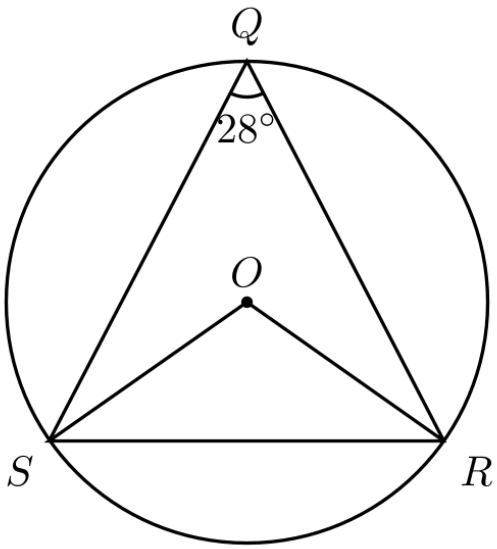
# 1 Problems public WAEC math 2023
## By cheetahwaec.com

**Problem 1**




In the diagram, $O$ is the center of the circle and $\angle SQR = 28°$. Find $\angle ORS$. Possible answers: A. 56°;B. 28°;C. 76°;D. 62°

**Problem 2**

Solve $1 + \sqrt[3]{x-3} = 4$. Possible answers: A. 30;B. 6;C. 12;D. 66

**Problem 3**

The angle of a sector of a circle of radius 3.4 $cm$ is 115°. Find the area of the sector. ( Take $\pi = \frac{22}{7}$) Possible answers: A. 11.6 $cm^2$;B. 12.7 $cm^2$;C. 10.2 $cm^2$;D. 9.4 $cm^2$

**Problem 4**

There are 30 students in a class; 15 study woodwork and 13 study metal work; 6 study neither of the 2 subjects. How many student study woodwork but not metal work?

**Problem 5**

Mr Manu is 4 times as old as his son, Adu; 7 years ago the sum of their ages was 76. How old is Adu? Possible answers: A. 22 years;B. 12 years;C. 18 years;D. 15 years

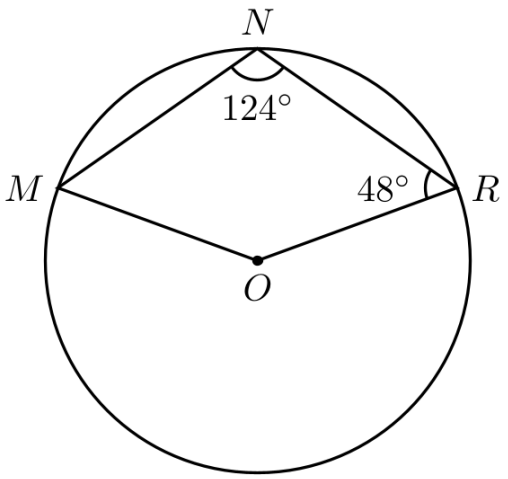
**Problem 6**

The angle of elevation of the top of a building from a point $Z$ on the ground is 50°. If the height of the building is 124 $m$, find the distance from $Z$ to the foot of the building. Possible answers: A. 147.78 $m$;B. 104.05 $m$;C. 161.87 $m$;D. 192.91 $m$

**Problem 7**

One-third of the sum of two numbers is 12, twice their difference is 12. Find the numbers. Possible answers: A. 22 and 14;B. 20 and 16;C. 21 and 15;D. 23 and 13

**Problem 8**




In the diagram above, $M, N, R$ are points on the circle centre $O$; $\angle ORN = 48°$ and $\angle RNM = 124°$. Find $\angle OMN$. Possible answers: A. 58°;B. 64°;C. 48°;D. 76°

**Problem 9**

Simplify $3\sqrt{12} + 10\sqrt{3} - \frac{6}{\sqrt{3}}$. Possible answers: A. $10\sqrt{3}$;B. $18\sqrt{3}$;C. $14\sqrt{3}$;$7\sqrt{3}$

**Problem 10**

For what value of x is $\frac{x^2+2}{10x^2-13x-3}$ is undefined? Possible answers: A. $\frac{1}{5}, \frac{3}{2}$;B. $-\frac{1}{5}, \frac{3}{2}$;C. $\frac{1}{5}, -\frac{3}{2}$;D. $-\frac{1}{5}, -\frac{3}{2}$

