Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel Level 1/Level 2 GCSE (9–1)

Time 1 hour 30 minutes

Paper reference **1MA1/1H**

Mathematics

PAPER 1 (Non-Calculator)
Higher Tier

You must have: Ruler graduated in centimetres and millimetres, protractor, pair of compasses, pen, HB pencil, eraser. Tracing paper may be used.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- You must **show all your working**.
- Diagrams are **NOT** accurately drawn, unless otherwise indicated.
- **Calculators may not be used.**

Information

- The total mark for this paper is 80
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

P64630A

E:1/1/1/1/1/1/

P 6 4 6 3 0 A 0 1 2 4

Pearson

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 (a) Work out 3.67×4.2

$$\begin{array}{r} {}^{2}3\ {}^{2}6\ 7 \\ \times\quad 4\ 2 \\ \hline {}^{1}7\ 3\ 4 \\ 1\ {}^{1}4\ 6\ 8\ 0 \\ \hline 1\ 5\ 4\ 1\ 4 \end{array}$$

15.414

(3)

(b) Work out $59.84 \div 1.6$

×10 ×10

598.4 ÷ 16

$$\begin{array}{r} 0\ 3\ 7\ .\ 4 \\ 16\overline{)\ 5\ {}^{5}9\ {}^{11}8\ .\ {}^{6}4} \end{array}$$

16
32
48
64
80
96
112
128
144

37.4

(3)

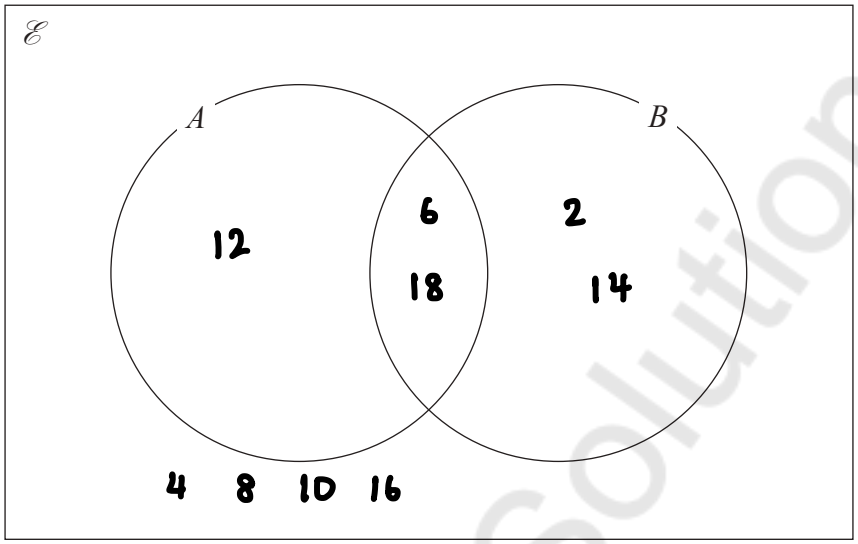
(Total for Question 1 is 6 marks)

2 $\mathscr{E}$ = {even numbers less than 19} = [2, 4, 6, 8, 10, 12, 14, 16, 18]

A = {6, 12, 18}

B = {2, 6, 14, 18}

Complete the Venn diagram for this information.



(Total for Question 2 is 3 marks)

3 Work out $4\frac{1}{5} - 2\frac{2}{3}$

Give your answer as a mixed number.

$4\frac{1}{5} = \frac{21}{5}$ $\quad 2\frac{2}{3} = \frac{8}{3}$

$\frac{21}{5} \times 3 \quad \frac{8}{3} \times 5$

$\frac{63}{15} - \frac{40}{15} = \frac{23}{15}$

$= 1\frac{8}{15}$

$1\frac{8}{15}$

(Total for Question 3 is 3 marks)

4 At the end of 2017

the value of Tamara's house was £220 000
the value of Rahim's house was £160 000

At the end of 2019

the value of Tamara's house had decreased by 20%
the value of Rahim's house had increased by 30%

At the end of 2019, whose house had the greater value?
You must show how you get your answer.

Tamara's

10% of £220,000 = £22,000

20% = £44,000

$$\begin{array}{r} {}^{1}{}^{1}220,000 \\ -\ 44,000 \\ \hline £\ 176,000 \end{array}$$

Rahim's

10% of £160,000 = £16,000

30% = £48,000

$$\begin{array}{r} {}^{1}160,000 \\ +\ 48,000 \\ \hline £\ 208,000 \end{array}$$

Rahim's

(Total for Question 4 is 4 marks)

5 Rosie, Matilda and Ibrahim collect stickers.

$$\frac{\text{number of stickers Rosie has}}{} : \frac{\text{number of stickers Matilda has}}{} : \frac{\text{number of stickers Ibrahim has}}{} = 4:7:15$$

Ibrahim has 24 more stickers than Matilda.

