# 7 ARITHMETIC SEQUENCES

## EQUATIONS

First term – f

Common difference – d

Common difference

$$d = \frac{(x_m - x_n)}{m - n}$$

$N^{th}$ term

$$x_n = f + (n-1)d$$

$$x_n = dn + (f - d)$$

$$x_n = an + b$$

$(a$ – common difference

$a + b$ – first term$)$

Sum of sequence

$$S_n = \frac{n}{2}[2f + (n-1)d]$$

$$S_n = \frac{n}{2}[x_1 + x_n]$$

$$S_n = \frac{n}{2}[f + l]$$

$$S_n = \frac{d}{2}n^2 + n\left(f - \frac{d}{2}\right)$$

# MODEL QUESTIONS

## Question 01

An arithmetic sequence starts as 5, 9, 13,...

(a) What is the next term?

(b) Is 2012 a term of this sequence? Why?

### Answer

(a) Common difference $d = 9 - 5 = \underline{4}$

Next term $x_4 = 13 + 4 = \underline{17}$

(b) No. $\frac{2012 - 5}{4}$ is not a natural number.

## Question 02

Second and fourth terms of the following arithmetic sequence are missing. Find the numbers at these positions.

11,__,19,__

### Answer

$x_2 = \frac{11 + 19}{2} = 15$

$d = 15 - 11 = 4$

$x_3 = 19 + 4 = 23$

11, $\underline{15}$, 19, $\underline{23}$

## Question 03

For the arithmetic sequence 4, 8, 12, 16,...

(a) Find the first term.

(b) Find common difference.

(c) Find $20^{th}$ term.

### Answer

(a) $\underline{4}$ (b) $8 - 4 = \underline{4}$

(c) $x_n = f + (n-1)d$

$x_{20} = 4 + (20 - 1) \times 4 = 4 + 19 \times 4 = \underline{80}$

## Question 04

In a flower garden, there are 23 rose plants in the first row, 21 in the second row, 19 in the third row and so on. There are 5 rose plants in the last row. How many rows are there in the flower garden?

### Answer

Let n be the number of rows in the flower garden.

The arithmetic is 23, 21, 19, ... 5

We have

First term $f = 23$

Common difference $d = -2$

Last term $l = 5$.

$$n = \frac{l - f}{d} + 1$$

$$= \frac{5 - 23}{-2} + 1 = \underline{10}$$

## Question 05

For the arithmetic sequence 6, 12, 18 ...

(a) What is the common difference?

(b) Find the 10th term

### Answer

Common difference $= 6$

$$10\text{th term} = (1\text{st term}) + (9 \times \text{common difference})$$

$$= 6 + (9 \times 6) = \underline{60}$$

## Question 06

For the arithmetic sequence 16, 20, 24...

(a) Find the $n^{th}$ term.

(b) Find the $7^{th}$ term.

### Answer

Common difference $= 4$

$n^{th}$ term $= f + (n-1)d$

$= 16 + (n-1) \times 4 = 16 + 4n - 4 = \underline{12 + 4n}$

$7^{th}$ term $= (1st\ term) + (6 \times common\ difference)$

$= 16 + (6 \times 4) = \underline{40}$

## Question 07

For the arithmetic sequence 22, 26, 30...

a) What is the common difference?

b) Find the 7th term

c) Will 50 be a term of this sequence? Why?

d) Can the difference between any two terms of this sequence be 50? Justify your answer.

## Answer

a) Common difference, $d = 26 - 22 = \underline{4}$

b) $7^{th}$ term is $= 22 + 6d = \underline{46}$

c) $\frac{50 - 22}{4} = 7$ . So, 50 is a term of this sequence.

d) 50 is not a multiple of 4. So, 50 cannot be the difference of two terms.

## Question 08

Consider the multiples of 7 in between 100 and 500.

a) What are the first and last numbers?

b) How many terms are ther in this sequence?

## Answer

a) first term $= 100 - 2 + 7 = 105$

last term $= 500 - 3 = 497$

b) $x_n = dn + (f - d)$

$497 = 7n + (105 - 7)$

$n = \frac{(497 - 98)}{7} = \underline{57}$

## Question 09

First term of an arithmetic sequence is 6 and sum of first two terms is 10.

a) Find Common difference

b) Find the third term.

**Answer**

First term $a = 6$

Sum of first two terms $= 10$

$a + a + d = 10$

$d = 10 - 12$

$= -2$

Third term $a_3 = a + 2d = 2$

## Question 10

Examine whether 685 is a term of the arithmetic sequence 7, 29, 51 ...? Give reason?

$f = 7$

$d = 29 - 7 = 22$

$x_n = f + (n-1)d$

$685 = 7 + (n-1)22$

$685 = 7 + 22n - 22$

$685 = 22n - 15$

$22n = 685 + 15$

$n = \frac{700}{22} = 31.82$

685 is not a term

## Question 11

Which term of the sequence, 205, 199 ... is the first negative term?

**Answer**

First term, $f = 205$

Common difference $d = 6$

First negative term $= x_n$

$x_n < 0$

$f + (n-1)d < 0$

$205 + (n-1) \times -6 < 0$

$205 - 6n + 6 < 0$

$6n > 211$

$n > 35.17$

$n \geq 36$

$36^{th}$ term is the first negative term.

## Question 12

Find the sum of first 24 terms of the list of numbers whose nth term is given by $a_n = 3 + 2n$.

**Answer**

$x_n = 3 + 2n$. Now, put $n = 1, 2, 3$

$x_1 = 3 + 2(1) = 5, \quad x_2 = 3 + 2(2) = 7, \quad x_3 = 3 + 2(3) = 9$

Thus, the terms of the AP are 5, 7, 9, ...

Here, $f = 5$ and $d = 2$

$$S_{24} = \frac{24}{2}[2(5) + (24-1)2]$$

$$= 12[10 + 46] = 12 \times 56 = 672$$

## Question 13

Find the sum : $-5 + (-8) + (-11) + \ldots\ldots\ldots\ldots + (-230)$

**Answer**

AP is $-5, -8, -11, \ldots -230$

$f = -5, \; d = -8 - (-5) = -3$

$$x_n = f + (n-1)d$$

$$-230 = -5 + (n-1)(-3)$$

$$-225 = (n-1)(-3)$$

$$(n-1) = \frac{-225}{-3}$$

$$(n-1) = 75$$

$$n = 76$$

$$S = \frac{n}{2}[f + l]$$

$$= [(-5) + (-230)]$$

$$= 38(-235)$$

$$= -8930$$

## Question 14

In an arithmetic sequence, the sum of first 14 terms is -203 and the sum of the next 11 terms is -572. Find the arithmetic sequence

**Answer**

$$S_{14} = -203$$

$$\frac{14}{2}(2a+13d) = -203$$

$$7(2a+13d) = -203$$

$$2a+13d = -29 \quad ...(1)$$

Also $S_{25} = S_{14} + (-572)$

$$S_{25} = -775$$

$$\frac{25}{2}(2a+24d) = -775$$

$$(2a+24d) = -\frac{775\times 2}{25}$$

$$(2a+24d) = -31\times 2$$

$$2a+24d = -62 \quad ...(2)$$

Eqn (2) – (1)

$\Rightarrow$ $11d = -33$

$d = -3$

and $2a+13(-3) = -29$

$a = 5$

Thus, the required arithmetic series is $5, 2, -1, -4, -7...$

## Question 15

If the 25th term of an arithmetic progression is 180 and the common difference is 7, then what is its first term?

## Answer

$x_{25} = 180$

$d = 7$

$x_{25} = f + 24d$

$180 = f + 24(7)$

$f = 180 - 168$

$= \underline{12}$

## Question 16

If the 12th term of an arithmetic sequence is 25 and the common difference is 3, then what is its 17th term?

## Answer

$x_{12} = 25$

$d = 3$

$x_{17} = ?$

$x_{12} = f + 11d$

$25 = f + (11\times 3)$

$f = 25 - 33 = \underline{-8}$

$x_{17} = f + 16d$

$= -8 + 16(3) = \underline{40}$

or

$x_{17} = x_{12} + 5d$

$= 25 + 5(3) = \underline{40}$

## Question 17

If the 3rd term of an arithmetic sequence is 10 and the 8th term is 25.What is the common difference? Find 13th term and 40th term.

**Answer**

$x_3 = 10$

$x_8 = 25$

$d = ?$

$x_{13} = ?$ $x_{40} = ?$

$$d = \frac{(x_m - x_n)}{m - n}$$

$$= \frac{25 - 10}{5} = \underline{3}$$

$$x_{13} = x_8 + 5d$$

$$= 25 + 15$$

$$= \underline{40}$$

$$x_{40} = x_8 + 32d$$

$$= 25 + 32(3)$$

$$= \underline{121}$$

## Question 18

If the 17th term of an arithmetic progression is 23 and the 23rd term is 17, then what is its first term and what is the common difference?

**Answer**

$x_{17} = 23$

$x_{23} = 17$

$f = ?$ $d = ?$

$$d = \frac{(x_m - x_n)}{m - n}$$

$$= \frac{17 - 23}{23 - 17} = \underline{-1}$$

$$f = x_{17} - 16d$$

$$= 23 + 16 = \underline{39}$$

## Question 19

Which term of the AP 5,15,25,... will be 150 more than its $30^{th}$ term?

**Answer**

$a = 5,\ d = 10$

$x_{30} = a + 29d$

$= 5 + (29 \times 10) = 295$

$a_n = a_{30} + 150$

$a + (n-1)d = 295 + 150$

$5 + (n-1)10 = 445$

$$n - 1 = \frac{445 - 5}{10} = 44$$

$n = 45$

## Question 20

(a) What is the least three digit number,which is a multiple of 6?

(b) Find the sum of all three digit numbers which are multiples of 6.

**Answer** (TryYourself)

## Question 21

Examine whether 143 is a term of the arithmetic sequence 3,11, 19 ...? Give reason?

**Answer** (TryYourself)

## Question 22

3rd term of an arithmetic sequence is 34 and its 8th term is 69

(a) Find the common difference of this sequence.

(b) Write the algebraic form of this sequence.

(c) If a new sequence is formed by multiplying each term of the given sequence by 4 and adding 3, then what is the tenth term of that sequence?

**Answer** (TryYourself)

## Question 23

For the arithmetic sequence 14, 19, 24, 29,...

(a) Find the next term.

(b) Find 24th term.

Answer (TryYourself)

Question 24

Find the sum : $-12+(-20)+(-28)+\ldots\ldots\ldots\ldots+(-300)$

Answer (TryYourself)

Question 25

If the 8th term of an arithmetic sequence is 43 and the common difference is 3, then what is its $12^{th}$ term?

Answer (TryYourself)





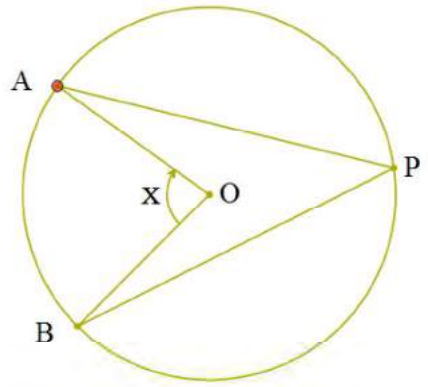
Prepared By
Fassal Peringolam
Brains Moozhikkal

# 2 CIRCLES

## MODEL QUESTIONS

### Question 01

In the given figure, O is the centre of the circle. ⇒
If $\angle OAP = 35^\circ$ and $\angle OBP = 40^\circ$, find the value of $\angle x$.




**Answer**

$\angle APO = \angle OAP = 35^\circ$

Similarly, $OB = OP$ and

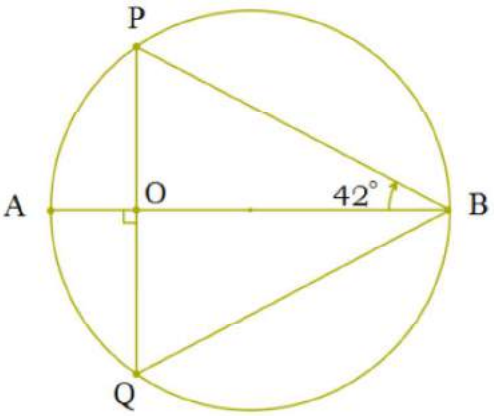
$\angle OPB = \angle OBP = 40^\circ$

$\angle APB = 35^\circ + 40^\circ = \underline{75^\circ}$

$\angle AOB = 2 \times 75^\circ = \underline{150^\circ}$

### Question 02

In the figure, O is the centre. ⇒
Find $\angle PQB$

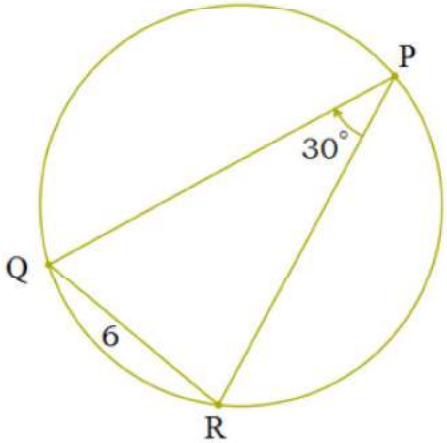



**Answer**

$$\angle PQB = \frac{[180^\circ - (2 \times 42^\circ)]}{2} = \underline{48^\circ}$$

### Question 03

In the figure PQ is the diameter of the circle, then
(a) Find the value of $\angle R$ ⇒
(b) Find the value of $\angle Q$
(c) If $QR = 6cm$, then find PR



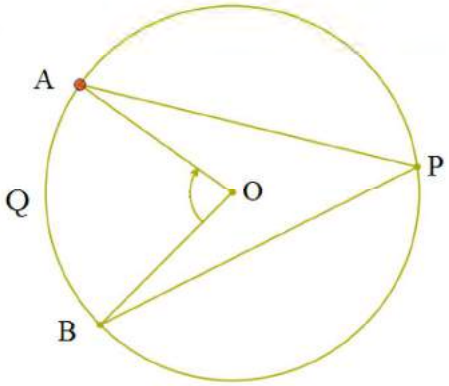
**Answer**

$\angle R = 90°,\ \angle Q = 90° - 30° = 60°$

The ratio of sides of triangle is $1 : \sqrt{3} : 2$

Thus PR $= 6\sqrt{3}$

**Question 04** ⇒




In the figure find $\angle APB$ and $\angle AQB$, where O is the centre of the circle and $\angle OAP = 32°$ and $\angle OBP = 47°$.

**Answer**

Join OP.

In OAP,

OA = OP = radius

$\angle OAP = \angle OPA = 32°$

In OPR,

OB = OP = radius

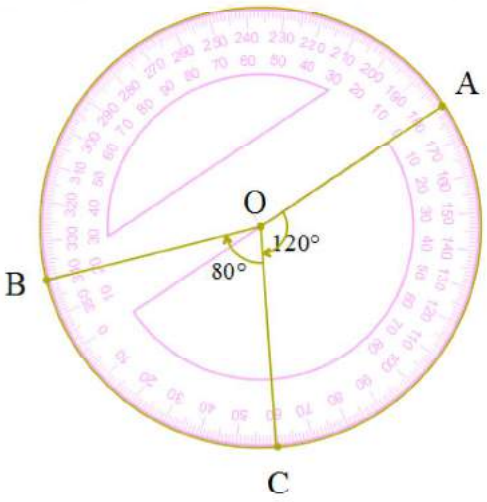
$\angle OBP = \angle OPB = 47°$

$\angle APB = 32° + 47° = 79°$

$\angle AQB = 180° - 79° = 10°$

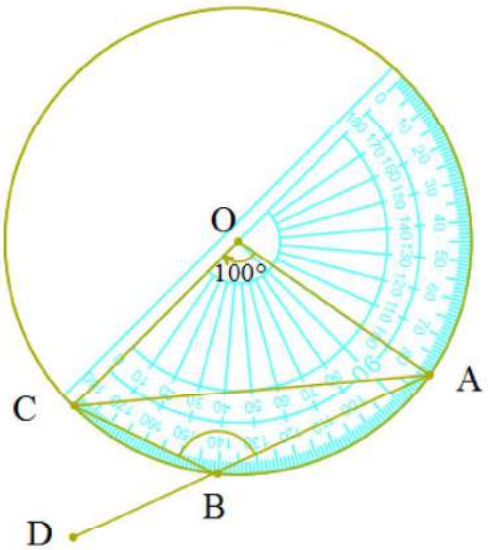
**Question 05**

What is the central angle of the arc ACB in this picture? ⇒




**Answer**

Arc ABC =120 80 = 200°




⇐ **Question 06**

O is the centre of the circle as shown in the figure.