**Problem 11**

Express $413_7$ to base 5 Possible answers: A. $2311_5$;B. $1131_5$;C. $1311_5$;D. $2132_5$

**Problem 12**

Evaluate, correct to three decimal place $\frac{4.314 \times 0.000056}{0.0067}$. Possible answers: A. 0.037;B. 0.004;C. 0.361;D. 0.036

**Problem 13**

The interior angle of a regular polygon is 6 times its exterior angle, find the number of sides of the polygon. Possible answers: A. 12;B. 15;C. 10;D. 14

**Problem 14**

Solve $2^{5x} \div 2^x = \sqrt[5]{2^{10}}$. Possible answers: A. $\frac{3}{2}$;B. $\frac{1}{2}$;C. $\frac{1}{3}$;D. $\frac{5}{3}$

**Problem 15**

If $\log_a 3 = m$ and $\log_a 5 = p$, find $\log_a 75$. Possible answers: A. $m^2 + p$;B. $2m + p$;C. $m + 2p$;D. $m + p^2$

**Problem 16**

Find the roots of the equations: $3m^2 - 2m - 65 = 0$. Possible answers: A. $\left(-5, \frac{-13}{3}\right)$;B. $\left(5, \frac{-13}{3}\right)$;C. $\left(5, \frac{13}{3}\right)$;D. $\left(-5, \frac{13}{3}\right)$

**Problem 17**

A student measured the height of a pole as 5.98 $m$ which is less than the actual height. If the percentage error is 5%, find correct to two decimal places the actual height of the pole. Possible answers: A. 6.29 $m$;B. 7.67 $m$;C. 7.18 $m$;D. 6.65 $m$

**Problem 18**

The radius and height of a solid cylinder is 8 $cm$ and 14 $cm$ respectively. Find, correct to two decimal places the total surface area. (Take $\pi = \frac{22}{7}$) Possible answers: A. $1,106.29$ cm$^2$;B. $1,016.29$ cm$^2$;C. $1,106.89$ cm$^2$;D. $1,206.27$ cm$^2$

**Problem 19**

Find the value of $a$ in the equation: $\cos(a+14)^\circ = \sin(4a+6)^\circ$. Possible answers: A. 15;B. 17;C. 14;D. 21

**Problem 20**

The radius of a sphere is 3 $cm$. Find, in terms of $\pi$, its volume. Possible answers: A. $30\pi$ cm$^3$;B. $108\pi$ cm$^3$;C. $27\pi$ cm$^3$;D. $36\pi$ cm$^3$

**Problem 21**

If m : n = $2\frac{1}{3} : 1\frac{1}{5}$ and n : q = $1\frac{1}{2} : 1\frac{1}{3}$, find q : m. Possible answers: A. 35 : 18;B. 16 : 35;C. 18 : 35;D. 35 : 16

**Problem 22**

Make $x$ the subject of the relation $y = \frac{ax^3-b}{3z}$. Possible answers: A. $x = \sqrt[3]{\frac{ax^3-b}{3z}}$;B. $x = \sqrt[3]{\frac{3yz-b}{a}}$;C. $x = \sqrt[3]{\frac{3yz+b}{a}}$;D. $x = \sqrt[3]{\frac{3yzb}{a}}$

**Problem 23**

An empty cylindrical tank is 140 $cm$ in diameter. If 200 litres of water was poured into the tank. Calculate, correct to the nearest centimeter, the height of the water in the tank. ( Take $\pi = \frac{22}{7}$) Possible answers: A. 91 $cm$;B. 7 $cm$;C. 13 $cm$;D. 57 $cm$

**Problem 24**

Arrange the following in ascending order of magnitude $110_{\text{two}}$ , $31_{\text{eight}}$ , $42_{\text{five}}$ . Possible answers: A. $110_{\text{two}}$ , $31_{\text{five}}$ , $42_{\text{eight}}$ ;B. $42_{\text{five}}$ , $110_{\text{two}}$ , $31_{\text{eight}}$ ;C. $42_{\text{five}}$ , $31_{\text{eight}}$ , $110_{\text{two}}$ ;D. $110_{\text{two}}$ , $42_{\text{five}}$ , $31_{\text{eight}}$

**Problem 25**

A number is chosen at random from 40 and 50 inclusive. Find the probability that the number is prime. Possible answers: A. $\frac{8}{11}$;B. $\frac{3}{11}$;C. $\frac{4}{11}$;D. $\frac{5}{11}$

