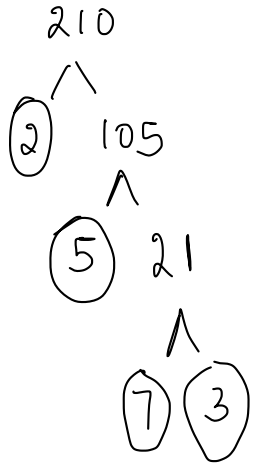
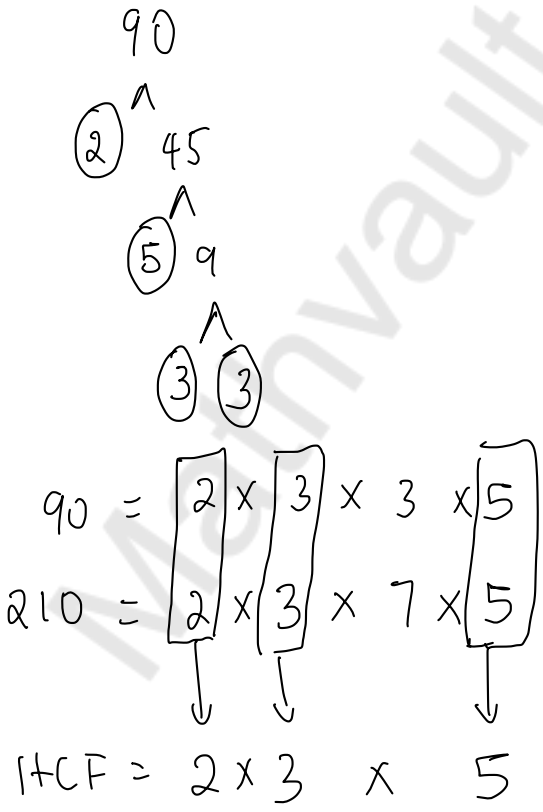
1 **(a)** Write 210 as a product of its prime factors.



$2 \times 3 \times 5 \times 7$

(2)

(b) Find the highest common factor (HCF) of 210 and 90

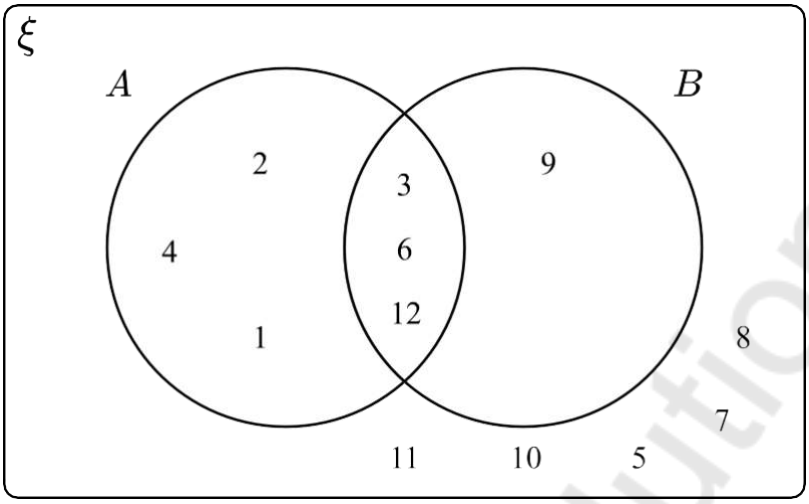


30

(2)

(Total for Question 1 is 4 marks)

2 Here is a Venn diagram



(a) Write down the numbers that are in the set A'

5, 7, 8, 9, 10, 11

(1)

(b) A number is chosen at random from the universal set.

Find the probability that the number is in the set A ∩ B

$\frac{3}{12} = \frac{1}{4}$

(2)

(Total for Question 2 is 3 marks)

3 Write these numbers in order of size, starting with the smallest.

3.15×10^4 3.15×10^{-2} 3.15×10^{-1} 3150

3.1500
31500

3.15×10^{-2} 3.15×10^{-1} 3150 3.15×10^4

(Total for Question 3 is 2 marks)

---

4 Work out $1\frac{3}{4} + 2\frac{1}{3}$

Give your answer as a mixed number in its simplest form.