Find $\angle CBD$

Answer

Take a point E on the circle, join AE and CE.

$$\angle AEC = 100/2 = 50^\circ$$

$$\angle AEC + \angle ABC = 180^\circ$$

$$\left(\begin{array}{l}\because \text{Opposite Angles of a} \\ \text{cyclic quadrilaterals}\end{array}\right)$$

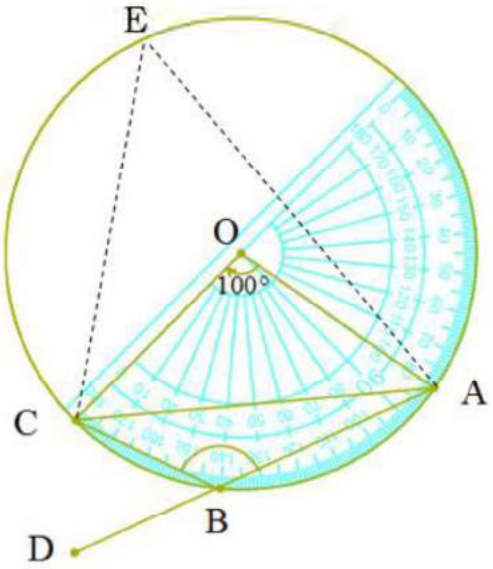
$$\angle ABC = 130^\circ$$

$$\angle ABC + \angle CBD = 180^\circ$$

$$(\because \text{linear pair})$$

$$130^\circ + \angle CBD = 180^\circ$$

$$\angle CBD = 50^\circ$$

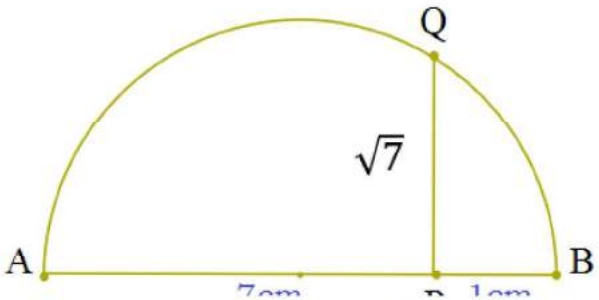



Question 07

Draw a line of $\sqrt{7}$ cm

Answer

$\Rightarrow$

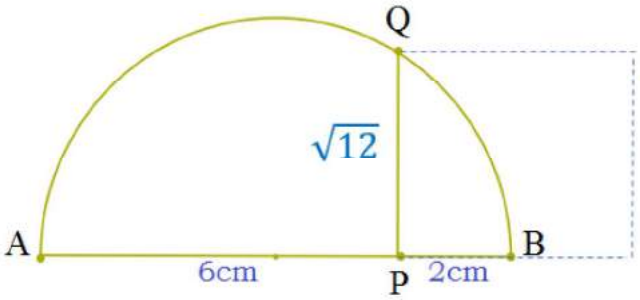



Question 08

Draw a squre of area $12cm^2$

Answer

$\Rightarrow$

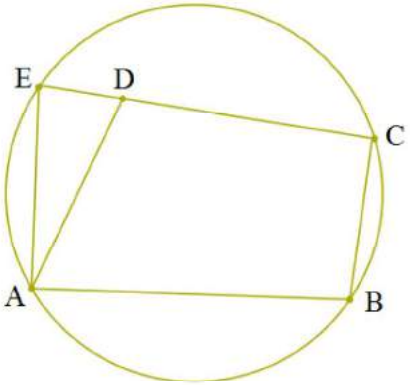



Question 09

Using the following fiqure,

(a) $\angle B + \angle E = .....?$

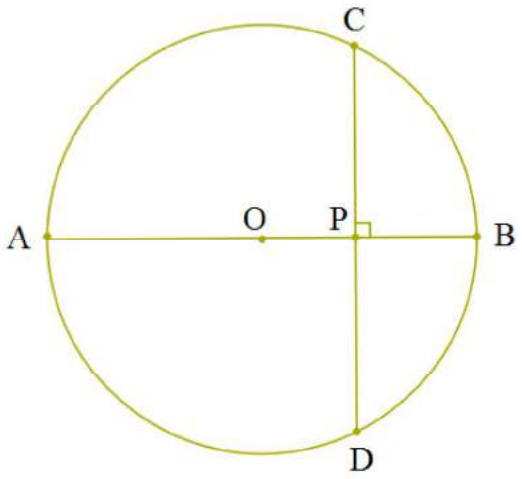
(b) $\angle ADC = \angle E + .....?$




Answer

(a) $180^\circ$ (b) $\angle EAD$

## Question 10




In figure

PB = 3cm,

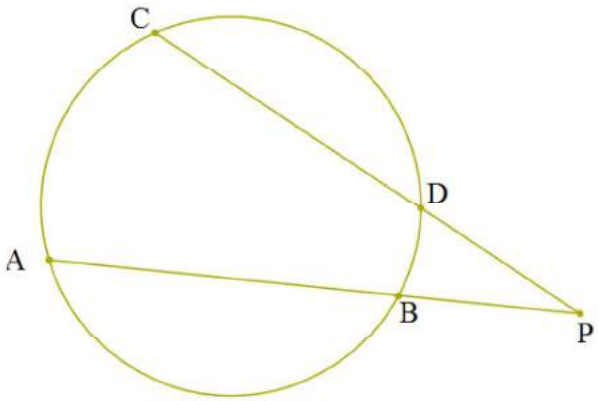
PA = 8cm,

PD = 4cm, then find PC

**Answer**

$$PC = \frac{PB \times PA}{PD} = \frac{38}{4} = 6cm$$

## Question 11




In figure

PD = 5cm,

PC = 12cm,

PB = 3cm, then find PA

**Answer**

$$PA = \left(\frac{PD \times PC}{PB}\right)$$

$$= \frac{5 \times 12}{3} = 20cm$$

## Question 12

Draw a circle of radius 3 centimerrcs.

(a) Draw triangle ABC with this circle as circum circle and angles 50°,60° and 70°.

(b) Construct triangle PQR outside the circle, by drawing tangents to the circle at the points A, B and C.

(c) Find all angle of triangle PQR.

**Answer** (TryYourself)

## Question 13

(a) Draw a rectangle of sides 5cm and 4cm. Draw a square, equal in area to this rectangle

(b) Draw an isosceles triangle, equal in area to this square.

**Answer** (TryYourself)

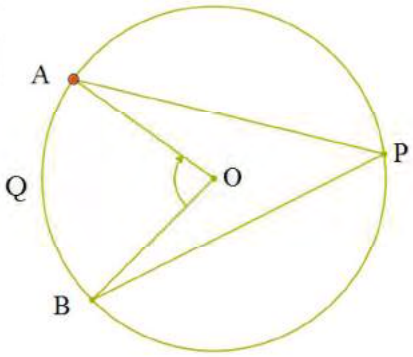
## Question 14

Draw a triangle with sides 5cm,6cm and 6cm.Draw a square having the same area ofthe triangle

**Answer** (TryYourself)

## Question 15

In the figure find $\angle APB$ and $\angle AQB$, where O is the centre of the circle and $\angle OAP = 30°$ and $\angle OBP = 45°$.

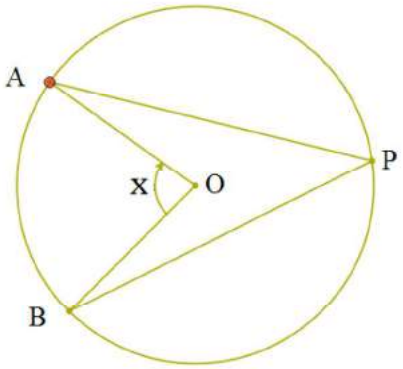



**Answer** (TryYourself)

## Question 16

In the given figure, O is the centre of the circle.

If $\angle OAP = 33°$ and $\angle OBP = 44°$, find the value of $\angle x$.




**Answer** (TryYourself)



Prepared By
Fassal Peringolam
Brains Moozhikkal

# 3 MATHEMATICS OF CHANCE

## MODEL QUESTIONS

**Question 01**

Two coins are tossed together. Find the probability of getting at least one tail.

**Answer**

Total possibilities = {HH, HT, TH, TT}

Number of possible outcomes = 4

The probability of getting at least one tail $= \frac{3}{4}$

**Question 02**

A bag contains 6 red balls, 8 green balls and 8 white balls. One ball is drawn at random from the bag, find the probability of getting

(i) A white or green ball

(ii) Neither green ball nor a red ball

**Answer**

Red balls = 6, Green balls = 8, White balls = 8

Total number of balls = 6 + 8 + 8 = 22

(i) $\frac{16}{20}$ (ii) $\frac{8}{20}$

## Question 03

A bag contains 4 red balls and some blue balls. If the probability of drawing a blue ball from the bag is thrice that of a red ball, find the number of blue balls in the bag.

## Answer

Number of red balls $= 4$

Total Number of balls $= 4 + x$

Probability of drawing a red ball from the bag $= \frac{5}{4+x}$

Probability of drawing a blue ball from the bag $= \frac{x}{4+x}$

By condition $\frac{x}{4+x} = 3 \times \frac{4}{4+x}$

$$x^2 - 8x - 48 = 0$$

$$x = -4 \text{ or } 12$$

$$x = 12$$

Hence the number of blue balls in the bag $= 12$

## Question 04

20 cards numbered 1, 2, 3, 4... 19, 20 are put in a box. One boy draws a card from the box. Find the probability that the number on the card is :

(i) Prime (ii) Divisible by 3 (iii) Divisible by 5

## Answer

Total number of outcomes = 20

(a) Prime numbers from 1 to 17 are 2,3,5,7,11,13,17,19.

Number of outcomes = 8

The probability that the the card drawn is prime number $= \frac{8}{20}$

(b) Numbers are divisible by 3 are 3, 6, 9, 12, 15, 18.

Number of outcomes = 6

The probability that the card drawn is divisible by $3 = \frac{6}{20}$

(c) Numbers are divisible by 5 are 5, 10, 15, 20.

Number of outcomes = 4

The probability that the card drawn is divisible by $3 = \frac{4}{20}$

## Question 05

Three coins are tossed simultaneously.

Find the probability of getting

(a) Three heads (b) Three heads

(c) Exactly 2 heads (d) At least 2 heads.

## Answer

Outcomes = {HHH, HHT, HTH, HTT, THH, THT, TTH, TTT}

Number of total outcomes = 8

(a) $\frac{1}{8}$ (b) $\frac{1}{8}$ (c) $\frac{3}{8}$ (d) $\frac{4}{8} = \frac{1}{2}$

## Question 06

Two dice rolled simultaneously. Find the probability of getting sum 5.

## Answer

Total probable pairs $= 6 \times 6 = 36$

(1,4),(2,3),(3,2) and (4,1) are the 4 pairs whose sum is 5

The probability of getting sum $5 = \frac{4}{36} = \frac{1}{9}$

## Question 07

Find the probability that a leap year selected at random will contain 53 sundays.

**Answer**

In a leap year, there are 366 days.

We have, 366 days = 52 weeks + 2 days.

Thus, a leap year has always 52 sundays.

Probability $= \frac{2}{7}$

## Question 08

Cards marked with the numbers 2 to 101 are placed in a box and mixed thoroughly. One card is drawn from this box. Find the probability that the number of the card is

(a) an even number

(b) a number less than 16

(c) a number which is a perfect square

(d) a prime number less than 25.

**Answer**

(a) $\frac{1}{2}$

(b) $\frac{14}{100} = \frac{7}{50}$

(c) The perfect squares are 4, 9, 16.....100

Probability $= \frac{9}{100}$

(d) The prime numbers less than 25 are

2, 3, 5, 7, 11, 13, 17, 19, 23

Probability $= \frac{9}{100}$

## Question 09

One is asked to say a two digit number.

(a) What is the probability of both digits being the same?

(b) What is the probability of the first digit being larger?

(c) What is the probability of the first digit being smaller?

## Answer

Total two digit numbers = 90

(a) $\frac{9}{90} = \frac{1}{10}$ (b) $\frac{45}{90} = \frac{1}{2}$ (c) $\frac{36}{90} = \frac{2}{5}$

## Question 10

One is asked to say a two digit number. What is the probability of it being a perfect square?

## Answer

Total two digit numbers = 90

Two digit perfect squares are 16, 25, 36, 49, 64, 81

Probability = $\frac{6}{90} = \frac{1}{15}$

## Question 11

Find the probability that a number selected at a random from the numbers 1, 2, 3, ...., 35 is a

(a) prime number (b) multiple of 7

(c) multiple of 3

## Answer

(a) $\frac{5}{35}$ (b) $\frac{11}{35}$

## Question 12

There are two small boxes A and B.In A there are 9white beads and 8 black beads. ln B there are 7 white and 8 black beads. We want to take a bead from a box

(a) What is the probability of getting a white bead from each box ?

(b) A white bead and a black bead are added to box B and then a bead is taken from it. What is the plobability of getting a white bead from it.

**Answer** (TryYourself)

## Question 13

There are two covers A and B ;each containing paper slips with natural numbers from 1 to 7 written on them.One slip is drawn from each cover. Using them,a two digit number is formed with the number from A in the unit place and the number from B in the tenth place. How many such two digit numbers can be formed? What is the probability that a two digit number so formed is even?

**Answer** (TryYourself)

## Question 14

A box contains 8 black beads and 12 white beads. Another box contains 9 black beads and 6 white beads. One bead from each box is taken.

(a) What is the probability that both beads are black?

(b) What is the probability of getting one black bead and one white bead?

**Answer** (TryYourself)

# 4 SECOND DEGREE EQUATIONS

## EQUATIONS

A quadratic equation in the variable x is of the form $ax^2 + bx + c = 0$, where a, b, care real numbers and $a \neq 0$.

The solutions of second degree equation $ax^2 + bx + c = 0$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

If $b^2 - 4ac = 0$ ,the equation has only one solution.

If $b^2 - 4ac < 0$ ,the equation has no solution.

If $b^2 - 4ac > 0$ , the equation has two different solutions.

## MODEL QUESTIONS



**Question 01**

Find two numbers whose sum is 6 and product is 9.

**Answer**

First number $= x$

Second number $= 6 - x$

$\therefore \quad x(6-x) = 9$

$6x - x^2 = 9$

$x^2 - 6x + 9 = 0$

$(x-3)^2 = 0$

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

$x = 3$

Numbers are 3, 3

OR

First number $= 3 + x$

Second number $= 6 - (3 + x)$

$= 3 - x$

$\therefore \quad (3+x)(3-x) = 9$

$3^2 - x^2 = 9$

$3^2 - x^2 = 9$

$x = 0$

Numbers are 3,3

OR

First number $= x$

Second number $= 6 - x$

$\therefore \quad x(6-x) = 9$

$x^2 - 6x + 9 = 0$

$x^2 - 6x + \left(\frac{6}{2}\right)^2 = -9 + \left(\frac{6}{2}\right)^2$

$x^2 - 6x + (3)^2 = -9 + (3)^2$

$(x)^2 - (2 \times x \times 3) + (3)^2 = -9 + 9$

$(x-3)^2 = 0$

Numbers are 3,3

OR

First number $= x$

Second number $= 6 - x$

$\therefore \quad x(6-x) = 9$

$6x - x^2 = 9$

$0 = 9 - 6x + x^2$

$x^2 - 6x + 9 = 0$

$a = 1,\ b = -6,\ c = 9$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$x = \frac{-(-6) \pm \sqrt{(-6)^2 - (4 \times 1 \times 9)}}{2 \times 1}$

$x = \frac{6 \pm \sqrt{36-36}}{2} = \frac{6 \pm 0}{2} = 3$

Numbers are 3,3

## Question 02

Sum of the area of two squares is 500 $m^2$. If the difference of their perimeters is 40 m, find the sides of the two squares.

## Answer

Let the side of the squares be x and y meters.