**Problem 26**

John was facing $S35^\circ$. If he turned 90° in the anticlockwise direction, find his new direction. Possible answers: A.S55°E;B. S35°W;C. N55°E;D. N35°W

**Problem 27**

A line $L$ passing through the point $(6, -13)$ is parallel to the line which passes through $(7, 4)$ and $(-3, 9)$. Find the equation of the line $L$. Possible answers: A. $y = \frac{1}{2}x - 10$;B. y = $\frac{-1}{2}x + 10$;C. $y = \frac{-1}{2}x - 10$;D. $y = \frac{1}{2}x + 10$

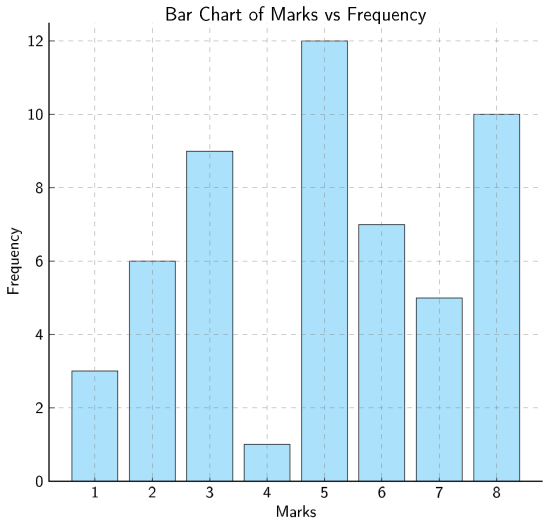
**Problem 28**

A bag contains 4 white marbles and 3 blue marbles. Another bag contains 5 red marbles and 6 blue marbles. If a marble is picked at random from each bag, find the probability that they are of the same colour. Possible answers: A. $\frac{9}{11}$;B. $\frac{18}{77}$;C. $\frac{1}{2}$;D. $\frac{11}{12}$

**Problem 29**

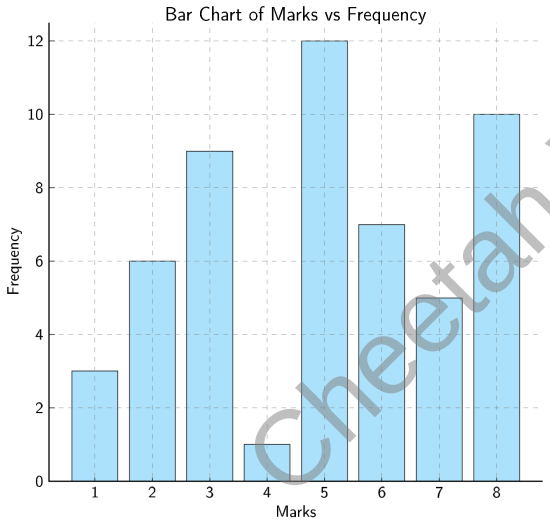
The truth set of $8 + 2x - x^2 = 0$ is $\{p, q\}$. Evaluate $p + q$. Possible answers: A. 4;B. 2;C. −6;D. −2

**Problem 30**




The bar chart below represents the distribution of marks scored by students in an economics examination. If the failed mark was 4, what is the probability that a student selected at random passed? Possible answers: A. 0.36;B. 0.74;C. 0.52;D. 0.64

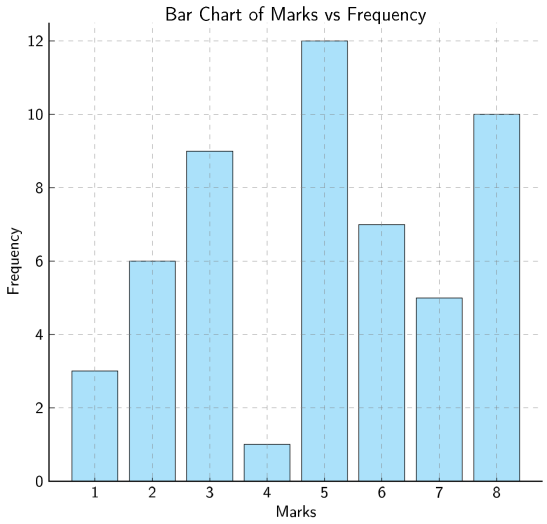
**Problem 31**






What percentage of the students scored at most 5 marks? See the bar chart below. Possible answers: A. 58.5%;B. 63.2%;C. 38.3%;D. 41.5%

