $x + y \leqslant 6$

This inequality can be rewritten as $y \leqslant -x + 6$. This inequality means that all points in R must lie below the line $x + y = 6$.

Answer:

Region R is the triangle bounded by the lines $y = 3, x + y = 6$, and $y = 5x$.

Question 7
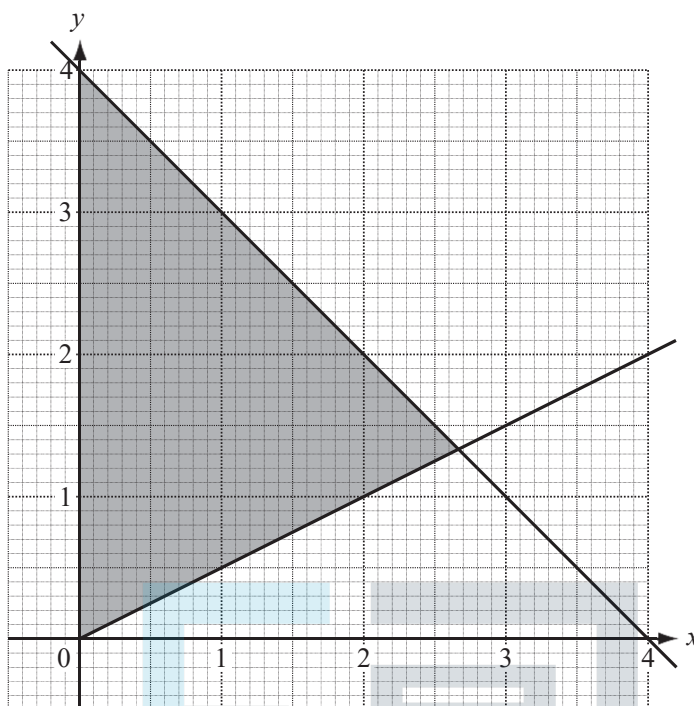
Find the three inequalities which define the shaded region on the grid. [5]

The three inequalities which define the shaded region on the grid are:

$y >= 3x - 2$

$y <= -x + 2$

$x <= 3$

To see this, we can consider each line separately.

The line $y = 3x - 2$ is the upper boundary of the shaded region. This means that all points in the shaded region must lie above this line. Therefore, the inequality $y >= 3x - 2$ is one of the inequalities that define the shaded region.

The line $y = -x + 2$ is the lower boundary of the shaded region. This means that all points in the shaded region must lie below this line. Therefore, the inequality $y <= -x + 2$ is one of the inequalities that define the shaded region.

The vertical line $x = 3$ is the right boundary of the shaded region. This means that all points in the shaded region must lie to the left of this line. Therefore, the inequality $x <= 3$ is one of the inequalities that define the shaded region.

Therefore, the three inequalities which define the shaded region are:

$y >= 3x - 2$

$y <= -x + 2$

$x <= 3$

Answer:

$y >= 3x - 2$

$y <= -x + 2$

$x <= 3$

Question 8

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

(a) Show that this information can be written as $x + 2y \geqslant 1200$.
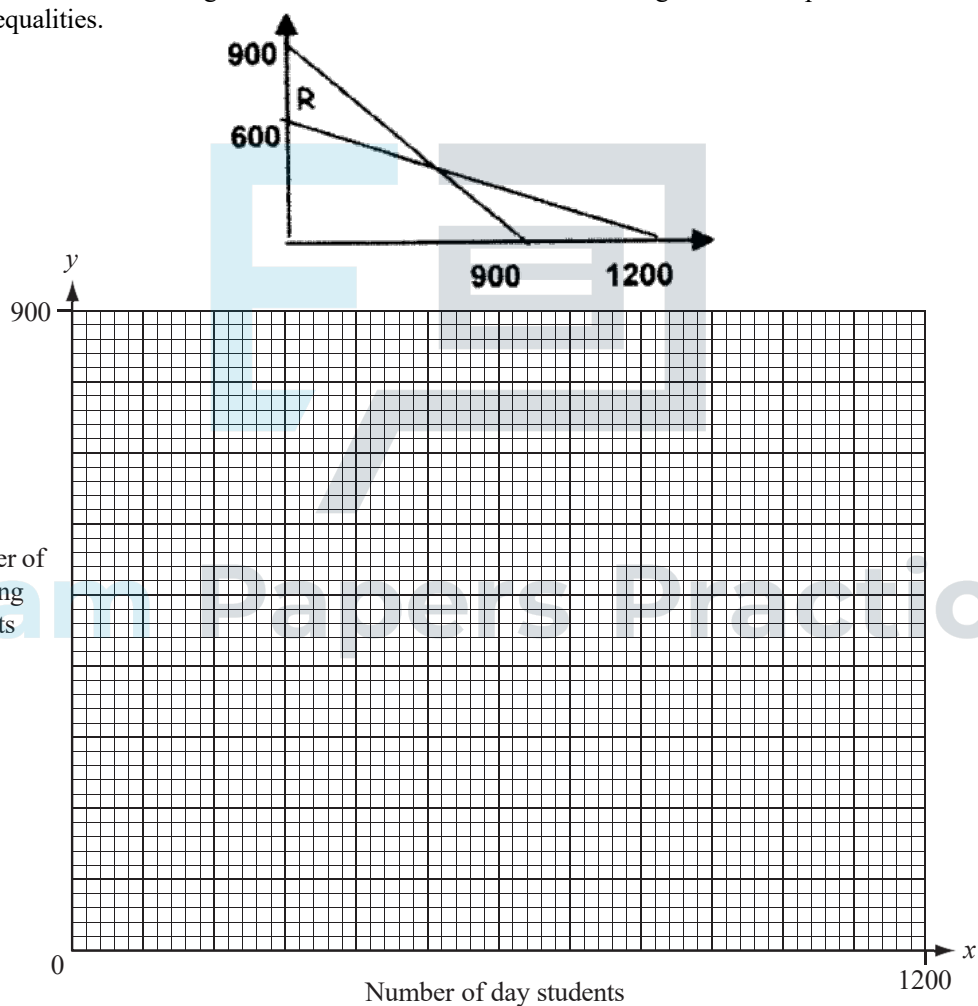
$$600x + 1200y \geq 720000$$