Ibrahim has more stickers than Rosie.
How many more?

R : M : I

4 : 7 : 15

15 - 7 = 8 parts

24 ÷ 8 = 3

Rosie = 12

Matilda = 21

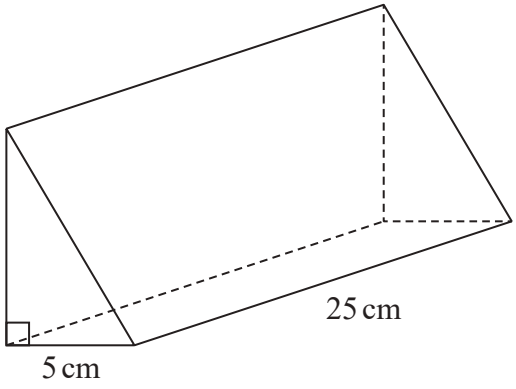
Ibrahim = 45

45 - 12 = 33

33

(Total for Question 5 is 3 marks)

6 The diagram shows a prism.



The cross section of the prism is a right-angled triangle.
The base of the triangle has length 5 cm

The prism has length 25 cm
The prism has volume 750 cm^3

Work out the height of the prism.

Vol. of prism = area of cross-section × length

750 = area of triangle × 25

÷25 ÷25

30 = area of triangle

30 = $\frac{1}{2}$ bh

30 = $\frac{1}{2}$ × 5 × h

×2 ×2

60 = 5 × h

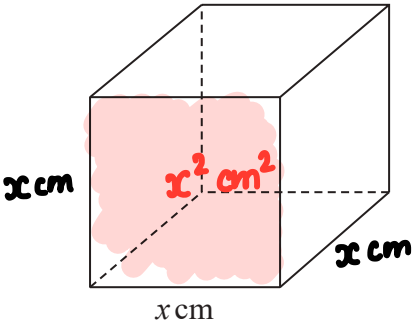
÷5 ÷5

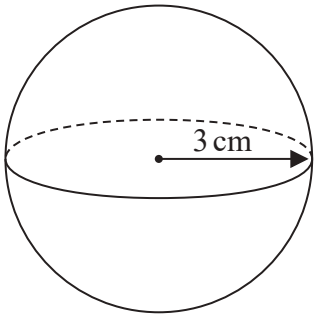
12 = h

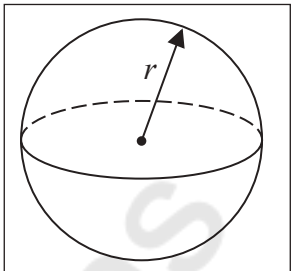
12 cm

(Total for Question 6 is 3 marks)

7 The diagram shows a cube with edges of length x cm and a sphere of radius 3 cm.







Surface area of sphere = $4\pi r^2$

The surface area of the cube is equal to the surface area of the sphere.

Show that $x = \sqrt{k\pi}$ where k is an integer.

S.A. cube = $6 \times x^2$

$= 6x^2$ cm²

S.A. of sphere = $4\pi r^2$ $r = 3$

$= 4\pi(3)^2$

$= 4\pi(9)$

$= 36\pi$

$6x^2 = 36\pi$

$\div 6 \quad \div 6$

$x^2 = 6\pi$

$\sqrt{\ } \quad \sqrt{\ }$

$x = \sqrt{6\pi}$

(Total for Question 7 is 4 marks)

8 Solve $x^2 = 5x + 24$

$-5x - 24 \quad -5x - 24$

$x^2 - 5x - 24 = 0$

$(x - 8)(x + 3) = 0$

$x - 8 = 0 \qquad x + 3 = 0$

$+8 \quad +8 \qquad -3 \quad -3$

$x = 8 \qquad x = -3$

$x = 8$ or $x = -3$

(Total for Question 8 is 3 marks)

9 (a) Write down the value of 7^0

$x^0 = 1$

1

(1)

(b) Find the value of $3 \times 3^6 \times 3^{-6}$

$3^{1+6+-6} = 3^1 = 3$

3

(1)

(c) Find the value of 2^{-4}

$x^{-a} = \frac{1}{x^a}$

$2^{-4} = \frac{1}{2^4} = \frac{1}{16}$

$\frac{1}{16}$

(1)

