Extended Mathematics
Topic : Algebra -2
Year :May 2013 -May 2024
Paper - 2
Questions Booklet

Question 1

Rearrange $y = \sqrt{8 + \dfrac{4}{x}}$ to make x the subject.

Answer x = …………………………… [4]

Question 2

Write as a single fraction in its simplest form.

$$\frac{x+3}{x-3} - \frac{x-1}{x+1}$$

Answer ………………………………… [4]

Question 3

Solve $3n + 23 < n + 41$.

Answer ..... …………………………… [4]

Question 4

The mass, m, of a sphere varies directly with the **cube** of its radius, r.
$m = 160$ when $r = 2$.

Find m when $r = 5$.

Answer m = ………………………………… [3]

Question 5

Solve $6x + 3 < x < 3x + 9$ for **integer** values of x.

Answer ………………………………… [4]

Question 6

y is inversely proportional to x^3.
$y = 5$ when $x = 2$.

Find y when $x = 4$.

Answer y = ………………………………… [3]

Question 7

Write as a single fraction in its simplest form.

$$\frac{2}{x+3} + \frac{3}{x+2}$$

Answer .... [3]

Question 8

t varies inversely as the square root of u.
$t = 3$ when $u = 4$.

Find t when $u = 49$.

Answer t = ... [3]

Question 9

Write $(27x^{12})^{\frac{1}{3}}$ in its simplest form.

Answer .... [2]

Question 10

Solve the inequality.

$$3x - 1 \leqslant 11x + 2$$

Answer .... [2]

Question 11

(a) Simplify $(64q^{-2})^{\frac{1}{2}}$.

Answer(a) .... [2]

(b) $5^7 \div 5^9 = p^2$

Find p.

Answer(b) p = ... [2]

Question 12

m varies directly as the cube of x.
$m = 200$ when $x = 2$.

Find m when $x = 0.4$.

Answer m = ... [3]

Question 13

Solve the inequality.
$$\frac{x}{2} + \frac{x-2}{3} < 5$$

Answer .... [4]

Question 14

The speed, v, of a wave is inversely proportional to the square root of the depth, d, of the water.
$v = 30$ when $d = 400$.

Find v when $d = 25$.

Answer $v = $ .... [3]

Question 15

Rearrange the formula to make x the subject.
$$y = x^2 + 4$$

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

Question 16

Write as a single fraction in its simplest form.
$$3 - \frac{t+2}{t-1}$$

Answer .... [3]

Question 17

(a) $3^x = \sqrt[4]{3^5}$

Find the value of x.

Answer(a) $x = $ .... [1]

(b) Simplify $(32y^{15})^{\frac{2}{5}}$.

Answer(b) .... [2]

Question 18

Make b the subject of the formula.
$$c = \sqrt{a^2 + b^2}$$

Answer $b = $ .... [3]

Question 19

y varies as the cube root of $(x + 3)$.
When $x = 5$, $y = 1$.

Find the value of y when $x = 340$.

Answer y = ... [3]

Question 20

Solve the inequality.

$$5t + 23 < 17 - 2t$$

Answer .... [2]

Question 21

Simplify.

$$3x^2y^3 \times x^4y$$

Answer .... [2]

Question 22

(a) Simplify $(3125t^{125})^{\frac{1}{5}}$.

Answer(a) .... [2]

(b) Find the value of p when $3^p = \frac{1}{9}$.

Answer(b) p = ... [1]

(c) Find the value of w when $x^{72} \div x^w = x^8$.

Answer(c) w = ... [1]

Question 23

w varies inversely as the square root of x.
When $x = 4$, $w = 4$.

Find w when $x = 25$.

Answer w = ... [3]

Question 24

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

(a) Find V when $A = 15$ and $h = 7$.

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

(b) Make h the subject of the formula.

Answer(b) h = ... [2]

Question 25

(a) $(2^{24})^{\frac{1}{2}} = p^4$

Find the value of p.

Answer(a) p = ... [2]

(b) Simplify $\dfrac{q^2 + q^2}{q^{\frac{1}{4}} \times q^{\frac{1}{4}}}$.

Answer(b) .... [3]

Question 26

Solve the inequality for positive integer values of x.

$$\frac{21 + x}{5} > x + 1$$

Answer .... [4]

Question 27

Write as a single fraction in its simplest form.

$$\frac{2}{x} - \frac{2}{x + 1}$$

Answer .... [3]

Question 28

Make x the subject of the formula.

$$y = (x - 4)^2 + 6$$

Answer x = ... [3]

Question 29

Write as a single fraction, in its simplest form.

$$\frac{3}{2x} + \frac{2x}{3} + 3 + 2x$$

Answer .... [4]

Question 30

y varies inversely as $(x + 5)$.
$y = 6$ when $x = 3$.

Find y when $x = 7$.

Answer y = ... [3]

Question 31

Make x the subject of the formula.

$$y = 2 + \sqrt{x - 8}$$

Answer x = ... [3]

Question 32

Write as a single fraction in its simplest form.

$$\frac{3}{2x - 1} - \frac{1}{x + 2}$$

Answer(a) .... [3]

Question 33
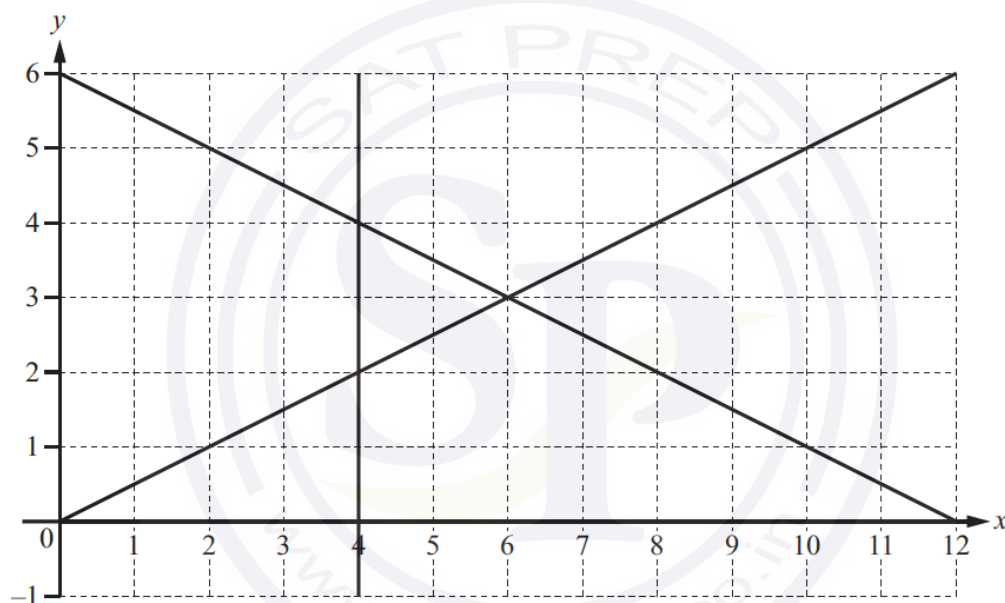
By shading the **unwanted** regions of the grid, find and label the region R which satisfies the following four inequalities.

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

[3]

Question 34

The cost of a circular patio, $\$C$, varies as the square of the radius, r metres.
$C = 202.80$ when $r = 2.6$.

Calculate the cost of a circular patio with $r = 1.8$.

Answer $ .... [3]

Question 35

Make r the subject of this formula.

$$v = \sqrt[3]{p + r}$$

Answer $r =$ .... [2]

Question 36

(a) Simplify

   (i) x^0,

Answer(a)(i) .... [1]

   (ii) $m^4 \times m^3$,

Answer(a)(ii) .... [1]

   (iii) $(8p^6)^{\frac{1}{3}}$.

Answer(a)(iii) .... [2]

(b) $243^x = 3^2$

   Find the value of x.

Answer(b) $x =$ .... [2]

Question 37

x varies directly as the cube root of y.
$x = 6$ when $y = 8$.

Find the value of x when $y = 64$.

Answer $x =$ .... [3]

Question 38

Simplify.

(a) $12x^{12} \div 3x^3$

Answer(a) .... [2]

(b) $(256y^{256})^{\frac{1}{8}}$

Answer(b) .... [2]

Question 39

Write as a single fraction in its simplest form.

$$\frac{3}{x+2} - \frac{4}{2x-5}$$

Answer .... [3]

Question 40

$81^x = 3$

Find the value of x.

Answer $x =$ .... [1]

Question 41
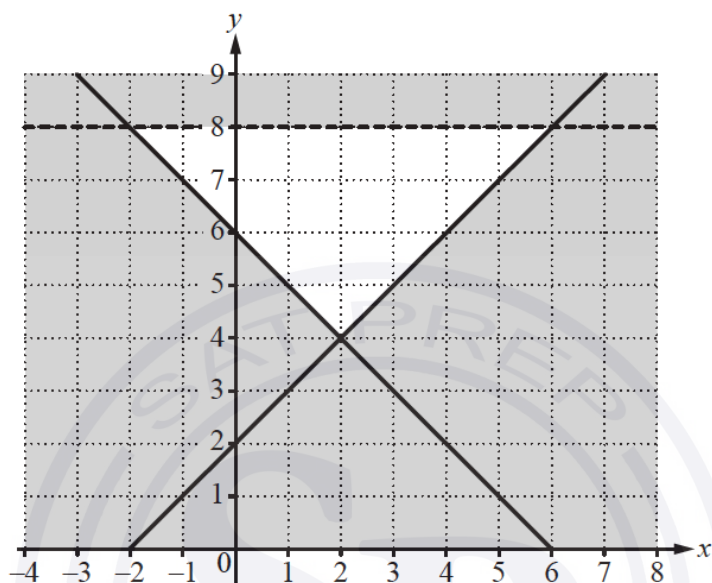
Write down the 3 inequalities which define the unshaded region.