According to the condition,

$x^2 + y^2 = 500 \quad ...(1)$

$4x - 4y = 40$

$(x-y) = 10$

$y = x - 10 \quad ...(2)$

(2) in (1), we get

$x^2 + (x-10)^2 = 500$

$2x^2 - 20x - 400 = 0$

$x^2 - 10x - 200 = 0$

$x = 20$

or $x = -10$

As the side cannot be negative, $x = 20$

Hence, side of the first square, $x = \underline{20m}$

Side of the second square, $y = (20-10) = \underline{10m}$

## Question 03

Find the roots of the second degree equation by the method of completing the square. $2x^2 - 7x + 3 = 0$

### Answer

$$2x^2 - 7x + 3 = 0$$

$$x^2 - \frac{7}{2}x + \frac{3}{2} = 0$$

$$x^2 - 2 \times x \times \frac{7}{4} = -\frac{3}{2}$$

$$x^2 - 2(x)\left(\frac{7}{4}\right) + \left(\frac{7}{4}\right)^2 = -\frac{3}{2} + \left(\frac{7}{4}\right)^2$$

$$\left(x - \frac{7}{4}\right)^2 = \frac{49}{16} - \frac{3}{2}$$

$$\left(x - \frac{7}{4}\right)^2 = \frac{49}{16} - \frac{24}{16} = \frac{25}{16}$$

$$\left(x - \frac{7}{4}\right) = \pm\frac{5}{4}$$

$x = \underline{3}$ or $x = \underline{\frac{1}{2}}$

## Question 04

Three consecutive positive integers are taken such that the sum of the square of the first and the product of the other two is 232. Find the integers.

### Answer

Let the three consecutive positive integers are $x, x+1, x+2$.

$$x^2 + (x+1)(x+2) = 232$$

$$x^2 + (x^2 + 2x + x + 2) = 232$$

$$x^2 + (x^2 + 3x + 2) = 232$$

$$2x^2 + 3x - 230 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{-3 \pm \sqrt{1849}}{4}$$

$$x = 10 \text{ or } -11.5$$

But, x is a positive integer, so, x is 10.

Thus, the numbers are 10, 11, 12.

## Question 05

The sum of the squares of two consecutive even numbers is 164. Find the numbers.

### Answer

Let the consecutive numbers be $x$, $x+2$.

$$x^2+(x+2)^2=164$$

$$x^2+x^2+4x+4=164$$

$$2x^2+4x-160=0$$

$$x^2+2x-80=0$$

$$x=8 \quad \text{or} \quad x=-10$$

The numbers are 8 and 10.

## Question 06

250 Rupees is divided equally among a certain number of children. If there were 25 children more, each would have received 50 paise less.Find the number of children.

### Answer

Let the number of children be x.

$$\text{Money received by each child} = \frac{250}{x}$$

If there were 25 children more, then

$$\text{Money received by each child} = \frac{250}{x+25}$$

From the given information,

$$\frac{250}{x}-\frac{250}{25+x}=\frac{50}{100}$$

$$\frac{250(25+x)-250\times x}{x(25+x)}=\frac{1}{2}$$

$$2[6250+250x-250x]=x(25+x)$$

$x^2 + 25x - 12500 = 0 \quad \Rightarrow \quad x = -125$ or $x = 100$

Since, the number of children cannot be negative,

Hence, the number of children is100.

## Question 07

By increasing the speed of a bus by 10 km / hr, it takes one and half hours less to cover a journey of 450 km. Find the original speed of the bus.

### Answer

Let speed of the bus be x km / hr, Time $= \frac{450}{x}$

If speed is $x + 10$, then, Time $= \frac{450}{x + 10}$

By question, $\frac{450}{x} - \frac{450}{x + 10} = \frac{3}{2}$

$$\frac{450(x+10) - 450x}{x(x+10)} = \frac{3}{2}$$

$$450(x+10) - 450x = \frac{3}{2}(x^2 + 10x)$$

$$450x + 4500 - 450x = \frac{3}{2}(x^2 + 10x)$$

$4500 \times 2 = 3x^2 + 30x$

$x^2 + 10x - 3000 = 0$

$x = 50$ or $x = -60$

speed $x = 50$ Km / hr

## Question 08

The hypotenuse of a right triangle is 20m. If the difference between the length of the other sides is 4m. Find the sides.

### Answer

$x^2 + y^2 = 20^2$

$x^2 + y^2 = 400$

Also $x - y = 4$

or $x = 4 + y$

$(4 + y)^2 + y^2 = 400$

$2y^2 + 8y - 384 = 0$

$y = 12$ or $y = -16$

Sides are 12cm and 16cm

## Question 09

Find two consecutive positive integers, sum of whose squares is 25.

**Answer**

Let required numbers be x and $x+1$.

Given, $x^2+(x+1)^2=25$ or $2x^2+2x-24=0$

$x^2+x-12=0$ or $(x+4)(x-3)=0$

$x=-4$ or $x=3$

Thus, the numbers are $x=3$ and $x+1=4$.

## Question 10

For what values of k, will the equation

$$4x^2-2(k+1)x+(k+4)=0$$

have repeated roots?

**Answer**

A quadratic equation will have repeated roots only when $b^2-4ac=0$.

$[-2(k+1)]^2-4x4(k+4)=0$ | $k^2-2k-15=0$

$4(k^2+2k+1)-16(k+4)=0$ | $(k-5)(k+3)=0$

$k^2+2k+1-4k-16=0$ | $k=5,-3$

## Question 11

There are two taps opening in to a tank. If both are opened, the tank would be full in 18minutes. The time taken for it to fill with only the large tap open is 15 minutes less than the time to till with only the small tap open. What is the time taken to fill the tank only with the small tap open?

**Answer** (TryYourself)

## Question 12

A 34cm long wire is bent into a rectangle. The length of its diagonal is 13cm. what are the lengths of the sides of the rectangle?

Answer (TryYourself)

## Question 13

If the equation $x^2 + kx + k = 0$ has only one solution, find the possible values of k.

Answer (TryYourself)

## Question 14

Length of a rectangular plot is 3 metres more than breadth. Area and perimeter are numerically equal. Find length and breadth of the plot.

Answer (TryYourself)

## Question 15

The sum of the squares of two consecutive odd numbers is 394. Find the numbers.

Answer (TryYourself)





Prepared By
Fassal Peringolam
Brains Moozhikkal

# 5 TRIGONOMETRY

## EQUATIONS

If the angles of a triangle are $60^0, 60^0, 60^0$ ; then its sides will be in the ratio $1:1:1$

If the angles of a triangle are $45^0, 45^0, 90^0$ ; then its sides will be in the ratio $1:1:\sqrt{2}$

If the angles of a triangle are $30^0, 60^0, 90^0$ ; then its sides will be in the ratio $1:\sqrt{3}:2$

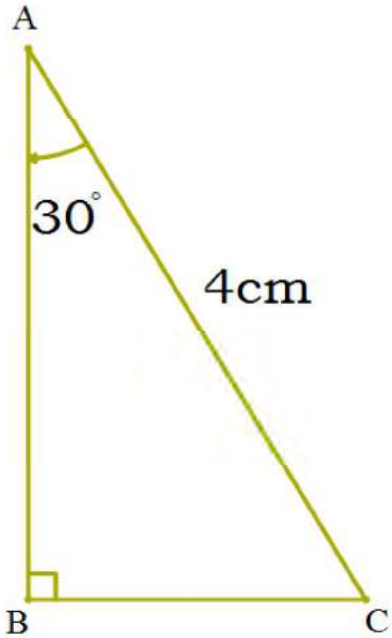
In triangle ABC

$$\sin A = \frac{BC}{AC} \quad ; \quad \cos A = \frac{AB}{AC} \quad ; \quad \tan A = \frac{BC}{AB}$$

## MODEL QUESTIONS

**Question 01**

One angle of a right triangle is $30^0$ and its hypotenuse is 4cm. What is its area?




**Answer**

Triangle side ratio is ratio $1:\sqrt{3}:2$

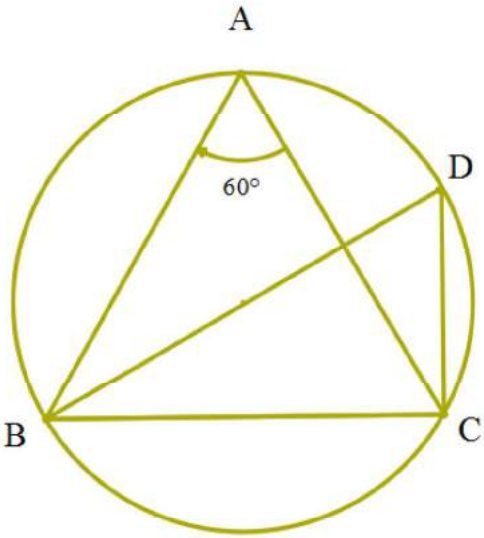
$$\text{Altitude} = \text{hypotenuse} \times \frac{\sqrt{3}}{2} = 4 \times \frac{\sqrt{3}}{2}$$

$$\text{Area} = \frac{1}{2} \times 23.46 = \underline{3.46 \text{ cm}^2}$$

**Question 02**

One angle of a triangle $60^0$ and the length of its opposite side is 4cm. What is its circumradius.

Answer




From figure, $\angle A = \angle D$

$$\therefore \quad \sin 60 = \frac{BC}{BD}$$

$$0.8660 = \frac{4}{BD}$$

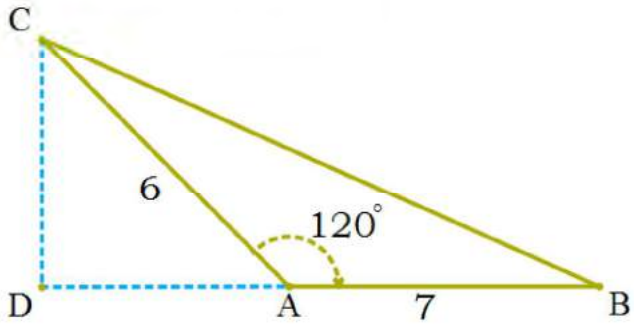
$$BD = 4.62 \text{ cm}$$

Therefore radius $= 2.31$ cm

Question 03

Two sides of a triangle are 7 and 6 centimeters and the angle between them is $120^0$. Find length of third side?

Answer




In triangle ADC

$CD = AC \sin 60$

$= 6 \times 0.8660 = 5.2\text{cm}$

$AD = AC \cos 60$

$= 6 \times 0.5 = 3\text{cm}$

$BD = BA + AD = 3 + 7 = 10\text{cm}$

In triangle BDC

$BC^2 = BD^2 + CD^2 = 10^2 + 5.2^2 = 100 + 27.04 = 127.04$

$BC = 11.3\text{cm}$

Third side is 11.3 cm

Question 04

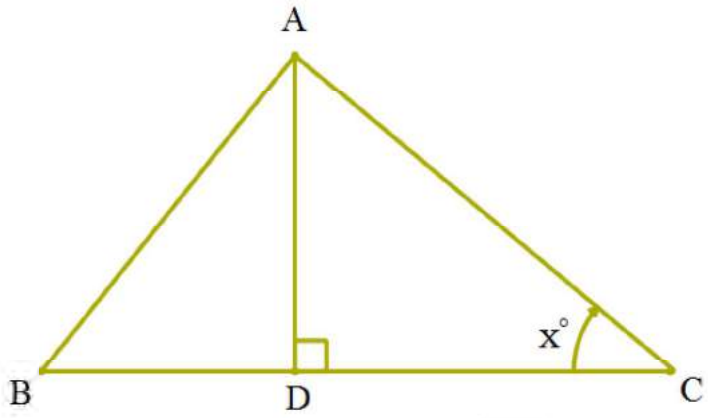
In the figure, $\angle BAC = 90^0, AD = 6\text{cm}, CD = 9\text{cm}, \angle ACD = x$

(a) What is $\tan x$?

(b) How much is $\angle BAD$?

(c) What is the length of BD?

Answer




(a) $\tan x = \frac{AD}{DC} = \frac{6}{9} = \frac{2}{3}$

(b) x

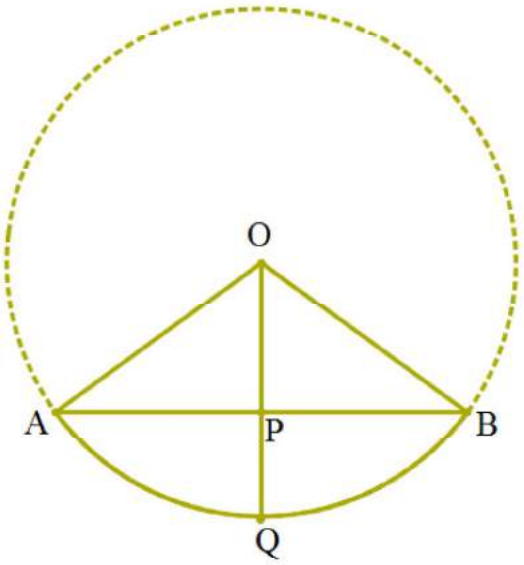
(c) $\tan x = \frac{BD}{AD} = \frac{BD}{6}$

$\frac{2}{3} = \frac{BD}{6}$

$BD = 4\ cm$

## Question 05

In the figure, AQB is an arc of a circle centred at O. Also, $\angle AOB = 120^0$, $\angle AOQ = 60^0$, PQ = 3cm. What is the radius of the circle?




Answer

$\cos 60 = \frac{OP}{AO} = \frac{(r-3)}{r}$

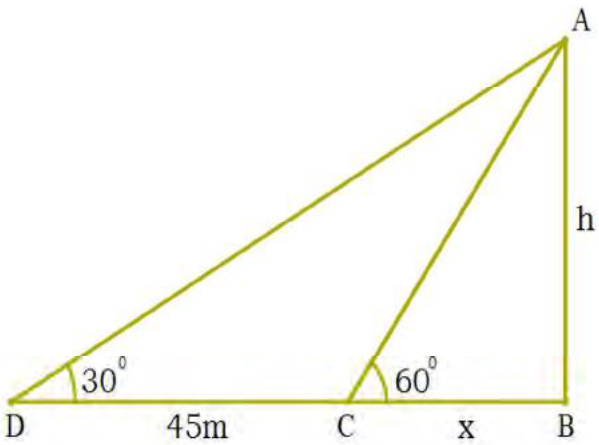
$0.5\ r = r - 3$

$r - 0.5\ r = 3$

$r = \frac{3}{0.5} = 6cm$

## Question 06

The shadow of a tower standing on a level ground is found to be 45 m longer when the sun's altitude is 30° than when it was 60°.Find the height of the tower.



Answer

In $\Delta ABD$,

$$\frac{AB}{BD} = \tan 30$$

$$\frac{h}{45+x} = \frac{1}{\sqrt{3}}$$

$$x = \left(\sqrt{3}h - 45\right) \quad ...(1)$$

In $\Delta ABC$,

$$\frac{AB}{BC} = \tan 60$$

$$\frac{h}{x} = \sqrt{3}$$

$$x = \frac{h}{\sqrt{3}} \quad ...(2)$$

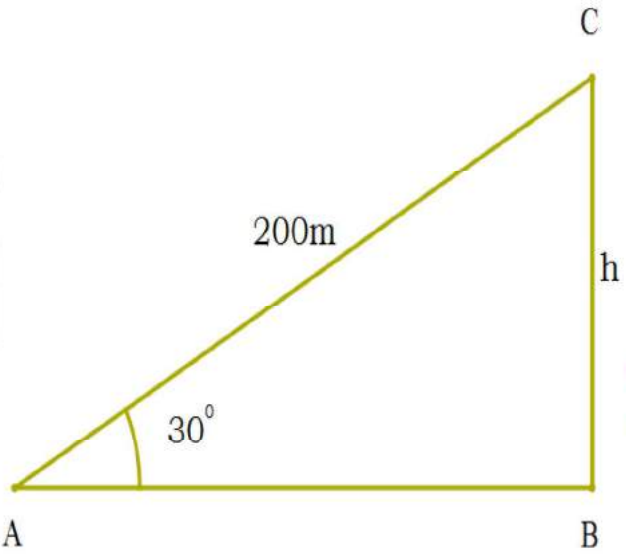
From (1) and (2), we get

$$\left(\sqrt{3}h - 45\right) = \frac{h}{\sqrt{3}}$$

$$h = 38.97m$$

Question 07

A kite is flying with a string of length 200m. If the thread makes an angle $30^0$ with the ground, find the distance of the kite from the ground level.




Answer

In the right $\Delta CAB$,

$$\sin 30 = \frac{h}{200}$$

$$h = 200\sin 30^0 = 200 \times 0.5 = 100 \text{ m}$$

The distance of the kite from the ground level is 100 m .