[1]

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

$$x + y \leq 900$$

(c) Draw two lines on the grid below and write the letter **R** in the region which represents these two inequalities.
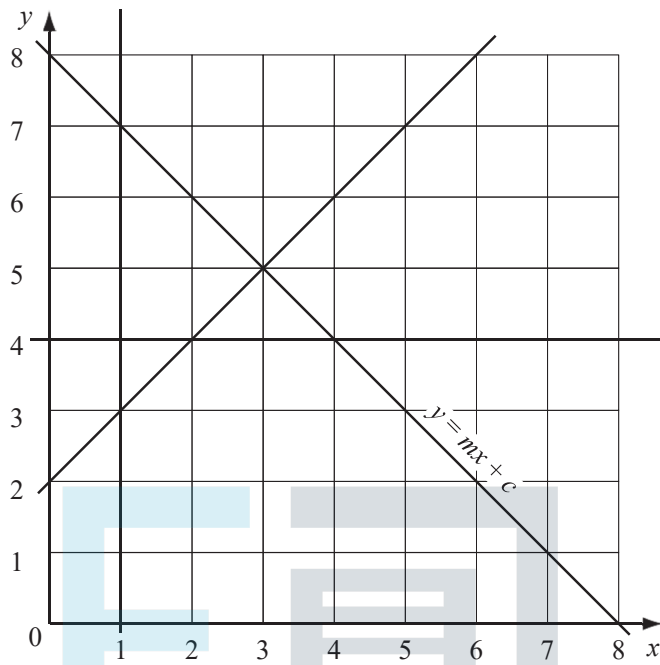
[1]
[4]

(d) What is the least number of **boarding** students at the school? [1]

300

Question 9

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

$m = -1 \quad c = 8$

[1]

[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]
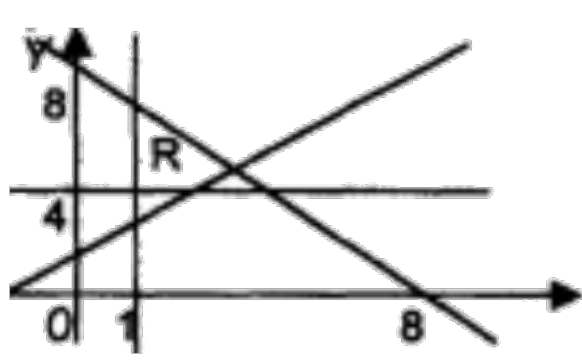
Question 10

21 Marina goes to the shop to buy loaves of bread and cakes.
One loaf of bread costs 60 cents and one cake costs 80 cents.
She buys x loaves of bread and y cakes.

(a) She must not spend more than $12.
Show that $3x + 4y \leq 60$.   [1]

$60x + 80y \leq 1200$ seen

(b) The number of loaves of bread must be greater than or equal to the number of cakes.
Write down an inequality in x and y to show this information.   [1]

$x \geq y$

(c) On the grid below show the two inequalities by shading the **unwanted** regions.
Write R in the required region.   [4]

line $y = x$ line through $(20, 0)$ and $(0, 15)$ shading out or R labelled
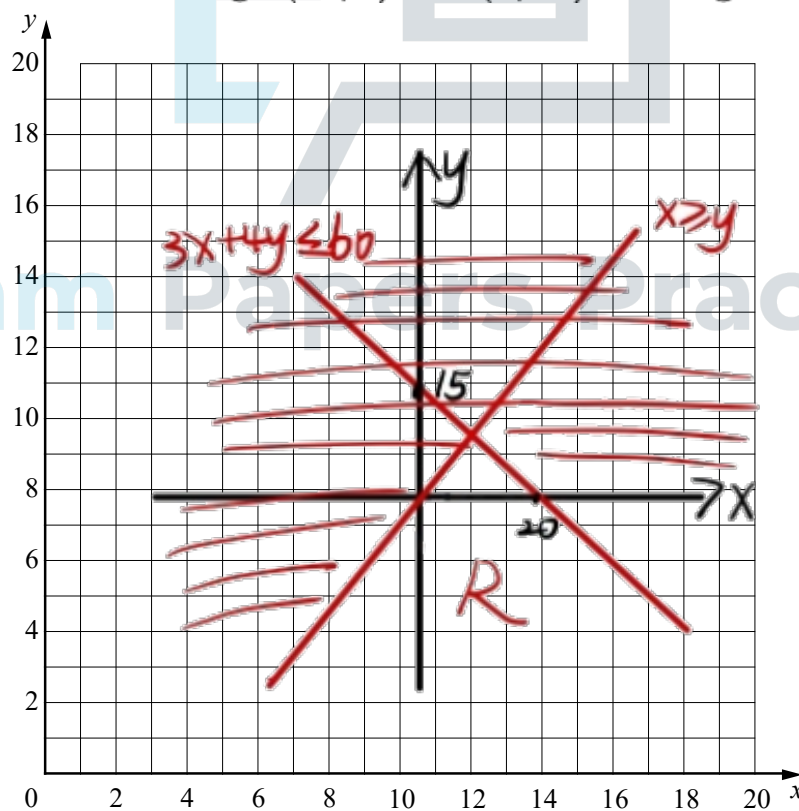
(d) The **total** number of loaves of bread and cakes is $x + y$.
Find the largest possible value of $x + y$.   [1]

20 c.a.o.

Question 11

A ferry has a deck area of 3600 m² for parking cars and trucks. Each car takes up 20 m² of deck area and each truck takes up 80 m². On one trip, the ferry carries x cars and y trucks.

(a) Show that this information leads to the inequality $x + 4y \leq 180$. [2]

x cars take up 20x of deck area y trucks take up $80y$ of deck area.

Total area taken up $= 20x + 80y$

$20x + 80y \quad r = 3600$

$\quad x + 4y \quad r = 180$

(b) The charge for the trip is $25 for a car and $50 for a truck.
The total amount of money taken is $3000.
Write down an equation to represent this information and simplify it. [2]

Charge for x cars is 25x

Charge for y trucks is 50y

Total charge is 25x + 50y

$25x + 50y = 3000$

$x + 2y = 120$

(c)   The line $x + 4y = 180$ is drawn on the grid below.