$3\times \frac{7}{4} + \frac{7}{3}\times 4$

$3\times 4 \quad 3\times 4$

$\frac{21}{12} + \frac{28}{12}$

$\frac{49}{12}$

$4\frac{1}{12}$

$4\frac{1}{12}$

(Total for Question 4 is 2 marks)

---

5 In a sale, prices are reduced by 40%

The sale price of a laptop is £360

Work out the original price of the laptop

$100\% \xrightarrow{-40\%} 60\%$

Original Price (y) $\xrightarrow{-x}$ £360

$100 : 60$

$y : 360$

$100 \times 360 = 60 \times y$

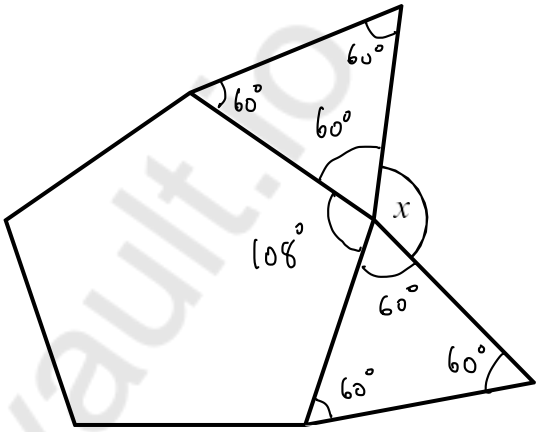
$\frac{100 \times 360}{60} = y = £600$

£ 600

(Total for Question 5 is 2 marks)

---

6 Here is a regular pentagon and two equilateral triangles



Show that angle x is 132°

One Exterior Angle in Pentagon $= \frac{360}{5} = 72°$

One Interior Angle in a pentagon $= 180 - 72 = 108°$

$x = 360 - 60 - 60 - 108°$

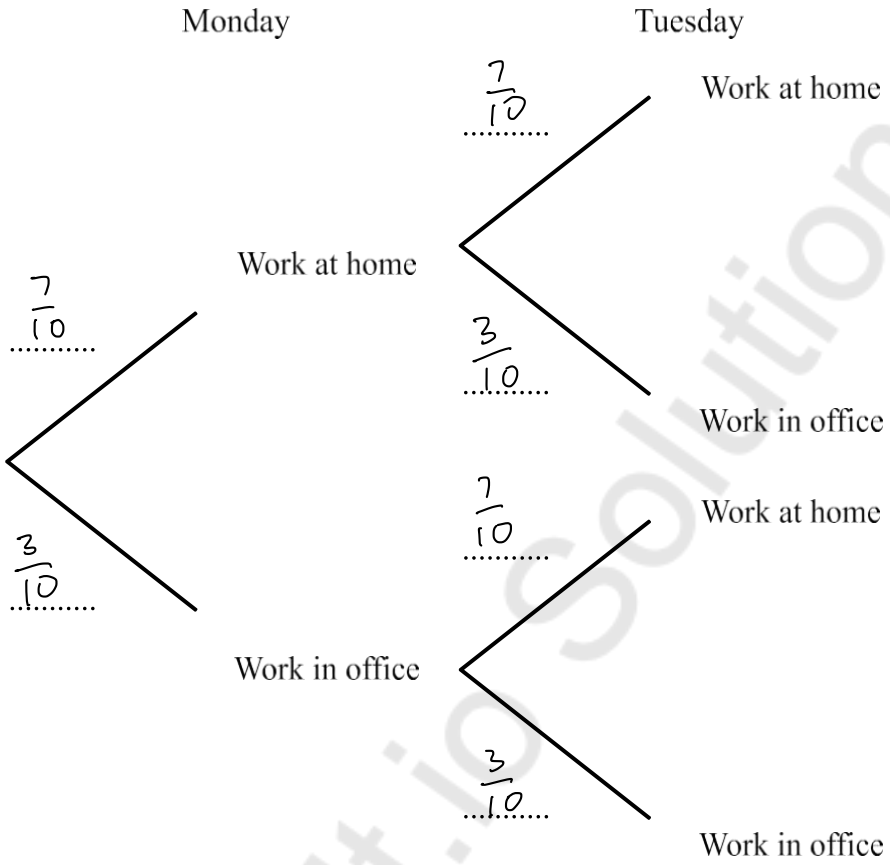
$x = 132°$

(Total for Question 6 is 3 marks)

---

7 The probability that Faraz will work from home on any given day is p

The probability that Faraz works at home on Monday and Tuesday is $\frac{49}{100}$