(d) Find the value of $27^{\frac{1}{3}}$

$x^{\frac{1}{3}} = \sqrt[3]{x}$

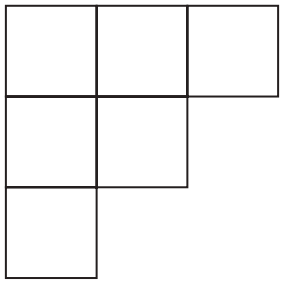
$27^{\frac{1}{3}} = \sqrt[3]{27} = 3$

3

(1)

(Total for Question 9 is 4 marks)

10 The diagram shows a shape made from 6 identical squares.



The total area of the shape is 5406 cm^2

(a) Find an estimate for the length of one side of each square.
Give your answer correct to the nearest whole number.

$5406 \approx 5400\,cm^2$

$5400\,cm^2 \div 6 = 900\,cm^2$

$\sqrt{900} = 30\,cm$

30 cm

(3)

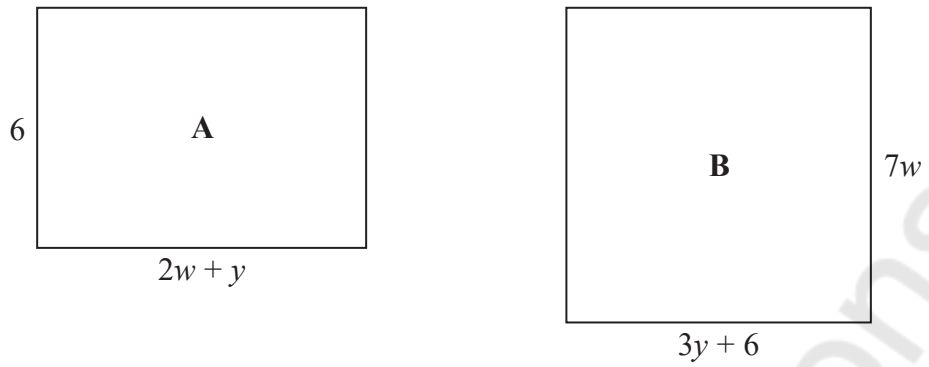
(b) Is your answer to part (a) an underestimate or an overestimate?
You must give a reason for your answer.

Underestimate. The area of the shape rounded down.

(1)

(Total for Question 10 is 4 marks)

11 The diagram shows two rectangles, **A** and **B**.



All measurements are in centimetres.

The area of rectangle **A** is equal to the area of rectangle **B**.

Find an expression for y in terms of w.