Answer ....

....

.... [4]

Question 42

p is inversely proportional to the square of $(q + 4)$.
$p = 2$ when $q = 2$.

Find the value of p when $q = -2$.

Answer $p =$ .... [3]

Question 43

y is inversely proportional to $(x + 2)^2$.
When $x = 1$, $y = 2$.

Find y in terms of x.

Answer $y =$ .... [2]

Question 44

Simplify.

$$\left(\frac{x^{64}}{16y^{16}}\right)^{\frac{1}{4}}$$

Answer .... [3]

Question 45

Make a the subject of the formula $s = ut + \frac{1}{2}at^2$.

Answer a = ... [3]

Question 46

Write the following as single fractions.

(a) $x + \frac{x}{2}$

Answer(a) .... [1]

(b) $x + \frac{2}{x}$

Answer(b) .... [1]

Question 47

y is directly proportional to the square of $(x - 1)$.
$y = 63$ when $x = 4$.

Find the value of y when $x = 6$.

Answer y = ... [3]

Question 48

Make x the subject of the formula.

$$y = ax^2 + b$$

Answer x = ... [3]

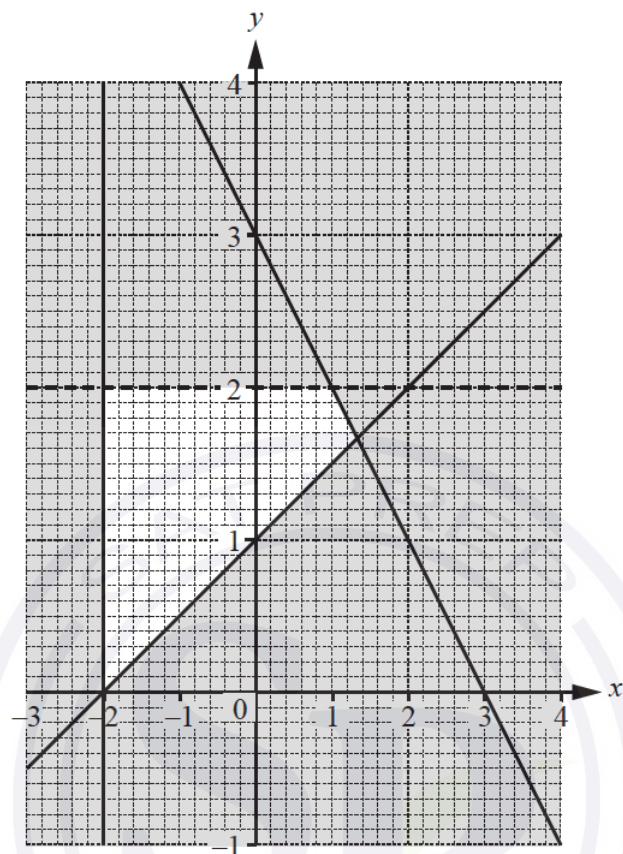## Question 49

V is directly proportional to the cube of $(r + 1)$.
When $r = 1$, $V = 24$.

Work out the value of V when $r = 2$.

Answer V = ... [3]

Question 50

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

....

....

....

.... [5]

Question 51

Simplify.

(a) $x^3 y^4 \times x^5 y^3$

.... [2]

(b) $(3p^2 m^5)^3$

.... [2]

Question 52

Solve the inequality.

$$6n + 3 > 8n$$

.... [2]

Question 53
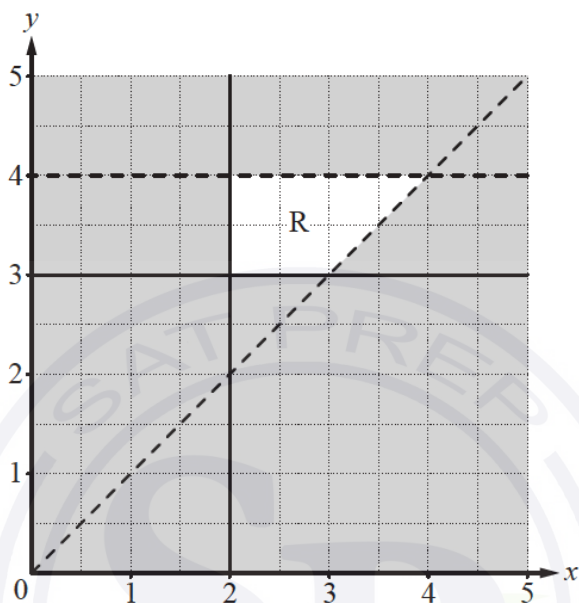
Find four inequalities that define the region, R, on the grid.

....

....

....

.... [4]

Question 54

y is directly proportional to $(x + 2)^2$.
When $x = 8$, $y = 250$.

Find y when $x = 4$.

$y =$ .... [3]

Question 55

Simplify.
$$(32x^{10})^{\frac{3}{5}}$$

.... [2]

Question 56
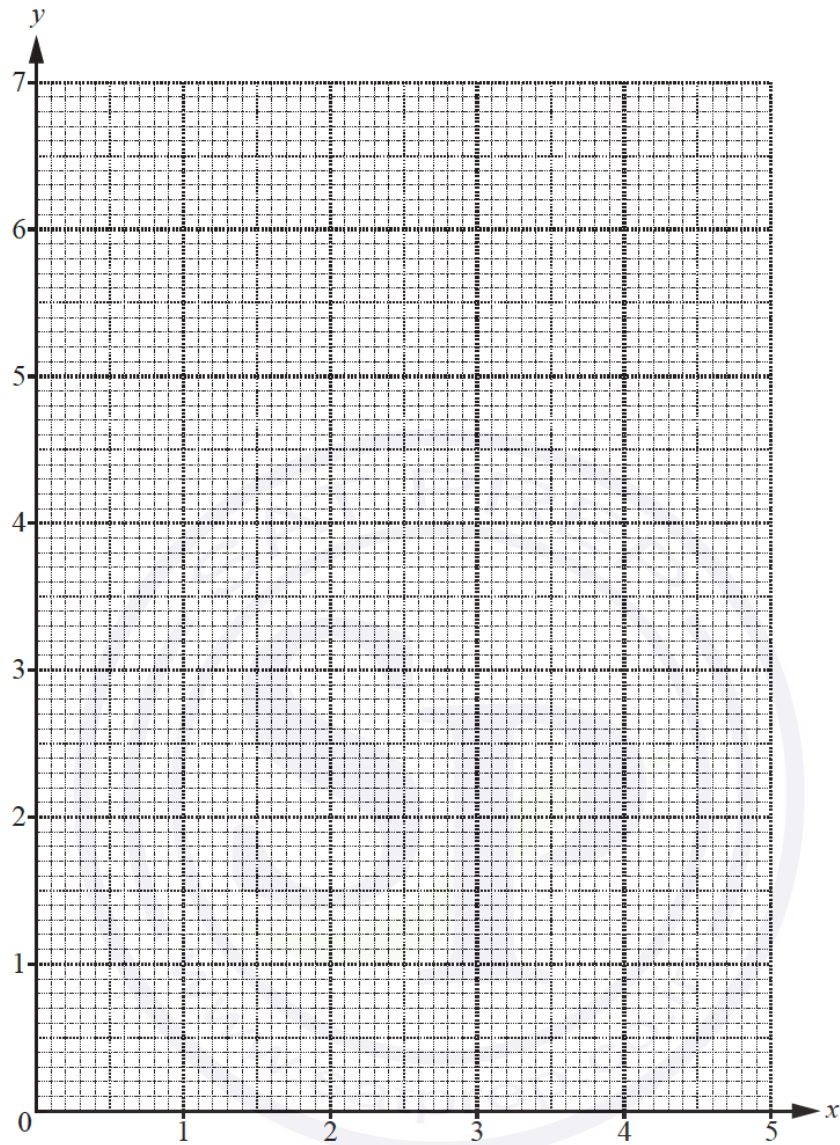
The region R satisfies these inequalities.

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

On the grid, draw and label the region R that satisfies these inequalities.
Shade the **unwanted** regions.

[5]

Question 57

Make p the subject of the formula.

$$rp + 5 = 3p + 8r$$

$p =$ .... [3]

12

Question 58

Solve the inequality $\frac{x}{3} + 5 > 2$.

.... [2]

Question 59

Simplify.

$$\left(\frac{1}{2}x^{\frac{2}{3}}\right)^3$$

.... [2]

Question 60

y is directly proportional to the positive square root of x.
When $x = 9$, $y = 12$.

Find y when $x = \frac{1}{4}$.

$y = $ .... [3]

Question 61

Simplify $\left(16p^{16}\right)^{\frac{1}{4}}$.

.... [2]

Question 62

Solve the inequality.

$$n + 7 < 5n - 8$$

.... [2]

Question 63

$$y = \frac{qx}{p}$$

Write x in terms of p, q and y.