(a) Complete the tree diagram

$p \times p = \frac{49}{100}$

$p^2 = \frac{49}{100}$

$p = \sqrt{\frac{49}{100}} = \frac{7}{10}$

(3)

(b) Work out the probability that Faraz works in the office on Wednesday, Thursday and Friday

$\frac{3}{10} \times \frac{3}{10} \times \frac{3}{10} = \frac{27}{1000}$

$\frac{27}{1000}$

(3)

(Total for Question 7 is 6 marks)

8 **(a)** Work out the value of $\frac{5^5 \times 5^{-2}}{5}$

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

25

(2)

(b) Find the value of 2^{-3}

$\frac{1}{2^3} = \frac{1}{8}$

$\frac{1}{8}$

(1)

(c) Find the value of $125^{\frac{1}{3}}$

$\sqrt[3]{125}$

5

(1)

(Total for Question 8 is 4 marks)

---

9 Solve $x^2 = 3x + 10$

$x^2 - 3x - 10 = 0$

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

$x = 5 \quad x = -2$

-10

$-10, +1$

$-5, +2$

$x = 5 \quad x = -2$

(Total for Question 9 is 3 marks)

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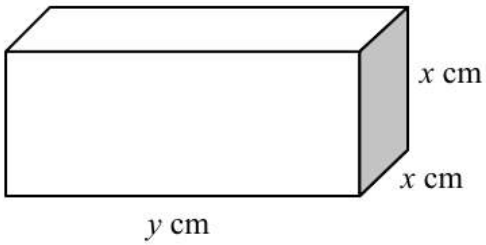
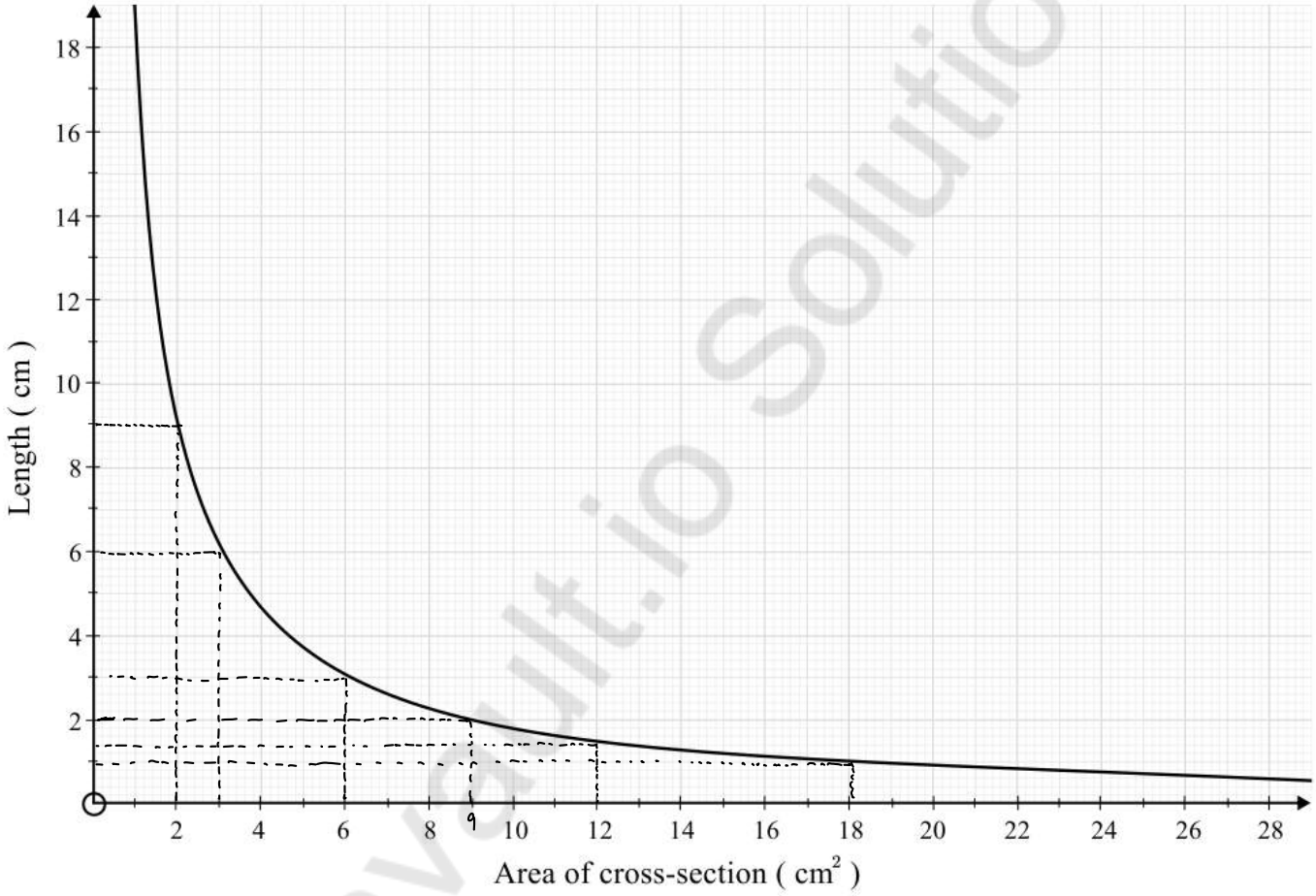
10 Here is a cuboid with a square cross-section.