**Problem 32**

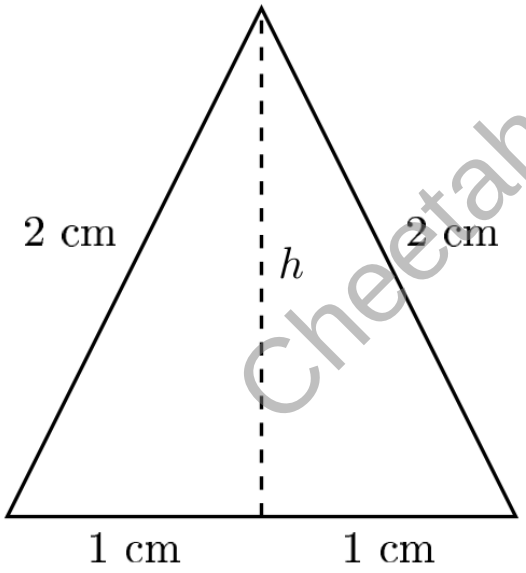



How many students scored at least 3 marks? See the bar chart below. Possible answers: A. 44;B. 52;C. 38;D. 18

**Problem 33**

Factorize completely: $x^2-(y+z)^2$. Possible answers: A. $(x-y-z)(x-y-z)$;B. $(x+y+z)(x-y-z)$;C. $(x+y+z)(x+y-z)$;D. $(x+y-z)(x-y+z)$

**Problem 34**






An equilateral triangle has a side of 2 $cm$. Calculate in cm the height of the triangle. Possible answers: A. 5;B. $\sqrt{5}$;C. 3;D. $\sqrt{3}$

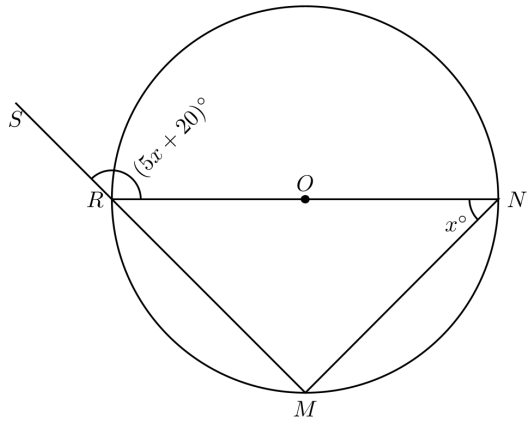
**Problem 35**

Mrs Kebeh stands at a distance of 110 $m$ away from a building of vertical height 58 $m$. If Kebeh is 2 $m$ tall, find the angle of elevation of the top of the building from her eye. Possible answers: A. 27°;B. 28°;C. 20°;D. 26°

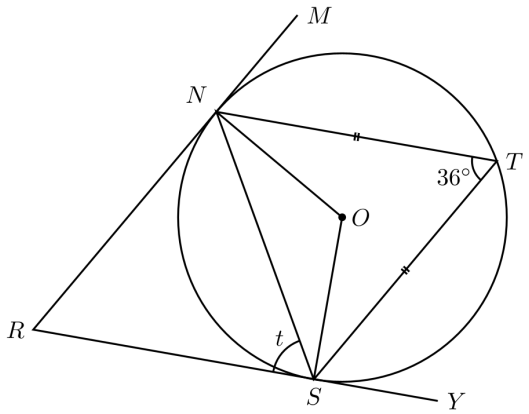
**Problem 36**

Consider the statements: p: Siah is from Foya.
q: Foya is in Lofa.
Write in symbolic for the statement: If Siah is from Foya, then Foya is in Lofa. Possible answers: A. $\sim q \Leftrightarrow p$;B. $q \Rightarrow p$;C. $p \Rightarrow q$;D. $p \Leftrightarrow q$

**Problem 37**
Write the name of a triangle with the vertices $(1, -3)$, $(6, 2)$ and $(0, 4)$. Possible answers: A. Scalene triangle;B. Isosceles triangle;C. Right-angle triangle;D. Equilateral triangle
**Problem 38**
The price of a shoe was decreased by 22%. If the new price is \$27.3. What is the original price? Possible answers: A. \$62.30;B. \$42.30;C. \$72.00;D. \$35.00
**Problem 39**