(i)   Draw, on the grid, the graph of your equation in part **(b)**.   [1]
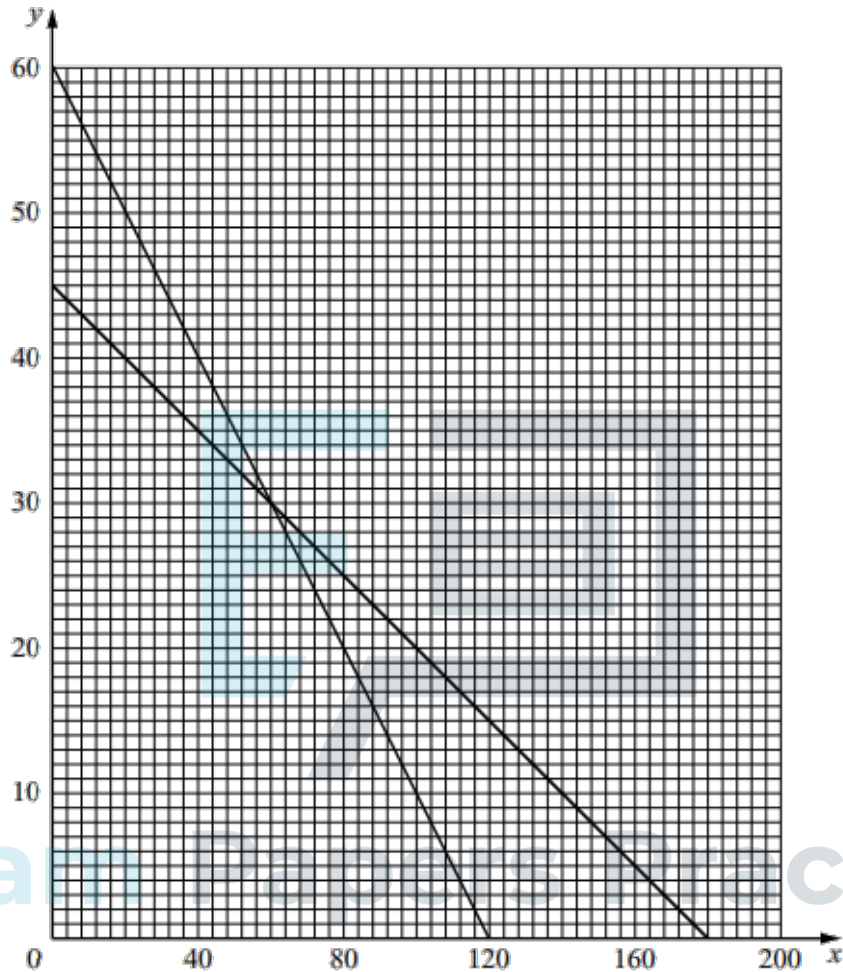
(ii)
  Write down a possible number of cars and a possible number of trucks on the trip, which together satisfy both conditions.
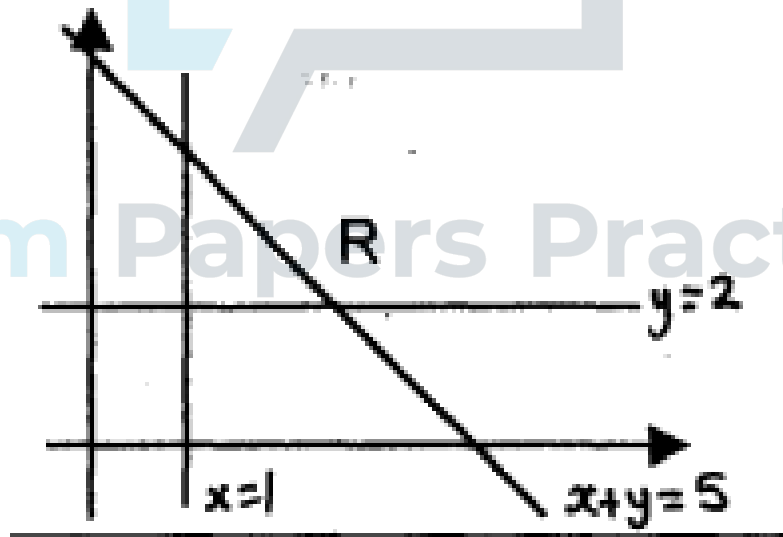
                            [1]

In the equation $x + 2y = 120$, when $x = 0, y = 60$ When $y = 0, x = 120$ Theses points are plotted and joined with a ruled, straight line.

Question 12
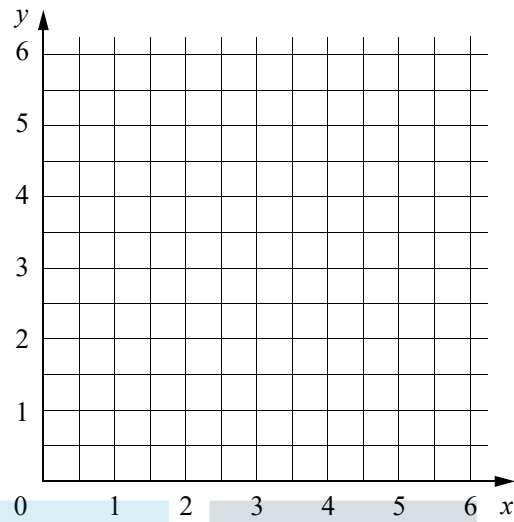
(a) On the grid, draw the lines $x = 1$, $y = 2$ and $x + y = 5$. [3]

(b) Write R in the region where $x \geqslant 1$, $y \geqslant 2$ and $x + y \geqslant 5$. [1]

Question 13

In one week, Neha spends x hours cooking and y hours cleaning.
The time she spends cleaning is at least equal to the time she spends cooking.
This can be written as $y \geqslant x$.

She spends no more than 16 hours in total cooking and cleaning.
She spends at least 4 hours cooking.

