

1 Work out $8.46 \div 0.15$

$$\frac{8.46}{0.15} = \frac{846}{15}$$

$\xrightarrow{\times 100}$
 $\xleftarrow{\times 100}$

Tip: By using equivalent fractions we can find another calculation that will have the same answer

$$846 \div 15 =$$

$$\begin{array}{r} 056.4 \\ 15 \overline{)846.60} \end{array}$$

15
30
45
60
75
90

56.4

(Total for Question 1 is 3 marks)

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

Give your answer as a mixed number.

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

$$= \frac{59}{8} - \frac{20}{8} = \frac{39}{8} = 4\frac{7}{8}$$

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

(Total for Question 2 is 3 marks)

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

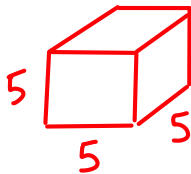
Work out the volume of the cube.

$$150 \div 6 = 25 \text{ (Area of one face)}$$

$$\begin{array}{r} 025 \\ 6 \overline{)150} \end{array}$$

To find the length of the cube:

$$\sqrt{25} = 5$$



$$\begin{aligned} \text{Volume} &= 5 \times 5 \times 5 \\ &= 125 \end{aligned}$$

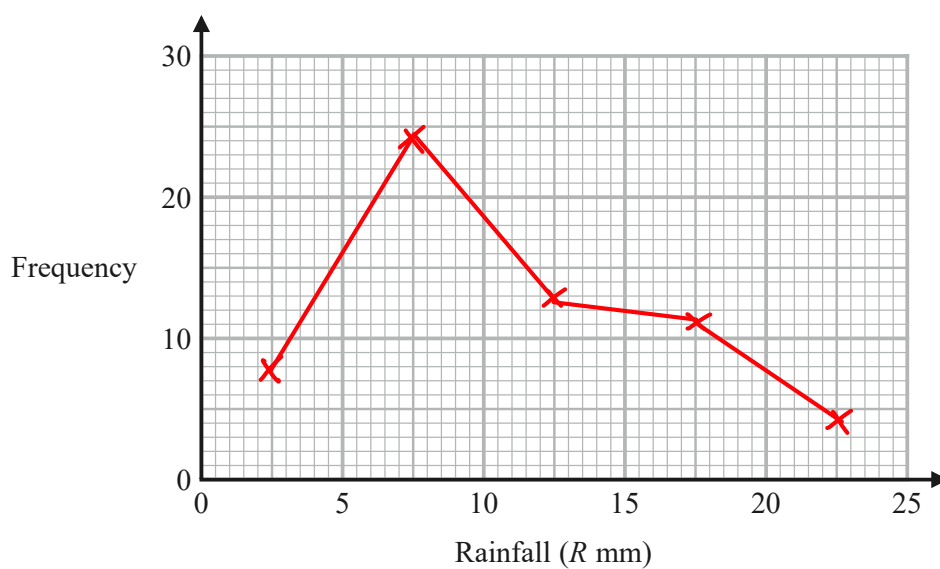
$$\underline{\hspace{2cm} 125 \hspace{2cm}} \text{ cm}^3$$

(Total for Question 3 is 4 marks)

- 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.