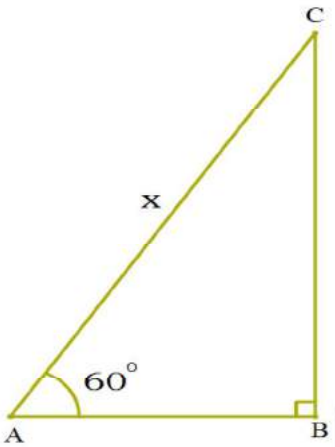
Question 08

A ladder leaning against a vertical wall, makes an angle of $60^0$ with the ground. The foot of the ladder is 3.5 m away from the wall.

Find the length of the ladder.

Answer

In the right ΔCAB,




$$\cos 60 = \frac{3.5}{x}$$

$$x = \frac{3.5}{\cos 60^0} = \frac{3.5}{0.5} = 7 \text{ m}$$

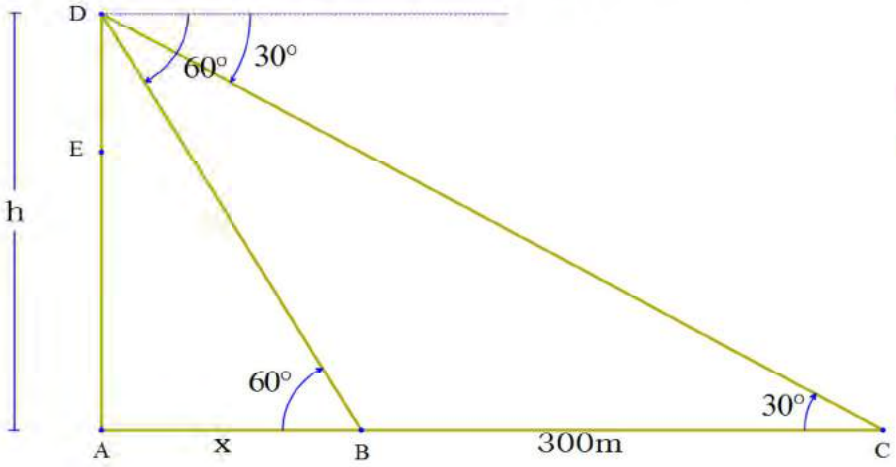
The length of the ladder is 7 m.

Question 09

A girl standing on a lighthouse built on a cliff near the seashore, observes two boats due East of the lighthouse. The angles of depression of the two boats are $30^0$ and $60^0$. The distance between the boats is 300 m.Find the distance of the top of the lighthouse from the sea level.

(Boats and foot of the lighthouse are in a straight line)

Answer




In ΔABD,

$$\tan 60° = \frac{AD}{AB}$$

$$AB = \frac{AD}{\tan 60°}$$

$$x = \frac{h}{\sqrt{3}}$$

In ΔACD

$$\tan 30° = \frac{AD}{AC}$$

$$AC = \frac{AD}{\tan 30°}$$

$$x + 300 = \frac{h}{\tan 30°}$$

$$x + 300 = h\sqrt{3}$$

$$\therefore \frac{h}{\sqrt{3}} + 300 = h\sqrt{3}$$

$$h + 300\sqrt{3} = 3h$$

$$2h = 300\sqrt{3}$$

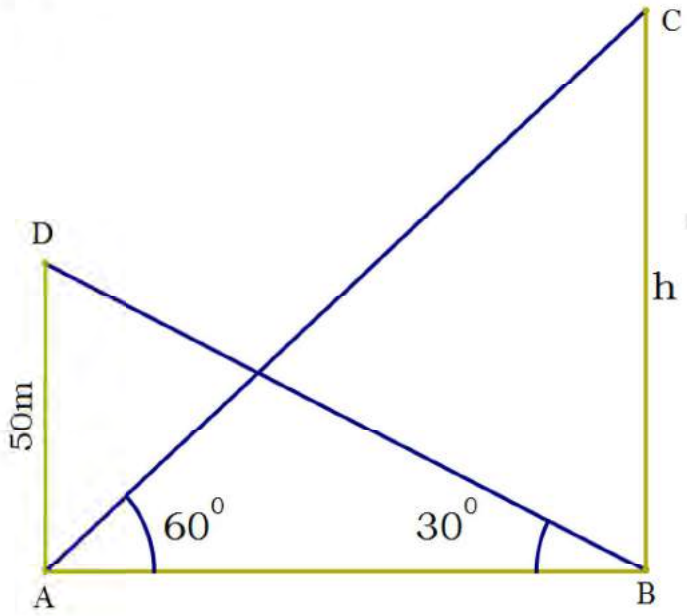
$$h = 150\sqrt{3}$$

$$h = 259.8\text{m}$$

## Question 10

The angle of elevation of the top of a hill from the foot of a tower is $60^0$ and the angle of elevation of the top of the tower from the foot of the hill is $30^0$.

**Answer**




In $\Delta ABD$,

$$\tan 30^\circ = \frac{AD}{AB}$$

$$AB = \frac{AD}{\tan 30^0}$$

$$x = 50\sqrt{3}$$

In $\Delta CAB$,

$$\tan 60^\circ = \frac{BC}{AB}$$

$$BC = AB \times \tan 60^0$$

$$h = 50\sqrt{3} \times \sqrt{3} = 150m$$

The height of the hill is 150m.

## Question 11

A boy, 1.4 metres tall, standing at the edge of a river bank sees the top of a tree on the edge of the other bank at an elevation of 55°.Standing back by 3 metres, he sees it at an elevation of 45°.

(a) Draw a rough figure showing these facts.

(b) How wide is the rivel and how tall is the tree?

$\{\sin 55^\circ = 0.8192, \cos 55^\circ = 0.5736, \tan 55^\circ = 1.4281\}$

**Answer** (TryYourself)

## Question 12

An observer in a lighthouse 100 m above the sea level is watching the ship sailing towards the lighthouse. The angle of depression of the ship from the observer is 30°. How far is the ship from the lighthouse?

{sin 30° = 0.5, cos 30° = 0.8660, tan 30° = 0.5773}

**Answer** (TryYourself)

## Question 13

A ladder is placed along a wall such that its upper end is touching the top of the wall. The foot of the ladder is 2m away from the wall and the ladder is making an angle of 60° with the level ground. Find the height of the wall.

{sin 60° = 0.8660, cos 60° = 0.5, tan 60° = 1.7320}

**Answer** (TryYourself)

## Question 14

The top of a tower is seen at an angle of elevation of 40° from a point 30m away from the base of the tower. What is the height of the tower?

{sin40° = 0.64; cos 40° = 0.77; tan40° = 0.84}

**Answer** (TryYourself)

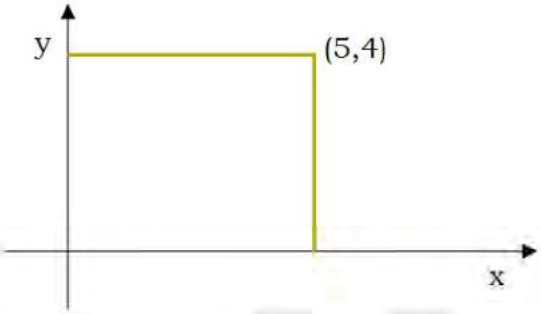


Prepared By
Fassal Peringolam
Brains Moozhikkal

# 6 COORDINATES

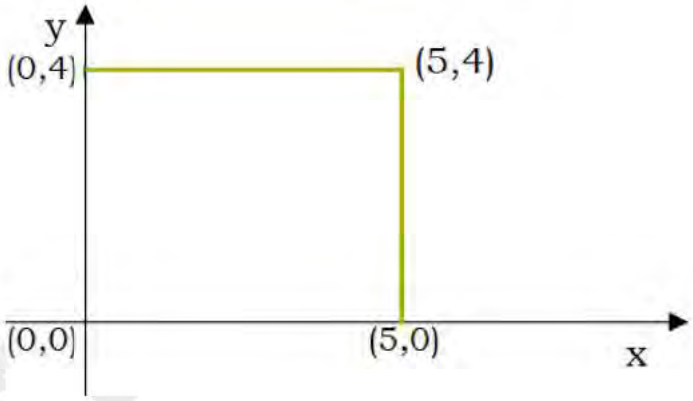
## Question 01

Find the coordinates of the other three vertices of the rectangle in the figure below.




## Answer

The coordinates of are $(0,0),(5,0),(5,4)$ and $(0,4)$




## Question 02

A circle is drawn with centre at $(0,\ 0)$ and radius 6 units in a coordinate system.

What are the coordinates of the points at which it cuts the $x-$axis? And the points where it cuts the $y-$axis?

## Answer

$x-$axis $(6,0)$ and $(-6,0)$ ; $y-$axis $(0,6)$ and $(0,-6)$

## Question 03

From the points given below, find the pair which are on a line parallel to the $x-$axis and the pair which are on a line parallel to the $y-$axis

$A(4,\ 3)$, $B(3,\ 5)$, $C(-6,\ 3)$, $D(3,-2)$, $E(5,\ 4)$

Answer

Parallel to the x – axis : A (4, 3) and C (–6, 3)

Parallel to the y – axis : B (3, 5) and D (3, –2)

Question 04

What is the distance between the points (–3, 2) and (4, 2)?

Answer

Distance $= |-3-4| = 7$

Question 05

What is the distance between the points (5, 8) and (6, 9)?

Answer

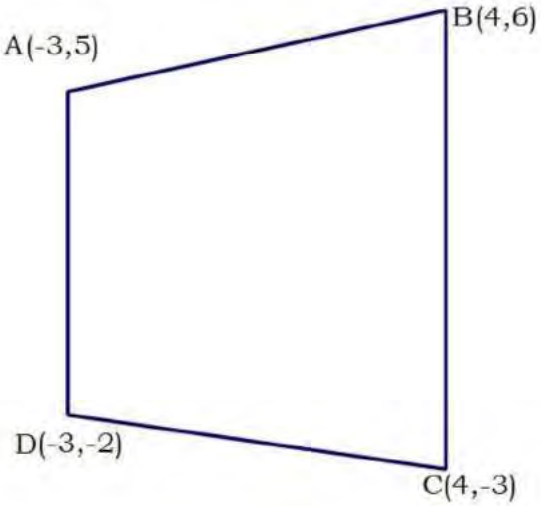
Distance $= \sqrt{(5-6)^2+(8-9)^2}$

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

Question 06

Calculate the length of the sides of quadrilateral.

Answer




$AB = \sqrt{(-3-4)^2+(5-6)^2}$

$= \sqrt{(-7)^2+(-1)^2} = \sqrt{50}$

$BC = \sqrt{(4-4)^2+(6+3)^2}$

$= \sqrt{(0)^2+(9)^2} = 9$

$CD = \sqrt{(4+3)^2+(-3+2)^2}$

$= \sqrt{(7)^2+(-1)^2} = \sqrt{50}$

$AD = \sqrt{(-3+3)^2+(5+2)^2}$

$= \sqrt{(0)^2+(7)^2} = 7$

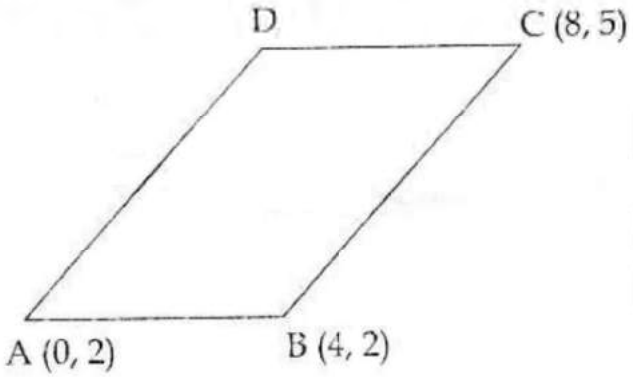
## Question 07

Draw x and y axis and mark the points $(0,4),(2,5),(-3,-2)$

**Answer** (TryYourself)

## Question 08

In figure, ABCD is a parallelogram.




(a) Write the coordinates of D.

(b) What is the height of this Parallelogram ?

(c) Find the perimeter and area of it.

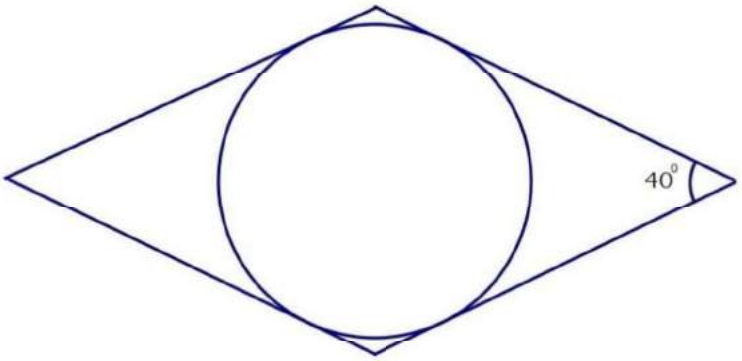
**Answer** (TryYourself)

Prepared By
Fassal Peringolam
M.Sc, B.Ed
(Maths & Science Tutor)
Brains Moozhikkal
9048 332 443
8281 332 443
Visit: www.sciencetablet.in

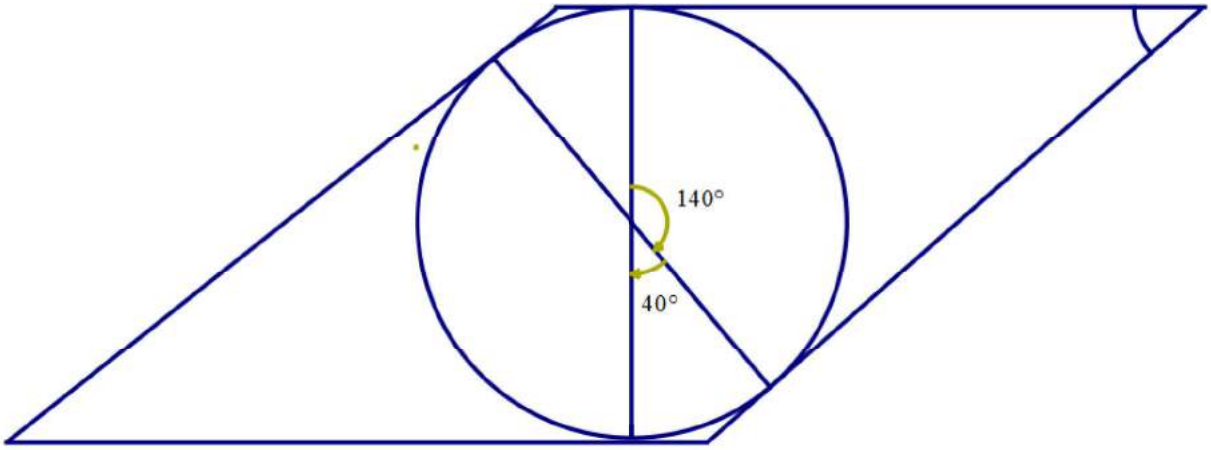
# 7 TANGENTS

## Question 01

In the picture, all sides of rhombus are tangents to a circle. Draw this picture.




## Answer




## Question 02

From a point P, the length of the tangent to a circle is 24cm and distance of P from the centre is 25cm. Find radius.

## Answer

From figure

$OP^2 = OQ^2 + QP^2$

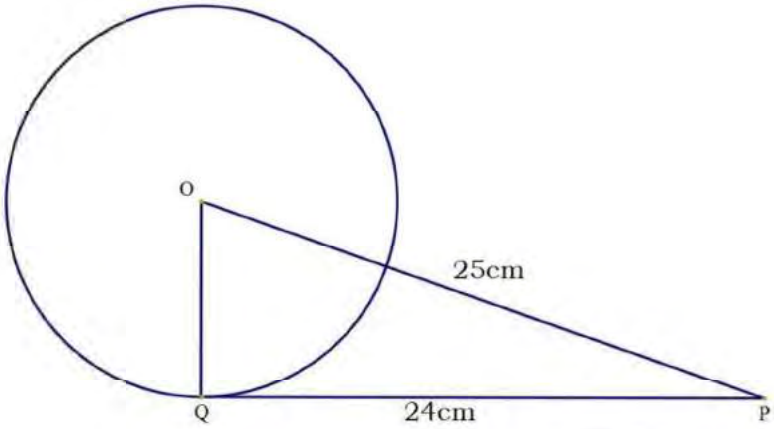
$25^2 = OQ^2 + 24^2$

$OQ^2 = 25^2 - 24^2$

$OQ^2 = 625 - 576$

$OQ^2 = 49$

$OQ = 7cm$




## Question 03

A point P is 26 cm away from the centre O of a circle and the length PQ of the tangent segment drawn from P to the circle is 10 cm. Find the radius of the circle.