(a) Write down two more inequalities in x and/or y to show this information. [2]

$$x + y \leq 16$$
$$x \geqslant 4$$

(b) Complete the diagram to show the three inequalities.
Shade the **unwanted** regions. [3]
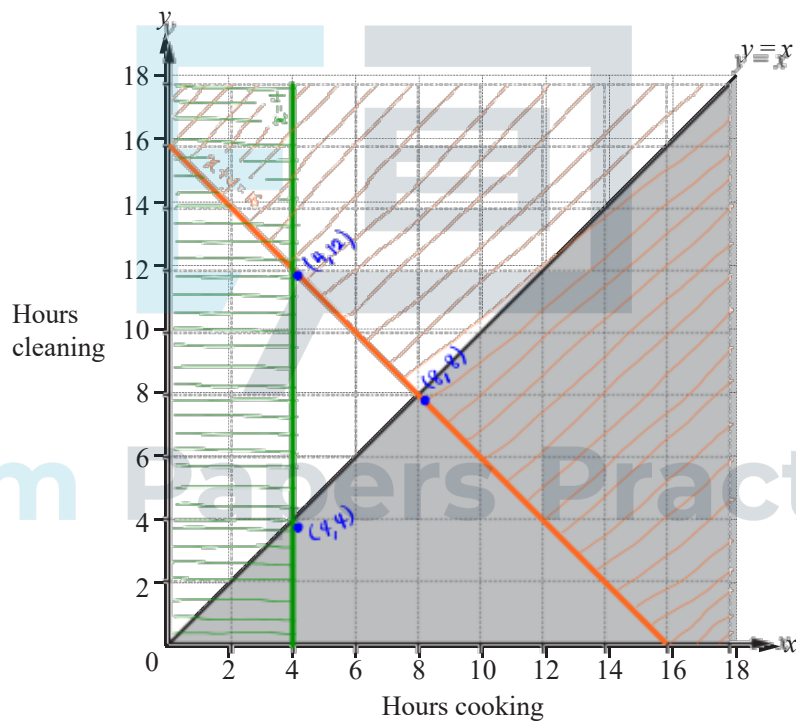
(c) Neha receives \$10 for each hour she spends cooking and \$8 for each hour she spends cleaning.

Work out the largest amount she could receive. [2]

Vertices (x, y)	$10x + 84$	Total (\$)
$(4, 12)$	$10(4) + 8(12)$	136
$(8, 8)$	$10(8) + 8(8)$	144
$(4, 4)$	$10(4) + 8(4)$	72

Largest amount $= 144$
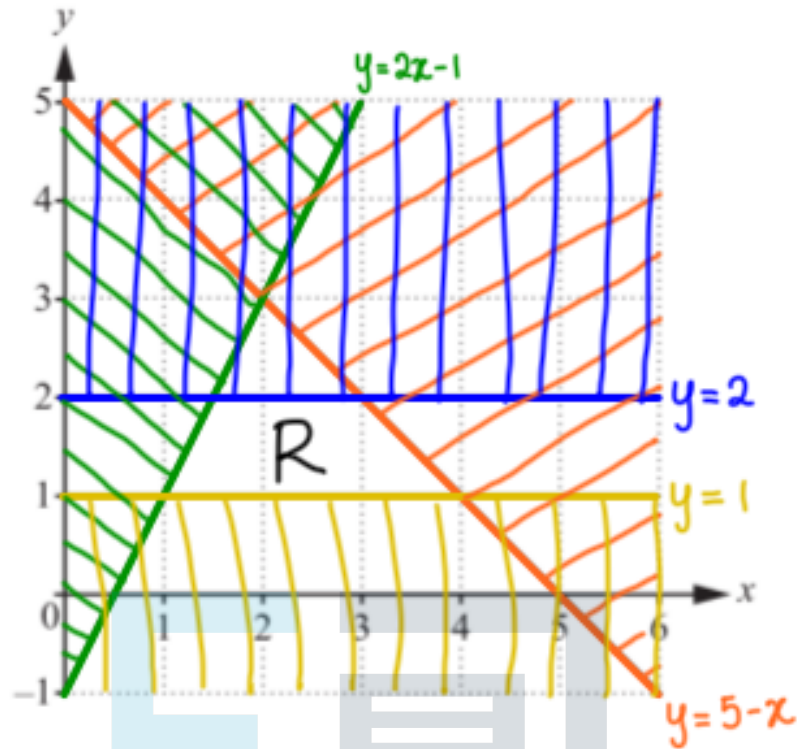
EXAM PAPERS PRACTICE

Question 14

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

$$y \leqslant 2 \qquad y \geqslant 1 \qquad y \leqslant 2x - 1 \qquad y \leqslant 5 - x \qquad [3]$$
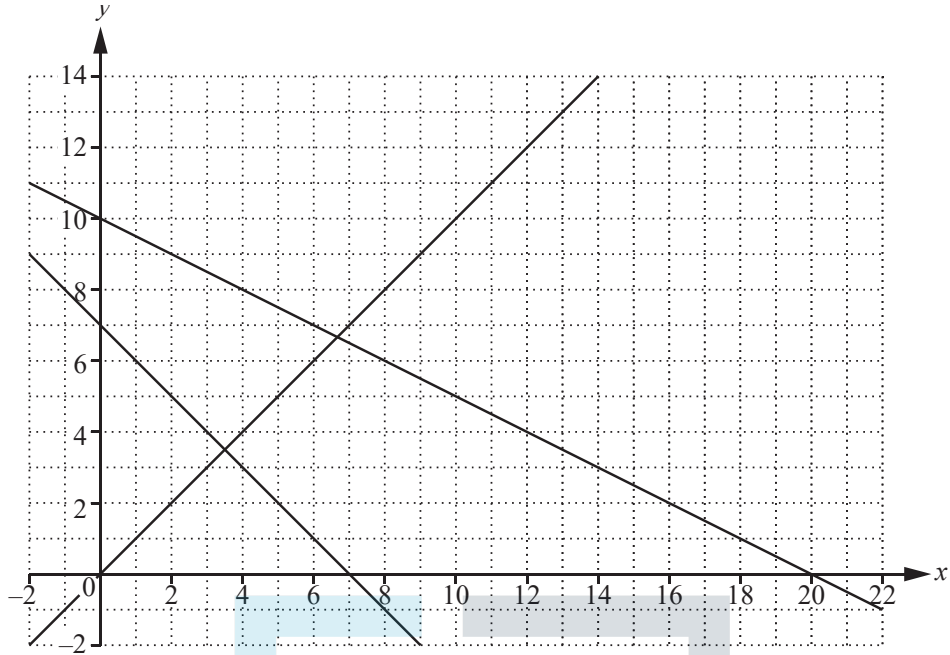
Question 15