Area of A = l x w
= 6(2w + y)
= 12w + 6y

Area of B = l x w
= 7w(3y + 6)
= 21wy + 42w

12w + 6y = 21wy + 42w
−12w −21wy −21wy −12w

6y − 21wy = 42w − 12w
6y − 21wy = 30w
y(6 − 21w) = 30w

$$y = \frac{30w}{6 - 21w}$$

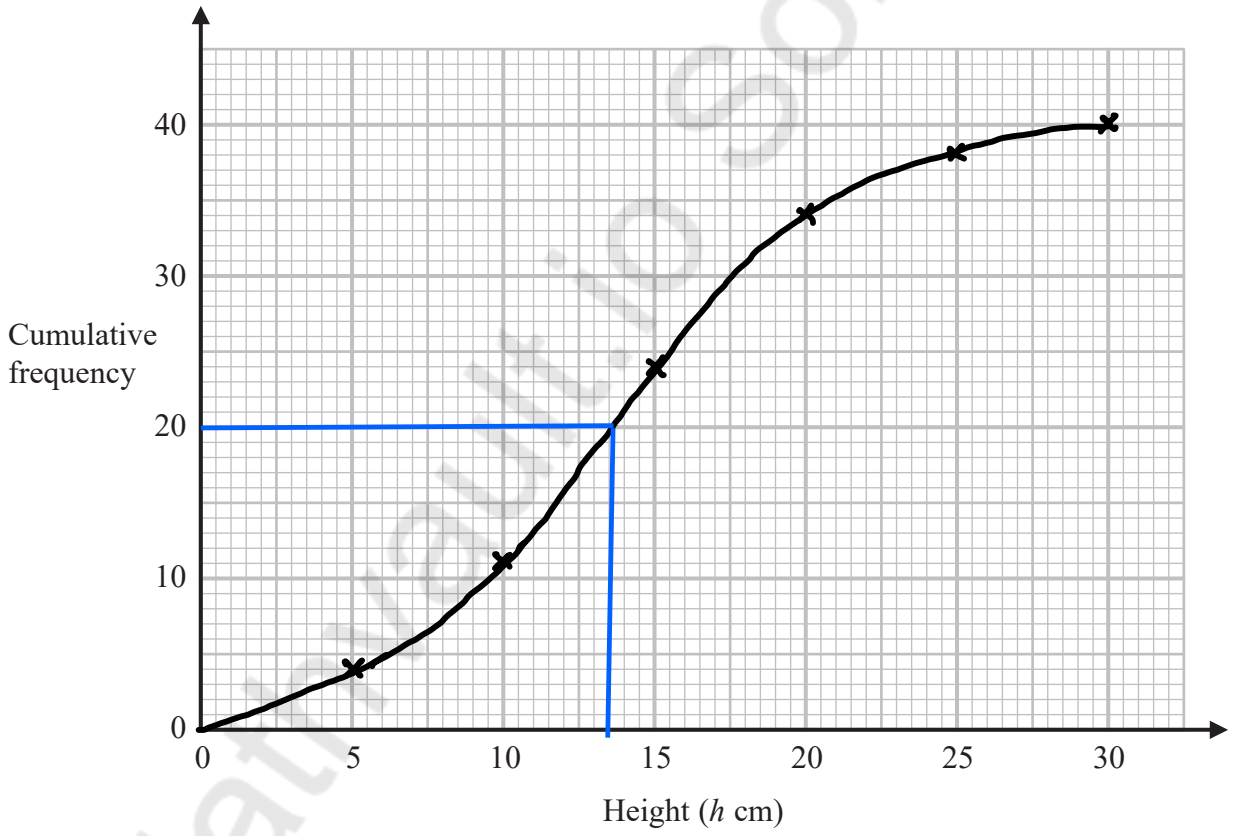
$y = \dfrac{30w}{6 - 21w}$

(Total for Question 11 is 4 marks)

12 The cumulative frequency table gives information about the heights, in cm, of 40 plants.

Height (h cm)	Cumulative Frequency
$0 < h \leqslant 5$	4
$0 < h \leqslant 10$	11
$0 < h \leqslant 15$	24
$0 < h \leqslant 20$	34
$0 < h \leqslant 25$	38
$0 < h \leqslant 30$	40

(a) On the grid, draw a cumulative frequency graph for this information.



(2)

(b) Use the graph to find an estimate for the median height of the plants.

13.5 cm

(1)

(Total for Question 12 is 3 marks)

13 Ted is trying to change $0.\dot{4}\dot{3}$ to a fraction.

Here is the start of his method.

$$x = 0.\dot{4}\dot{3}$$

$$10x = 4.\dot{3}\dot{4}$$

$$10x - x = 4.\dot{3}\dot{4} - 0.\dot{4}\dot{3}$$

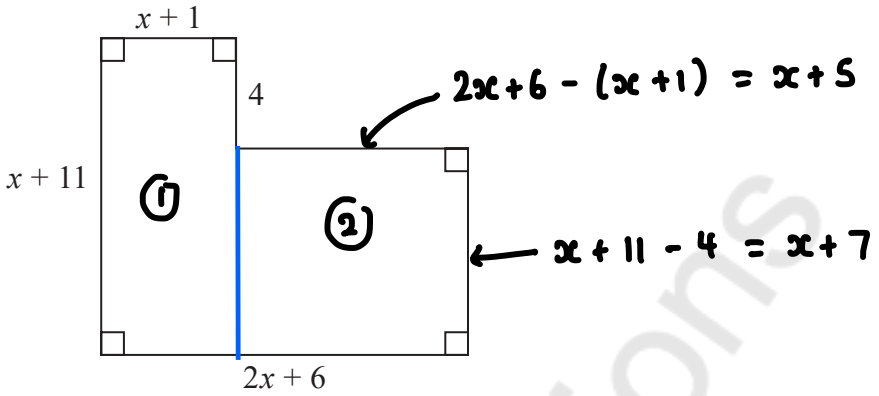
Evaluate Ted's method so far.

The recurring digits in x and $10x$ do not match.

