

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 Work out $8.46 \div 0.15$

$$\frac{8.46}{0.15} \times 100 \quad \times 100$$

$$\frac{846}{15}$$

15
30
45
60
75
90

$$15 \overline{) 056.4} \\ \underline{15} 88496 \\ 88496 \\ 0$$

56.4

(Total for Question 1 is 3 marks)

2 Work out $7\frac{3}{8} - 2\frac{1}{2}$

Give your answer as a mixed number.

$$7\frac{3}{8} = \frac{59}{8}$$

$$2\frac{1}{2} = \frac{5}{2}$$

8
16
24
32
40

$$\frac{59}{8} - \frac{5}{2}$$

$$\frac{59}{8} - \frac{20}{8}$$

x4

$$\frac{39}{8} = 4\frac{7}{8}$$

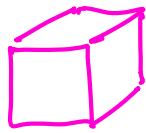
4 $\frac{7}{8}$

(Total for Question 2 is 3 marks)

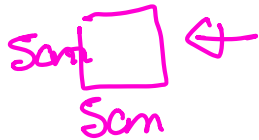


3 A cube has a total surface area of 150 cm^2

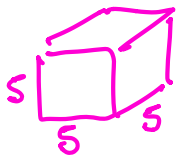
Work out the volume of the cube.



↪ 6 faces = 150 cm^2
so 1 face = 25 cm^2



↪ 25 cm^2 means a side length of 5 cm



Volume = $5 \times 5 \times 5$
= 125

..... 125 cm^3

(Total for Question 3 is 4 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

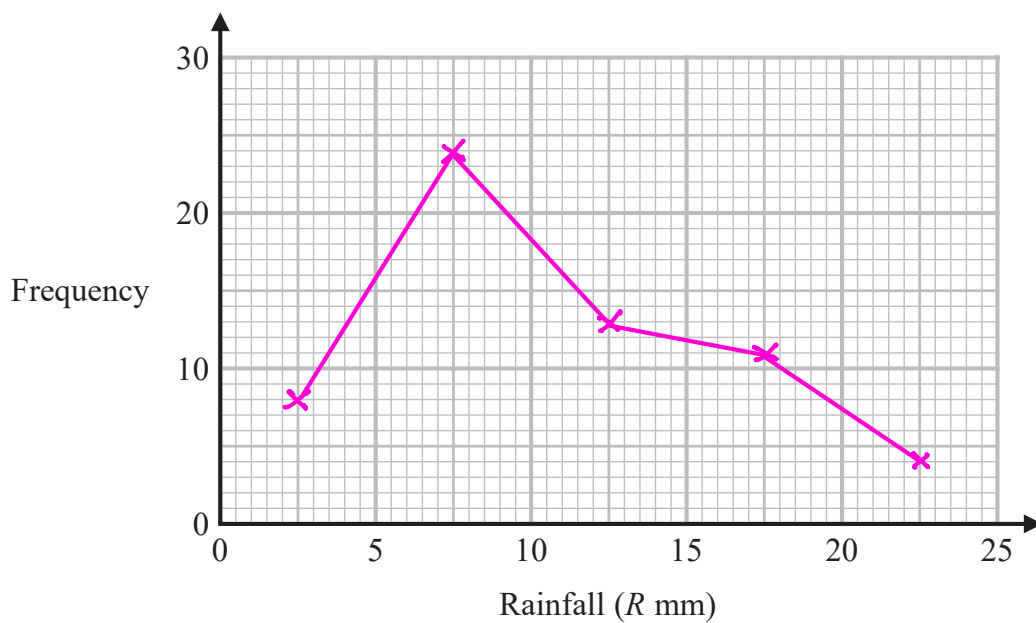


P 7 5 1 4 8 A 0 3 2 4

4 The table shows information about the daily rainfall in a town for 60 days.

Rainfall (R mm)	Frequency
$0 \leq R < 5$	8
$5 \leq R < 10$	24
$10 \leq R < 15$	13
$15 \leq R < 20$	11
$20 \leq R < 25$	4

Draw a frequency polygon for this information.