By shading the unwanted regions of the grid above, find and label the region R that satisfies the following four inequalities.
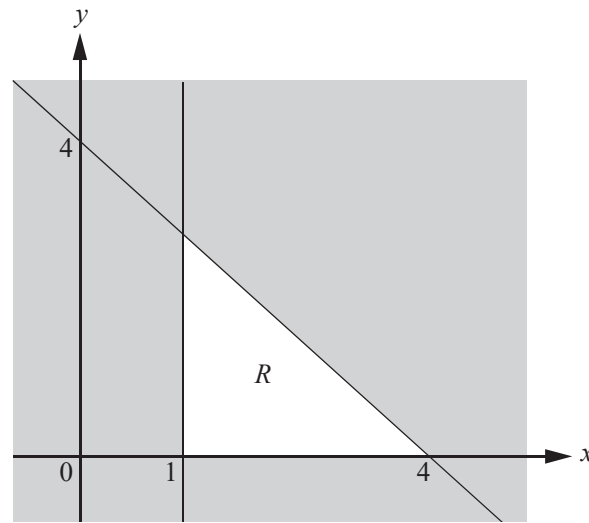
$$x \geqslant 0 \qquad x + y \geqslant 7 \qquad y \geqslant x \qquad x + 2y \leqslant 20 \qquad \text{[3]}$$

Correct region

Question 16

NOT TO
SCALE

Write down the three inequalities that define the unshaded region, R. [4]

$$y \geqslant 0 \text{ and } x \geqslant 1 \text{oe and } x + y \leqslant 4 \text{oe}$$
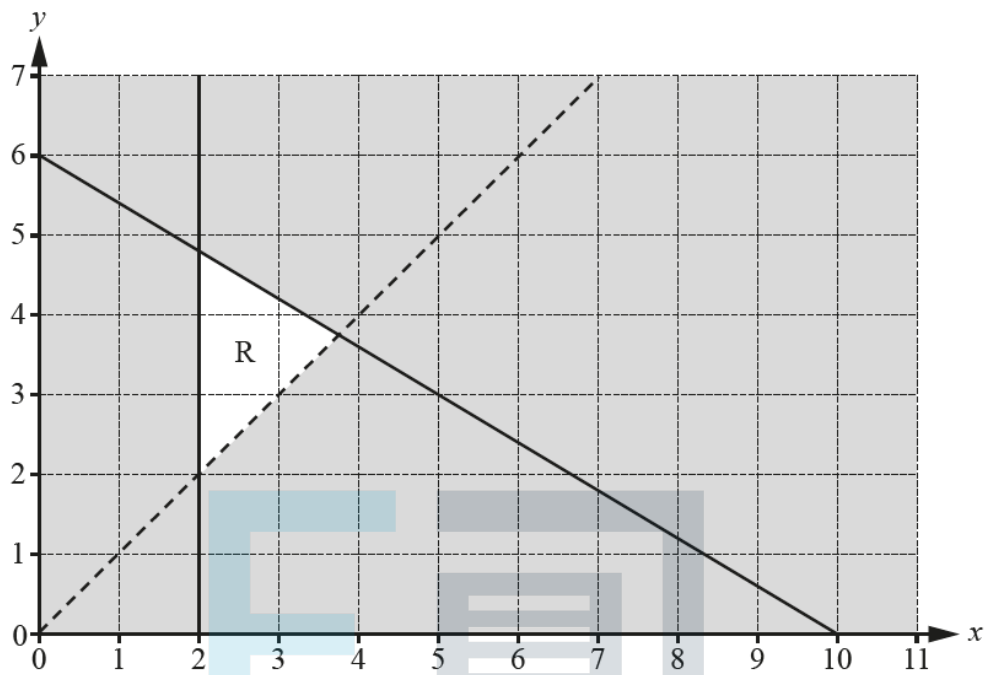
Question 17

Find the three inequalities that define the unshaded region, R. [5]

$$y \leqslant -\tfrac{3}{5}x + 6 \text{ oe}$$
$$x \geqslant 2 \text{ oe}$$
$$y > x \text{ oe}$$
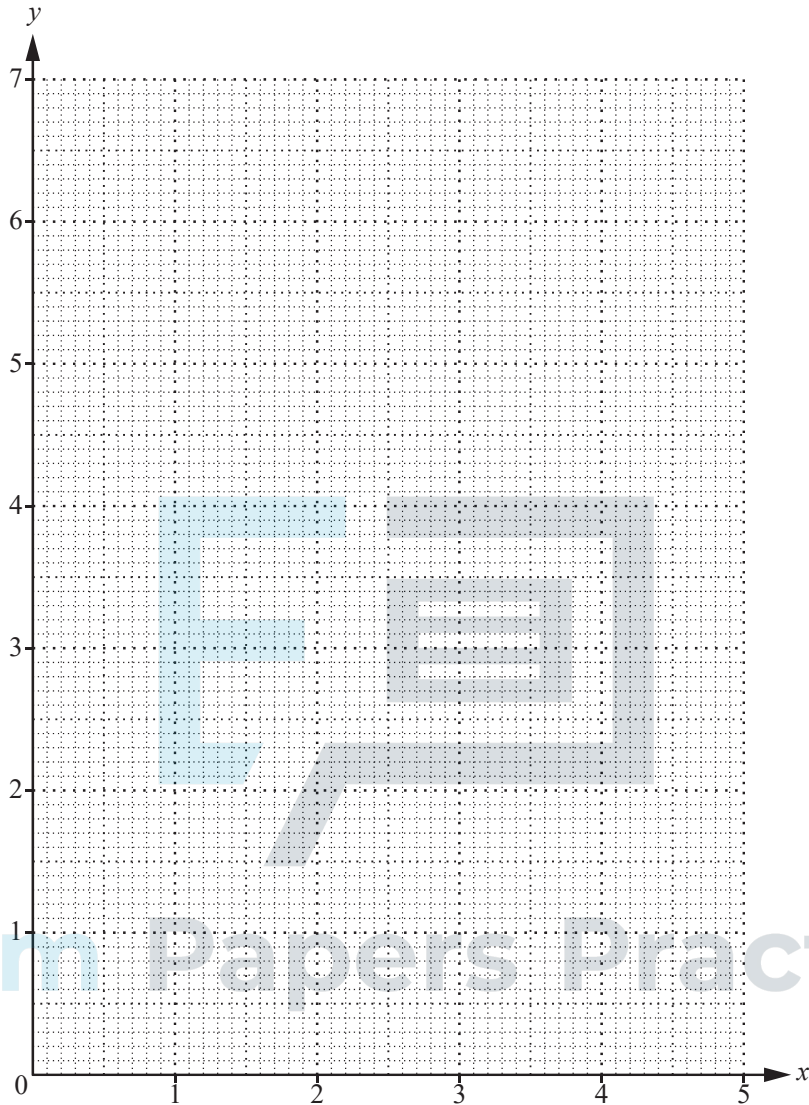
Question 18