He should use $100x = 43.\dot{4}\dot{3}$, then $100x - 9x$

(Total for Question 13 is 1 mark)

14 Here is a shape with all its measurements in centimetres.



The area of the shape is A cm^2

Show that $A = 2x^2 + 24x + 46$

① Area = l x w
= (x+1)(x+11)
= $x^2 + 11x + x + 11$
= $x^2 + 12x + 11$

② Area = l x w
= (x+5)(x+7)
= $x^2 + 5x + 7x + 35$
= $x^2 + 12x + 35$

$$A = \begin{array}{r} x^2 + 12x + 11 \\ x^2 + 12x + 35 \\ \hline 2x^2 + 24x + 46 \end{array}$$

(Total for Question 14 is 3 marks)

15 Show that $\frac{4x+3}{2x} + \frac{3}{5}$ can be written in the form $\frac{ax+b}{cx}$ where a, b and c are integers.

$$\frac{5(4x+3) + 3(2x)}{10x}$$

$$\frac{20x + 15 + 6x}{10x}$$

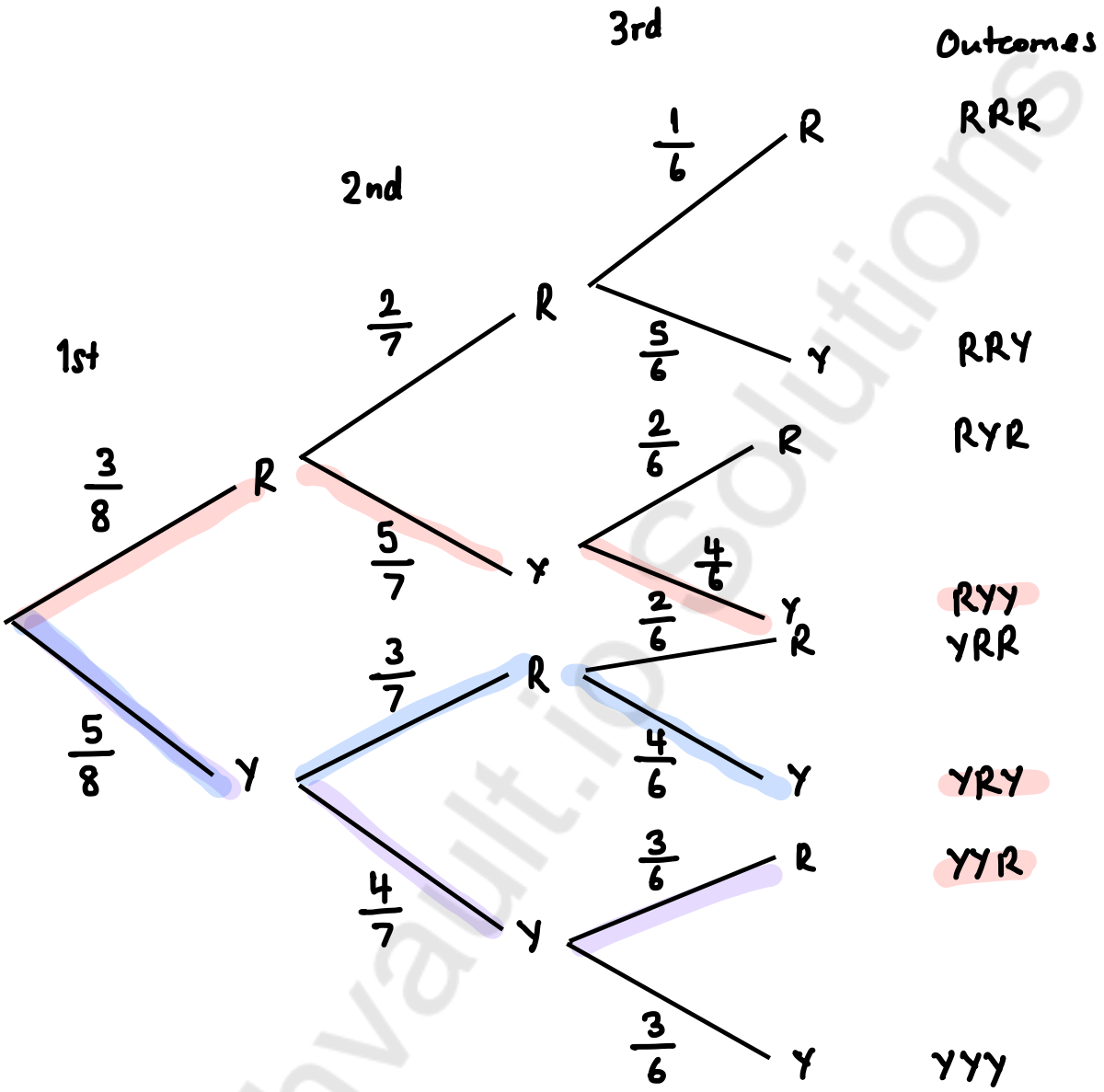
$$\frac{26x + 15}{10x}$$

(Total for Question 15 is 3 marks)

16 There are only 3 red counters and 5 yellow counters in a bag.

Jude takes at random 3 counters from the bag.

Work out the probability that he takes exactly one red counter.