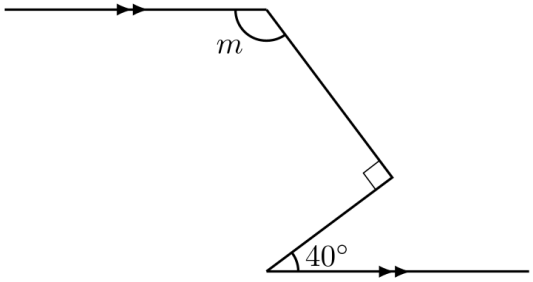



In the diagram, $NR$ is a diameter, $\angle$MNR = x° and, $\angle$SRN = $(5x + 20)^\circ$. Find the value of $2x^\circ$. Possible answers: A. 42°;B. 35°;C. 20°;D. 90°
**Problem 40**
Solve: $\log_3 x + \log_3(x - 8) = 2$. Possible answers: A. 8;B. 6;C. 9;D. 7
**Problem 41**
Find the quadratic equation whose roots are $\frac{2}{3}$ and $\frac{-3}{4}$. Possible answers: A. $12y^2 - y - 6 = 0$;B. $12y^2 - y + 6 = 0$;C. $12y^2 + y - 6 = 0$;D. $y^2 + y - 6 = 0$
**Problem 42**
The length of the diagonal of a square is 12 $cm$. Calculate the area of the square. Possible answers: A. 36 cm$^2$;B. 48 cm$^2$;C. 72 cm$^2$;D. 18 cm$^2$
**Problem 43**




In the diagram above, $O$ is the centre of a circle; $|NT| = |ST|$ and $\angle NTS = 36°$. Find the measure of the angle marked $t$. Possible answers: A. 72°;B. 54°;C. 36°;D. 108°

**Problem 44**




Find the value of $m$ in the diagram below. Possible answers: A. 40°;B. 50°;C. 130°;D. 140°

**Problem 45**

Find the gradient of the line passing through the points $(\frac{1}{2}, -\frac{1}{3})$ and $(3, \frac{2}{3})$. Possible answers: A. $\frac{2}{5}$;B. $\frac{5}{2}$;C. $\frac{2}{7}$;D. $\frac{7}{2}$

**Problem 46**

A notebook of length 15 $cm$ was measured to be 16.8 $cm$, calculate, correct to two decimal places, the percentage error in the measurement. Possible answers: A. 12.00%;B. 11.71%;C. 10.71%;D. 11.21%

**Problem 47**

If $2x - 3y = -11$ and $3x + 2y = 3$, evaluate $(y - x)^2$. Possible answers: A. 16;B. 25;C. 9;D. 4

**Problem 48**

The diagonals of a rhombus are 16 $cm$ and 12 $cm$, find the length of the side. Possible answers: A. 20 $cm$;C. 8 $cm$;C. 14 $cm$;D. 10 $cm$

**Problem 49**

$M$ varies jointly as the square of $n$ and square root of $q$. If $M = 24$ when $n = 2$ and $q = 4$, find $M$ when $n = 5, q = 9$. Possible answers: A. 288;B. 400;C. 300;D. 225

**Problem 50**

Find the mean deviation of numbers: $14, 15, 16, 17, 18, 19$. Possible answers: A. 2.5;B. 1.7;C. 1.5;D. 3.5

**Problem 51**

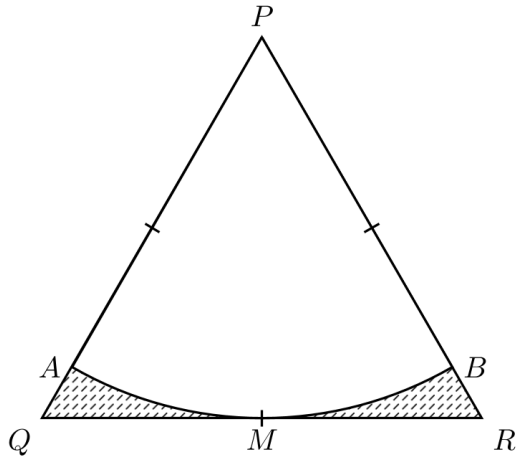
A. A car travels a distance of 112 $km$ at an average speed of 70 km/h. It then travels a further 60 $km$ at an average speed of 50 km/h. Calculate, for the entire journey, the total time taken.
B. If $\frac{x}{y} = 2$ and $\frac{y}{z} = 3$, find the value of $\frac{x+y}{y+z}$. Represent the answer as $\frac{a}{b}$, where $a, b$ are integers,