The region R satisfies these inequalities.

$$y \leqslant 2x \qquad\qquad 3x + 4y \geqslant 12 \qquad\qquad x \leqslant 3$$

On the grid, draw and label the region R that satisfies these inequalities.
Shade the **unwanted** regions. [5]
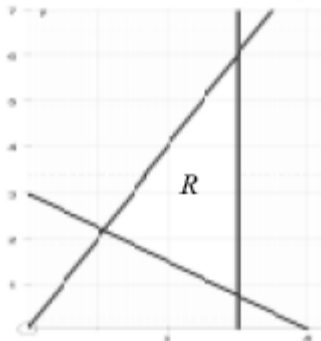
Question 19
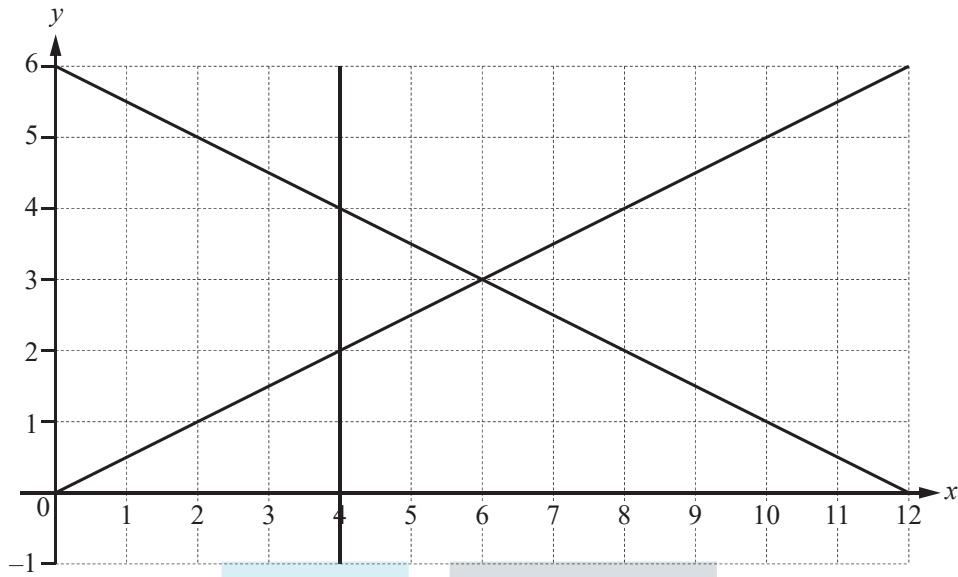
By shading the **unwanted** regions of the grid, find and label the region R which satisfies the following four inequalities.

$$y \geqslant 0 \qquad x \geqslant 4 \qquad 2y \leqslant x \qquad 2y + x \leqslant 12 \qquad [3]$$

substitute
$x = 0$, $y = 0$
in eq n.
If it is true then shading is towards origin
If false then away from origin

EXAM PAPERS PRACTICE
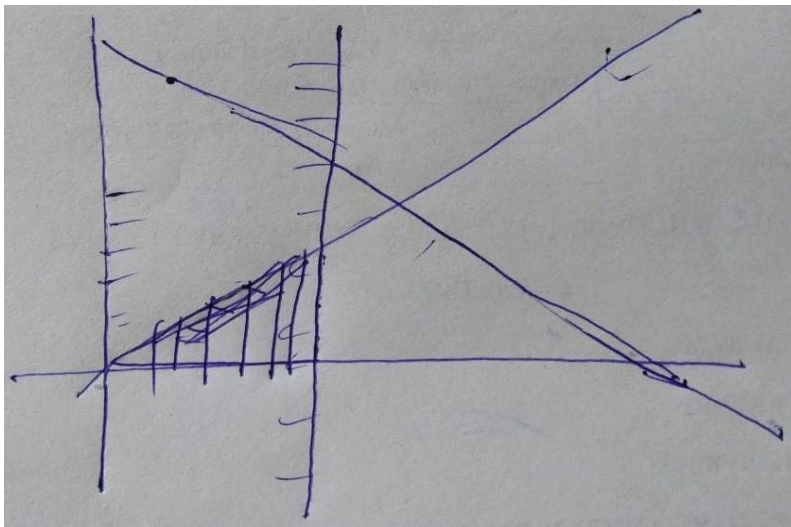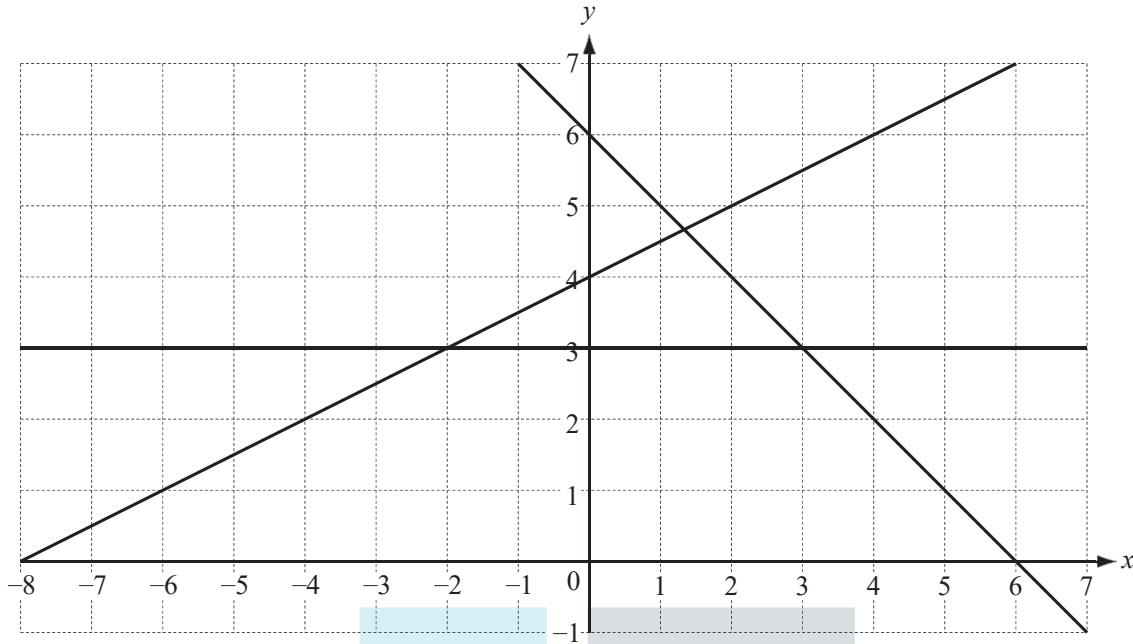
Question 20