The cuboid has a fixed volume, V cm^3 .

This graph shows some information about the cuboid.



(a) Use the graph to complete this table:

Area of cross-section	1	2	3	6	12	18
Length	18	9	6	3	1.4	1

(2)

(b) Write down the volume, V, of the cuboid.

$A \propto \frac{1}{L}$ $V = AL$ $V = 2 \times 9 = 18$

$A = \frac{V}{L}$ $V = 1 \times 18$ $V = 3 \times 6 = 18$

$V = 18$

18 cm^3

(1)

(c) Work out the surface area of the cuboid when the length of the cuboid is 2cm.

$L = 2 \quad A = 9$

$A = x^2 \qquad L = y$

$9 = x^2 \qquad y = 2$

$x = 3$

Left and Right $= 9 + 9 = 18\ cm^2$

Top and Base $= (3 \times 2) \times 2 = 12\ cm^2$

Front and Back $= (3 \times 2) \times 2 = 12\ cm^2$

$42\ cm^2$

42 cm²

(4)

(Total for Question 10 is 7 marks)

---

11 Richard and Jamie coach a football team.

This year they have taken the training sessions in the ratio 11:14.

Jamie says he has taken more than 60% of the coaching sessions.

Is Jamie correct?

Show how you decide.

R : J

11 : 14

Total parts $= 11 + 14 = 25$

R $\Rightarrow \frac{11}{25} \times 100 = 44\%$

J $\Rightarrow \frac{14}{25} \times 100 = 56\%$

$56\% < 60\%$

Jamie is wrong.

(Total for Question 11 is 3 marks)

---

12 The table shows information about the number of hours worked in a week by some adults.

Number of hours (h)	Frequency
$0 \leq h < 15$	45
$15 \leq h < 25$	32
$25 \leq h < 35$	42
$35 \leq h < 40$	25
$40 \leq h < 60$	50