write down the answer as $a, b$

**Problem 52**

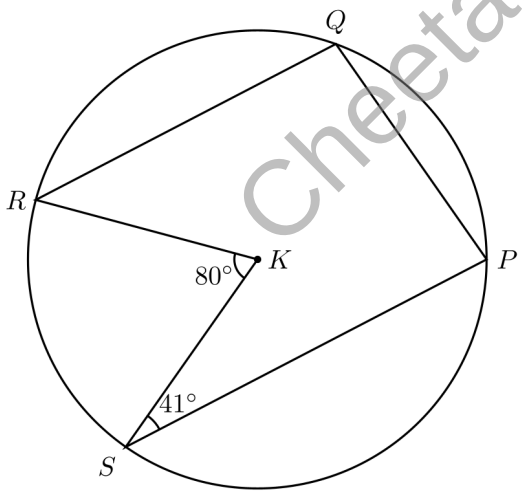
A. In a football match, tickets for children and adults were sold at $D3.00$ and $D5.00$ respectively. If 400 people attended a football match and $D1700.00$ was collected in ticket sales. How many tickets were sold to adults? B. Mr Johnson sold 250 tickets. If 175 of the tickets were for adults, how much sales did he make altogether?

**Problem 53**




a. In the diagram above, $PQR$ is an equilateral triangle of side 18 cm; M is the midpoint of $QR$. An arc of a circle with center $P$ touches $QR$ at $M$ and meets $PQ$ at $A$ and $PR$ at $B$. Calculate, correct to two decimal places, the area of the shaded region. (Take $\pi = \frac{22}{7}$)

**Problem 54**




A. In the diagram above, $P, Q, R$, and $S$ are points on the circle with centre $K$; $KR$ is a bisector of angle $\angle SRQ, \angle KSP = 41°$ and $\angle SKR = 80°$. Find: $\angle RQP$;
B. Find $\angle SPQ$.

**Problem 55**

a. A boy stands at the point $M$ on the same horizontal level as the foot, $T$ of a vertical building. He observes an object on the top, $P$ of the building at an angle of elevation of 66°. He moves directly backward to a new point $C$ and observes the same object at an angle of 53°. If $|MT| = 50\ m$: Illustrate the information in a diagram;

bi. Calculate and correct to one decimal place: the height of the building;

bii. Calculate and correct to one decimal place: $|MC|$.

**Problem 56**

A. Let $M = \{n : 2n - 3 \leq 37\}$, where $n$ is a counting number. Write down all the elements in $M$ separetd by the comma and without blank spaces.

If a number is selected at random from $M$ what is the probability that it is a multiple of 3? If a number is selected at random from $M$ what is the probability that it is a factor of 10? Represent the answers as $\frac{a}{b}$ and write the answers as $a, b$, where $a, b$ are integers.

B. A shop owner gave an end-of-year bonus to two of his attendees, Kontor and Gapson in the ratio of their ages. Gapson's age is one and a half times that of Kontor who is 20 years old. Kontor received *Le* 200, 000.00. (i) Find he total amount shared. (ii) Find Gapson's amount.

**Problem 57**

A. The sum of three numbers is 81. The second number is twice the first, the third number is 6 more than the second. Find the numbers. Write down the answer as $a, b, c$, where $a$ is the first number, $b$ is the second one, $c$ is the third one. B. There are points $P(3, 5)$ and $Q(-5, 7)$ on the Cartesian plane such that $R(x, y)$ is the midpoint of $PQ$. Find the equation of the line that passes through $R$ and perpendicular to line $PQ$. Represent the answer as $y = ax + b$, write down the answer as $a, b$

**Problem 58**

A. Complete the table of values of y $= 2x^2 - x - 4$ for $-3 \leq$ x $\leq 3$, write the answer as a sequence of missing values for $y$ coresponding to the values of $x$ from $-2$ to 3.

| x | -3 | -2 | -1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|
| y | 17 | | | -4 | | | |

B. Using a scale of 2 *cm* to 1 unit on the $x$-axis and 2 *cm* to 2 unit on the $y$-axis, draw the graph of y $= 2x^2 - x - 4$ for $-3 \leq$ x $\leq 3$.