The region R contains points which satisfy the inequalities

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

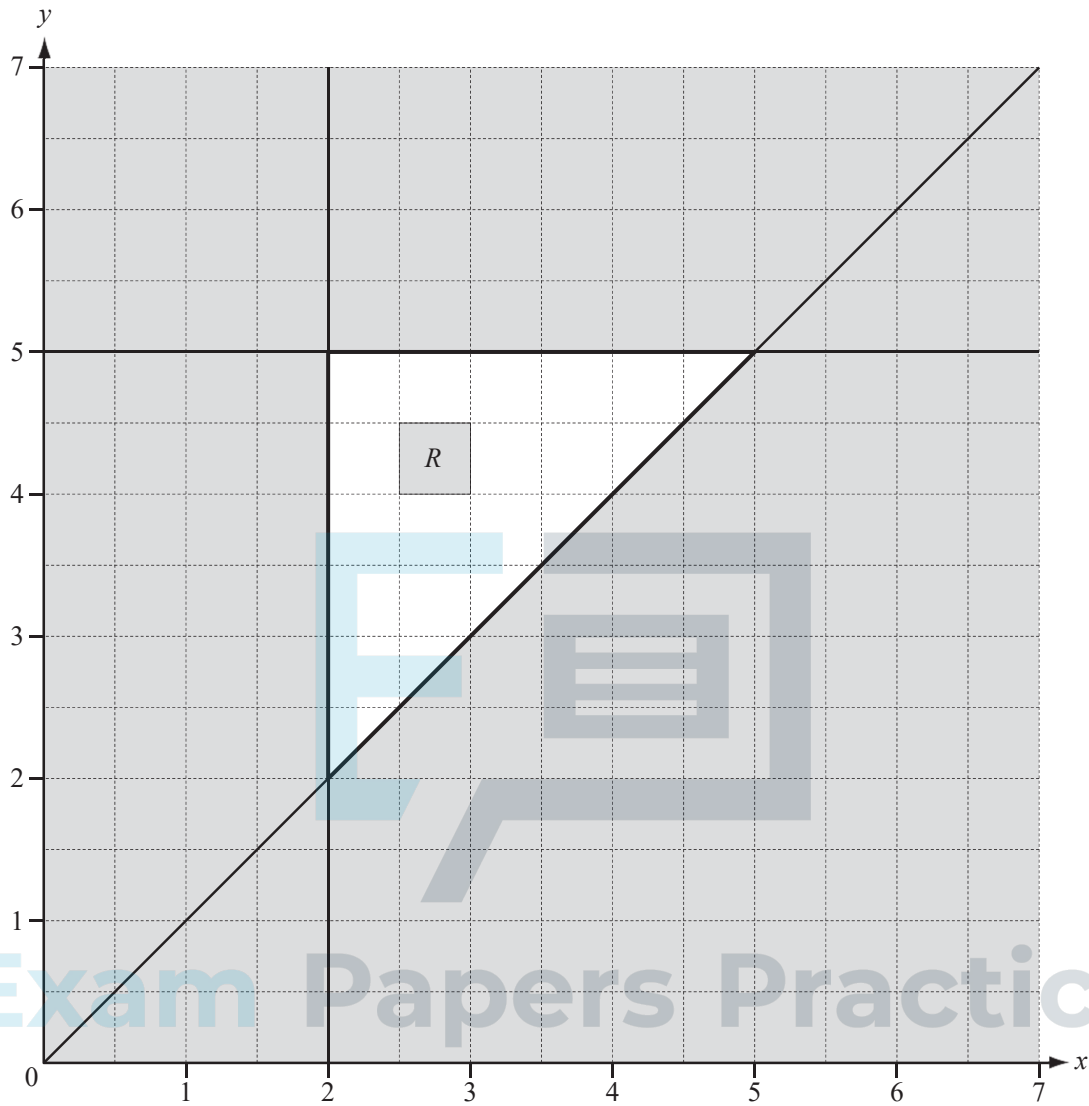On the grid, label with the letter R the region which satisfies these inequalities.

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

EXAM PAPERS PRACTICE
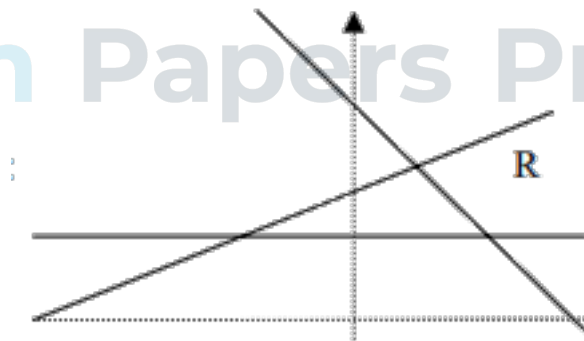
Question 21

The region R is bounded by three lines.