## Answer

$OP^2 = OQ^2 + PQ^2$

$OQ^2 = OP^2 - PQ^2$

$= 26^2 - 10^2$

$= (26+10)(26-10) = 36 \times 16$

$OQ = 6 \times 4 = 24$

Radius of the circle = 24 cm.

## Question 04

If from the point of contact of tangent (of a circle), a chord is drawn, then prove that the angles which the chord makes with the tangent line are equal respectively to the angle formed by the chord in the corresponding alternate segments.

## Answer

$\angle ABC = 90^0$ (angle in a semi-circle is 90)

$\angle CAB + \angle BCA = 90^0$ ...(1)

( sum of two acute angles of a right triangle ABC)

$\angle CAT = 90^0$

( diameter is $\perp$ to the tangent at the point of contact)

$\angle CAB + \angle BAT = 90^0$ ...(2)

From (1) and (2)

$\angle CAB + \angle BCA = \angle CAB + \angle BAT$

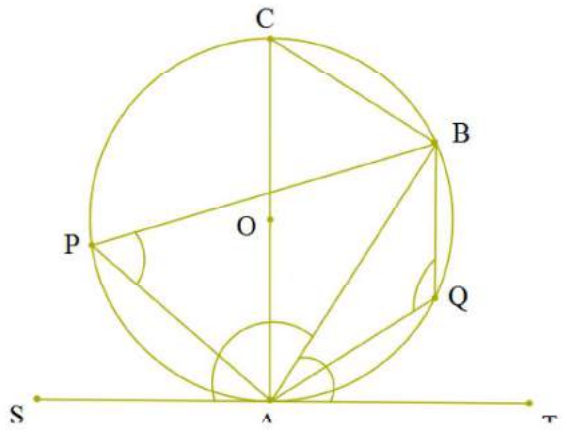
$\angle BCA = \angle BAT$

$\angle BCA = \angle BPA$

( angles in the same segment )

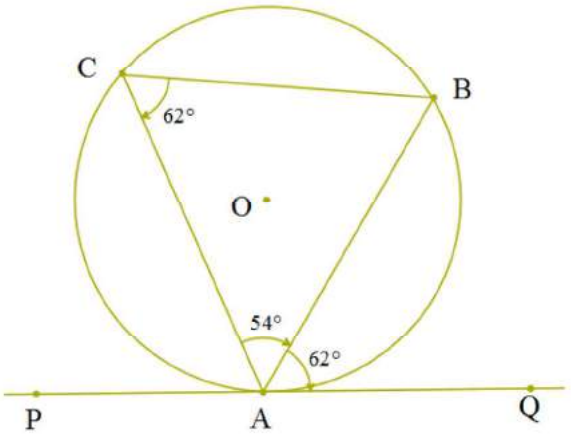
$\angle BCA = \angle BAT$

Proved




## Question 05

Let PQ be a tangent to a circle at A and AB be a chord. Let C be a point on the circle such that $\angle BAC = 54^0$ and $\angle BAQ = 62^0$. Find $\angle ABC$.




### Answer

$\angle ABC = 180^0 - (\angle BAC + \angle ACB)$

$\angle ABC = 180^0 - (54^0 - 62^0) = 64^0$

## Question 06

A circle is touching the side BC of $\Delta ABC$ at P and touching AB and AC produced at Q and R respectively.

Prove that $AQ = \frac{1}{2}(\text{Perimeter of } \Delta ABC)$

### Answer

Since tangents from an exterior point to a circle are equal in length.

$$BP = BQ \quad \ldots (1)$$

$$CP = CR \quad \ldots (2)$$

$$AQ = AR \quad \ldots (3)$$

from eqn. (3), we have $AQ = AR$

$$AB + BQ = AC + CR$$

$$AB + BP = AC + CP \quad \ldots (4)$$

Now, Perimeter of $\Delta ABC$

$$= AB + BC + AC$$

$$= AB + (BP + PC) + AC$$

$$= (AB + BP) + (AC + PC) \quad \text{Using (4)}$$

Perimeter of $\Delta ABC = 2(AB + BP) = 2\,AQ$

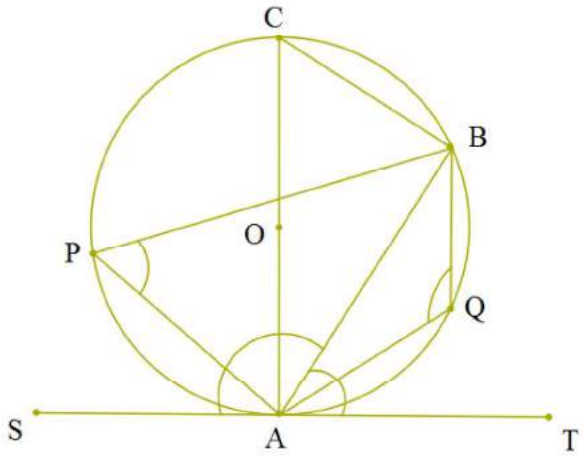
$$AQ = \frac{1}{2}(\text{Perimeter of } \Delta ABC).$$

## Question 07

Prove that:

(i) $\angle BAT = \angle BPA$

(ii) $\angle BAS = \angle AQB$.




## Answer

$$\angle ABC = 90^\circ$$

$(\because$ angle in a semi-circle is $90^\circ)$

$$\angle CAB + \angle BCA = 90^\circ \quad \ldots(1)$$

(sum of two acute angles of a right $\Delta ABC$)

$$\angle CAT = 90^\circ$$

(diameter is $\perp$ to the tangent at the point of contact)

$$\angle CAB + \angle BAT = 90^\circ \quad \ldots(2)$$

$\angle CAB + \angle BCA = \angle CAB + \angle BAT$ ($\because$ from (1) and (2))

$\angle BCA = \angle BAT$ ...(3)

$\angle BCA = \angle BPA$ ...(4)

($\because$ angles in the same segment)

$\angle BAT = \angle BPA$

($\because$ from (3) and (4), (5))

Now $\angle BPA + \angle AQB = 180^0$

($\because$ opposite angles of a cyclic quadrilateral)

$\angle BAT + \angle AQB = 180^0$ ($\because$ from (5) and (6))

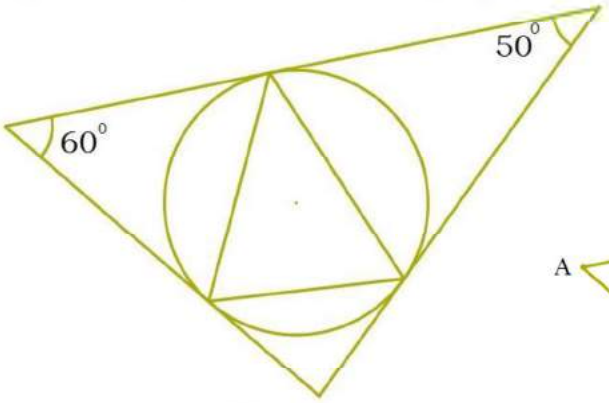
Also $\angle BAT + \angle BAS = 180^0$ ...(7) ($\because$ linear pair)

$\angle BAT + \angle AQB = \angle BAT + \angle BAS$ ($\because$ from (6) and (7))

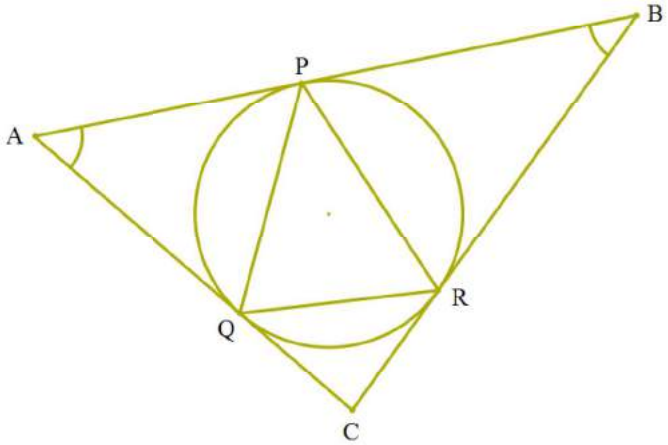
$\angle BAS = \angle AQB$.

## Question 08

Calculate the angles of the smaller triangle.




## Answer




$$\angle APQ = \angle AQP = \frac{180\text{-}60}{2} = 60^0$$

$\therefore$ $\angle PRQ = 60^0$

$$\angle BPR = \angle BRP = \frac{180-50}{2} = 65^0$$

$$\therefore \quad \angle PQR = 65^0$$

$$\angle CQR = \angle CRQ = \frac{180-70}{2} = 55^0$$

$$\therefore \quad \angle QPR = 55^0$$

Angles of the smaller triangle $55^0, 60^0, 65^0$

## Question 09

In the figure, tangents PA and PB are drawn to a circle with centre O from an external point P. If CD is a tangent to the circle at E and AP = 25 cm, find the perimeter of ∠PCD

## Answer

We know that the lengths of the two tangents from an exterior point to a circle are equal.

∴ CA = CE, DB = DE and PA = PB.

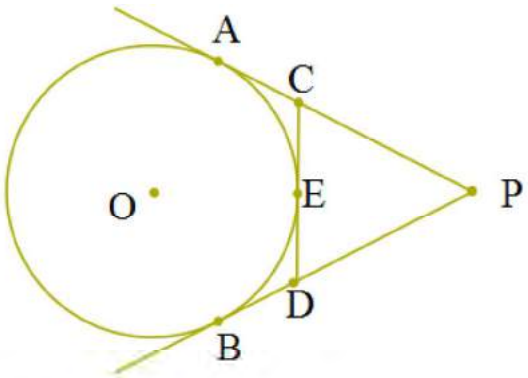
Now, the perimeter of ∠PCD

= PC + CD + DP

= PC + CE + ED + DP

= PC + CA + DB + DP

= PA + PB = 2PA $(\because PB = PA)$



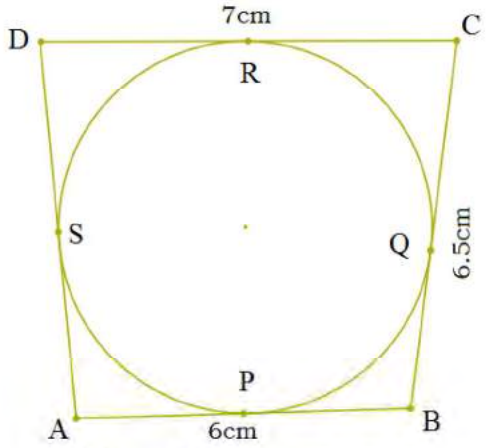

Thus, the perimeter of ∠PCD = 2 × 25

= 50 cm.

## Question 10

ABCD is a quadrilateral such that all of its sides touch a circle. If AB = 6 cm, BC = 6.5 cm and CD = 7cm , then find the length of AD.

**Answer**




We have,

$$AP = AS$$
$$BP = BQ$$
$$CR = CQ$$
$$DR = DS$$

Hence, $AP + BP + CR + DR = AS + BQ + CQ + DS$

$$AB + CD = AD + BC.$$
$$AD = AB + CD - BC$$
$$= 6 + 7 - 6.5$$
$$= 6.5\text{cm}$$

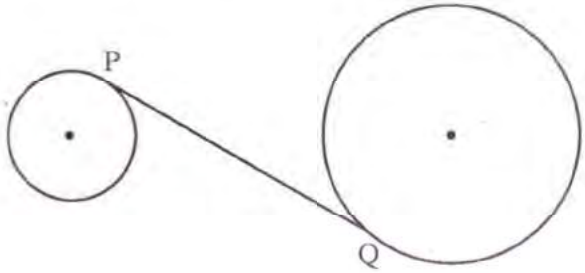
**Question 11**

Draw a triangle of sides 5 cm, 6 cm and 7 cm. Draw its incircle. Measure and write the radius of the incircle.

**Answer** (TryYourself)

**Question 12**

In the figure,the radius of the smaller circle is 3 centimetres, that of the bigger circle is 6 centimetres and the distance between the centres of the circles is 15 centimetres. PQ is a tangent to both the circles. Find its length.




**Answer** (TryYourself)

# 8 SOLIDS

**Square Pyramid:**

Lateral surface area $= 4 \times \frac{1}{2}(\text{Base edge} \times \text{Slant height})$

$$\text{L.S.A} = 2al$$

Total Surface Area = Base Area × Lateral surface area

$$\text{T.S.A} = a^2 + 2al$$

*Relations connecting base edge a, lateral edge e, slant height l, height h and base diagonal d :*

$$e^2 = l^2 + \frac{1}{4}a^2 \quad ; \quad l^2 = h^2 + \frac{1}{4}a^2 \quad ; \quad e^2 = h^2 + \frac{1}{4}d^2$$

$$\text{Volume} = \frac{1}{3}\text{Base area} \times \text{height} \quad ; \quad \text{Volume} = \frac{1}{3}a^2h$$

**Cones**

The radius of the sector becomes the slant height of the cone; the arc length of the sector becomes the base circumference of the cone.

*Suppose that a cone of base radius r and slant height l, radius of the sector l and the central angle x, then*

$$\frac{x}{360} = \frac{r}{l}$$

$$\text{L.S.A} = \pi rl \; ; \; \text{T.S.A} = \pi r(l + r) \; ; \; l^2 = h^2 + r^2 \; ; \; \text{Volume} = \frac{1}{3}\pi r^2 h$$

**Spheres**

$$\text{T.S.A} = 4\pi r^2 \quad ; \quad \text{Volume} = \frac{4}{3}\pi r^3$$

**Hemispheres**

$$\text{L.S.A} = 2\pi r^2 \quad ; \quad \text{T.S.A} = 3\pi r^2 \quad ; \quad \text{Volume} = \frac{2}{3}\pi r^3$$

## Question 01

A toy in the shape of a square pyramid has base edge 16cm and slant height 10cm.

(a) Find lateral surface area.

(b) Find Total surface area.

(c) Calculate its volume.

**Answer**

$$\text{L.S.A} = 2 \times 16 \times 10 = 320 \text{ cm}^2$$

$$\text{T.S.A} = a^2 + 2al$$

$$= 16 \times 16 + 320$$

$$= 576 \text{ cm}^2$$

$$h^2 = l^2 - \frac{1}{4}a^2$$

$$= 100 - 64$$

$$h = 6$$

$$V = a^2 h$$

$$= 256 \times 6 = 1536 \text{ cm}^3$$

## Question 02

Height of a cone is 40cm. Slant height is 41cm.

(a) Find diameter of its base. (b) Find Volume

**Answer**

$$r^2 = l^2 - h^2$$

$$r^2 = 41^2 - 40^2 = 81$$

$$r = 9$$

$$\text{Diameter} = 18\text{cm}$$

$$\text{Volume} = \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi \times 9^2 \times 40 = 3394.3 \text{ cm}^3$$

## Question 03

Radius and slant height of a solid right circular cone are 35 cm and 37 cm respectively. Find the curved surface area and total surface area of the cone.

### Answer

$$r = 35 \text{ cm}, l = 37 \text{ cm}$$

Curved surface area, $CSA = \pi rl = \pi(35)(37) = 4070 \text{ cm}^2$

Total surface area, $TSA = \pi r [l + r]$

$$= \frac{22}{7} \times 35 \times (37 + 35) = 7920 \text{cm}^2$$

## Question 04

A sector containing an angle of 120° is cut off from a circle of radius 21 cm and folded into a cone. Find the curved surface area of the cone.

### Answer

Circumference of the base of the cone = Length of the arc

$$2\pi r = \frac{\theta}{360^0} 2\pi R$$

$$r = \frac{\theta}{360^0} R$$

$$r = \frac{\theta}{360^0} \times 21 = 7 \text{ cm}$$

$l$ = Radius of the sector = 21cm

$$CSA = \pi rl = \frac{22}{7} \times 7 \times 21 = 462 \text{cm}^2$$

or

CSA of the cone = Area of the sector

$$2\pi r = \frac{\theta}{360^0} \pi R^2 = \frac{120}{360^0} \frac{22}{7} (21)^2 = 462 \text{cm}^2$$

## Question 05

A hollow sphere in which a circus motorcyclist performs his stunts, has an inner diameter of 7 m.Find the area available to the motorcyclist for riding.

## Answer

Inner diameter of the hollow sphere, $2r = 7$ m.