C. i. Use the graph to find: the roots of the equation $2x^2 - x - 4$.

ii. Use the graph to find the: values of $x$ for which $y$ increases as $x$ increases. Represent the asnwer as $x > \frac{a}{b}$, where $a, b$ are integers, write down the answer as $a, b$.

iii. Use the graph to find, correct to one decimal place, the minimum point of $y$.

**Problem 59**

A. The table below shows the height of teak trees harvested by a farmer. Find the median height.

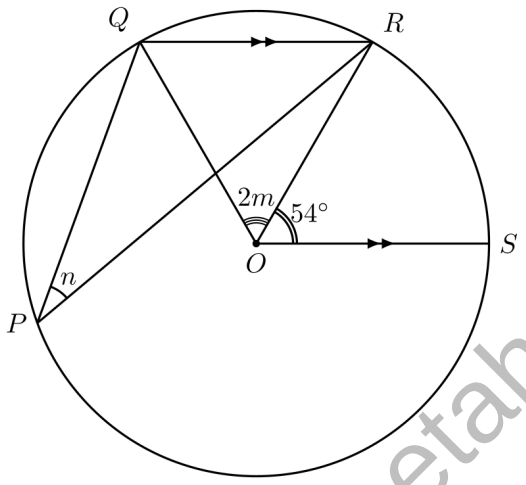
| Height(m) | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|
| Number of trees | 4 | 6 | 4 | 5 | 6 | 2 |

B. Calculate and correct to one decimal place the mean.
C. Calculate and correct to one decimal place the standard deviation.

**Problem 60**
a. In a town, Chief $X$ resides 60 $m$ away on a bearing of 057° from Palace $P$, while Chief $Y$ resides on a bearing of 150° from the same Palace $P$. The residence of $X$ and $Y$ are 180 $m$ apart. Illustrate the information in a diagram. b. Find and correct to three significant figures, the: i. bearing of $X$ from $Y$; ii. distance between $P$ and $Y$.

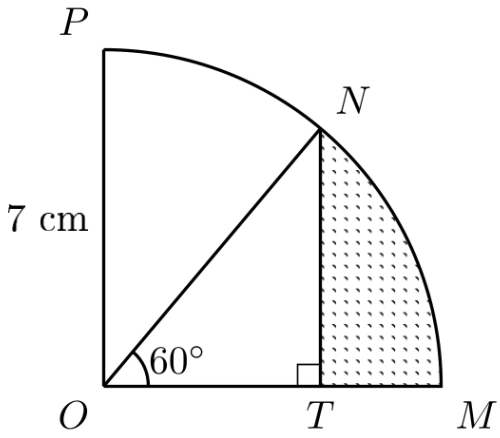
**Problem 61**
A. Two regular polygons $P$ and $Q$ are such that the number of sides of $P$ is twice the number of sides of $Q$. The difference between the exterior angle of $P$ and $Q$ is 45°. Find the number of sides of $P$. B. The area of a semi-circle is $32\pi$ cm$^2$. Find, in terms of $\pi$, the circumference of the semi-circle. Represent the answer as $a\pi + b$, where $a, b$ are integers, write down the answer as $a, b$.

**Problem 62**




A. In the diagram above $P, Q, R$, and $S$ are points on the circle with centre $O$; QR||OS, $\angle$QOR = 2 m, $\angle$QPR = n and $\angle$SOR = 54°. Find the values of $m$ and $n$. B. The length of a rectangle is 4 $cm$ more than the width. If the perimeter is 40 $cm$, find the area.

**Problem 63**




A. In the diagram above, the radius of the sector of circle centre $O$ is 7 $cm$ and $\angle MON$ is $60°$. Find, correct to one decimal place, the area of the shaded portion. (Take $\pi = \frac{22}{7}$) B. The $x$ and $y$ intercepts of a straight line are $\frac{-3}{4}$ and $\frac{2}{7}$ respectively. Find the equation of the line. Represent the answer as $y = \frac{a}{b}x + \frac{c}{d}$, where $a, b, c, d$ are integers, write down the answer as $a, b, c, d$.

**Problem 64**

The $x$ and $y$ intercepts of a straight line are $\frac{-3}{4}$ and $\frac{2}{7}$ respectively. Find the equation of the line. Represent the answer as $y = \frac{a}{b}x + \frac{c}{d}$, where $a, b, c, d$ are integers, write down the answer as $a, b, c, d$.