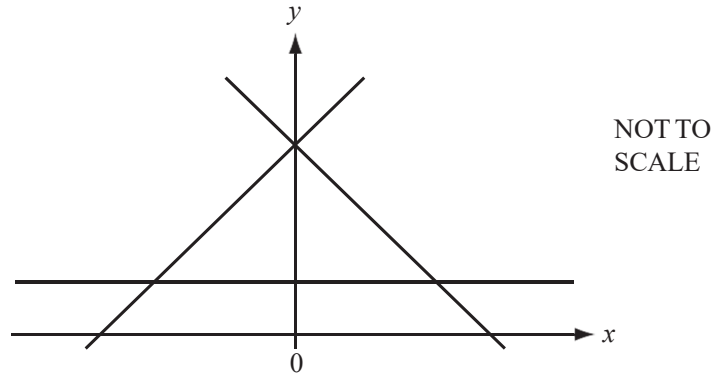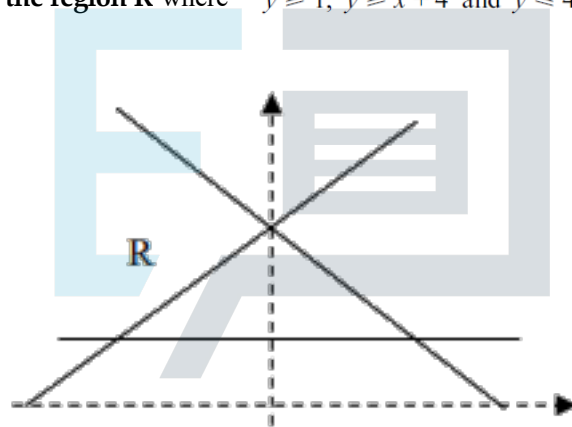Write down the three inequalities which define the region R. [4]

$y \leq 5$
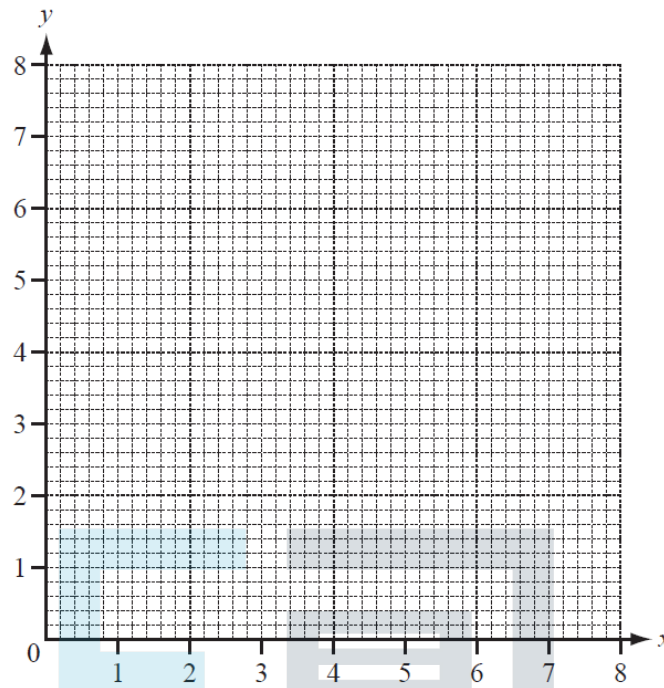$x \geq 2$
$y \geq x$

Question 22

NOT TO
SCALE

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

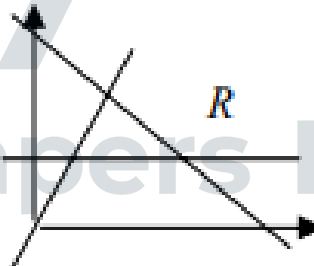On the diagram, **label the region R** where $\quad y \geq 1$, $y \geq x + 4$ and $y \leq 4 - x$. [3]
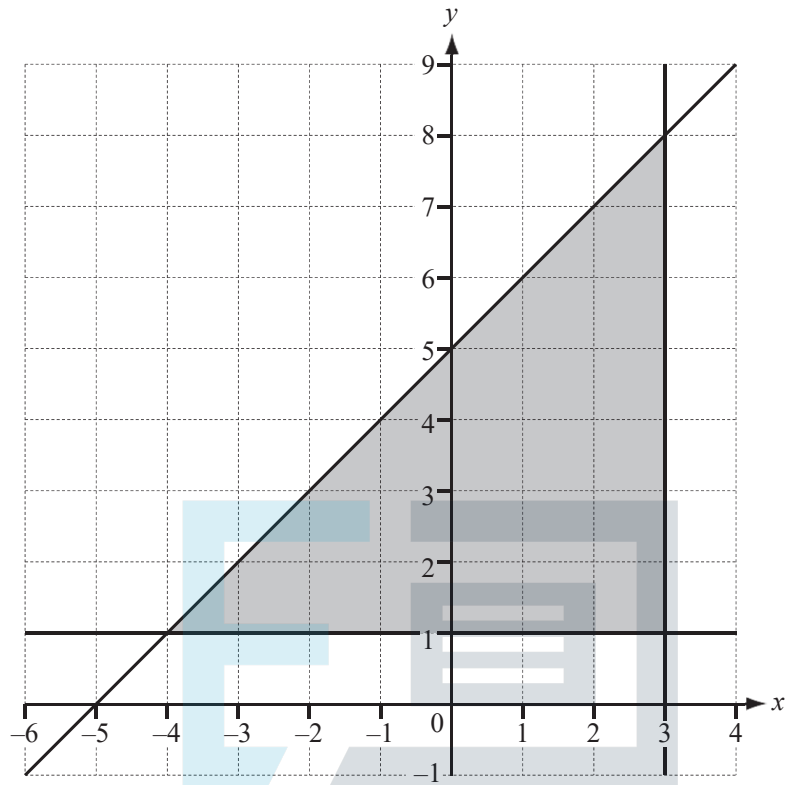
Question 23

(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]

Correct R cao

Question 24

Find the three inequalities which define the shaded triangle in the diagram. [5]

$$y \geqslant 1, \, x \leqslant 3, \, y \leqslant x + 5 \quad \text{oe}$$