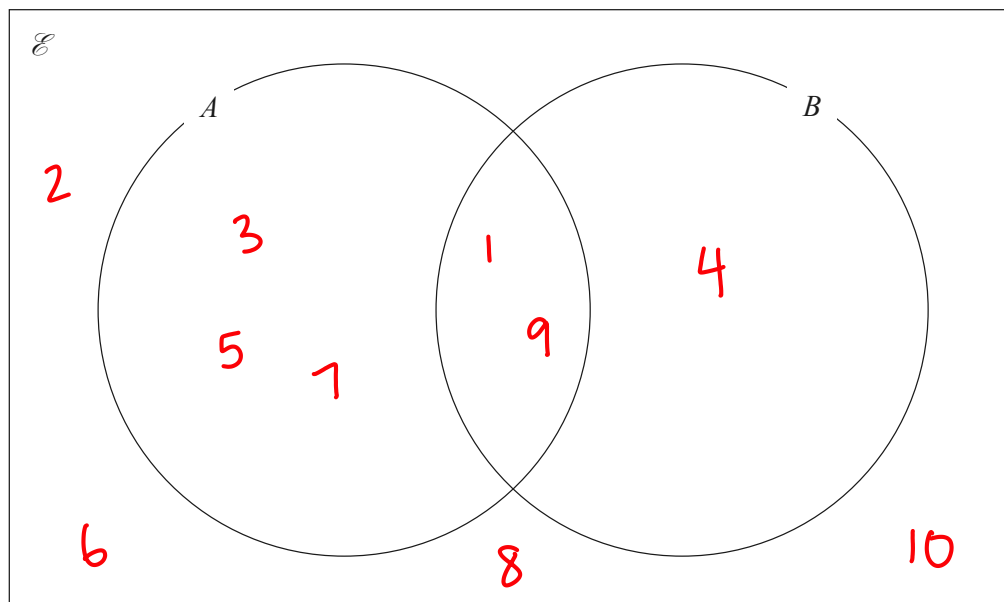
(Total for Question 4 is 2 marks)

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

$A = \{\text{odd numbers}\} \quad 1, 3, 5, 7, 9$

$B = \{\text{square numbers}\} \quad 1, 4, 9$

(a) Complete the Venn diagram for this information.



(3)

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

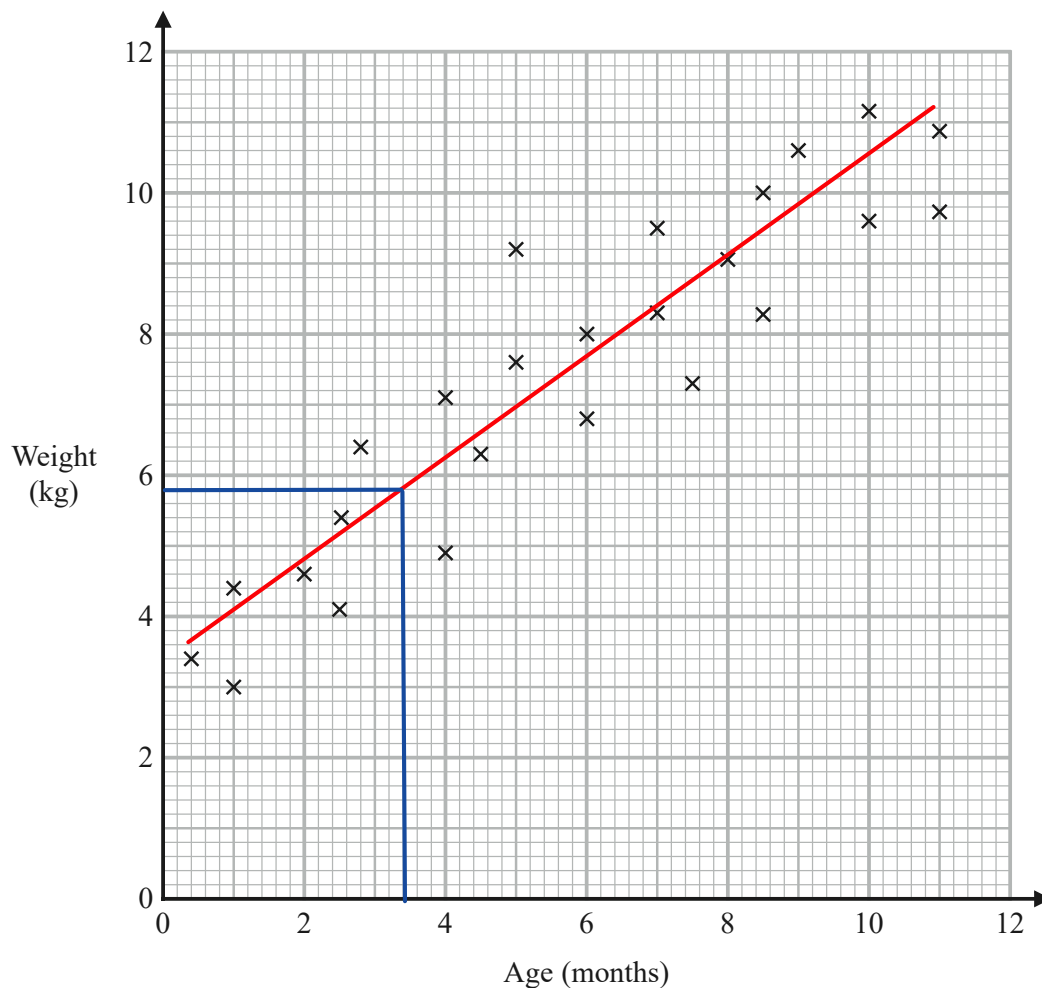
(b) Find the probability that this number is in the set B' (not B)