(Total for Question 4 is 2 marks)



DO NOT WRITE IN THIS AREA

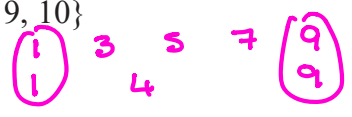
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

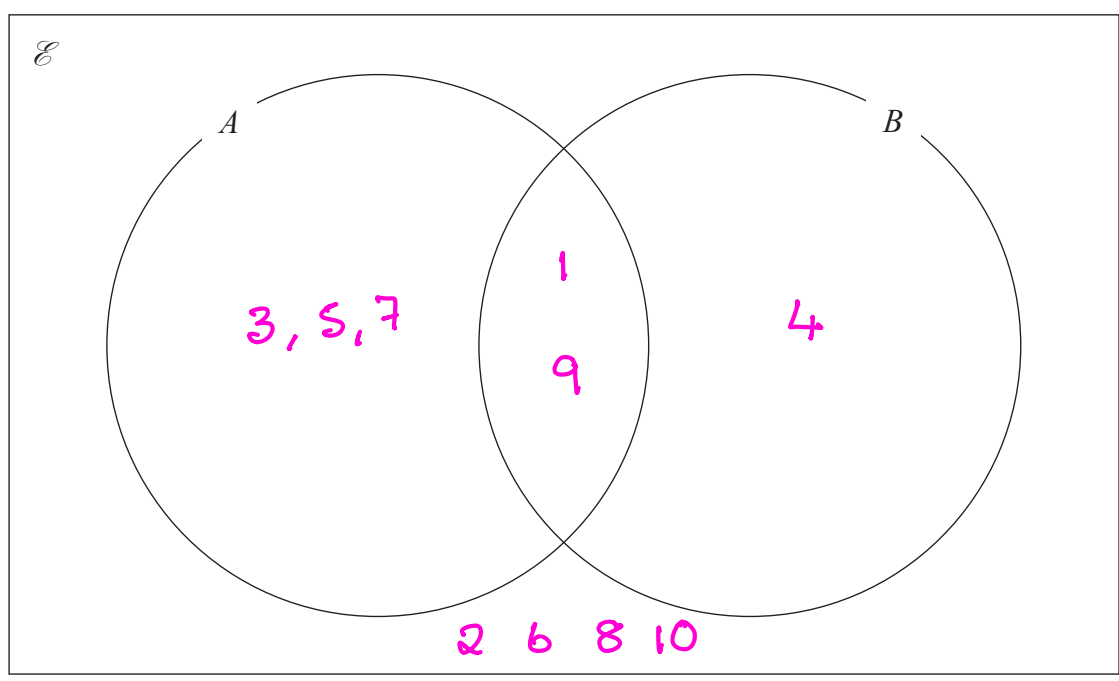
5 $\mathcal{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

$A = \{\text{odd numbers}\}$

$B = \{\text{square numbers}\}$



(a) Complete the Venn diagram for this information.



(3)

A number is chosen at random from the universal set \mathcal{E}

(b) Find the probability that this number is in the set B' NOT B'