$x = $ .... [2]

Question 64
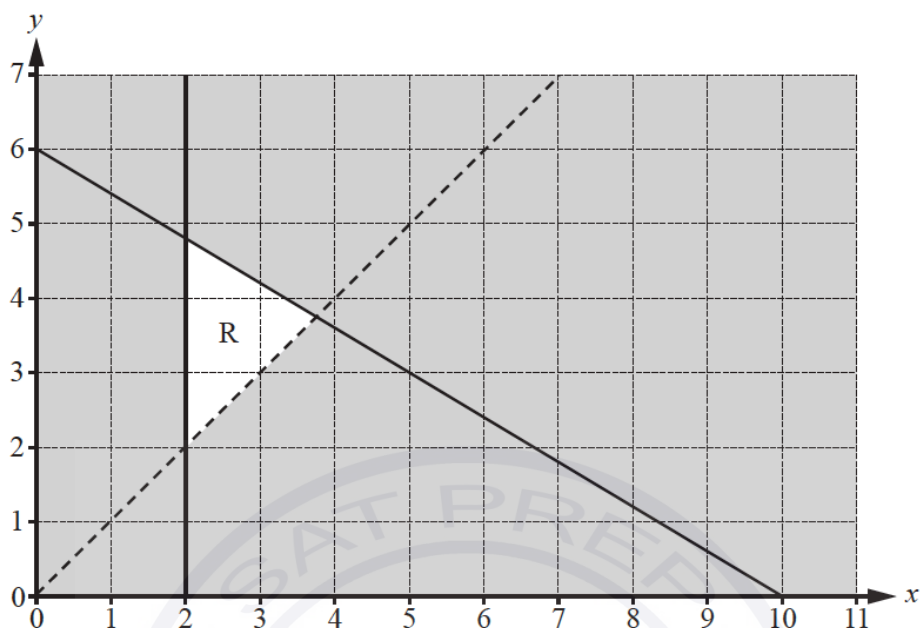
Find the three inequalities that define the unshaded region, R.

....

....

.... [5]

Question 65

d is inversely proportional to $(w + 1)^2$.
$d = 3.2$ when $w = 4$.

Find d when $w = 7$.

$d =$ .... [3]

Question 66

Simplify.
$$n^2 \times n^5$$

.... [1]

Question 67

Find the positive integers that satisfy the inequality $t + 2 > 3t - 6$.

.... [3]

Question 68

Simplify.
$$36y^5 \div 4y^2$$

.... [2]

Question 69

NOT TO
SCALE
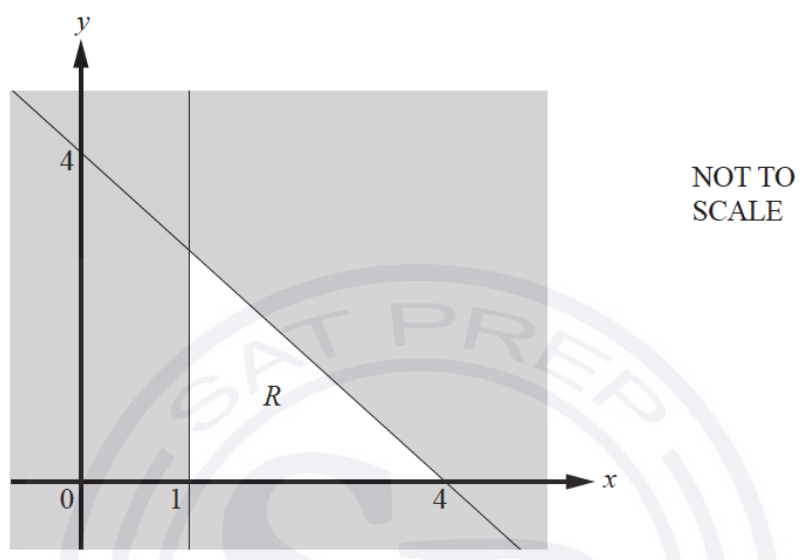
Write down the three inequalities that define the unshaded region, R.

....

....

.... [4]

Question 70

$$y = p^2 + qr$$

(a) Find y when $p = -5$, $q = 3$ and $r = -7$.

$y = $ .... [2]

(b) Write p in terms of q, r and y.

$p = $ .... [2]

Question 71

y is directly proportional to the square root of $(x + 2)$.
When $x = 7$, $y = 2$.

Find y when $x = 98$.

$y = $ .... [3]

Question 72

Write as a single fraction.

$$1 - \frac{2}{p} - \frac{3}{t}$$

.... [2]

Question 73

Simplify.

$$(36x^{16})^{\frac{1}{2}}$$

.... [2]

Question 74

Work out.

(a) $t^{24} \div t^4$

.... [1]

(b) $(x^5)^2$

.... [1]

(c) $(81m^8)^{\frac{3}{4}}$

.... [2]

Question 75

y is inversely proportional to x^2.
When $x = 5$, $y = 16$.

Find y when $x = 10$.

$y = $ .... [3]

Question 76

Simplify.

(a) $6w^0$

.... [1]

(b) $5x^3 - 3x^3$

.... [1]

(c) $3y^6 \times 5y^{-2}$

Question 77

(a) Solve the inequality.

$$x + 13 \geqslant 3x + 7$$

.... [2]

(b) List the positive integers that satisfy the inequality in **part (a)**.

.... [1]

Question 78
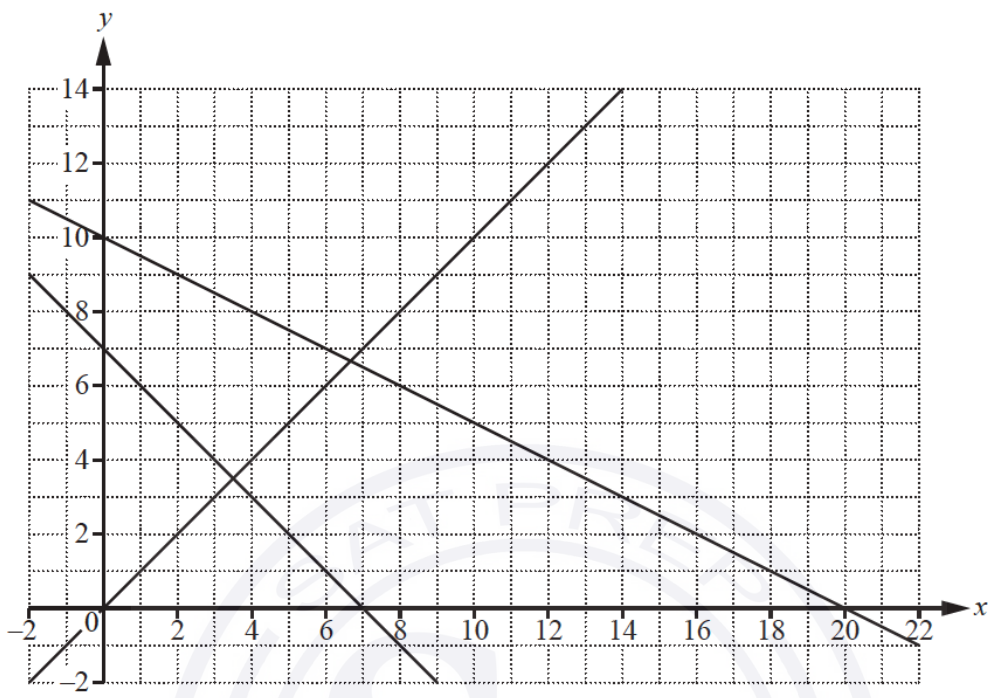
By shading the unwanted regions of the grid above, find and label the region R that satisfies the following four inequalities.

$$x \geqslant 0 \qquad x + y \geqslant 7 \qquad y \geqslant x \qquad x + 2y \leqslant 20$$

[3]

Question 79

y is inversely proportional to x^2.
When $x = 2$, $y = 8$.

Find y in terms of x.

$y = $ ....[2]

Question 80

Simplify.

$$\left(\frac{8}{a^{12}}\right)^{\frac{1}{3}}$$

....[2]

Question 81

Make a the subject of the formula.
$$x = y + \sqrt{a}$$

$a = $ ....[2]

Question 82

(a) Simplify.

$$(16x^{16})^{\frac{3}{4}}$$

.... [2]

(b) $2p^{\frac{3}{2}} = 54$

Find the value of p.

$p =$ .... [2]

Question 83

y is inversely proportional to $\sqrt{1+x}$.
When $x = 8$, $y = 2$.

Find y when $x = 15$.

$y =$ .... [3]

Question 84

Write as a single fraction in its simplest form.

$$\frac{2x-1}{3} - \frac{2}{x+1}$$

.... [3]

Question 85

Make q the subject of the formula $p = 2q^2$.

$q =$ .... [2]

Question 86

Work out.

(a) $125^{\frac{2}{3}}$

[1]

Question 87

Solve the inequality.

$$3n - 11 > 5n - 18$$

.... [2]

Question 88

Write as a single fraction in its simplest form.

(a) $\dfrac{x^2 - 3x}{x^2 - 9}$

.... [3]

(b) $\dfrac{3}{x-4} + \dfrac{2}{2x+5}$

.... [3]

Question 89
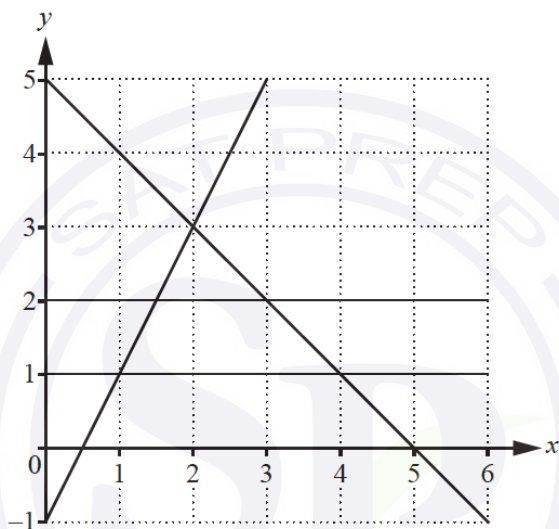
By shading the **unwanted** regions of the grid, find and label the region R that satisfies the following four inequalities.