$$\frac{7}{10}$$

(2)

(Total for Question 5 is 5 marks)

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



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

As the age of the baby increases, the weight increases

(1)

Another baby has a weight of 5.8 kg

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

3.4 months
(2.5 to 4.5)⁽²⁾

(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.

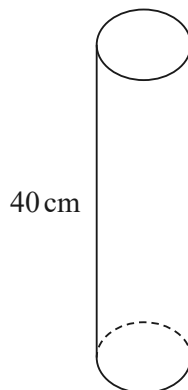
$$\begin{array}{l} \times 5 \quad 20\% = £240 \\ \quad \quad 100\% = £1200 \end{array} \quad \times 5$$

$$\begin{array}{r} 240 \\ \times \quad 5 \\ \hline 1200 \\ 2 \end{array}$$

£ 1200

(Total for Question 7 is 2 marks)

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



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

The cylinder has a

volume of 1200 cm^3
height of 40 cm.

$$\text{Area} = 1200 \div 40 = 30 \text{ cm}^2$$

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

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

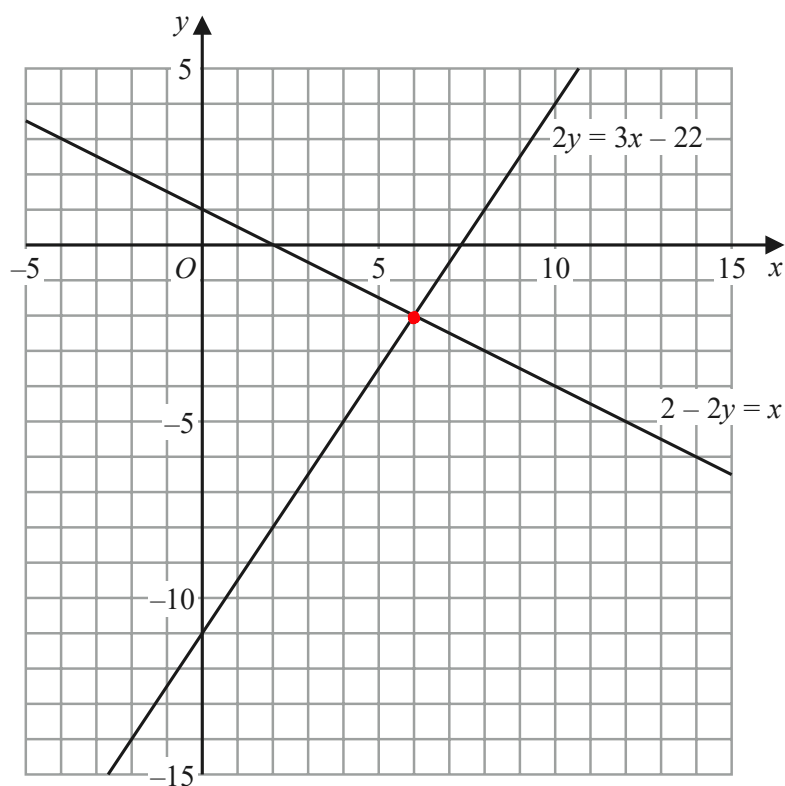
$$p = \frac{90}{30} = 3$$

..... 3 newtons/cm²

(Total for Question 8 is 3 marks)