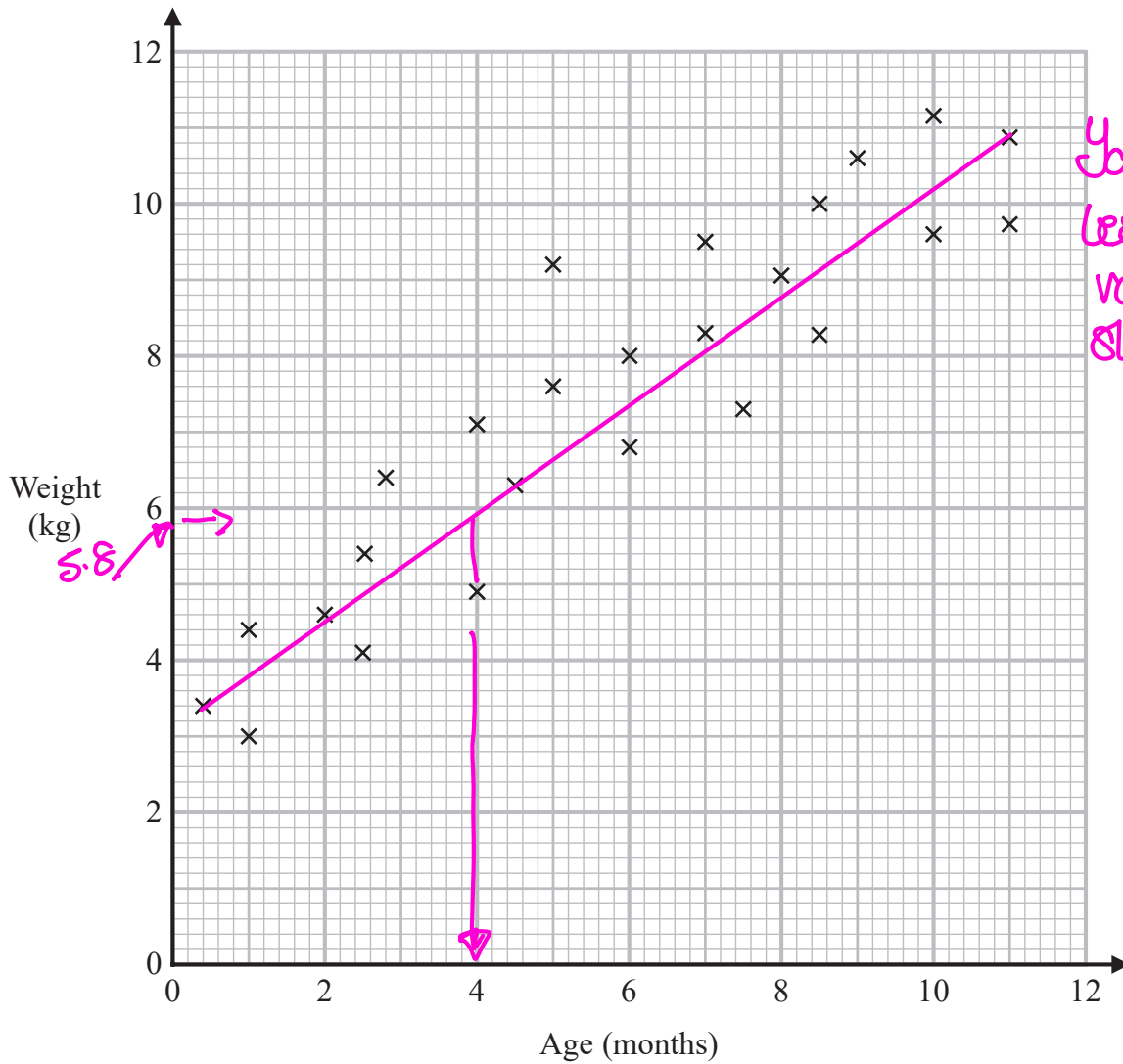
$\frac{7}{10}$

(2)

(Total for Question 5 is 5 marks)



6 The scatter graph shows information about the ages and weights of some babies.



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

(a) Describe the relationship between the age and the weight of the babies.

There is a positive correlation between age and weight.

(1)

Another baby has a weight of 5.8 kg

(b) Using the scatter graph, find an estimate for the age of this baby.

4 months

(orange accentuated) 2.5 to 4.5

(Total for Question 6 is 3 marks)



- 7 The price of a holiday increases by 20%
This 20% increase adds £240 to the price of the holiday.

Work out the price of the holiday before the increase.

$$\boxed{100\%} \quad \boxed{20\%}$$

↑
240

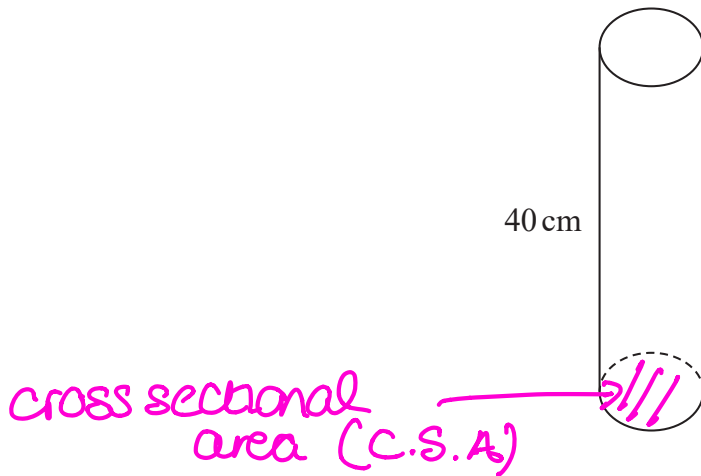
$$\begin{array}{l} 20\% = 240 \\ \downarrow \\ 10\% = 120 \\ \downarrow \\ 100\% = 1200 \end{array} \quad \begin{array}{l} \left. \begin{array}{l} \downarrow \\ \downarrow \end{array} \right\} \div 2 \\ \left. \begin{array}{l} \downarrow \\ \downarrow \end{array} \right\} \times 10 \end{array}$$

£ 1200

(Total for Question 7 is 2 marks)



8 The diagram shows a solid cylinder on a horizontal floor.



$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

$$\begin{aligned} \text{Volume} &= \text{CSA} \times \text{height} \\ 1200 &= \text{CSA} \times 40 \\ \text{CSA} &= \frac{1200}{40} = 30 \end{aligned}$$

The cylinder has a

volume of 1200 cm^3
height of 40 cm.