Available area to the motorcyclist for riding

= Inner surface area of the sphere

$= 4\pi r^2 = \pi(2r)^2 = 154 cm^2$

Available area to the motorcyclist for riding = 154 $cm^2$

## Question 06

Total surface area of a solid hemisphere is 675 sq.cm. Find the curved surface area of the solid hemisphere.

## Answer

$3\pi r^2 = 675\pi cm^2$

$r^2 = 225$

The curved surface area of the solid hemisphere,

$CSA = 2\pi r^2 = 2\pi \times 225 = 450\pi cm^2$.

## Question 07

The volume of a solid right circular cone is 4928 $cm^3$. If its height is 24 cm, then find the radius of the cone.

## Answer

$V = 4928\ cm^3$ and $h = 24$ cm

Thus, $\frac{1}{3}\pi r^2 h = 4928$

$r^2 = 196$ or $r = 14cm$

## Question 08

(a) The radius of a wooden hemisphere is 10 cm. What is its volume?

(b) If this hemisphere is carved in to a cone of maximum size, find the volume of the cone.

**Answer** (TryYourself)

## Question 09

A toy is in form of a cone mounted on a hemi sphere of radius 3.5 cm. The total height of the toy is 15.5 cm.

(a) Find slant height.

(b) Find its total surface area.

**Answer** (TryYourself)

## Question 10

A metal sphere of diameter 24 centimetres is melted and recast into cones of base radius and height 6 centimetres. How many such cones are made?

**Answer** (TryYourself)





Prepared By
Fassal Peringolam
Brains Moozhikkal

# 9 GEOMETRY AND ALGEBRA

## Question 01

Find the midpoint of the line segment joining the points $(3,0),(-1,4)$

## Answer

Midpoint of the line segment joining the line segment joining the points $(3,0),(-1,4)$

$$=\left(\frac{3-1}{2},\frac{0+4}{2}\right)=(1,2)$$

## Question 02

Find the coordinates of the point which divides the join of the points $(-1,7),(4,-3)$ the ratio 2:3.

## Answer

Given $(x_1,y_1)=(-1,7)$; $(x_1,y_1)=(4,-3)$; $p=2,w=5$

$$x=x_1+\frac{p}{w}(x_2-x_1)=-1+\frac{2}{5}(4+1)=1$$

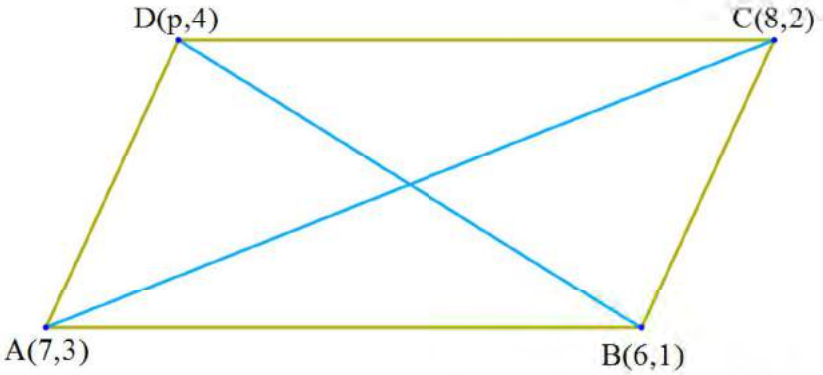
$$y=y_1+\frac{p}{w}(y_2-y_1)=7+\frac{2}{5}(-3-7)=7-4=3$$

Hence the coordinates of the point = $(1,3)$

## Question 03

If $(7,3),(6,1),(8,2)$ and $(p,4)$ are the vertices of a parallelogram taken in order, then find the value of p.

Answer




The midpoints of the diagonal AC and the diagonal BD coincide.

$$\left(\frac{7+8}{2},\frac{3+2}{2}\right)=\left(\frac{6+p}{2},\frac{1+4}{2}\right)$$

$$\left(\frac{15}{2},\frac{5}{2}\right)=\left(\frac{6+p}{2},\frac{5}{2}\right)$$

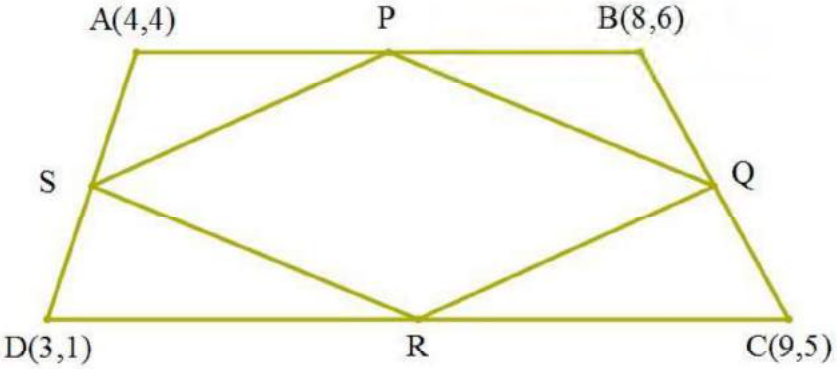
$$\frac{15}{2}=\frac{6+p}{2}$$

$$p=9$$

Question 04

The coordinates of the vertices of of a quadrilateral are (4,4), (8,6), (9,5), (3,1). Find the coordinates of the midpoints of all sides.

Answer



Midpoint of $(4,4),(8,6) = \left(\frac{4+8}{2}, \frac{4+6}{2}\right) = (6,5)$

Midpoint of $(8,6),(9,5) = \left(\frac{8+9}{2}, \frac{6+5}{2}\right) = (8.5,5.5)$

Midpoint of $(9,5),(3,1) = \left(\frac{9+3}{2}, \frac{5+1}{2}\right) = (6,3)$

Midpoint of $(4,4),(3,1) = \left(\frac{4+3}{2}, \frac{4+1}{2}\right) = (3.5,2.5)$

## Question 05

Find the equation of the line joining the points $(1,3)$ and $(2,7)$

## Answer

If $(x,y)$ be any point on this line, then

$$\frac{(y-4)}{(x-1)} = 2$$

$$y-4 = 2(x-1)$$

$$y-4 = 2x-2$$

$$2x+y+2=0$$

## Question 06

Find the equation of the line joining $(-1,3)$, $(2,5)$.

## Answer

$$\frac{y-3}{x+1} = \frac{5-3}{2+1}$$

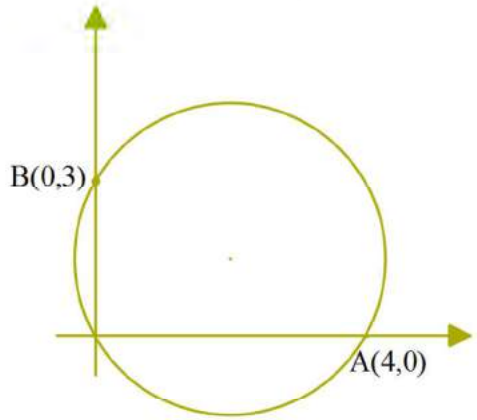
$$\frac{y-3}{x+1} = \frac{2}{3}$$

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

$$2x-3y+11=0$$

## Question 07

What is the equation of the circle?




## Answer

$$\text{Radius} = \frac{\sqrt{3^2+4^2}}{2} = 2.5\text{cm}$$

$$\text{Centre of circle} = \left(\frac{4}{2},\frac{3}{2}\right) = \left(2,\frac{3}{2}\right)$$

Equation of the circle

$$(x-2)^2 + \left(y-\frac{3}{2}\right)^2 = \left(\frac{5}{2}\right)^2$$

$$x^2 - 4x + 4 + y^2 - 3y + 2.25 = 6.25$$

$$x^2 + y^2 - 4x - 3y = 0$$

## Question 08

What is the equation of the circle?

Centre $(2,1)$, radius $\sqrt{5}$

## Answer

Equation of the circle

$$(x-2)^2 + (x-1)^2 = 5$$

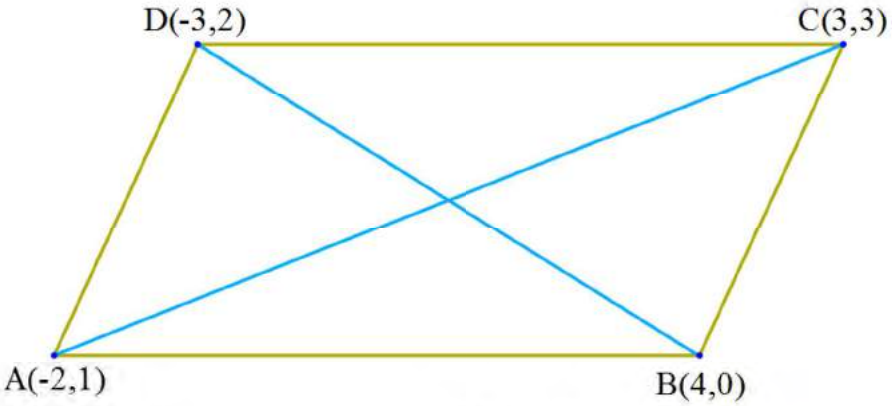
$x^2 - 4x + 4 + y^2 - 2y + 1 = 5$

$x^2 + y^2 - 4x - 2y = 0$

## Question 09

Using the concept of slope, show that the points $(-2,-1)$, $(4,0)$, $(3,3)$ and $(-3,2)$ taken in order form a parallelogram.

## Answer




$$\text{Slope of AB} = \frac{0+1}{4+2} = \frac{1}{6}$$

$$\text{Slope of CD} = \frac{2-3}{-3-3} = \frac{1}{6}$$

Slope of AB = Slope of CD

$$\text{Slope of BC} = \frac{3-0}{3-4} = -3$$

$$\text{Slope of AD} = \frac{2+1}{-3+2} = -3$$

Slope of BC = Slope of AD

$\therefore$ ABCD is a parallelogram.

## Question 10

What is the point at which the line $2x + 4y - 1 = 0$ cuts the x – axis? What about they – axis?

Answer

If the line $2x+4y-1=0$ cut the x axis at (x,0), then

$$2x-1=0$$

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

The line intersect x axis is $\left(\frac{1}{2},0\right)$

If the line $2x+4y-1=0$ cut the y axis at (0, y), then

$$4y-1=0$$

$$y=\frac{1}{4}$$

The line intersect y axis is $\left(0,\frac{1}{4}\right)$

Question 11

Find the midpoint of the line segment joining the points $(2,4),(-4,2)$

Answer (TryYourself)

Question 12

Find the coordinates of the point which divides the join of the points $(2,4),(6,9)$ the ratio 3:4.

Answer (TryYourself)

Question 13

Find the equation of the line joining the points $(2,5)$ and $(4,9)$

Answer (TryYourself)

# 10 POLYNOMIALS

## Question 01

Write the solution of polynomials

$p(x) = x^2 - 7x + 12$

## Answer

$x^2 - 7x + 12 = (x-4)(x-3)$

if $p(x) = 0$

$(x-4)(x-3) = 0$

$x = 4, x = 3$

## Question 02

Check whether $(x-1)$ is a factor of $3x^3 - 2x^2 - 3x + 2$

## Answer

$P(1) = 3\times1^3 - 2\times1^2 - 3\times1 + 2 = 0$

Therefore $(x-1)$ is a factor

## Question 03

Write $2x^2 + 5x + 3$ as a product of two first degree polynomials.

## Answer

$P(x) = 2x^2 + 5x + 3$

$2x^2 + 5x + 3 = 0$

$$x = \frac{(-5 \pm 1)}{2} = -2 \text{ or } \frac{-3}{2}$$

Then the polynomial $x+2$ , $x+\left(\frac{3}{2}\right)$ are factors of $P(x)$

$$(x+2)\left(x+\frac{3}{2}\right) = x^2+\left(\frac{5}{2}\right)x+3$$

$$= \frac{1}{2}(2x^2+5x+3)$$

$$\therefore 2x^2+5x+3 = 2(x+2)\left(x+\frac{3}{2}\right) = (2x+3)(x+1)$$

## Question 04

Find the value of k if remainder when $5x^3+4x^2-11x+k$ is divided by $(x-1)$ is 0.

### Answer

$$P(1) = 5x^3+4x^2-11x+k = 0$$

$$5\times1^3+4\times1^2-11\times1+k = 0$$

$$k = 2$$

## Question 05

When $x^3-2x^2+kx+7$ is divided by $(x-4)$ remainder is 11. Find k.

### Answer

$$P(x) = x^3-2x^2+kx+7 = 11$$

$$P(4) = 4^3-2\times4^2+k\times4+7 = 11$$

$$4k = -64+32-7+11$$

$$4k = -28$$

$$k = -7$$

## Question 06

Find the remainder on dividing the polynomial $x^3-3x^2+5x+7$ by $x-3$. Is $x-3$ a factor of this polynomial? Why?

Answer (TryYourself)

Question 07

If $(x-2)$ is a factor of the polynomial $3x^3-2x^2+kx-6$, then what is the value of k?

Answer (TryYourself)

Question 08

What number should be added to $2x^3+x^2-13x$ so that $x-2$ is a factor. Check whether $x+3$ is a factor of the polynomial obtained.

Answer (TryYourself)

Question 09

Check whether $x+1$ is a factor of $6x^3+3x^2$.

Answer (TryYourself)

Question 10

When $2x^3+kx^2+17x-2$ is divided by $(x-2)$ and by $(x-3)$ we get the same remainder. Find k.

Answer (TryYourself)

Question 11

Write $x^2-x-1$ as a product of two first degree polynomials.

Answer (TryYourself)

# 11 STATISTICS

## Question 01

Find mean

| Daily Wages (Rupees) | Number of Workers |
|---|---|
| 210 | 2 |
| 225 | 4 |
| 250 | 6 |
| 270 | 2 |
| 300 | 1 |

## Answer

| Daily Wages (Rupees) | Number of Workers | Total Wages (Rupees) |
|---|---|---|
| 210 | 2 | 420 |
| 225 | 4 | 900 |
| 250 | 6 | 1500 |
| 270 | 2 | 540 |
| 300 | 1 | 300 |
| Total | 15 | 3660 |

$$\text{Mean} = \frac{3660}{15} = 244$$



## Question 02

The table below shows the classification of 50 persons in a locality according to their daily income:

| Daily Income (Rupees) | Number of Workers |
|---|---|
| 145 - 155 | 7 |
| 155 - 165 | 9 |
| 165 - 175 | 14 |
| 175 - 185 | 11 |
| 185 - 195 | 7 |
| 195 - 205 | 2 |

What is the mean daily income?