9



Use these graphs to solve the simultaneous equations

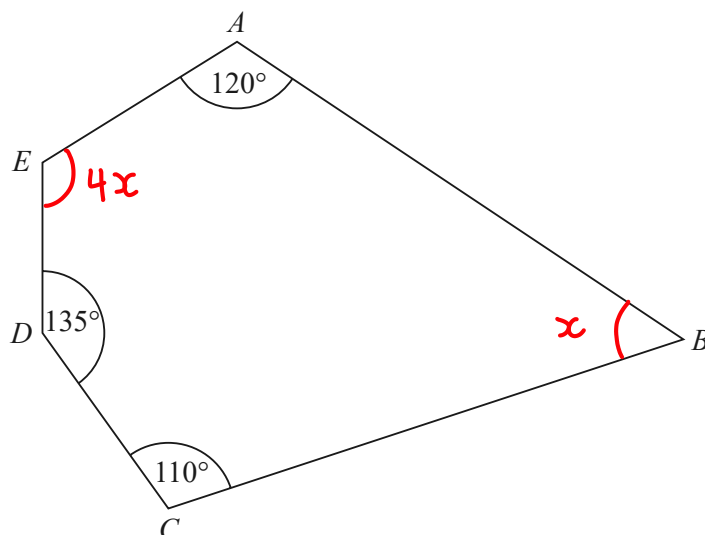
$$\begin{aligned}2 - 2y &= x \\ 2y &= 3x - 22\end{aligned}$$

$$x = \text{.....} \textcolor{red}{6} \text{.....}$$

$$y = \text{.....} \textcolor{red}{-2} \text{.....}$$

(Total for Question 9 is 1 mark)

10 Here is a pentagon.



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

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

$$\begin{aligned} & (5-2) \times 180 \\ &= 3 \times 180 \\ &= 540^\circ \end{aligned}$$

$$\begin{array}{r} 180 \\ \times 3 \\ \hline 540 \\ 1 \end{array}$$

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

$$\begin{array}{r} 131 \\ 4540 \\ - 365 \\ \hline 175 \end{array}$$

$$\begin{array}{r} 5x + 365 \\ - 365 \\ \hline 5x \\ \div 5 \\ \hline x = 35 \end{array} \quad \begin{array}{r} 540 \\ - 365 \\ \hline 175 \\ \div 5 \\ \hline 35 \end{array}$$

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

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

140

(Total for Question 10 is 4 marks)

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- 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.

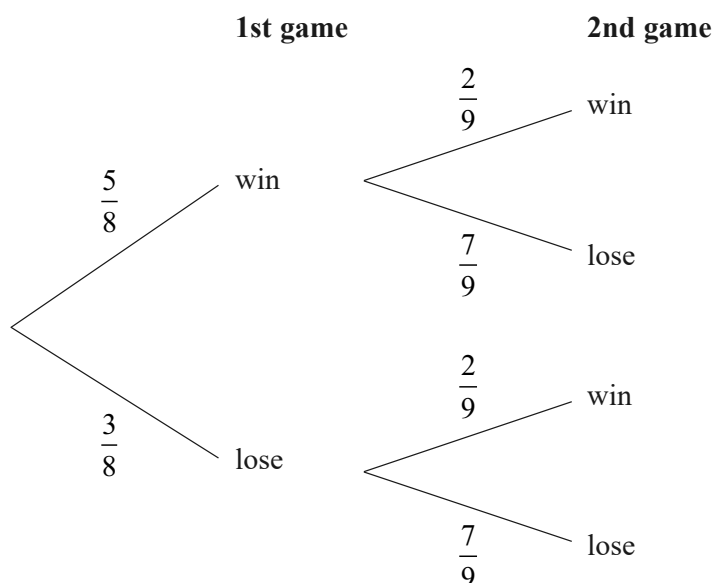
$$\frac{6x^5y^3 \times 6x^5y^3}{3x^2y^7 \times 4xy^{-3}} = \frac{36x^{10}y^6}{12x^3y^4}$$

$$3x^7y^2$$

(Total for Question 11 is 3 marks)