The cylinder exerts a force of 90 newtons on the floor.

Work out the pressure on the floor due to the cylinder.

$$P = ?$$

$$F = 90$$

$$A = 30$$

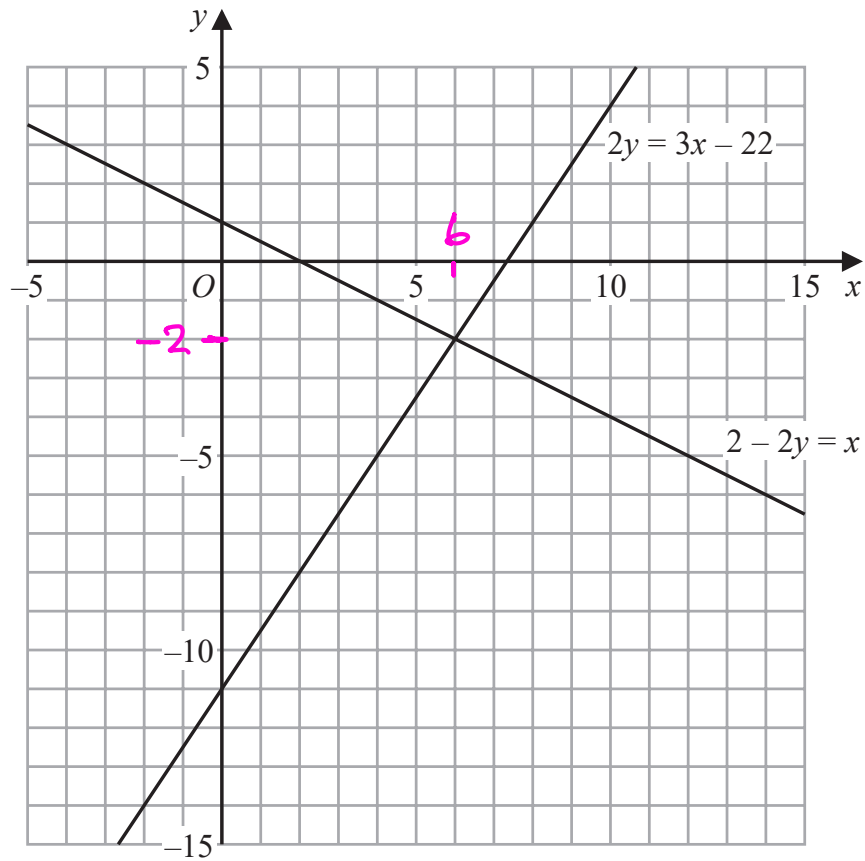
$$\begin{aligned} \text{Pressure} &= \frac{90}{30} \\ &= 3 \text{ N/cm}^2 \end{aligned}$$

..... 3 newtons/cm²

(Total for Question 8 is 3 marks)