Frequency Density

45 ÷ 15 = 3

32 ÷ 10 = 3·2

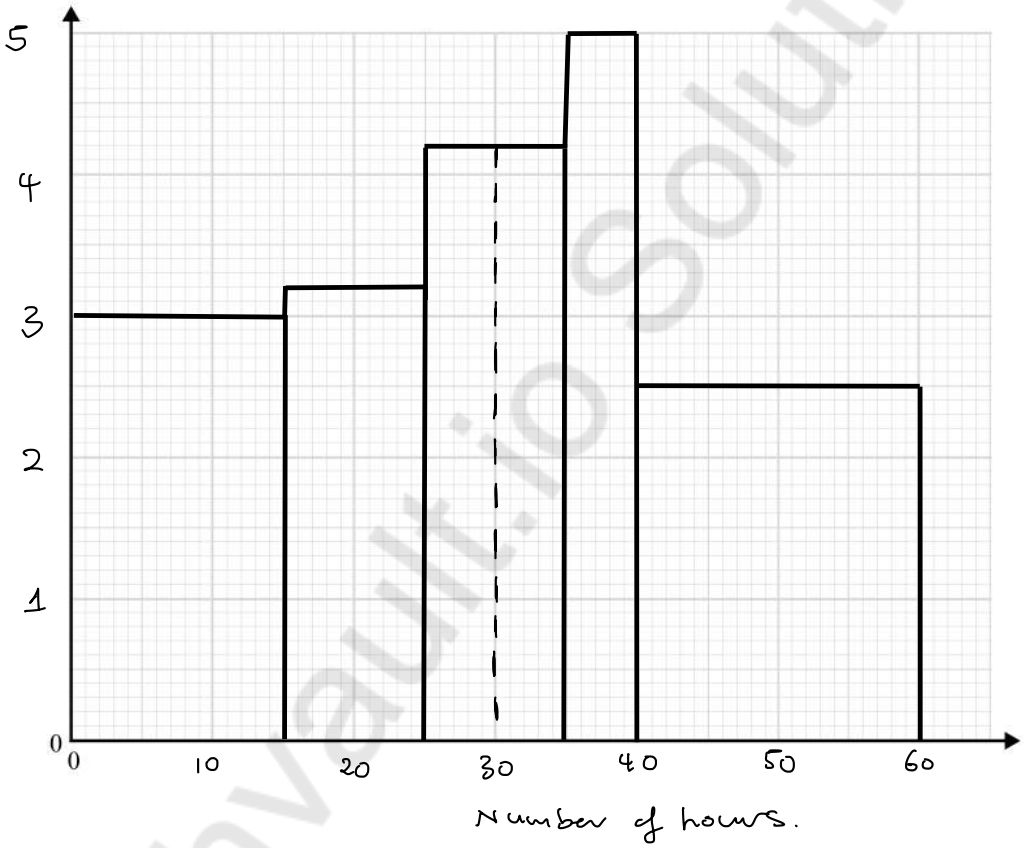
42 ÷ 10 = 4·2

25 ÷ 5 = 5

50 ÷ 20 = 2·5

194

(a) On the grid draw a histogram to show this information.



(3)

(b) Work out an estimate for the fraction of these adults who work between 30 and 40 hours.

30 - 35 ⇒ 5 × 4·2 = 21·0

35 - 40 ⇒ 5 × 5 = 25

46

46/194

(2)

(Total for Question 12 is 5 marks)

13 Work out $0.6\dot{8} - 0.1\dot{2}$

Give your answer as a fraction in its simplest form.

$$\begin{array}{r} 0.68\dot{} \\ -\ 0.12\dot{} \\ \hline 0.56\dot{} \end{array}$$

$0.5\dot{6} = x$

$5.\dot{6} = 10x$

$56.\dot{6} = 100x$

$56.\dot{6} - 5.\dot{6} = 100x - 10x$

$51 = 90x$

$\frac{51}{90} = x$

$\frac{17}{30} = x$

$$\begin{array}{r} 56.\dot{6} \\ 5.\dot{6} \\ \hline 51.0 \end{array}$$

$\frac{17}{30}$

(Total for Question 13 is 4 marks)

---

14 y is directly proportional to x^2

When $x = 10$, $y = 36$

Work out the value of y when $x = 3$

$y \propto x^2$

$y = kx^2$

$36 = k(10)^2$

$36 = 100k$

$k = 0.36 = \frac{36}{100} = \frac{18}{50} = \frac{9}{25}$

$y = \frac{9}{25}x^2$

$y = \frac{9}{25} \times 3^2$

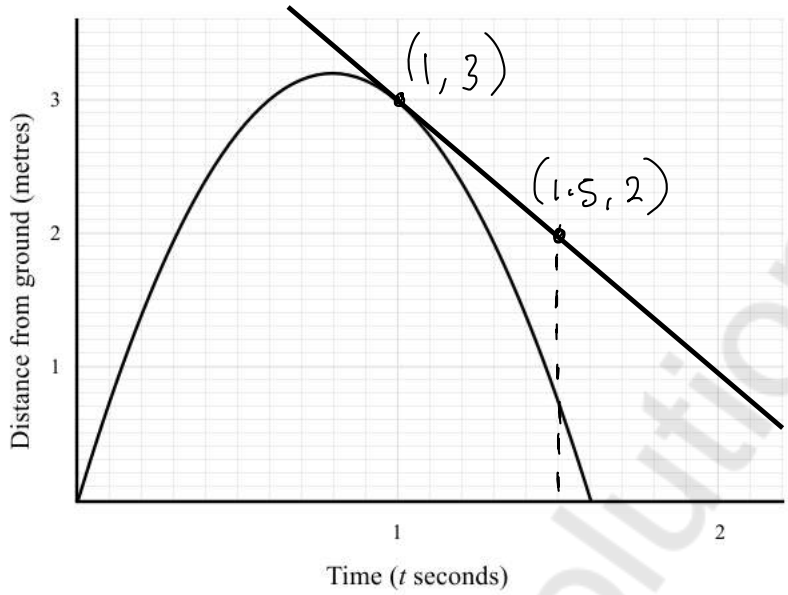
$y = \frac{9}{25} \times 9 = \frac{81}{25}$