$P(RYY) + P(YRY) + P(YYR)$

$\left(\frac{3}{8} \times \frac{5}{7} \times \frac{4}{6}\right) + \left(\frac{5}{8} \times \frac{3}{7} \times \frac{4}{6}\right) + \left(\frac{5}{8} \times \frac{4}{7} \times \frac{3}{6}\right)$

$\frac{5}{28} + \frac{5}{28} + \frac{5}{28} = \frac{15}{28}$

$\frac{15}{28}$

(Total for Question 16 is 4 marks)

17 On the grid show, by shading, the region that satisfies all of these inequalities.

$2y + 4 < x$ $\quad$ $x < 3$ $\quad$ $y < 6 - 3x$

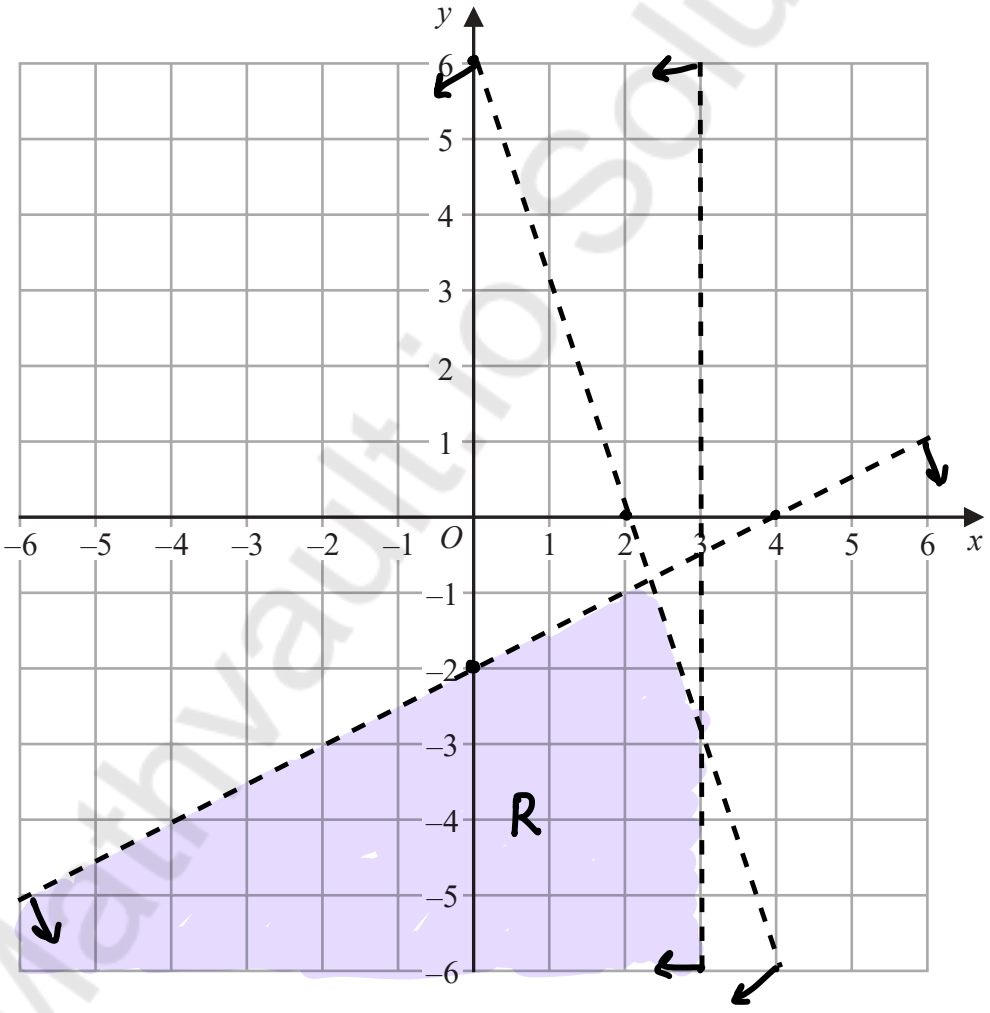
Label the region **R**.