## Answer

| Daily Income (Rupees) | Number of Workers | Class Average | Total Income |
|---|---|---|---|
| 145 - 155 | 7 | 150 | 1050 |
| 155 - 165 | 9 | 160 | 1440 |
| 165 - 175 | 14 | 170 | 2380 |
| 175 - 185 | 11 | 180 | 1980 |
| 185 - 195 | 7 | 190 | 1330 |
| 195 - 205 | 2 | 200 | 400 |
| Total | 50 | | 8580 |

$$\text{Mean} = \frac{8580}{50} = 171.6$$

## Question 03

Find mean

| Rainfall(mm) | Number of Days |
|---|---|
| 54 | 3 |
| 56 | 5 |
| 58 | 6 |
| 55 | 3 |
| 50 | 2 |
| 47 | 4 |
| 44 | 5 |
| 41 | 2 |

## Answer

| Rainfall(mm) | Number of Days | Total Rainfall(mm) |
|---|---|---|
| 54 | 3 | 162 |
| 56 | 5 | 280 |
| 58 | 6 | 348 |
| 55 | 3 | 165 |
| 50 | 2 | 100 |
| 47 | 4 | 188 |
| 44 | 5 | 220 |
| 41 | 2 | 82 |
| Total | 30 | 1545 |

$$\text{Mean} = \frac{1545}{30}$$

$$= 51.5\text{mm}$$

## Question 04

Find the median.

| Height | Number of Children |
|---|---|
| 135 - 140 | 4 |
| 140 - 145 | 7 |
| 145 - 150 | 18 |
| 150 - 155 | 11 |
| 155 - 160 | 6 |
| 160 - 165 | 5 |

## Answer

| Height | Number of Children |
|---|---|
| below 140 | 4 |
| below 145 | 11 |
| below 150 | 29 |
| below 155 | 40 |
| below 160 | 46 |
| below 165 | 51 |

$$y = \frac{51}{2} = 25.5$$

$$\frac{(x - 145)}{(150-145)} = \frac{(25.5-11)}{(29-11)}$$

$$\text{Median } x = 149.03$$



## Question 05

Find the median age

| Age | Number of teachers |
|---|---|
| 25 - 30 | 6 |
| 30 - 35 | 8 |
| 35 - 40 | 12 |
| 40 - 45 | 20 |
| 45 - 50 | 16 |
| 50 - 55 | 6 |

## Answer

| Age | c.f |
|---|---|
| below 30 | 6 |

| | |
|---|---|
| below 35 | 14 |
| below 40 | 26 |
| below 45 | 46 |
| below 50 | 62 |
| below 55 | 68 |

$$y = \frac{68}{2} = 34$$

Using Proportionality assumption,

$$\frac{(x - 40)}{(45-40)} = \frac{(34-26)}{(46-26)}$$

Median = 42

## Question 06

The table below shows the number of students in maths club of a school, classified according to their heights. Find the median age

| Height | Number of students |
|---|---|
| 110 - 120 | 4 |
| 120 - 130 | 24 |
| 130 - 140 | 20 |
| 140 - 150 | 32 |
| 150 - 160 | 20 |

Find the median height

Answer (TryYourself)

## Question 07

The table below shows the classification of the members of a committee, according to their age

| Age | Number of members |
|---|---|
| 25 - 30 | 4 |
| 30 - 35 | 7 |
| 35 - 40 | 12 |
| 40 - 45 | 15 |

| | |
|---|---|
| 45 - 50 | 16 |
| 50 - 55 | 12 |
| 55 - 60 | 9 |
| 60 - 65 | 5 |

Find the median age

Answer (TryYourself)

Question 08

Mark of students in a class are given

| Age | Number of members |
|---|---|
| 0 - 10 | 2 |
| 10 - 20 | 3 |
| 20 - 30 | 5 |
| 30 - 40 | 8 |
| 40 - 50 | 12 |
| 50 - 60 | 7 |
| 60 - 70 | 5 |
| 70 - 80 | 3 |

Find mean of the marks

Answer (TryYourself)

Question 08

Heights of students in a school are given

| Age | Number of members |
|---|---|
| 121- 130 | 12 |
| 131 - 140 | 16 |
| 141 - 150 | 30 |
| 151 - 160 | 20 |
| 161 - 170 | 14 |
| 171 - 180 | 8 |

Find median of heights

Answer (TryYourself)

## CHAPTER 01

1) If the first two terms of an arithmetic progression are 5 and 7, then, what is common difference? What is the third term?
2) If the third and fourth terms of an arithmetic progression are 25 and 30, what is the fifth term?
3) If first and third terms of an arithmetic progression are 11 and 27, what is the second term?
4) The second and third terms of an arithmetic progression are 7 and 5. What is its first term?
5) If the third and fourth terms of an arithmetic progression are 50 and 65, what are the first and second terms?
6) If the first two terms of an arithmetic progression are x and x+y, what is the third term?
7) If the first two terms of an arithmetic progression are x and y, what is the third term?
8) Three consecutive terms of an arithmetic progression are 3, x and −5, what is x?
9) The first term of an arithmetic progression is a and the third term is b. What is the second term?
10) If the first term of an arithmetic progression is 7 and the common difference is −2, find its 12th term?
11) If the first term of an arithmetic progression is 8 and the common difference is 5, then what is its 23rd term?
12) If the first term of an arithmetic progression is −7 and the common difference is −3, then what is its 44th term?
13) If the 25th term of an arithmetic progression is 180 and the common difference is 7, then what is its first term?
14) If the 12th term of an arithmetic progression is 25 and the common difference is 3, then what is its 17th term?
15) If the 3rd term of an arithmetic sequence is 10 and the 8th term is 25.
What is the common difference?
Find 13th term and 40th term.
16) If the 17th term of an arithmetic progression is 23 and the 23rd term is 17,

then what is its first term and what is the common difference?

17) If the 5th term of an arithmetic progression is 32 and the 11th term is 74, then what is its first term and what is the common difference?

18) Seats are arranged in rows in an auditorium. Each row has 5 more seats than the row in front. The 15th row from the front has 82 seats. Which row has 97 seats?

19) Is 0 a term of the arithmetic progression −123, −120, −117...?

20) Is 203 a term of the arithmetic progression 7, 12, 17...?

21) How many numbers between 100 and 500 leave a remainder 3 on division by 5?

22) If the sum of three consecutive numbers in an arithmetic progression is 24 and the product of these terms is 224. Find the first term and the common difference.
[Hint: Let the three terms are a−d, a, a+d]

23) Find the sum
23+38+53+68+83+98+113

24) Find the sum of all multiples of 7 which are less than 100.

25) Find the sum of the first 25 terms of the arithmetic progression with first term 11 and common difference 4.

26) Find the sum of the first 12 terms of the arithmetic progression with first term -12 and common difference 3.

27) Find the sum of all the multiples of 9 between 100 and 300.

28) If the sum of the first 15 terms of an arithmetic progression is 240, what is its 8th term?

29) If the sum of the first 25 terms of an arithmetic progression is 350, what is its 13th term?

30) By how much is the sum of the first 25 terms of the arithmetic progression 2, 5, 8 ... greater than the sum of the first 25 terms of the arithmetic progression 1, 4, 7,...?

31) By how much is the sum of the first 50 terms of the arithmetic progression 9, 15, 21... greater than the sum of the first 25 terms of

the arithmetic progression 3, 9, 15,...?

32) The first row of seats in a volleyballs ground has 80 chairs and each row has 10more chairs than the row in front. If there are 10 rows of chairs, how many chairs are there altogether?

33) The first term of an A.P. is 6 and the common difference is 5. Find the A.P. and its general term.

34) Find the common difference and 15th term of the A.P. 125, 120, 115, 110, ...

35) Find the 17th term of the A.P. 4, 9, 14, ...

36) The 10th and 18th terms of an A.P. are 41 and 73 respectively.
Find the 27th term.

37) A TV manufacturer has produced 1000 TVs in the seventh year and 1450 TVs in the tenth year. Assuming that the production increases uniformly by a fixed number every year, find the number of TVs produced in the first year and in the 15th year.

38) A man has saved 640/- during the first month, 720/- in the second month and 800/- in the third month. If he continues his savings in this sequence, what will be his savings in the 25th month?

39) The sum of three consecutive terms in an A.P. is 6 and their product is –120.
Find the three numbers.

40) Find the three consecutive terms in an A. P. whose sum is 18 and the sum of their squares is 140.

41) Find the sum of the arithmetic series $5+11+17+\ldots+95$.

42) In an arithmetic series, the sum of first 14 terms is -203 and the sum of the next 11 terms is –572.
Find the arithmetic series.

43) How many terms of the arithmetic series $24+21+18+15+\ldots$, be taken continuously so that their sum is – 351.

44) Find the sum of all 3 digit natural numbers, which are divisible by 8.

45) In an arithmetic series, the sum of first 11 terms is 44 and that of the next 11 terms is 55. Find the arithmetic series.

46) In the arithmetic sequence 60, 56, 52, 48 ... starting

from the first term, how many terms are needed so that their sum is 368?

47) Find the sum of all 3 digit natural numbers, which are divisible by 9.

48) A construction company will be penalised each day for delay in construction of a bridge. The penalty will be 4000/- for the first day and will increase by 1000/- for each following day. Based on its budget, the company can afford to pay a maximum of 1,65,000/- towards penalty. Find the maximum number of days by which the completion of work can be delayed.

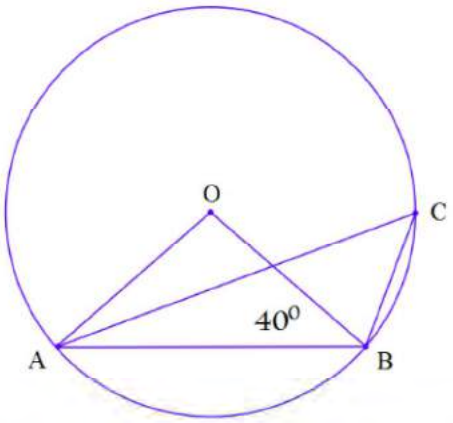
49) Find the sum of all natural numbers between 300 and 500 which are divisible by 11.

50) A sum of 1000/- is deposited every year at 8% simple interest. Calculate the interest at the end of each year. Do these interest amounts form an A.P.? If so, find the total interest at the end of 30 years.

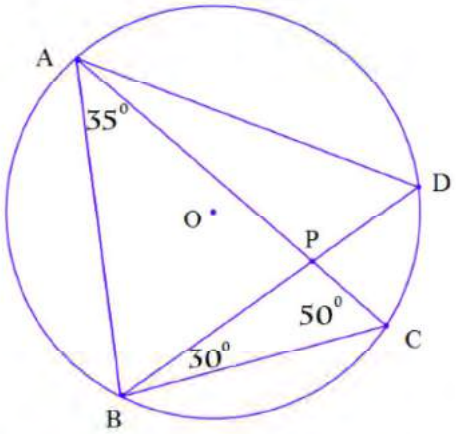
## CHAPTER 02

1) What is the central angle of a semicircle?

2) Find angle ACB.



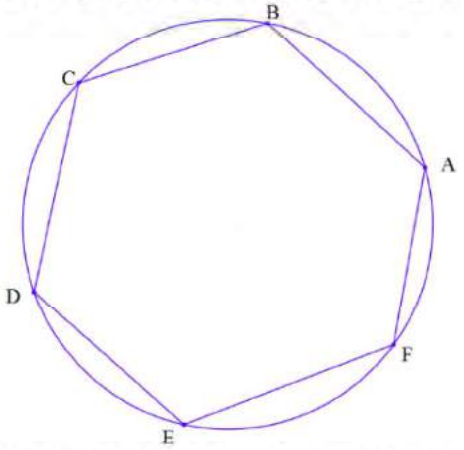

3) Find all the angles of the quadrilateral ABCD in the figure shown



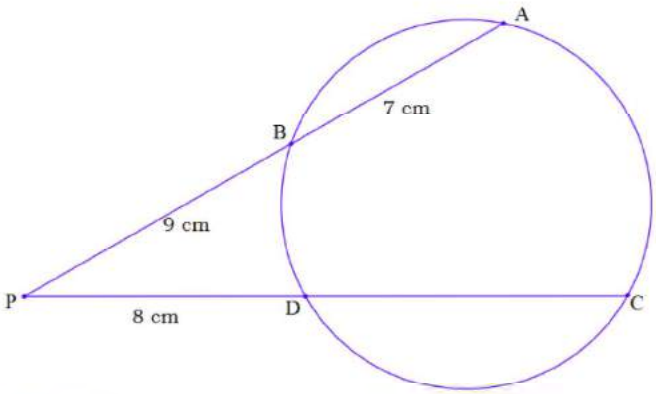

4) Prove that a rectangle is a cyclic quadrilateral.

5) Prove that for the cyclic hexagon ABCDEF in the picture.

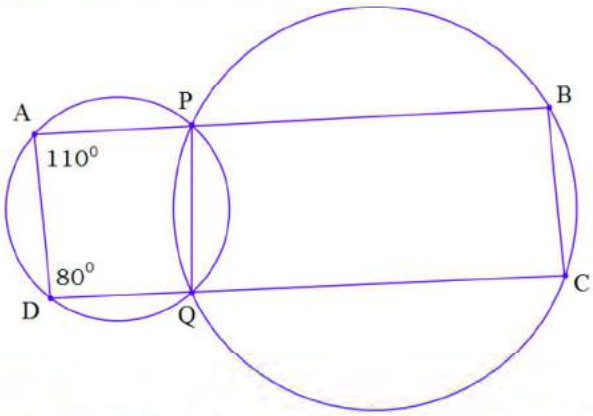
$\angle A + \angle C + \angle E = \angle B + \angle D + \angle F$



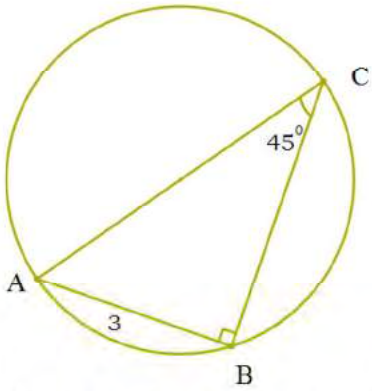

6) Calculate the length of CD



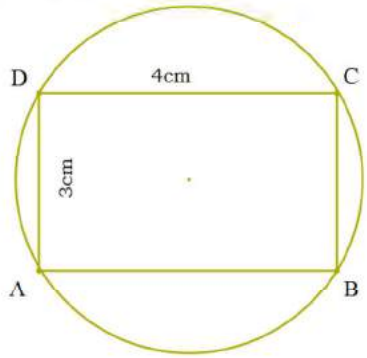

7) Find all angles.



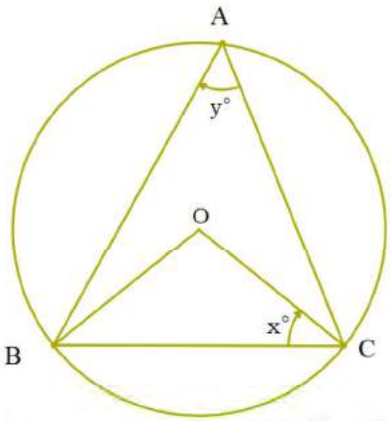

8) What is the radius of the circle




9) What is the area of the circle




10) In the figure below, 0 is the centre of the circle.




Prove that $x+y=90°$

11) Draw a rectangle of sides 5 cm and 4 cm and draw a square of the same area.

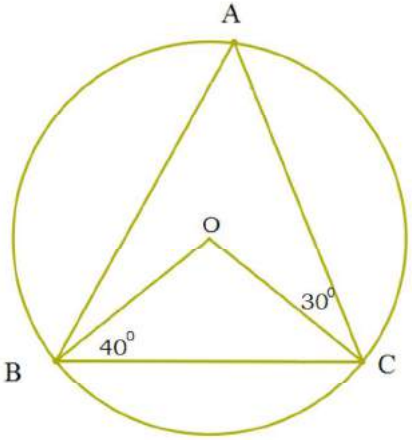
12) Draw a triangle of sides 4, 5, 6 cm and draw a square of the same area.

13) AB and CD are two chords of a circle which intersect each other internally at P.

(i) If CP = 4 cm, AP = 8 cm, PB = 2 cm, then find PD.

(ii) If AP=12 cm, AB=15 cm, CP =PD, then find CD

14) In the figure below, 0 is the centre of the circle. Find $\angle OCA, \angle AOC$



15) Draw a triangle of sides 5, 5, 5 centimetres and draw a square of the same area.

16) In $\Delta ABC$, we have $\angle A = 60°$ and $\angle B = 70°$. Is the vertex C inside or outside the circle with diameter AB?

17) Prove that if a pair of opposite angles of a quadrilateral are right, then a circle can be drawn through all four of its vertices.

18) In the quadrilateral ABCD, we have AB=3cm, BC=4 cm, AC=5 cm, $\angle A = 120°$, $\angle C = 70°$. If we draw the circle with AC as diameter, which of the four vertices of ABCD would be inside the circle? Which of them would be outside this circle? Is any vertex on the circle? What about the circle with BD as diameter?

19) Draw a rectangle of sides 5 cm and 4 cm and draw a square of the same area.

20) Draw a triangle of sides 5, 6, 6 cm and draw a square of the same area.

## CHAPTER 03

1) A die is rolled. Find the probability of getting
(i)the number 4
(ii)an even number
(iii)a prime factor of 6
(iv)a number greater than 4.

2) An integer is chosen from the first twenty natural numbers. What is the probability that it is a prime number?

3) A bag contains 5 red balls and some blue balls. If the probability of drawing a blue ball from the bag is thrice that of drawing a red ball, then find the number of blue balls in the bag.

4) A ticket is drawn from a bag containing 100 tickets. The tickets are numbered from one to hundred. What is the probability of getting a ticket with a number divisible by 10?

5) A die is thrown twice. Find the probability of getting a total of 9.

6) A box contains 4 white balls and 6 black balls and another one, 3 white and 5 black. We can choose one box and take a ball. If we want a black ball, which box is the better choice?

7) You ask someone to say a (natural) number less than 10.

What is the probability that the number is a prime? What if the number asked is to be less than 100?

8) A box contains paper slips with numbers written on them- 4 odd and 5 even. Two more paper slips, one with an odd number and another with an even number are put in. Does the probability of getting an odd number increase or decrease? What about the probability of getting an even number?