$\frac{81}{25}$

(Total for Question 14 is 3 marks)

---

15 A ball is thrown in the air. This distance-time graph shows how far the ball is above the ground.



Work out an estimate for the gradient of the graph when $t = 1$

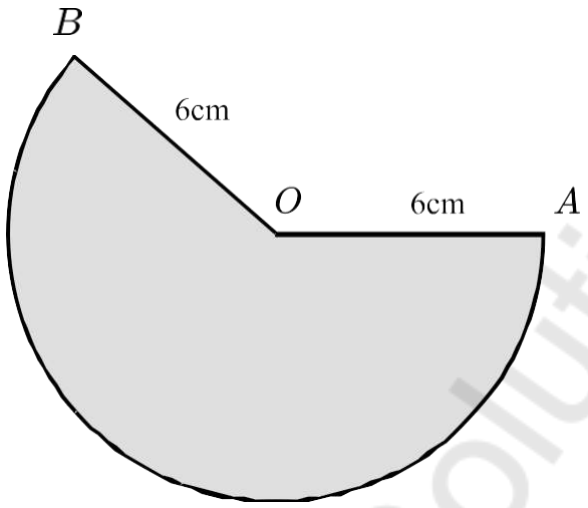
You must show how you get your answer.

$$m = \frac{2-3}{1.5-1} = \frac{-1}{0.5} = -2$$

-2 m/s

(Total for Question 15 is 3 marks)

16 *OAB* is a sector of a circle, radius 6cm.



The length of the arc is 7π cm.

Work out, in terms of π, the area of the sector.

Give your answer in its simplest form.

$\frac{\theta}{360} \times 2\pi r = L$

$\frac{\theta}{360} \times 2\pi \times 6 = 7\pi$

$\theta = \frac{7\pi \times 360}{2\pi \times 6} = \frac{7}{2} \times 60 = 210^\circ$

Area $= \frac{210}{360} \times \pi \times 6^2$

Area $= \frac{210\pi}{360} \times 36 = 21\pi \text{ cm}^2$

21π cm^2

(Total for Question 16 is 4 marks)

17 Make p the subject of the formula $r = \dfrac{7(2p+1)}{5p-3}$

$r(5p-3) = 7(2p+1)$

$5pr - 3r = 14p + 7$

$5pr - 14p = 3r + 7$

$p(5r-14) = 3r+7$

$p = \dfrac{3r+7}{5r-14}$

$\dfrac{3r+7}{5r-14}$

(Total for Question 17 is 4 marks)

---

18 Lara has some 5p coins and some 10p coins.

The total value of the coins is £2.10. = 210p

The ratio of 5p coins:10p coins is 5:1.

Work out how many 5p coins and how many 10p coins Lara has.

$5x + 10y = 210$

$5\left(\frac{5}{6}w\right) + 10\left(\frac{1}{6}w\right) = 210$

$\frac{25}{6}w + \frac{10}{6}w = 210$

$\frac{35}{6}w = 210$

$w = \dfrac{210 \times 6}{35}$

$w = \dfrac{30 \times 6}{5} = 36$ coins

Total coins = w

5p : 10p

5 : 1

$\frac{5}{6}w$ $\frac{1}{6}w$

x : y

5p $\Rightarrow \frac{5}{6} \times 36 = 30$

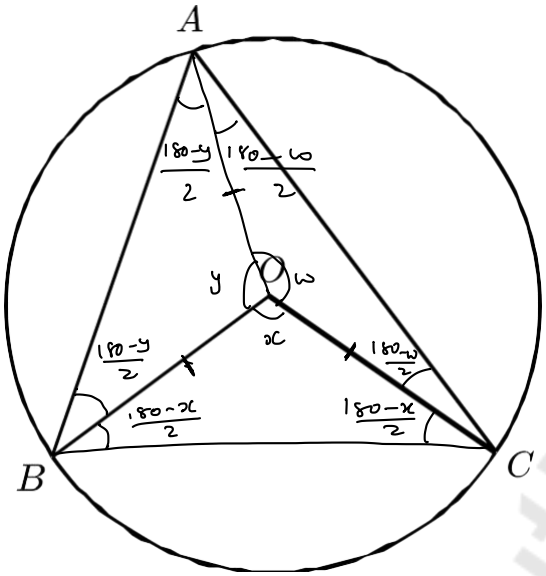
10p $\Rightarrow \frac{1}{6} \times 36 = 6$