9



Use these graphs to solve the simultaneous equations

$$\begin{aligned} 2 - 2y &= x \\ 2y &= 3x - 22 \end{aligned}$$

$$x = \underline{\quad 6 \quad}$$

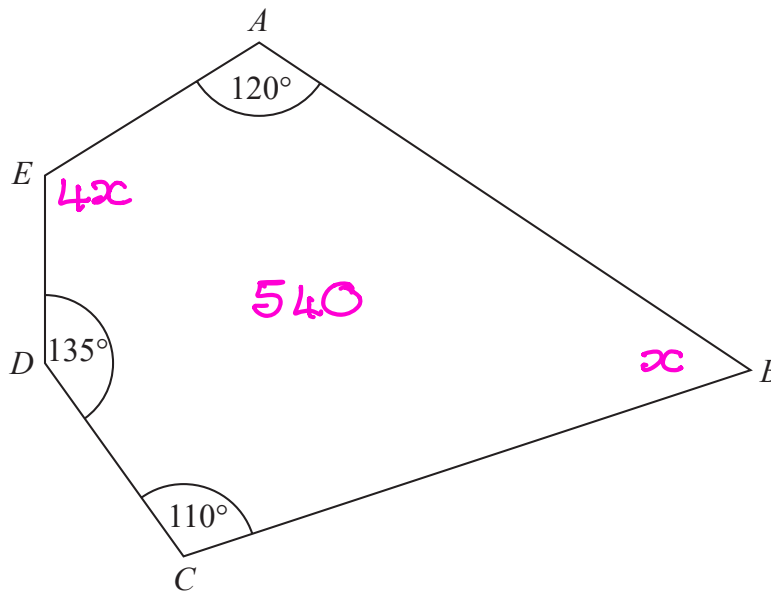
$$y = \underline{\quad -2 \quad}$$

(Total for Question 9 is 1 mark)



P 7 5 1 4 8 A 0 9 2 4

10 Here is a pentagon.



$$\begin{array}{r} 120 \\ + 135 \\ \hline 110 \\ \hline 365 \end{array}$$

Angle $AED = 4 \times \text{angle } ABC$

Work out the size of angle AED .
You must show all your working.

$$\begin{array}{l} 3 \text{ sides} = 180 \\ 4 \text{ sides} = 360 \\ 5 \text{ sides} = \underline{540} \end{array}$$

$$\begin{aligned} 5x + 365 &= 540 \\ 5x &= 540 - 365 \\ &= 175 \\ x &= \frac{175}{5} \\ &= 35 \end{aligned}$$

$$\begin{array}{r} 4 \overline{)540} \\ \underline{-365} \\ 175 \end{array}$$

$$\begin{array}{r} 035 \\ 5 \overline{)175} \end{array}$$

$$\begin{aligned} AED &= 4x = 4 \times 35 \\ &= 140 \end{aligned}$$

140

(Total for Question 10 is 4 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



11 Write $\frac{(6x^5y^3)^2}{3x^2y^7 \times 4xy^{-3}}$ in the form ax^by^c where a , b and c are integers.

$$(6x^5y^3)^2 = 6x^5y^3 \times 6x^5y^3$$
$$= 36x^{10}y^6$$

$$3 \times 4 \times x^2 \times x^1 \times y^7 \times y^{-3} = 12x^3y^4$$

$$\text{so: } \frac{36x^{10}y^6}{12x^3y^4}$$

$$= 3x^7y^2$$

$$3x^7y^2$$

(Total for Question 11 is 3 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