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

Question 90

h is directly proportional to the square root of p.
$h = 5.4$ when $p = 1.44$.

Find h when $p = 2.89$.

$h =$ .... [3]

Question 91

(a) $2^r = \dfrac{1}{16}$

Find the value of r.

$r = $ .... [1]

(b) $3^t = \sqrt[5]{3}$

Find the value of t.

$t = $ .... [1]

Question 92

$x^{\frac{2}{3}} \div x^{-\frac{4}{3}}$

.... [1]

Question 93

$\left(\dfrac{8}{y^6}\right)^{-\frac{1}{3}}$

.... [2]

Question 94

Make x the subject of the formula.
$$y = \sqrt{x^2 + 1}$$

$x = $ .... [3]

Question 95

Write as a single fraction in its simplest form.
$$\dfrac{x+1}{x} - \dfrac{y-1}{y}$$

.... [3]

Question 96

Find the integers which satisfy the inequality.

$$-5 < 2n - 1 \leqslant 5$$

.... [3]

Question 97

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.
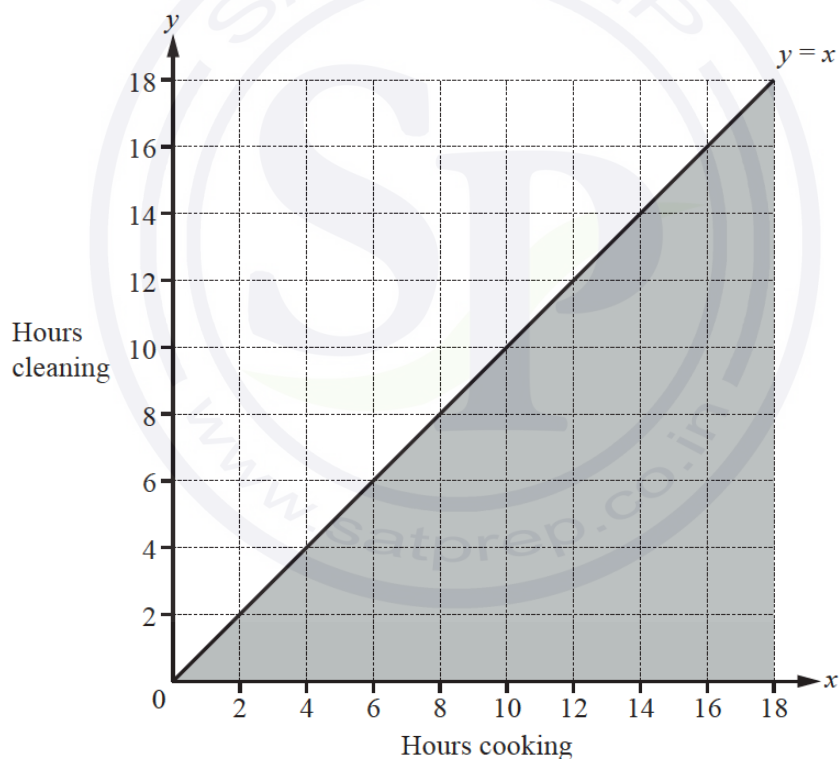This can be written as $y \geqslant x$.

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]

(b) Complete the diagram to show the three inequalities.
Shade the **unwanted** regions.

Hours cooking

[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]

Question 98

Write as a single fraction in its simplest form.

$$\frac{5}{x-3} + \frac{3}{x+7} + \frac{1}{2}$$

.... [4]

Question 99

y is inversely proportional to $(x+1)^2$.
$y = 50$ when $x = 0.2$.

(a) Write y in terms of x.

$y =$ .... [2]

(b) Find the value of y when $x = 0.5$.

$y =$ .... [1]

Question 100

Simplify.

(a) $(m^5)^2$

.... [1]

(b) $4x^3y \times 5x^2y$

.... [2]

Question 101

y is inversely proportional to x.
When $x = 9$, $y = 8$.

Find y when $x = 6$.

$y =$ .... [3]

Question 102

$$2^P = \frac{1}{8^4}$$

Find the value of p.

$p =$ .... [2]

Question 103

Write as a single fraction in its simplest form.

$$\frac{1}{y-1} - \frac{1}{y}$$

.... [3]

Question 104

y is directly proportional to $(x-1)^2$.
When $x = 3$, $y = 24$.

Find y when $x = 6$.

$y =$ .... [3]

Question 105

(a) Find the value of $\left(\dfrac{1}{81}\right)^{-\frac{3}{4}}$.

.... [1]

(b) Simplify.
$$\sqrt[3]{27t^{27}}$$

.... [2]

Question 106

$$A = (2\pi + y)x^2$$

Rearrange the formula to make x the subject.

$x =$ .... [2]

Question 107
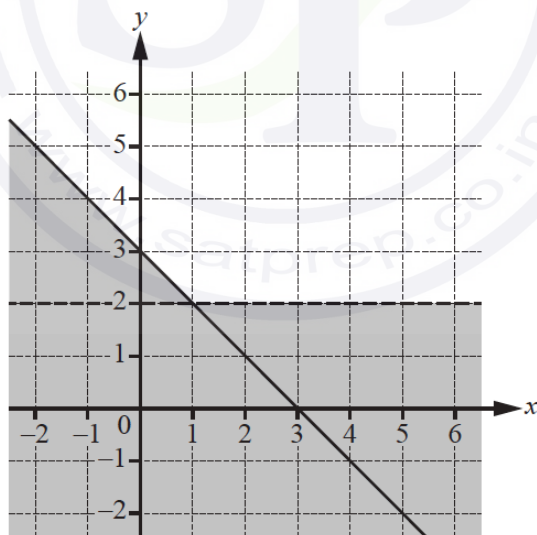
Find the two inequalities that define the region on the grid that is **not** shaded.

....

.... [3]

Question 108
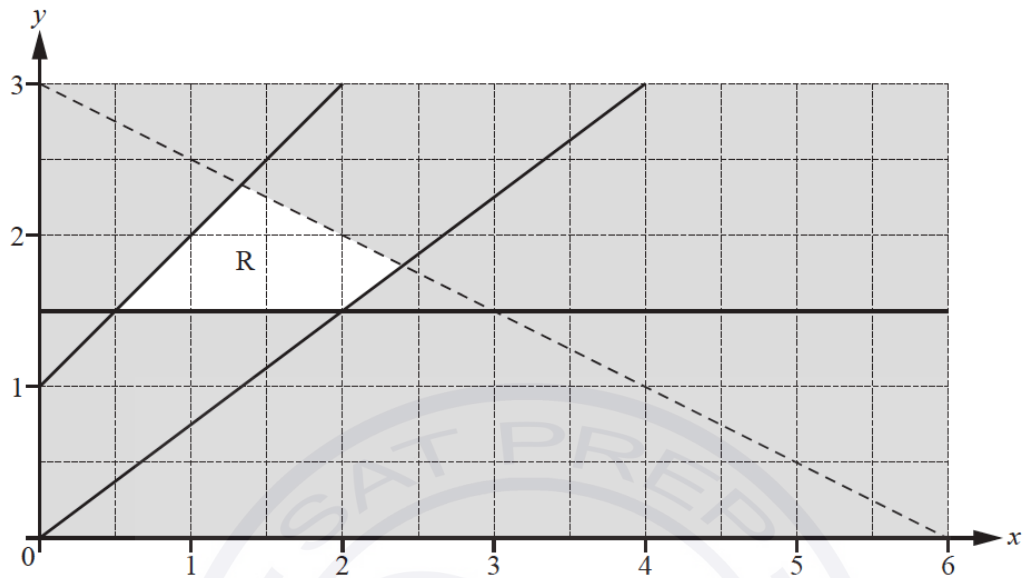
There are four inequalities that define the region R.
One of these is $y \leqslant x + 1$.

Find the other three inequalities.

....
....
.... [4]

Question 109

y is directly proportional to $(x - 1)^2$.
When $x = 5$, $y = 4$.

Find y when $x = 7$.

$y =$ .... [3]

Question 110

Solve the inequality.
$$3n - 5 > 17 + 8n$$

.... [2]

Question 111

$$3^{-q} \times \frac{1}{27} = 81$$

Find the value of q.

$q =$ .... [2]

Question 112

Write as a single fraction in its simplest form.

$$\frac{1}{x} - \frac{1}{x+1}$$

.... [3]

Question 113

y is directly proportional to the square root of x.
When $x = 9$, $y = 6$.

Find y when $x = 25$.

$y =$ .... [3]

Question 114

(a) Simplify $\dfrac{w^2}{w^3}$.

.... [1]

(b) Simplify $\left(3w^3\right)^3$.

.... [2]

Question 115

$$A = \pi r l + \pi r^2$$

Rearrange this formula to make l the subject.

$l =$ .... [2]

Question 116

Make m the subject of the formula.

$$x = \frac{3m}{2-m}$$

$m =$ .... [4]

Question 117
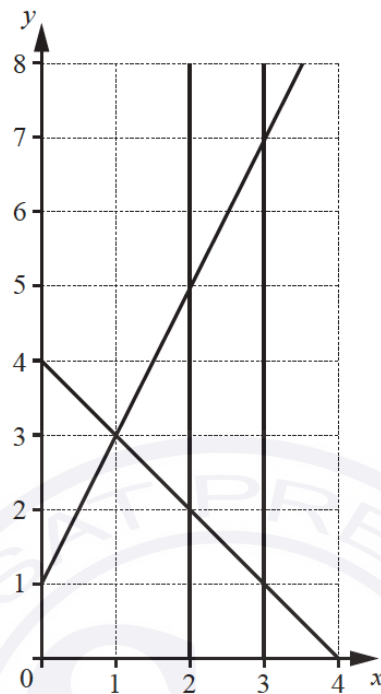
By shading the **unwanted** regions of the grid, find and label the region R that satisfies the following four inequalities.

$$x \leqslant 3 \qquad x \geqslant 2 \qquad y \leqslant 2x+1 \qquad y \geqslant 4-x$$

[3]

Question 118

Solve.
$$7m - 2 \geqslant 19$$

.... [2]

Question 119

(a) $t^x \times t^2 = t^{10}$

Find the value of x.