5p coins: 30

10p coins: 6

(Total for Question 18 is 4 marks)

19



Prove that angle *BOC* is double angle *BAC*.

$B\hat{A}C = \frac{180-y}{2} + \frac{180-w}{2}$ (Base angles in isosceles triangle are equal)

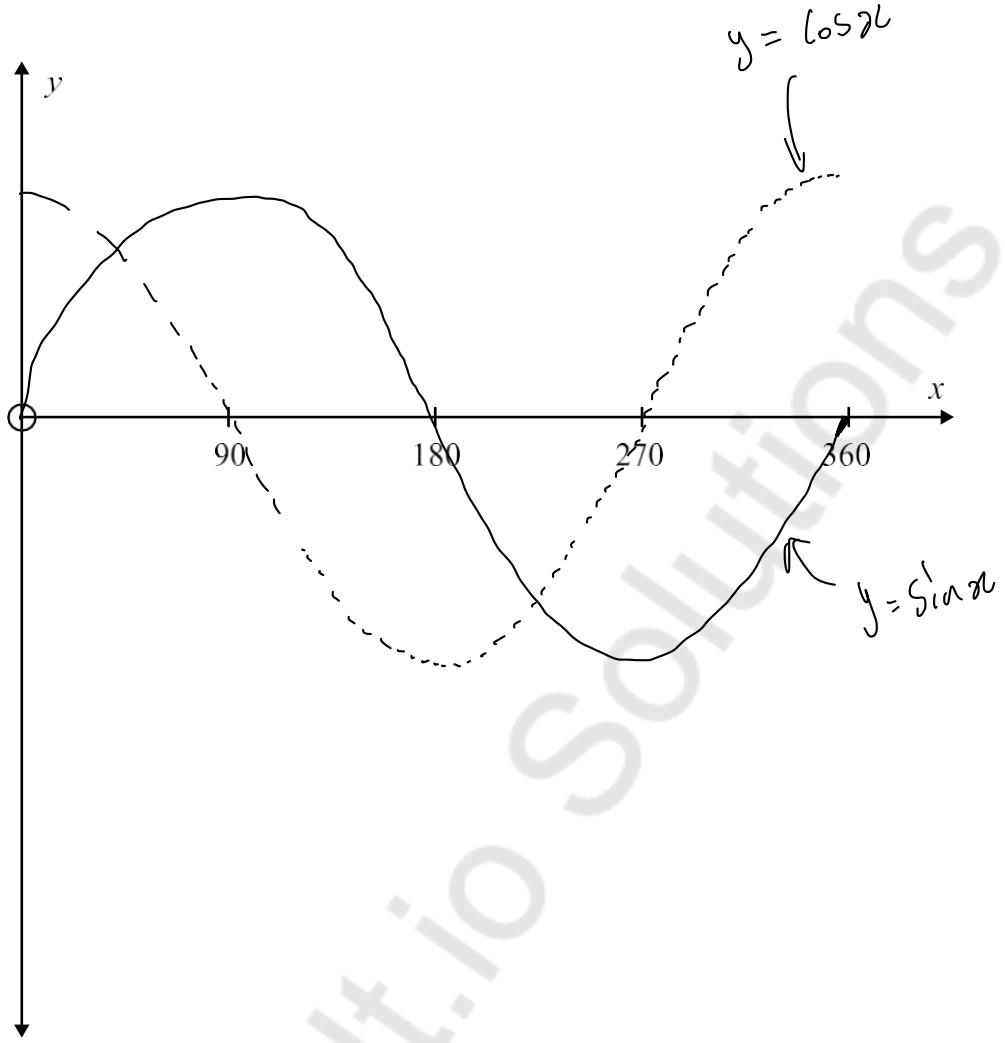
$B\hat{A}C = \frac{360-y-w}{2}$ (Angles at a point sum to 360)