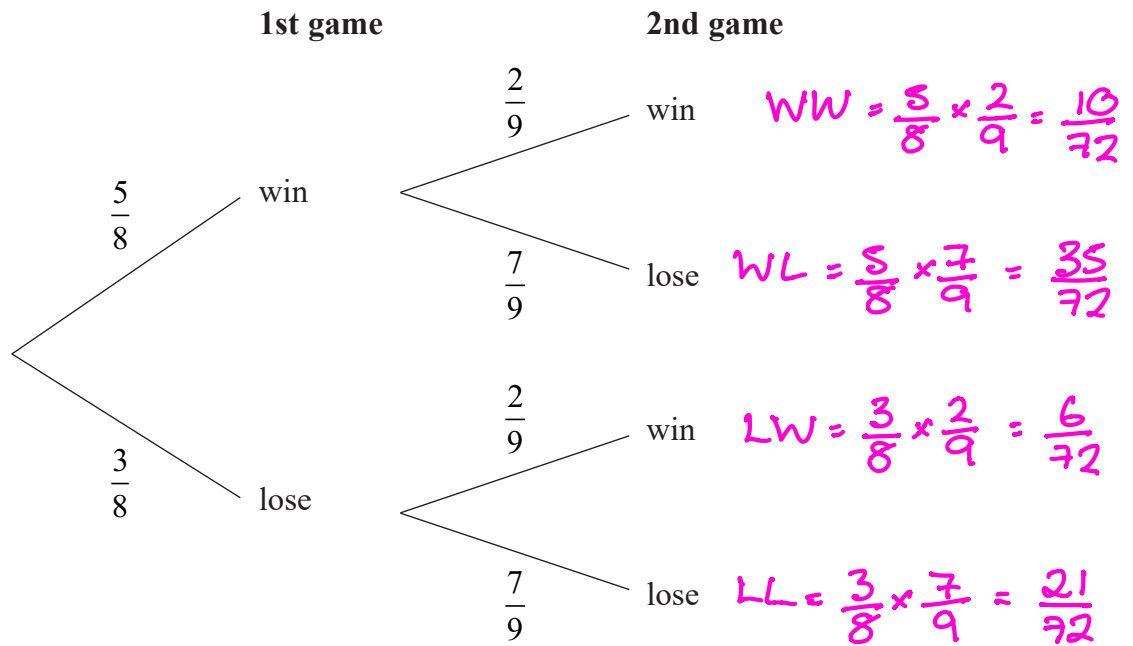
DO NOT WRITE IN THIS AREA



P 7 5 1 4 8 A 0 1 1 2 4

12 Martha plays a game twice.

The probability tree diagram shows the probabilities that Martha will win or lose each game.



Find the probability that Martha will lose at least one game.

check $\frac{72}{72} = 1$

$$P(WL) + P(L,W) + P(LL)$$

$$= \frac{35}{72} + \frac{6}{72} + \frac{21}{72}$$

$$\frac{62}{72}$$

(Total for Question 12 is 3 marks)

$$\left(\frac{31}{36}\right)$$



13 y is directly proportional to x .

$$y = 24 \text{ when } x = 1.5$$

Work out the value of y when $x = 5$

$$y \propto x$$

$$y = kx$$

$$24 = k \times 1.5$$

$$k = \frac{24}{1.5} = 16$$

$$\begin{aligned} \text{so } y &= 16x \\ y &= 16 \times 5 \\ &= 80 \end{aligned}$$

$$y = \underline{\quad 80 \quad}$$

(Total for Question 13 is 3 marks)

14 (a) Write $\frac{1}{16}$ in the form 4^n where n is an integer.

$$16 = 4^2$$

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

$$\underline{\quad 4^{-2} \quad} \quad (1)$$

(b) Work out the value of $8^{\frac{5}{3}} - 9^{\frac{3}{2}}$

$$8^{\frac{5}{3}} \rightarrow \sqrt[3]{8^5} = 2$$

$$2^5 = 32$$

$$9^{\frac{3}{2}} \rightarrow \sqrt{9^3} = 3$$

$$3^3 = 27$$

$$\text{so } 32 - 27 = 5$$

$$\underline{\quad 5 \quad} \quad (3)$$

(Total for Question 14 is 4 marks)



- 15 The equation of line L_1 is $y = 2x - 5$
The equation of line L_2 is $6y + kx - 12 = 0$

L_1 is perpendicular to L_2

Find the value of k .

You must show all your working.

$$L_1 \quad y = 2x - 5$$

$$L_2 \quad 6y + kx - 12 = 0$$

$$6y = -kx + 12$$

$$y = -\frac{k}{6}x + 2$$

perpendicular $2 \rightarrow -\frac{1}{2}$

$$\text{so } -\frac{1}{2} = -\frac{k}{6}$$

$$\therefore k = 3$$

$$k = \underline{\quad 3 \quad}$$

(Total for Question 15 is 3 marks)

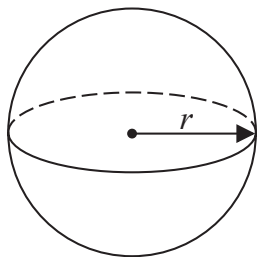
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



16 Here is a sphere.



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

$\frac{3}{8}$ of the surface area of this sphere is $75\pi \text{ cm}^2$

Find the diameter of the sphere.

Give your answer in the form $a\sqrt{b}$ where a is an integer and b is a prime number.

$$\frac{8}{8} = 4\pi r^2$$

$$\frac{3}{8} = 75\pi$$

$$\frac{1}{8} = 25\pi$$

$$\text{so } \frac{8}{8} = 200\pi$$

$$200\pi = 4\pi r^2$$

$$r^2 = \frac{200}{4} = 50$$

$$r = \sqrt{50} = \sqrt{2} \sqrt{25}$$

$$= 5\sqrt{2}$$

$$\text{so diameter} = 10\sqrt{2}$$

$$10\sqrt{2}$$

cm

(Total for Question 16 is 4 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



P 7 5 1 4 8 A 0 1 5 2 4

17 Make x the subject of the formula $y = \frac{4(2x-7)}{5x+3}$

$$(5x+3)y = 4(2x-7)$$

$$5xy + 3y = 8x - 28$$

$$5xy - 8x = -3y - 28$$

$$x(5y-8) = -3y-28$$

$$x = \frac{-3y-28}{5y-8}$$

$$\left(\text{OR } \frac{3y+28}{8-5y} \right)$$

$$x = \frac{-3y-28}{5y-8}$$

(Total for Question 17 is 4 marks)