$x =$ .... [1]

Simplify.

(i) $\left(\dfrac{4}{x}\right)^{-2}$

.... [1]

(ii) $a^3 b^7 \div a^6 b^2$

.... [2]

Question 120

Write as a single fraction in its simplest form.

$$\frac{x-5}{3} + \frac{6}{x+2}$$

.... [3]

Question 121

Find the integer values of n that satisfy the inequality $15 \leqslant 4n < 28$.

.... [3]

Question 122

y is inversely proportional to x^3.
When $x = 2$, $y = 0.5$.

Find y in terms of x.

$y =$ .... [2]

Question 123

(a)   Find the value of n when $5^n = \frac{1}{125}$.

$n =$ .... [1]

(b)   Simplify $\left(\frac{64}{m^3}\right)^{-\frac{1}{3}}$.

.... [2]

Question 124

y is directly proportional to $(x - 4)$.
When $x = 16$, $y = 3$.

Find y in terms of x.
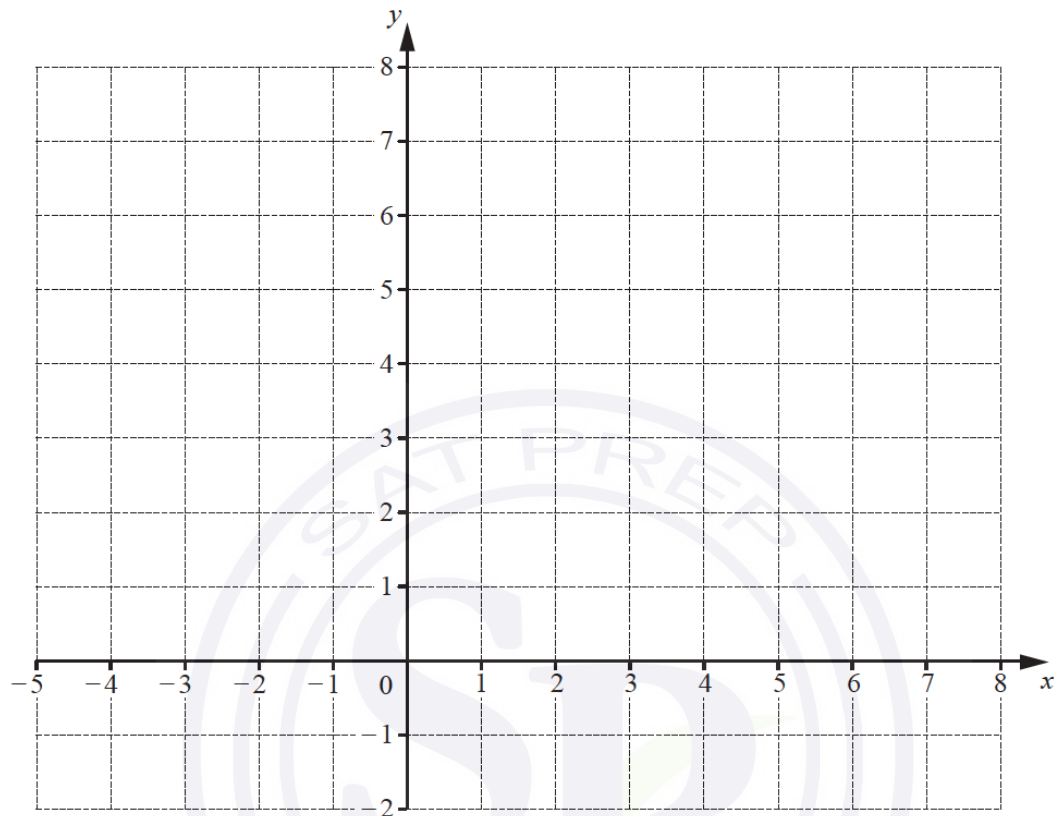
$y =$ .... [2]

27

Question 125

By shading the **unwanted** regions of the grid, draw and label the region R which satisfies the following three inequalities.

$$y \leqslant 2 \qquad\qquad x < 3 \qquad\qquad y \leqslant x+4$$

[5]

Question 126

y is inversely proportional to the square of $(x+1)$.
$y = 0.875$ when $x = 1$.

Find y when $x = 4$.

$y = $ .... [3]

Question 127

Complete this statement with an expression in terms of m.

$$18m^3 + 9m^2 + 14m + 7 = (9m^2 + 7)(............................)$$

[2]

Question 128

Rearrange this formula to make m the subject.

$$P = \frac{k+m}{m}$$

.... [4]

Question 129

Write as a single fraction in its simplest form.

$$\frac{2x}{x+3} + \frac{x+3}{x-5}$$

.... [3]

Question 130
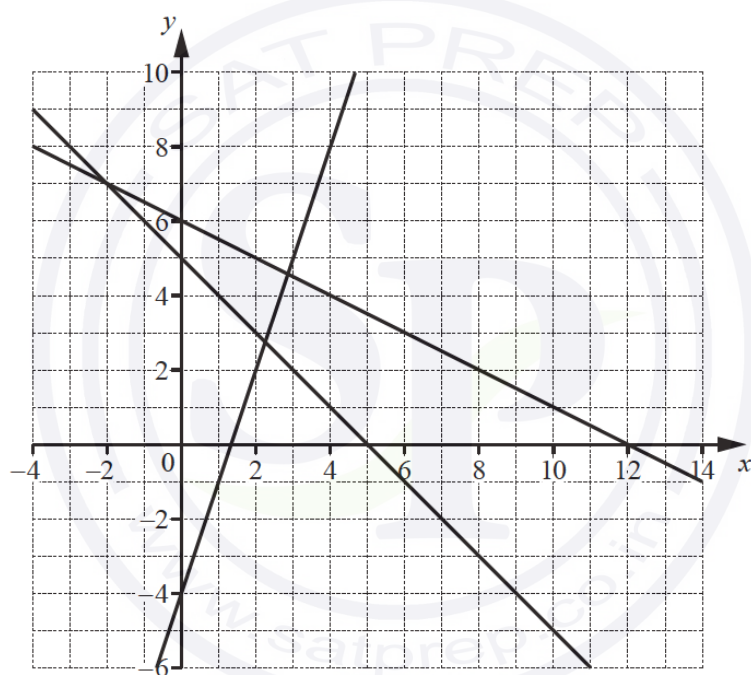
$$y \leqslant -\tfrac{1}{2}x + 6 \qquad y \geqslant 3x - 4 \qquad x + y \geqslant 5$$

(a) By shading the **unwanted** regions of the grid, find and label the region R that satisfies the three inequalities. [2]

(b) Find the largest value of $x+y$ in the region R, where x and y are integers.

.... [1]

Question 131

Simplify.

(a) $5m^2 \times 2m^3$

.... [2]

(b) $\left(x^8\right)^3$

.... [1]

Question 132

Write as a single fraction in its simplest form.

$$\frac{1}{x+2} - \frac{2}{3x-1}$$

.... [3]

Question 133

(a) Simplify $\left(81y^{16}\right)^{\frac{3}{4}}$.

.... [2]

(b) $2^3 = 4^p$

Find the value of p.

$p =$ .... [1]

Question 134

y is inversely proportional to the square root of $(x + 1)$.
When $x = 8$, $y = 2$.

Find y when $x = 99$.

$y =$ .... [3]

Question 135

Simplify.

(a) $t^{21} \div t^7$

.... [1]

(b) $\left(u^5\right)^5$

.... [1]

Question 136

t is inversely proportional to the square of $(x + 1)$.
When $x = 2$, $t = 5$.

(a) Write *t* in terms of *x*.

$t =$ .... [2]

(b) When $t = 1.8$, find the positive value of *x*.