$2y + 4 = x$
$2y + 4 = 0$
$2y = -4$
$y = -2$
$(0, -2)$

$2(0) + 4 = x$
$4 = x$
$(4, 0)$

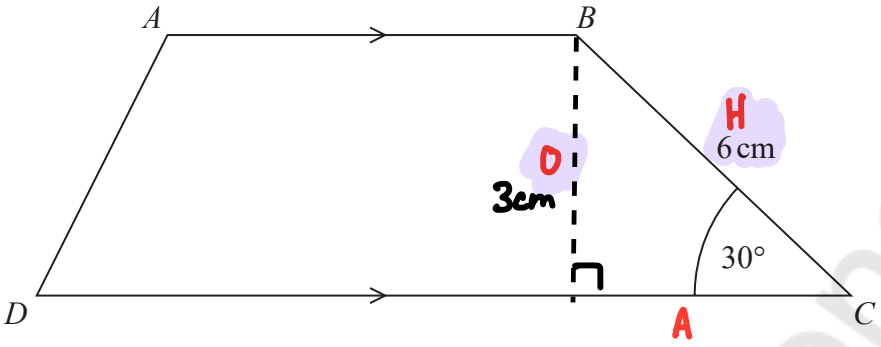
$y = 6 - 3(0)$
$y = 6$
$(0, 6)$

$0 = 6 - 3x$
$-6 = -3x$
$x = 2$
$(2, 0)$



(Total for Question 17 is 3 marks)

18 Here is trapezium $ABCD$.



The area of the trapezium is $66\,cm^2$

the length of AB : the length of $CD = 2 : 3$

Find the length of AB.

$A = \frac{1}{2}(a+b) \times h$

$66 = \frac{1}{2}(AB+CD) \times 3$

$\div 3 \qquad \div 3$

$22 = \frac{1}{2}(AB+CD)$

$\times 2 \qquad \times 2$

$44 = AB + CD$

$AB : CD$

$2 : 3 \quad = 5$ parts

$\times 8.8$

17.6

$\sin\theta = \frac{O}{H}$

$\sin(30) = \frac{O}{6}$

$\times 6 \qquad \times 6$

$O = 6 \times \sin(30)$

$= 6 \times 0.5$

$= 3$

$44 \div 5 = 8.8$

$5\overline{)44^{4}4^{4}0}$ = 08.8

17.6 cm

(Total for Question 18 is 5 marks)

19 Show that $\frac{8+\sqrt{12}}{5+\sqrt{3}}$ can be written in the form $\frac{a+\sqrt{3}}{b}$, where a and b are integers.

$\sqrt{12} = \sqrt{4}\sqrt{3} = 2\sqrt{3}$

$$\frac{8+2\sqrt{3}}{5+\sqrt{3}} \times \frac{5-\sqrt{3}}{5-\sqrt{3}}$$

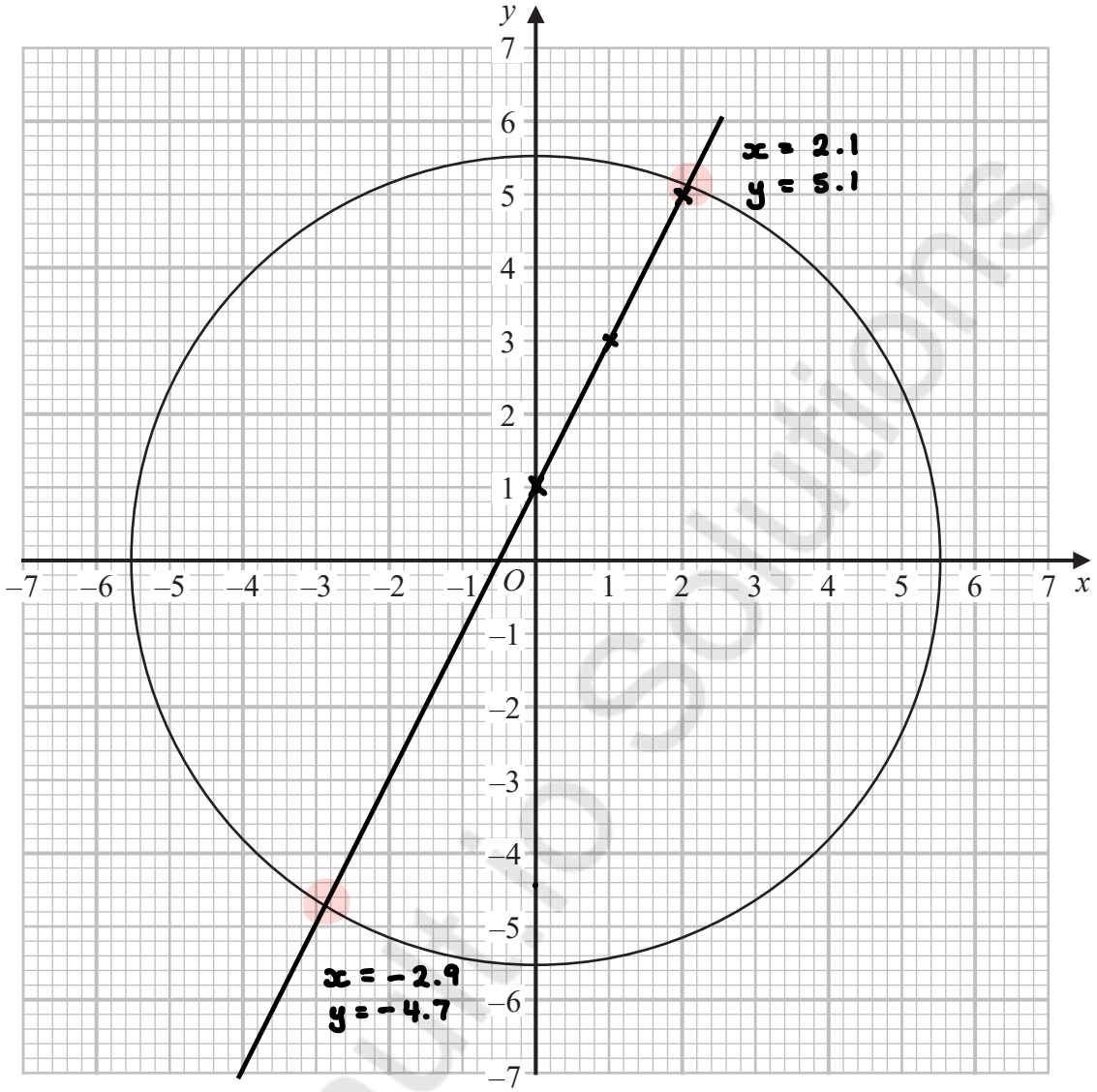
$$\frac{(8+2\sqrt{3})(5-\sqrt{3})}{(5+\sqrt{3})(5-\sqrt{3})}$$