18 7 kg of carrots and 5 kg of tomatoes cost a total of 480p

$$\text{check. } 7 \times 30 + 5 \times 54 = 210 + 270 = 480 \checkmark$$

cost of 1 kg of carrots : cost of 1 kg of tomatoes = 5 : 9

Work out the cost of 1 kg of carrots and the cost of 1 kg of tomatoes.

$$\begin{array}{l} \text{carrots : toms} \\ 5 : 9 \end{array}$$

$$\frac{t}{c} = \frac{9}{5}$$

$$t = \frac{9}{5}c$$

$$7c + 5t = 480$$

$$7c + 5\left(\frac{9}{5}c\right) = 480$$

$$16c = 480$$

$$c = \frac{480}{16} = 30$$

$$\begin{aligned} t &= \frac{9}{5} \times 30 = \frac{270}{5} \\ &= 54 \end{aligned}$$

carrots 30 p

tomatoes 54 p

(Total for Question 18 is 4 marks)



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

19 The menu in a restaurant has starters, main courses and desserts.

There are 5 starters.

There are 12 main courses.

There are x desserts.

There are 420 different ways to choose one starter, one main course and one dessert.

Work out the value of x .

$$5 \times 12 \times x = 420$$

$$60x = 420$$

$$x = \frac{420}{60} = 7$$

$$x = 7$$

(Total for Question 19 is 2 marks)



20 For $x \geq 0$, the functions f and g are such that

$$f(x) = 3x + 4 \quad g(x) = \frac{\sqrt{x} + 2}{5}$$

(a) Find $g^{-1}(x)$

$$\begin{aligned} y &= \frac{\sqrt{x} + 2}{5} & 5y &= \sqrt{x} + 2 \\ & & 5y - 2 &= \sqrt{x} \\ & & x &= (5y - 2)^2 \end{aligned}$$

$$g^{-1}(x) = \frac{(5x - 2)^2}{25} \quad (2)$$

(b) Solve $gf(x) = 3$

$$gf(x) = \frac{\sqrt{3x+4} + 2}{5} = 3$$

$$\sqrt{3x+4} + 2 = 15$$

$$\sqrt{3x+4} = 13$$

$$3x+4 = 169$$

$$3x = 165$$

$$\begin{aligned} x &= \frac{165}{3} \\ &= 55 \end{aligned}$$

check.

$$f(55) = 165 + 4 = 169$$

$$\begin{aligned} g(169) &= \frac{\sqrt{169} + 2}{5} \\ &= \frac{15 + 2}{5} = 3 \checkmark \end{aligned}$$

$$x = 55 \quad (3)$$

(Total for Question 20 is 5 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

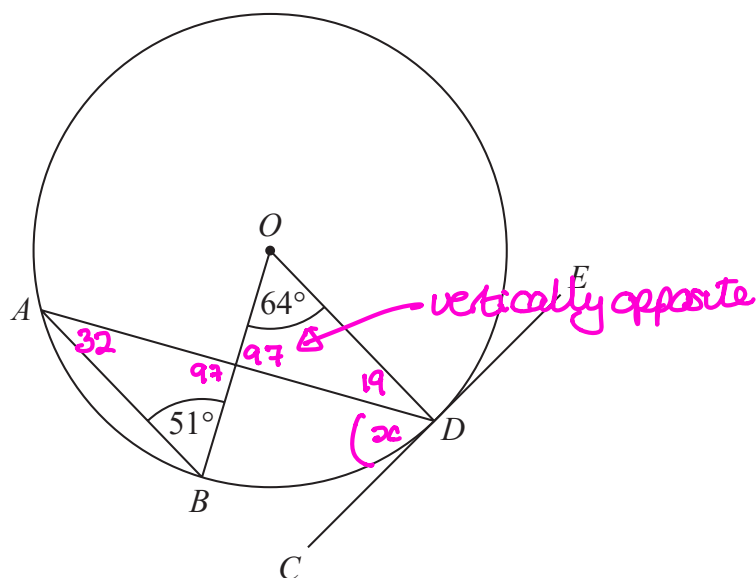


DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

- 21 A, B and D are points on a circle with centre O .
 CDE is the tangent to the circle at D .