$x =$ .... [2]

Question 137
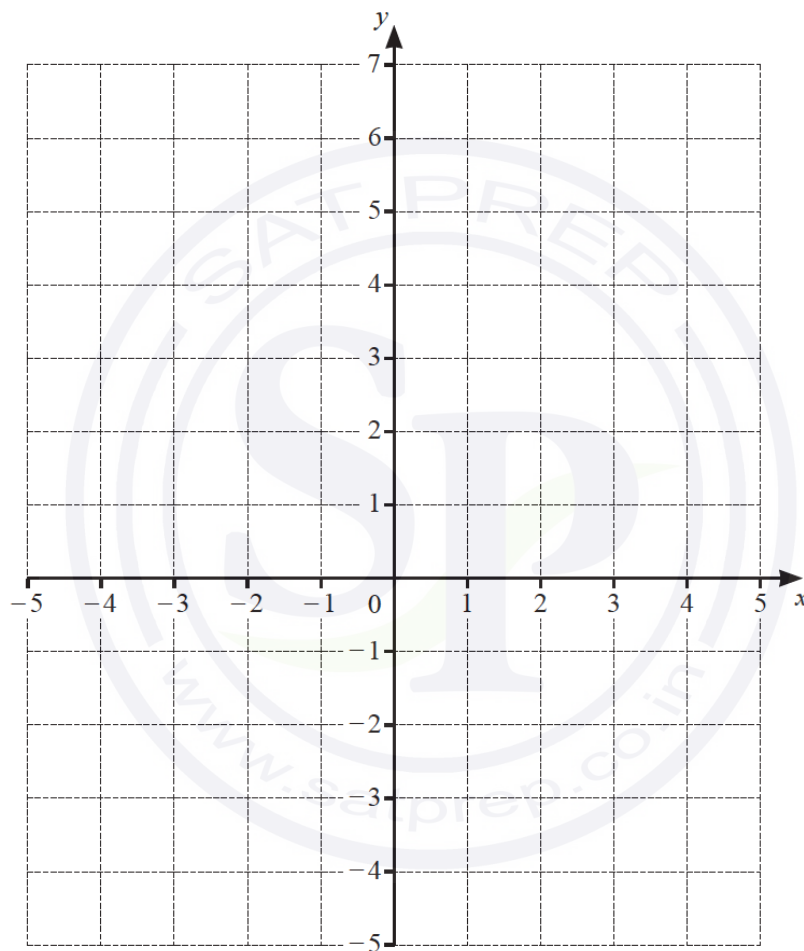
By shading the **unwanted** regions on the grid, draw and label the region *R* that satisfies the following inequalities.

$$-2 < x \leqslant 3 \qquad\qquad y \leqslant x + 3$$

[4]

Question 138

(a) $3^{-2} \times 3^x = 81$

Find the value of x.

x = ... [2]

(b) $x^{-\frac{1}{3}} = 32x^{-2}$

Find the value of x.

x = ... [3]

Question 139
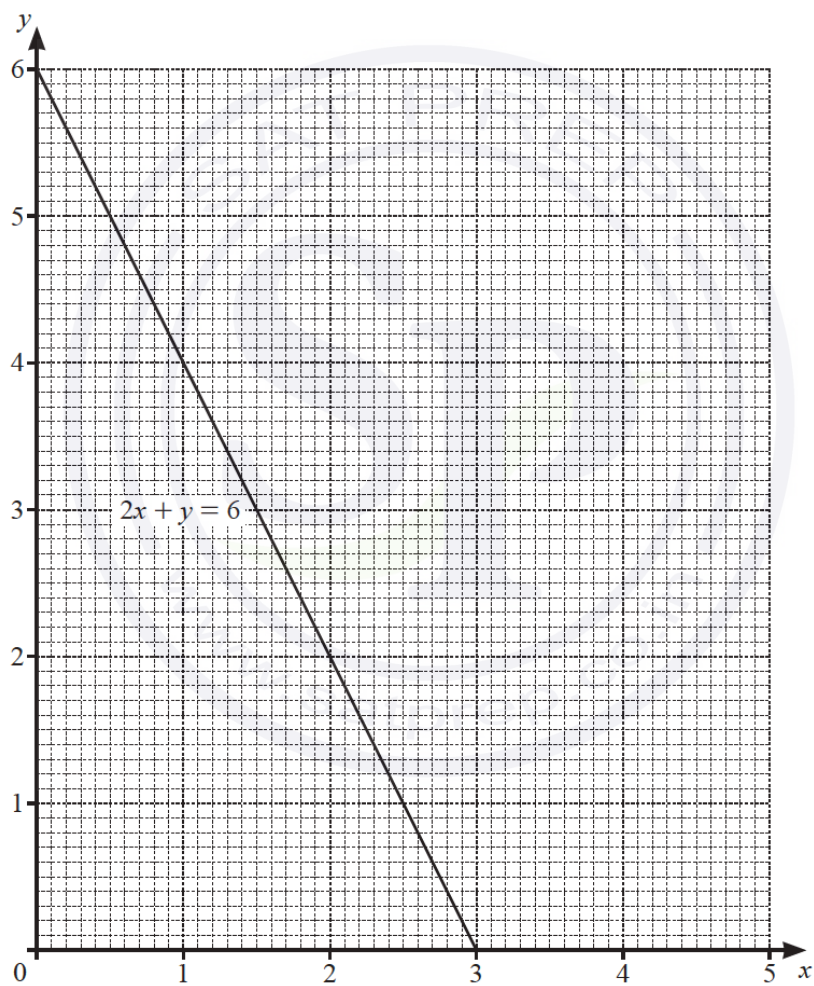
By shading the **unwanted** regions of the grid, find and label the region R that satisfies the following inequalities.

$$y \leqslant 5 \qquad 2x + y \geqslant 6 \qquad y \geqslant x + 1 \qquad \text{[4]}$$

Question 140

Solve the inequality.

$$\frac{x}{2} - 13 > 12 + 3x$$

.... [2]

Question 141

Write $\frac{x}{2} - \frac{2x+4}{x+1}$ as a single fraction, in its simplest form.

.... [3]

Question 142

y is inversely proportional to x^2.
When $x = 4$, $y = 2$.

Find y when $x = \frac{1}{2}$.

$y =$ .... [3]

Question 143

$$P = 2r + \pi r$$

Rearrange the formula to write r in terms of P and π.

$r =$ .... [2]

Question 144

Simplify.

$$\left(\frac{x^3}{8}\right)^{-\frac{4}{3}}$$

.... [2]

Question 145

Simplify $2x^3 \times 3x^2$.

.... [2]

Question 146

y is directly proportional to the cube root of $(x+3)$.
When $x = 5$, $y = \frac{2}{3}$.

Find y when $x = 24$.

$y =$ .... [3]

Question 147

Simplify.

(a) $p^2 \times p^4$

.... [1]

(b) $m^{15} \div m^5$

.... [1]

(c) $(k^3)^5$

.... [1]
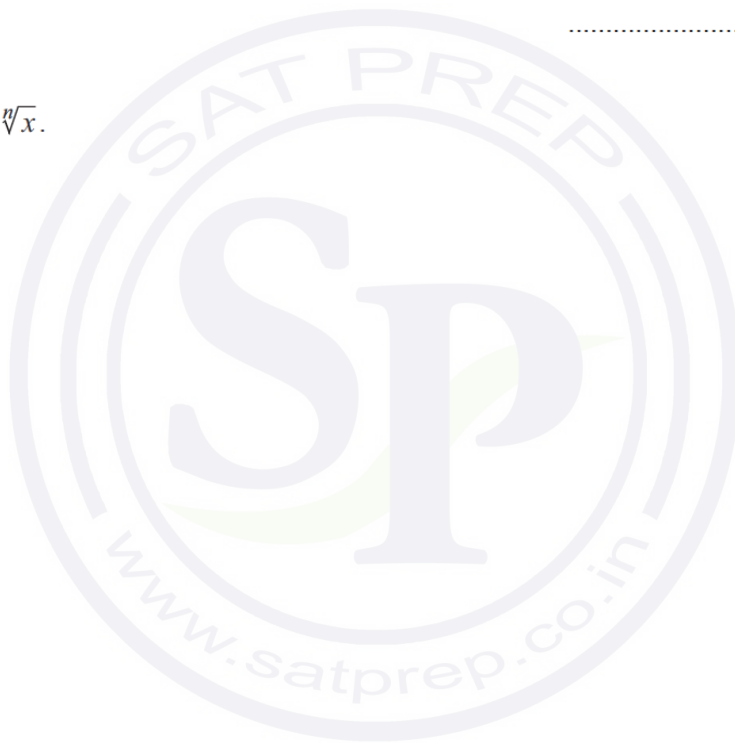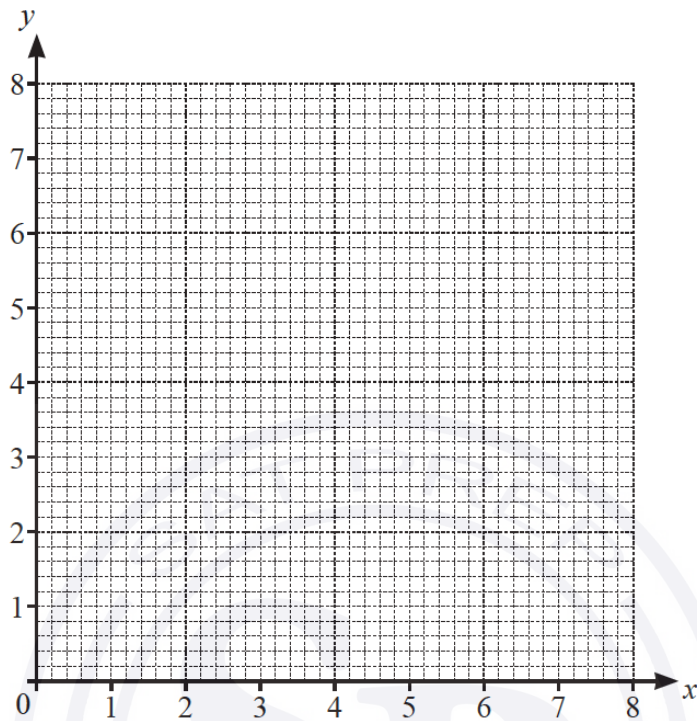
Question 148

$\sqrt[3]{y^2} = \sqrt[6]{x}$ and $y = \sqrt[n]{x}$.

Find the value of n.

Question 149

(a) By drawing suitable lines and shading unwanted regions, find the region, R, where

$$x \geqslant 2, \quad y \geqslant x \quad \text{and} \quad 2x + y \leqslant 8.$$ [5]

(b) Find the largest value of $x + y$ in the region R.

.... [1]

Question 150

p is directly proportional to $(q+2)^2$.
When $q = 1$, $p = 1$.

Find p when $q = 10$.

$p =$ .... [3]

Question 151

Simplify.