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.

$$\begin{aligned}
 W, L &= \frac{5}{8} \times \frac{7}{9} = \frac{35}{72} \\
 L, W &= \frac{3}{8} \times \frac{2}{9} = \frac{6}{72} \\
 L, L &= \frac{3}{8} \times \frac{7}{9} = \frac{21}{72}
 \end{aligned}$$

$$\frac{35}{72} + \frac{6}{72} + \frac{21}{72} = \frac{62}{72}$$

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

(Total for Question 12 is 3 marks)

13 y is directly proportional to x .

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

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

$$y \propto x$$

$$y = kx$$

$$y = 16 \times 5$$

$$= 80$$

$$\begin{array}{r|l} 24 & = k \times 1.5 \\ \div 1.5 & \div 1.5 \\ \hline 16 & = k \end{array}$$

$$y = 16x$$

$$y = 80$$

(Total for Question 13 is 3 marks)

$$\frac{24}{1.5} = \frac{240}{15}$$

$$15 \overline{) 240} \begin{array}{r} 016 \\ \underline{150} \\ 90 \end{array}$$

$$\begin{array}{r} 15 \\ 30 \\ 45 \\ 60 \\ 75 \\ 90 \end{array}$$

Tip: By using equivalent fractions we can find another calculation that will have the same answer



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

$$4^2 = 16$$

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

$$4^{-2}$$

(1)

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

$$8^{5/3} \rightarrow \sqrt[3]{8^5} = 2^5 = 32$$

$$9^{3/2} \rightarrow \sqrt{9^3} = 3^3 = 27$$

$$32 - 27 = 5$$

$$5$$

(3)

(Total for Question 14 is 4 marks)

- 15 The equation of line L_1 is $y = 2x - 5$ $\longrightarrow$ Gradient = 2
 The equation of line L_2 is $6y + kx - 12 = 0$ $\longrightarrow$ Gradient = $-\frac{1}{2}$

L_1 is perpendicular to L_2

Find the value of k .

You must show all your working.

$$\begin{array}{rcl}
 6y + kx - 12 & = & 0 \\
 -kx & & -kx \\
 6y - 12 & = & -kx \\
 +12 & & +12 \\
 6y & = & -kx + 12 \\
 \div 6 & & \div 6 \\
 y & = & -\frac{k}{6}x + 2
 \end{array}$$

$$\begin{array}{rcl}
 -\frac{k}{6} & = & -\frac{1}{2} \\
 \frac{k}{6} & = & \frac{1}{2} \\
 & \swarrow \times 3 &
 \end{array}$$

$$k = 3$$

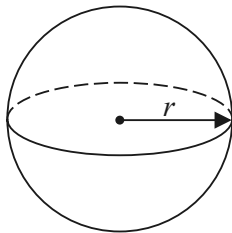
(Total for Question 15 is 3 marks)

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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.

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

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

$$\frac{8}{8} = 200\pi \quad (\text{Total SA})$$

$$\begin{array}{rcl} 4r^2 & = & 200\pi \\ 4r^2 & = & 200 \\ \div 4 & & \div 4 \\ r^2 & = & 50 \\ \sqrt{} & & \sqrt{} \\ r & = & \sqrt{50} = 5\sqrt{2} \end{array}$$

$$\begin{array}{r} \times 25 \\ 8 \\ \hline 200 \\ 4 \end{array}$$

$$10\sqrt{2} \text{ cm}$$

(Total for Question 16 is 4 marks)

$$\begin{aligned} \sqrt{50} &= \sqrt{25 \times 2} \\ &= 5 \times \sqrt{2} \\ &= 5\sqrt{2} \end{aligned}$$