$x = 360 - w - y = B\hat{O}C$ (Angles in a triangle sum to 180°)

$B\hat{A}C = \frac{B\hat{O}C}{2}$

(Total for Question 19 is 4 marks)

20 **(a)** Sketch the graph of $y = \sin(x)$ for $0 \leq x \leq 360$



(2)

(b) Write down the value of x between 0° and 180° for which $\sin(x) = \cos(x)$

$\sin 30 = \cos 60$

$\sin x = \cos(90 - x)$

$\cos 90 - x = \cos x$

$90 - x = x$

$90 = 2x$

$45 = x$

45°

(1)

(Total for Question 20 is 3 marks)

$x^2 - 3 = 5x - x^2$ -6

$2x^2 - 5x - 3 = 0$ $-6 \quad +1$

$2x^2 - 6x + x - 3 = 0$

$2x(x-3) + 1(x-3) = 0$

$x = -\frac{1}{2} \quad x = 3$

21 The functions f, g and h are such that

$f(x) = x^2 - 3$ $\quad$ $g(x) = 5x - x^2$ $\quad$ $h(x) = x + 3$

$g(x) = x(5 - x)$

(a) Find $h^{-1}(7)$

$h(x) = x + 3$

$x = y + 3$

$x - 3 = y$

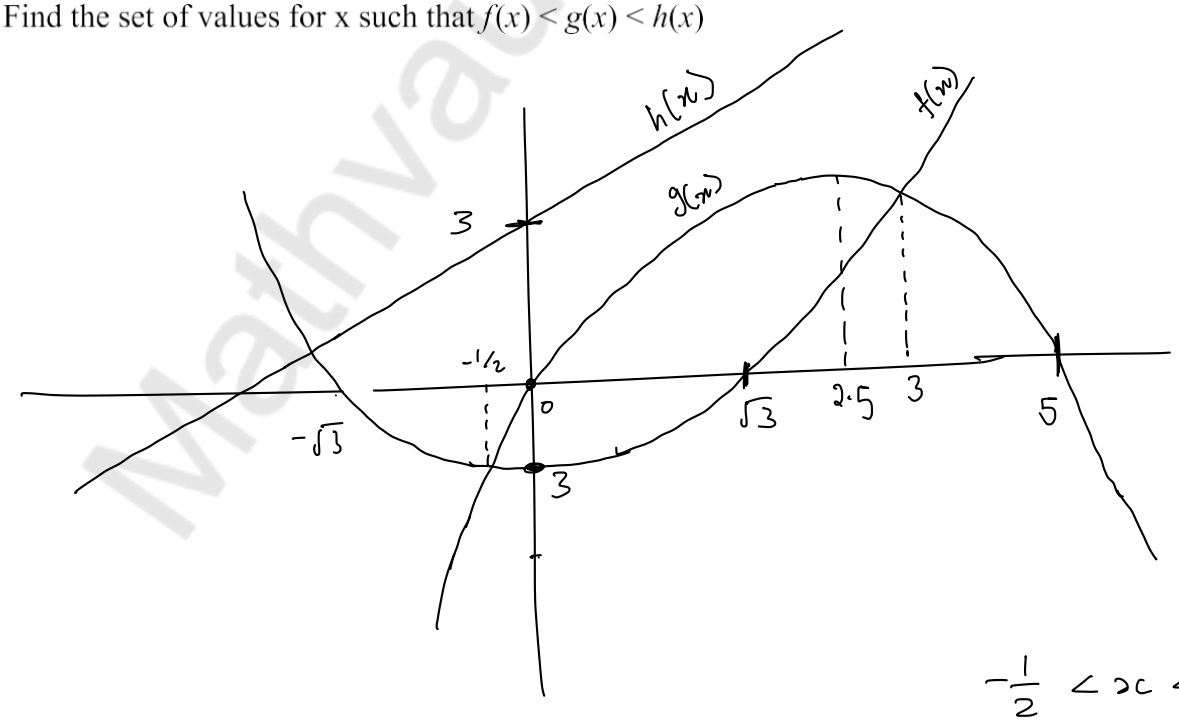
$h^{-1}(x) = x - 3$

$h^{-1}(7) = 7 - 3 = 4$

4

(2)

(b) Find the set of values for x such that $f(x) < g(x) < h(x)$



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

(5)