(a) $(5x^4)^3$

.... [2]

(b) $(256x^{256})^{\frac{3}{8}}$

.... [2]

Question 152

Simplify $8t^8 \div 4t^4$.

.... [2]

Question 153

m is inversely proportional to the square of $(p-1)$.
When $p = 4$, $m = 5$.

Find m when $p = 6$.

$m =$ .... [3]

Question 154

y is inversely proportional to the square root of x.
When $y = 7$, $x = 2.25$.

Write y in terms of x.

$y =$ .... [2]

Question 155

(a) Simplify.

$\left(4xy^2\right)^3$

.... [2]

(b) $25 = 125^k$

Find the value of k.

$k =$ .... [1]

Question 156

y is inversely proportional to the square root of x.
When $y = 7$, $x = 2.25$.

Write y in terms of x.

$y =$ .... [2]

Question 157

(a) Simplify.

$$\left(4xy^2\right)^3$$

.... [2]

(b) $25 = 125^k$

Find the value of k.

$k =$ .... [1]

Question 158

Simplify.

$$a^2 \div a^6$$

.... [1]

Question 159

Simplify.

$$2x^2 \times 5x^5$$

.... [2]

Question 160

Simplify $\left(343x^9\right)^{\frac{2}{3}}$.

.... [2]

Question 161
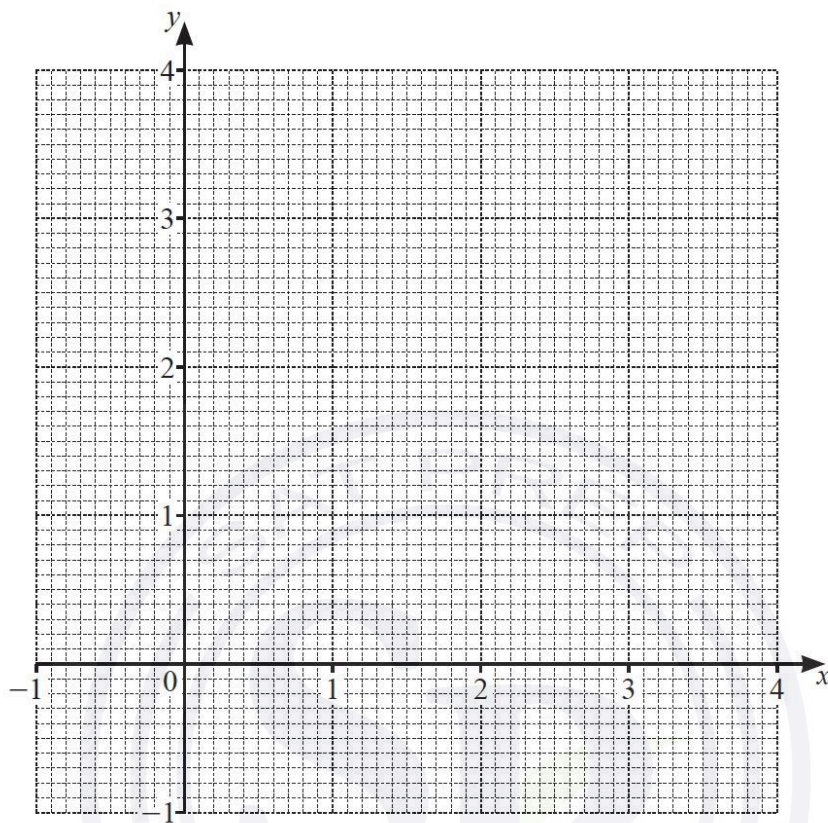
The region R satisfies these three inequalities.

$$y > 1 \qquad y < 2x + 2 \qquad x + y \leqslant 3$$

By drawing three suitable lines, and shading unwanted regions, find and label the region R. [5]

Question 162

z is inversely proportional to the square of $(y - 2)$.
When $y = 5$, $z = 9$.

Find z in terms of y.

$z = $ .... [2]

Question 163

x is an integer and $-3 \leqslant 2x - 1 < 3$.

Find the values of x.

.... [2]

Question 164

Simplify $3x^3 \times 4x^4$.

.... [2]

Question 165

The force of attraction, F Newtons, between two magnets is inversely proportional to the square of the distance, d cm, between the magnets.

When $d = 1.5$, $F = 48$.

(a) Find an expression for F in terms of d.

$F = $ .... [2]

(b) When the distance between the two magnets is doubled the new force is n times the original force.

Work out the value of n.

$n = $ .... [1]

Question 166

y is directly proportional to the square root of $(x - 3)$.
When $x = 28$, $y = 20$.

Find y when $x = 39$.

$y = $ .... [3]

Question 167

(a) Simplify fully.

$$(4ab^5)^4$$

.... [2]

(b) $\quad 2p^{\frac{1}{3}} = 6$

Find the value of p.

$p = $ .... [1]

(c) $\quad 81^2 \div 3^t = 9$

Find the value of t.

$t = $ .... [2]

Question 168

Simplify fully.

$$\left(243y^{10}\right)^{\frac{3}{5}}$$

.... [2]

Question 169

Simplify.

$$32g^{32} \div 4g^4$$

.... [2]

Question 170

(a) Write 243×27^{2n} as a single power of 3 in terms of n.

.... [2]

(b) $k = 2 \times 3^2 \times p^3$, where p is a prime number greater than 3.

Write $6k^2$ as a product of prime factors in terms of p.

.... [2]

Question 171

(a) Simplify.

$$\frac{x^{\frac{2}{3}}}{x^{\frac{8}{3}}}$$

.... [1]

(b) $16 = 64^k$

Find the value of k.

$k = $ .... [1]

(c) Solve.

$$3^{3x} \times \left(\frac{1}{9}\right)^{4-3x} = 3$$

$x = $ .... [3]

Question 172

y is inversely proportional to the square root of $(x-2)$.
When $x = 4.25$, $y = 12$.

Find x when $y = 3$.

$x = $ .... [3]

Question 173

y is inversely proportional to the square root of $(x + 4)$.
When $x = 5$, $y = 2$.

Find y when $x = 77$.

$y =$ .... [3]

Question 174

Mrs Kohli buys a jacket, 2 shirts and a hat.
The jacket costs $\$x$.
The shirts each cost $24 less than the jacket and the hat costs $16 less than the jacket.
Mrs Kohli spends exactly $100.

Write down an equation in terms of x.
Solve this equation to find the cost of the jacket.

$ .... [3]

Question 175

(a) Simplify $h^2 \times h^5$.

.... [1]

(b) Simplify $\left(\dfrac{7}{x}\right)^{-3}$.

.... [1]

(c) $a^8 \div a^p = a^2$

Find the value of p.

$p =$ .... [1]

Question 176
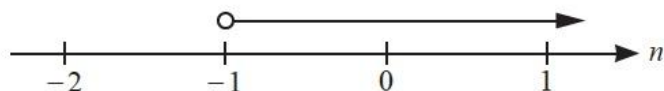
Write down the inequality, in terms of n, shown by the number line.

.... [1]

Question 177

$$m^{-\frac{1}{4}} = 27m^{-1}$$

Find the value of m.

$m =$ .... [3]

Question 178

y is inversely proportional to the cube of $(x-1)$.
$y = 9.45$ when $x = 3$.

Find y when $x = 4$.

$y =$ .... [3]

Question 179

Simplify.

(a) $y^3 \div y^5$

.... [1]

(b) $7x^0$

.... [1]

Question 180

(a) y is directly proportional to the cube root of $(x+1)$.
When $x = 7$, $y = 1$.

Find the value of y when $x = 124$.

$y =$ .... [3]

(b) F is inversely proportional to the square of d.

Explain what happens to F when d is halved.

.... [1]

Question 181

Find the value of p when $6^p \times 6^4 = 6^{28}$.

$p = $ .... [1]

Question 182

w is proportional to the square root of y.
y is inversely proportional to x.
When $x = 4$, $y = 16$ and $w = 8$.

Find w in terms of x.

$w = $ .... [3]

Question 183

$$x^2 + 8x + 10 = (x+p)^2 + q$$

(a) Find the value of p and the value of q.

$p = $ ....

$q = $ .... [2]

(b) Solve.
$$x^2 + 8x + 10 = 30$$

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

Question 184

Simplify fully $(216y^{216})^{\frac{2}{3}}$.

.... [2]

Question 185

$$4^x = \frac{1}{64}$$

Find the value of x.

$x = $ .... [1]

Question 186

Write as a single fraction in its simplest form.

$$\frac{4}{2x-3} \div \frac{2x^2+14x}{2x^2+11x-21}$$

.... [4]

44

Question 187

y is proportional to the square of $(x-7)$.
When $x = 12$, $y = 2$.

Find y when $x = 17$.

$y =$ .... [3]

Question 188

Solve $\dfrac{4}{x+1} + \dfrac{2}{2x-5} = 3$.

You must show all your working.

$x =$ .... or $x =$ .... [7]

Question 189

Simplify fully.

(a) $(81x^{16})^{\frac{3}{4}}$

.... [2]

(b) $\left(\dfrac{1}{y^2}\right)^{-\frac{1}{2}}$

.... [1]

Question 190

y is inversely proportional to $\sqrt{x}$ and x is directly proportional to w^2.
When $w = 12$, $y = 12$.

Find y in terms of w.

$y =$ .... [3]

Question 191

Simplify $\left(3125x^{3125}\right)^{\frac{1}{5}}$.

.... [2]

Question 192

Simplify $18x^{18} \div 9x^9$.

.... [2]

Question 193

Simplify.

$$\frac{5x^2 - 19x + 12}{x^2 - 9}$$

.... [4]

Question 194

y is inversely proportional to x^2.
When $x = 3$, $y = 2$.