Work out the size of angle ADC .
 Write down any circle theorems you use.

let $ADC = x$

$BAD = 32$ angle at the centre is twice the angle at the circumference (BOD)

$180 - (51 + 32) = 180 - 83 = 97$ angle in a triangle = 180

$ODA = 180 - (97 + 64) = 161 = 19$

$x = 90 - 19 = 71$ angle between tangent and radius = 90°

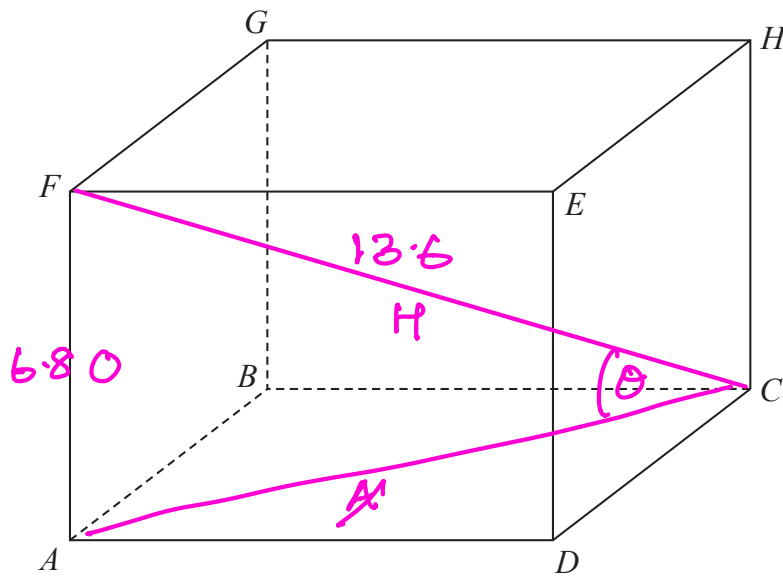
71

(Total for Question 21 is 4 marks)



P 7 5 1 4 8 A 0 1 9 2 4

22 $ABCDEFGH$ is a cuboid.



$AF = 6.8 \text{ cm}$
 $FC = 13.6 \text{ cm}$

Work out the size of the angle between FC and the plane $ABCD$.

$$\sin \theta = \frac{6.8}{13.6} = \frac{1}{2}$$

$$\theta = 30^\circ$$

30

(Total for Question 22 is 2 marks)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



23 Write $\frac{3\sqrt{3}}{4-\sqrt{3}} - \frac{2}{\sqrt{3}}$ in the form $\frac{a\sqrt{3}+b}{c}$ where a , b and c are integers.

$$\frac{3\sqrt{3}}{4-\sqrt{3}} \times \frac{4+\sqrt{3}}{4+\sqrt{3}} = \frac{12\sqrt{3} + 3\sqrt{3}\sqrt{3}}{16 + 4\sqrt{3} - 4\sqrt{3} - 3}$$
$$= \frac{12\sqrt{3} + 9}{13}$$

$$\frac{2}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$$

so: $\frac{12\sqrt{3} + 9}{13} - \frac{2\sqrt{3}}{3} = \frac{3(12\sqrt{3} + 9) - 13 \times 2\sqrt{3}}{39}$

$$= \frac{36\sqrt{3} + 27 - 26\sqrt{3}}{39}$$

$$= \frac{10\sqrt{3} + 27}{39}$$

$$\frac{10\sqrt{3} + 27}{39}$$

(Total for Question 23 is 4 marks)



24 Find the set of possible values of x for which

$$4x^2 - 25 < 0 \quad \text{and} \quad 12 - 5x - 3x^2 > 0$$

You must show all your working.

$$(2x - 5)(2x + 5) < 0$$

$$\frac{5}{2} \quad \frac{-5}{2}$$

$$2.5 \quad \underline{\underline{-2.5}}$$

$$-3x^2 - 5x + 12 > 0 \quad \begin{matrix} -36 \\ 4, 9 \end{matrix}$$

$$-3x^2 - 9x + 4x + 12 > 0$$

$$-3x(x + 3) + 4(x + 3) > 0$$

$$(-3x + 4)(x + 3) > 0$$

$$\frac{4}{3} \quad \frac{1}{3} \quad -3$$

$$\underline{\underline{\frac{4}{3}}}$$

$$\underline{\underline{-2.5 < x < \frac{4}{3}}}$$

(Total for Question 24 is 5 marks)

TOTAL FOR PAPER IS 80 MARKS

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