$$\frac{40-8\sqrt{3}+10\sqrt{3}-6}{25+5\sqrt{3}-5\sqrt{3}-3}$$

$$\frac{34+2\sqrt{3}}{22} = \frac{17+\sqrt{3}}{11}$$

(Total for Question 19 is 4 marks)

20 The diagram shows the graph of $x^2 + y^2 = 30.25$



Use the graph to find estimates for the solutions of the simultaneous equations

$x^2 + y^2 = 30.25$

$y - 2x = 1$ ⟶ $y = 2x + 1$

+2x +2x

x	0	1	2
y	1	3	5

$x = -2.9$ $y = -4.7$ $x = 2.1$ $y = 5.1$

(Total for Question 20 is 3 marks)

21 The functions f and g are such that

$$f(x) = 3x^2 + 1 \quad \text{for } x > 0 \qquad \text{and} \qquad g(x) = \frac{4}{x^2} \quad \text{for } x > 0$$

(a) Work out gf(1)

$f(1) = 3(1)^2 + 1$
$= 3 + 1$
$= 4$

$g(4) = \frac{4}{(4)^2} = \frac{4}{16} = \frac{1}{4}$

$\frac{1}{4}$

(2)

The function h is such that $h = (fg)^{-1}$

(b) Find h(x)

$fg(x) = 3\left(\frac{4}{x^2}\right)^2 + 1$

$= 3\left(\frac{16}{x^4}\right) + 1$

$= \frac{48}{x^4} + 1$

$y = \frac{48}{x^4} + 1$

$x = \frac{48}{y^4} + 1$
$-1 \quad -1$

$x - 1 = \frac{48}{y^4}$
$\times y^4 \quad \times y^4$

$y^4(x-1) = 48$
$\div(x-1) \quad \div(x-1)$

$y^4 = \frac{48}{x-1}$

$\sqrt[4]{\ } \quad \sqrt[4]{\ }$

$y = \sqrt[4]{\frac{48}{x-1}}$

$h(x) = \sqrt[4]{\frac{48}{x-1}}$

(4)

(Total for Question 21 is 6 marks)

22 Find the coordinates of the turning point on the curve with equation $y = 9 + 18x - 3x^2$
You must show all your working.

$ax^2 + bx + c$

$y = -3x^2 + 18x + 9$

$= -3(x^2 - 6x - 3)$

$= -3\left[(x-3)^2 - (3)^2 - 3\right]$

$= -3\left[(x-3)^2 - 9 - 3\right]$

$= -3\left[(x-3)^2 - 12\right]$

$= -3(x-3)^2 + 36$

$x - 3 = 0$

$+3 \quad +3$

$x = 3$

(3 , 36)

(Total for Question 22 is 4 marks)

TOTAL FOR PAPER IS 80 MARKS

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