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

$$\begin{aligned}
 x(5x+3) &= 4(2x-7) \\
 y(5x+3) &= 8x-28 \\
 5xy+3y &= 8x-28 \\
 -5xy &= 8x-28-5xy \\
 3y &= 8x-28-5xy \\
 +28 &= 8x-5xy+28 \\
 3y+28 &= 8x-5xy \\
 3y+28 &= x(8-5y) \\
 \frac{3y+28}{8-5y} &= x
 \end{aligned}$$

(Total for Question 17 is 4 marks)

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

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.

$$7c + 5t = 480$$

$$\begin{array}{l} c : t \\ 5 : 9 \end{array}$$

$$c = \frac{5}{9}t \quad \text{or}$$

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

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

$$7c + 9c = 480$$

$$16c = 480$$

$$\div 16 \quad \div 16$$

$$c = 30$$

carrots 30 p

tomatoes 54 p

(Total for Question 18 is 4 marks)

$$\begin{array}{r} 16 \\ 32 \\ 48 \end{array}$$

$$7c + 5t = 480$$

$$\begin{array}{r} 210 + 5t = 480 \\ - 210 \end{array}$$

$$5t = 270$$

$$\div 5 \quad \div 5$$

$$t = 54$$

$$\begin{array}{r} 054 \\ 5 \overline{)270} \end{array}$$

- 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 .

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

$$60x = 420$$

$$\div 60 \quad \div 60$$

$$x = 7$$

$$x = 7$$

(Total for Question 19 is 2 marks)

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

$$f(x) = 3x + 4$$

$$g(x) = \frac{\sqrt{x} + 2}{5}$$

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

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

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

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

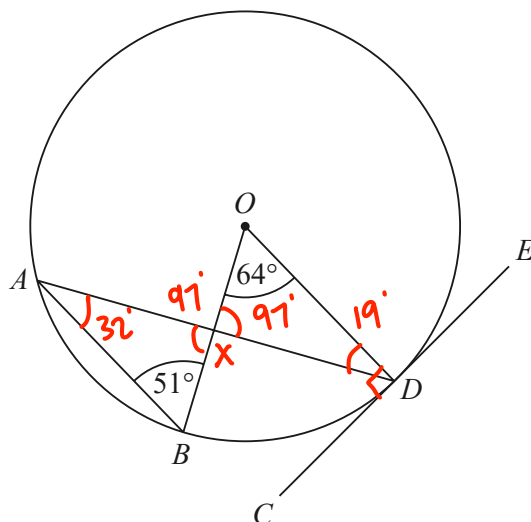
$$\begin{aligned} \frac{\sqrt{3x+4} + 2}{5} &= 3 \\ \times 5 & \quad \times 5 \\ \sqrt{3x+4} + 2 &= 15 \\ -2 & \quad -2 \\ \sqrt{3x+4} &= 13 \\ ^2 & \quad ^2 \\ 3x+4 &= 169 \\ -4 & \quad -4 \\ 3x &= 165 \\ \div 3 & \quad \div 3 \\ x &= 55 \end{aligned}$$

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

(Total for Question 20 is 5 marks)

$$\begin{array}{r} 055 \\ 3 \overline{)165} \end{array}$$

- 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.

$$\angle BAD = 32^\circ \quad \text{angles at the centre are twice the angle at the circumference}$$