Find y when $x = 2$.

$y =$ .... [3]

Question 195

Simplify $\left(3125w^{3125}\right)^{\frac{1}{5}}$.

.... [2]

Question 196

Simplify.

$$\frac{2x^2 + 5x - 12}{4x^2 - 9}$$

.... [4]

Question 197

y is inversely proportional to the cube root of $(x + 5)$.
When $x = 3$, $y = 12$.

Find y when $x = 22$.

$y =$ .... [3]

Question 198

Rearrange the formula to make m the subject.

$$R = \frac{2(m - k)}{m}$$

$m =$ .... [4]

Question 199

Write as a single fraction in its simplest form.

$$\frac{5}{3x+2} + \frac{4}{2x-1}$$

..................................[3]

Question 200

m is inversely proportional to the square of $(t+2)$.
$m = 0.64$ when $t = 3$.

Find m when $t = 8$.

$m =$ .... [3]

Question 201

Make x the subject of the formula.

$$c = \frac{3x}{2x-5}$$

$x =$ .... [4]

Question 202

y is directly proportional to the square of $(x + 3)$.
When $x = 2$, $y = 5$.

Find y when $x = 1$.

$y =$ .... [3]

Question 203

Simplify.

$$\frac{x-5}{x^2-25}$$

.... [2]

Question 204

$$T = \sqrt{3d-e}$$

Rearrange the formula to make d the subject.

$d =$ .... [3]

Question 205

The graph of $y = 2x + 1$ is drawn on the grid.
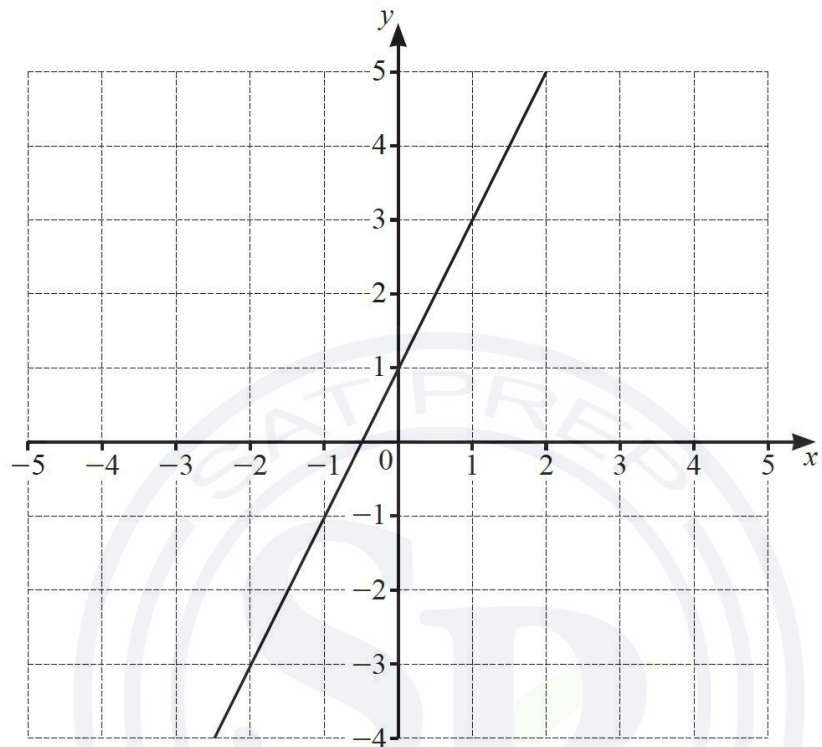
By shading the **unwanted** regions of the grid, find and label the region R which satisfies these inequalities.

$$y \geqslant 2x + 1 \qquad\qquad y \geqslant 1 \qquad\qquad 4x + 3y < 12 \qquad\qquad [4]$$

Question 206

$$P = \frac{2wy^2}{3}$$

Find the positive value of y when $P = 108$ and $w = 8$.

$y =$ .... [3]

Question 207

Simplify.

$$\frac{ax - 2a - x + 2}{a^2 - 1}$$

.... [4]

Question 208

x is inversely proportional to the square root of w.
When $w = 16$, $x = 3$.

Find x in terms of w.

$x = $ .... [2]

Question 209

Write as a single fraction in its simplest form.

(a) $\dfrac{10x^2 - 60x}{x^2 - x - 30}$

.... [3]

(b) $\dfrac{7}{x+3} + \dfrac{5}{8x-1}$

.... [3]

Question 210
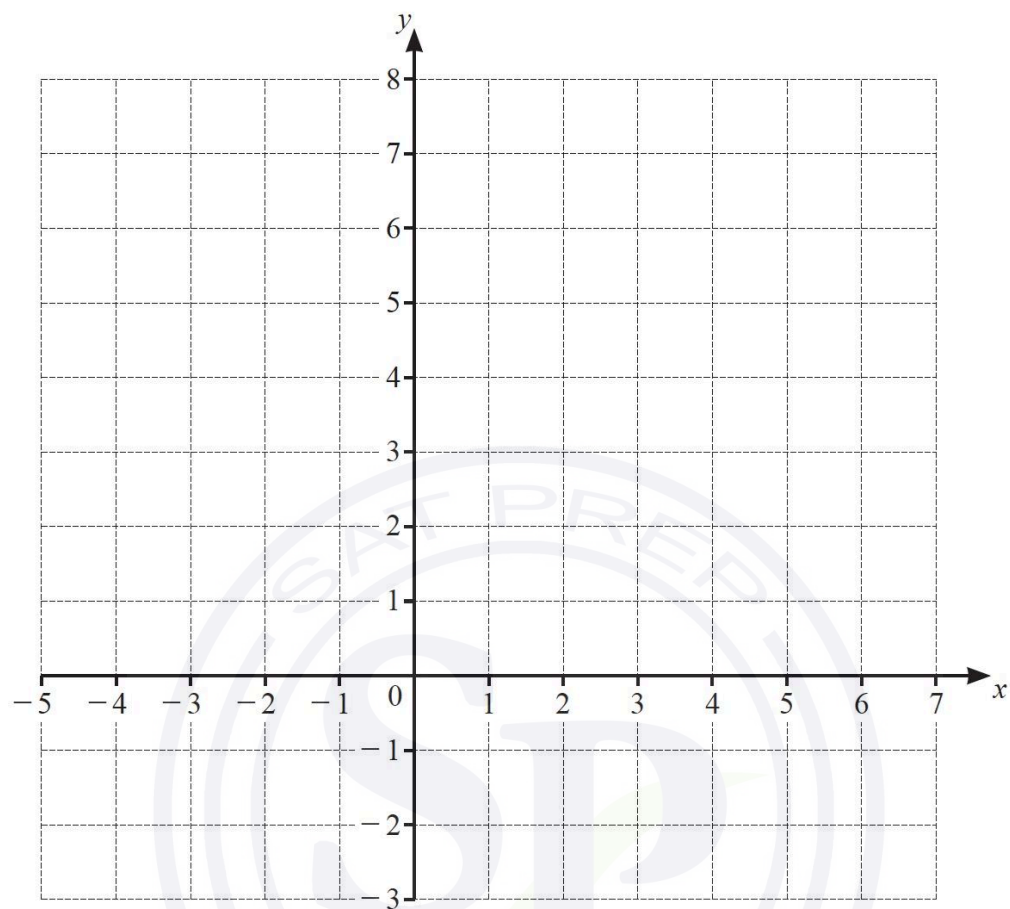
By shading the **unwanted** regions of the grid, draw and label the region R which satisfies these inequalities.

$$y > 1 \qquad\qquad x \leqslant 2 \qquad\qquad y \geqslant x + 2$$

[5]

Question 211

Solve.
$$4(2x - 3) \geqslant 43 + 3x$$

.... [3]

Question 212

y is inversely proportional to the square of $(x+3)$.
When $x = 5$, $y = 0.375$.

Find y in terms of x.

$y = $ .... [2]

Question 213

Simplify.

$$\frac{pt-p-t+1}{1-t^2}$$

.... [4]

Question 214

Simplify.

$$\frac{2}{y+1} - \frac{3}{y}$$

Give your answer as a single fraction in its simplest form.

.... [3]

Question 215

(a) y is directly proportional to $(x-1)^2$.
When $x = 4$, $y = 3$.

Find y when $x = 7$.

$y = $ .... [3]
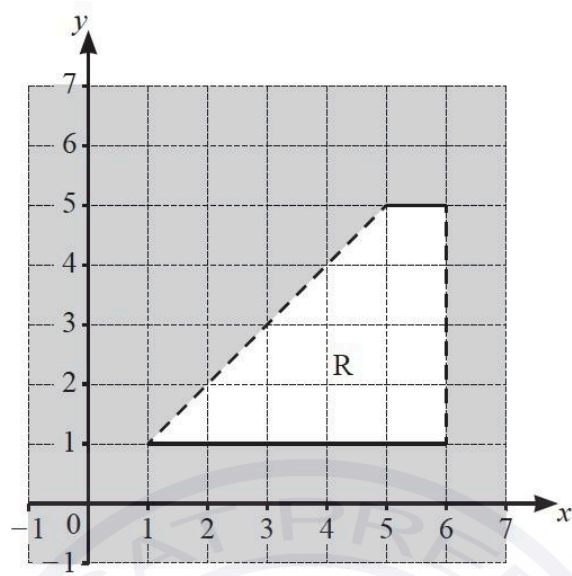
(b) m is inversely proportional to the square root of p.

Explain what happens to the value of m when the value of p is multiplied by 9.

.... [1]

Question 216

Find the inequalities that define the unshaded region, R.

.... [4]