$$\angle AOB = 64^\circ \quad \text{angles in a triangle add to } 180^\circ$$

$$\angle ODB = 19^\circ$$

$$\angle ODC = 90^\circ \quad \text{radius meets the tangent at } 90^\circ$$

$$\angle ODB = 19^\circ$$

$$\angle ADC = 71^\circ$$

$$\begin{array}{r} 32 \\ + 51 \\ \hline 83 \end{array}$$

$$\begin{array}{r} 180 \\ - 83 \\ \hline 97 \end{array}$$

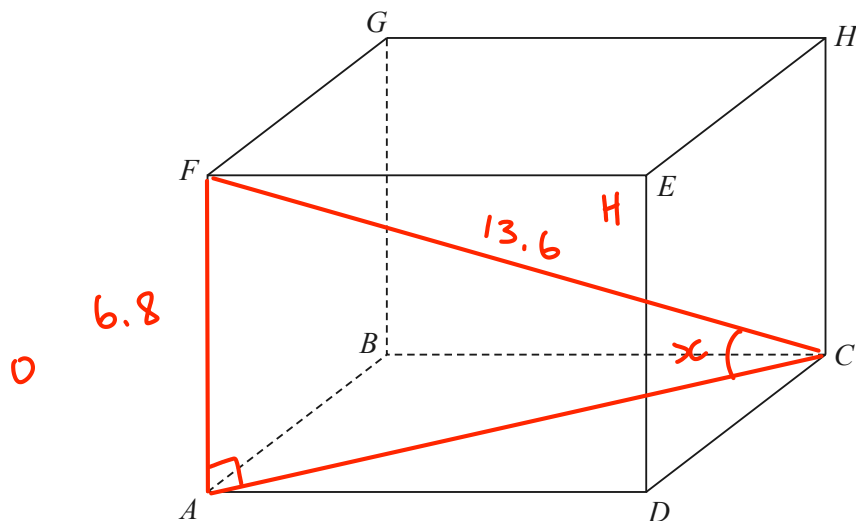
$$\begin{array}{r} 64 \\ + 91 \\ \hline 155 \end{array}$$

$$\begin{array}{r} 180 \\ - 109 \\ \hline 71 \end{array}$$

71

(Total for Question 21 is 4 marks)

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 $ABCD$.

$S^{\circ} H$

$$\sin^{-1} \left(\frac{6.8}{13.6} \right)$$

$$= \sin^{-1} \left(\frac{1}{2} \right) = 30^{\circ}$$

30

(Total for Question 22 is 2 marks)



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.

$$\frac{3\sqrt{3} \times \sqrt{3}}{(4-\sqrt{3}) \times \sqrt{3}} - \frac{2(4-\sqrt{3})}{\sqrt{3}(4-\sqrt{3})}$$

$$= \frac{9}{4\sqrt{3}-3} - \frac{8-2\sqrt{3}}{4\sqrt{3}-3}$$

$$= \frac{(1+2\sqrt{3})}{(4\sqrt{3}-3)} \times \frac{(4\sqrt{3}+3)}{(4\sqrt{3}+3)}$$

$$= \frac{4\sqrt{3}+3+24+6\sqrt{3}}{48+12\sqrt{3}-12\sqrt{3}-9} = \frac{10\sqrt{3}+27}{39}$$

(Total for Question 23 is 4 marks)

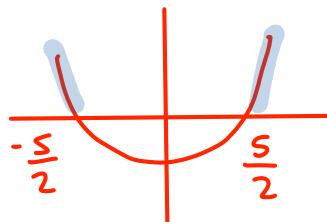
24 Find the set of possible values of x for which

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

You must show all your working.

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

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



$$-\frac{5}{2} < x < \frac{5}{2}$$

$$12 - 5x - 3x^2 > 0$$

$$0 > 3x^2 + 5x - 12$$

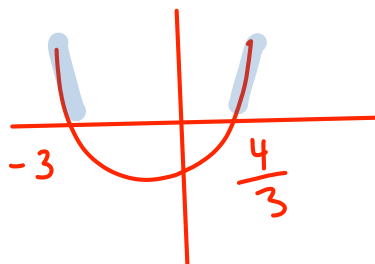
$$3x^2 + 9x \mid -4x - 12$$

$$3x(x+3) \mid -4(x+3)$$

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

$$x = \frac{4}{3} \quad x = -3$$

$$\begin{array}{r} -36 \\ 1, 36 \\ 2, 18 \\ 3, 12 \\ \textcircled{-4, 9} \end{array}$$



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

(Total for Question 24 is 5 marks)

TOTAL FOR PAPER IS 80 MARKS