9) There are two boxes, each containing slips numbered 1 to 5. One slip is drawn from each box and their numbers added. What are the possible sums? Compute the probability of each sum.

10) There are two small boxes A and B. In A there are 9 white beads and 8 black beads, In B there are 7 white and 8 black beads. We want to take a bead from a box.

(a) What is the probability of getting a white bead from each box?

(b) A white beads and a black bead are added to box B and then a bead is taken from it. What is the probability of getting a white bead from it?

11) 20 lots numbered 1 to 20 are taken in a box. Another box contains lots of prime numbers less than 20. One lot each is drawn from each box.

What is the probability of getting two prime numbers?

What is the probability of getting two even numbers?

12) There are 18 beads in a box. Some of them are white and the remaining are black. The Probability of drawing a black bead from it is $\frac{1}{3}$.

a) How many black beads are there in the box?

b) How many white beads are there in the box?

c) How many white beads should be added probability of drawing a black bead becomes $\frac{1}{4}$?

## CHAPTER 04

13) If 5 is subtracted from a number and the result doubled, we get 16. What is the number?

14) The common difference of an arithmetic progression is 2. If we add 1 to the product of the first and second terms we get 9. Find the progression.

15) When each side of a square is reduced by 5m the area became 225 $m^2$. What was the length of a side of the original square?

16) Anu is 4 years older than Vinu. If 4 is added to the product of their ages the result is 169. What are their ages?

17) The square of a natural number and four times the next natural number is added and the result is 36. What is the number?

18) There are two squares with each side of the second 1 m less than that of the first. The area of the first and the perimeter of the second are equal numbers.

What is the length of a side of the larger square?

19) The length of a rectangle is 2m more than its width and its area is 15 $m^2$. Find its dimensions.

20) The difference of two numbers is 6 and their product is 16. What are the numbers?

21) If from the square of a number six times the number is subtracted, we get 40. What is the number?

22) When the first few terms of an arithmetic progression with first term 4 and common difference 2 are added the sum got is 40. How many terms are added?

23) If the product of a number with 6 more than the number is 160 what is the number?

24) If the product of a number with 8 less than the number is 65 what is the number?

25) The width of a rectangle is 7m more than its height and its area is 60$cm^2$. Find the dimensions.

26) How many terms of the arithmetic progression 4, 10, 16 starting from the first are to be added to get 252?

27) For the quadratic equation $x^2-14x+k=0$ to have a single solution what should be the value of k?

28) For the equation $x^2+10x+k=0$ to have at least one solution what should be the value of k?

29) The sum of the squares of two consecutive odd numbers is 202. Find the numbers.

30) The sum of the ages of two children is 30 and the product of their ages is 216 How old are they?

31) If the difference of two negative numbers is 5 and their product is 336. What are the numbers?

32) The sum of two numbers is 50 and the sum of their squares is 2050.What are the numbers?

33) The width of a rectangle is 5cm more than its height and its area is 456 $cm^2$. Find the dimensions.

34) The perimeter of a rectangular swimming pool is 160m and its area is 1500 square meters. Find the length and breadth of the pool.

35) Can a rectangle be constructed with area 700 $cm^2$ and perimeter 104m?

36) A wire 60cm long is bent into a right angled triangle of hypotenuse 26cm. Compute the lengths of the other two sides of the triangle.

37) When the length of each side of a square was increased by 5cm, its perimeter became 36cm. What was the length of a side of the original square?

38) The sum of a number and 5 multiplied by 4 gives 36. What is the number?

39) When the length of each side of a square was increased by 5cm, its area became 36 square cm. What was the length of a side of the original square?

40) The square of the sum of a number and 5 is 36. What is the number?

41) The common difference of an arithmetic sequence is 5 and the square of the second term is 36. What is the first term?

42) Of three consecutive integers, 1 added to the product of the first and the third gives 169. What are the numbers?

43) 2000 rupees is invested in a scheme giving interest compounded annually. After two years the amount

became 2205 rupees. What is the rate of interest?

44) A pavement 2m wide runs around a square ground. The total area of the ground and the pavement is 1225 $m^2$. What is the area of the ground?

45) The common difference of an arithmetic sequence is 1 and the product of the first and the third terms is 143. What are the first three terms?

46) The common difference of an arithmetic sequence is 6 and the product of the first and the second terms is 280. What are the first three terms of this sequence?

47) In a right angled triangle, one of the perpendicular sides is 5cm longer than the other and its area is 12 square cm. What are the lengths of its sides?

48) A rectangle is to be made with perimeter 1 00 cm and area, 525 square cm. What should be the lengths of its sides?

49) How many tens of the arithmetic sequence 3, 7, 11, ... must be added to get 300?

50) The length of a rectangle is 10 cm more than its breadth; and its area is 144 square cm. What are the length and breadth?

51) How many terms of the arithmetic sequence 5,7,9, . . . should be added to get 140?

52) The perimeter of a rectangle is 28m and its diagonal is 10m. What are the lengths of its sides?

53) Find a pair of numbers with sum 4 and product 2.

54) Thirty candies were distributed among some children. Relishing the sweet, the whiz-kid among them said, "If we were one short, we would all get one more." How many kids were there?

55) There are two taps opening into a tank. If both are opened, the tank would be full in 12 minutes. The time taken for it to fill with only the small tap open, is 10 minutes more than the time to fill with only the large tap open. What is the time taken to fill the tank with only the small tap open?

56) We want to make a rectangle of perimeter 20 cm and area 26 square cm. What should be the lengths of the sides?

57) An 8 cm long wire is to be bent into a rectangle. Can a rectangle with diagonal2 cm be made from it? What about a rectangle with diagonal 4cm?

## CHAPTER 05

1) Find the area of a triangle with the length of two sides 5 cm and 6 cm and the angle between them $50^0$.

2) A point outside a circle of radius 2 cm is to be chosen such that the angle between the two tangents from this point to the circle is $40^0$. How far away from the centre of the circle should be this point?

3) One angle of a triangle is $60^0$ and the side opposite to this angle is 3 cm. Find circumradius of the triangle.

4) Find the area of a triangle with two of its sides 10 cm and 6 cm and the angle between these sides $80^0$.

5) Two adjacent sides of a parallelogram are 10 cm and 3 cm long and the angle between these sides is $60^0$. Compute its area.

6) In $\Delta ABC$ the sides AB and AC are equal. Also BC=6 cm and $\angle B=37$. Find the altitude through A.

7) In a circle a chord of length 8 cm makes an angle of $100^0$ at the centre. What is the radius of the circle?

8) Prove that if one angle of a triangle is $30^0$ then the length of the side opposite this angle is equal to the circumradius of the triangle.

9) The angle between the tangents drawn from a point outside a circle of radius 3 cm is $70^0$. How far away from the centre is this point?

10) Tangents are drawn to a circle from a point whose distance from the centre is double the radius. Prove that the angle between the tangents is $60^0$.

11) Two adjacent sides of a parallelogram are 5 cm and 3 cm long and the angle between them is 60. Find the length of their diagonals.

12) The area of a parallelogram is 30 $cm^2$. One of its sides is 6cm and one of its angles is $60^0$. What is the length of its other side?

13) The sides of an equilateral triangle are 4 centimetres long. What is the radius of its circumcircle?

14) One angle of a right angled triangle is $30^0$ and its hypotenuse is 4 cm. What is its area?

15) The hypotenuse of a right angled triangle is 6 cm long and one of its angles is $40^0$. What are the lengths of its other two sides?

16) The lengths of two sides of a triangle are 6cm and 4cm and the angle between them is $50^0$. What is the area of this triangle?

17) One angle of a triangle is $70^0$ and the length of its opposite side is 4 cm. What is its circumradius?

18) Two sides of a triangle arc 7cm and 6 cm long and the angle between them is $40^0$. What is the length of the third side?

19) The lengths of two sides of a triangle are 6 cm and 4 cm and the angle between them is $130^0$. What is its area?

20) One angle of a triangle is $110^0$ and the side opposite to it is 4 cm long. What is its circumradius?

21) Two sides of a triangle arc 7cm and 6 cm long and the angle between them is $140^0$. What is the length of the third side?

22) Two sides of a parallelogram are of length 6 cm and 4 cm and the angle between them is 35. What are the lengths of its diagonals?

23) A ladder leans against a wall with its foot 2 metres away from the wall and it makes a $40^0$ angle with the ground. How high is the top of the ladder from the ground?

24) A man 1.7m tall stands l0m away from the foot of a tree; and he sees the top of the tree at an angle of elevation $40^0$. How tall is the tree?

25) A man 1.8m tall looks down from the top of a lighthouse 25m high and sees a ship at an angle of depression $35^0$. How far is

the ship from the foot of the lighthouse?

26) A boy, 1 .5m tall, standing at the edge of a river bank, sees the top of a tree on the the edge of the other bank at an elevation of $50^0$. Standing back by 10m, he sees it at an elevation of $25^0$. How wide is the river and how tall is the tree?

27) The length of the shadow of a tree is 18m, when the sun is at an elevation of 40°.Find the height of the tree

28) A man 1.75m tall, standing at the foot of a tower sees the top of a hill 40m away at an elevation of 60°. On climbing to the top of the tower, he sees the top of the hill at an elevation of 50°. Compute the heights of the hill and the tower.

29) A boy 1.5m tall, sees the top of a building under construction at an elevation of 30°. The building is completed, adding 10 more metres to its height; and then the boy sees the top at an elevation of 60° from the same spot. Find the height of the building?

30) A man 1.8m tall, looking down from the top of a telephone tower sees the top of a building 10m high at an angle of depression 40° and the foot of the building at an angle of depression 60°. What is the height of the tower? How far is it away from the building?

31) A ramp for unloading a moving truck, has an angle of elevation of $30^0$. If the top of the ramp is 0.9 m above the ground level, then find the length of the ramp.

32) Two crows *A* and *B* are sitting at a height of 15 m and 10 m in two different trees vertically opposite to each other. They view a vadai (an eatable) on the ground at an angle of depression $45^0$ and $60^0$ respectively. They start at the same time and fly at the same speed along the shortest path to pick up the vadai. Which bird will succeed in it? Hint: (foot of two trees and vadai (an eatable) are in a straight line)

33) A person in an helicopter flying at a height of 700 m, observes two objects lying opposite to each other on either bank of a river. The angles of depression of the objects are $30^0$ and $45^0$. Find the width of the river.

34) A student sitting in a classroom sees a picture on the black board at a height of 1.5 m from the horizontal level of sight. The angle of elevation of the picture is $30^0$. As the picture is not clear to him, he moves straight towards the black board and sees the picture at an angle of elevation of $45^0$. Find the distance moved by the student.

35) From the top and foot of a 40 m high tower, the angles of elevation of the top of a lighthouse are found to be $30^0$ and $60^0$ respectively. Find the height of the lighthouse. Also find the distance of the top of the lighthouse from the foot of the tower.

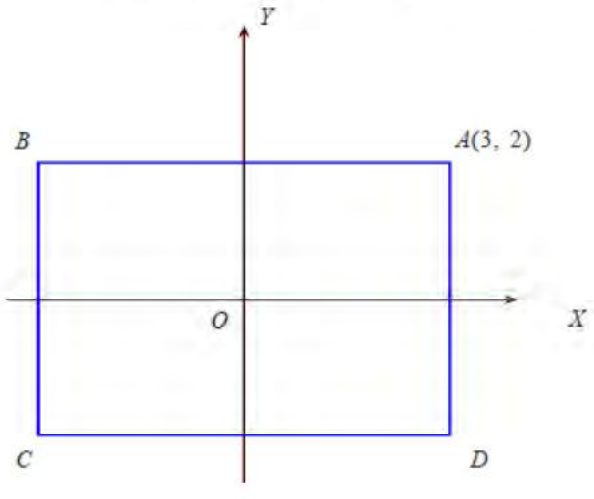
36) A man 1.7m tall standing 10m away from a tree sees the top of the tree at an angle of elevation 500. What is the height of the tree?

37) A boy 1.5m tall standing on the bank of a river sees the top of a tree on the edge of the other bank at an angle of elevation $60^0$. Steeping 20m backward he sees it at an angle of elevation of $30^0$ . Compute the height of the tree and the width of the river.

38) A man 1.75m tall, standing at the foot of a 20m tower sees the top of a tree at an elevation of 60°. On climbing to the top of the tower, he sees the top of the tree at an elevation of 45°. Compute the height of the tree.

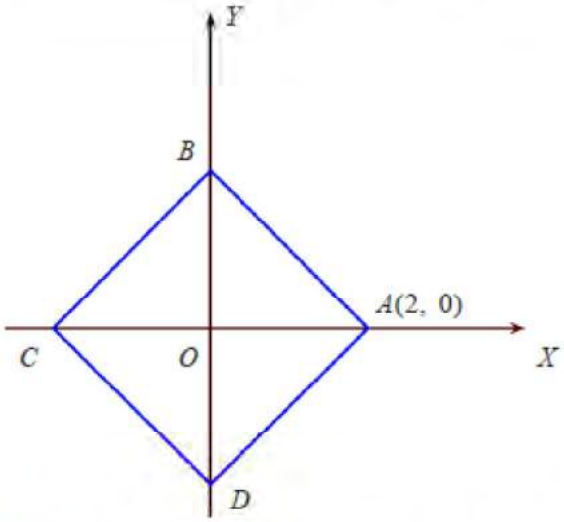
## CHAPTER 06

1) In the figure below, ABCD is a rectangle with the origin O as its centre and sides parallel to the axes.

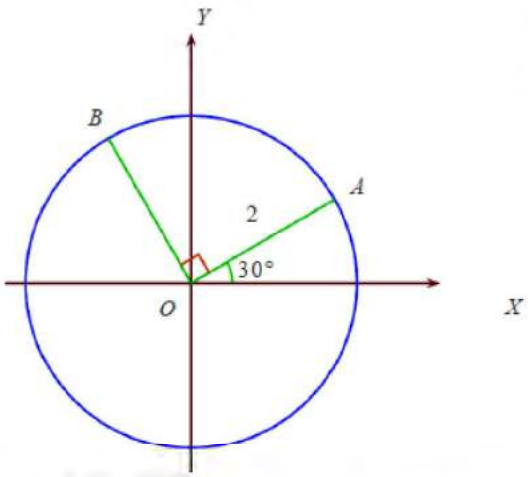


What are the coordinates of B, C, D?

2) In the figure below, *ABCD* is a square. Find the coordinates of *B,C,D.*




3) What are the coordinates of the points *A* and *B* in the figure below?




4) With the axes of coordinates chosen along two adjacent sides of a rectangle, two opposite vertices have coordinates (0, 0) and (4, 3). What are the coordinates of the other two vertices?

5) Draw x and y axis then mark the following points.

(4,3), (-4,7), (-4,-6), (5,9), (6,-4)

6) Find the distance from x axis (4, 4),(4, 3),(5, 7),(4,-3)

7) The coordinates of vertices of a triangle are (2,4), (4,5), (3,7).
Find the coordinates of the centre of its circumcircle and the circumradius.

8) The centre of a circle is (5,4) and its radius 8cm. Find which of the points (5,5),(-4,7),(-3,2),(4,5),(3,4) lie within the circle.

## CHAPTER 07

1) Draw a circle of radius 3 cm and mark a point P which is 7cm away from its centre. Draw the tangents from P to the circle.

2) The length of the tangent from a point to a circle of radius 12 cm is 16 cm. How far away is this point from the centre of the circle.

3) The length of the tangent from a point 61cm away from the centre of a circle is 60 cm. What is the radius of the circle?

4) Draw a circle of radius 3 cm and draw a rhombus with one angle 50°, all four sides touching the circle.
5) Draw a circle of radius 5 cm and draw a regular pentagon with all its sides touching the circle.
6) Prove that in any circle, the tangents at two points make equal angles with the chord joining the points of contact.
7) Draw a triangle of sides 4cm, 5cm, 6cm and draw its incircle.
8) Draw an equilateral triangle of sides 6cm and draw its incircle and circumcircle.
9) Prove that in an equilateral triangle, the circumcentre and incentre are the same. What is the ratio of the circumradius and inradius?
10) Draw a square of sides 5 cm and draw its circumcircle and incircle.

## CHAPTER 08

1) A square of side 5 cm and four isosceles triangles, each of one side 5 cm and the height to the opposite vertex 8 cm; these are to be joined to make a square pyramid. How much paper is needed for the job?
2) The lateral faces of a square pyramid are equilateral triangles of side 30 cm. What is its surface area?
3) What is the volume of a square pyramid of base edge 1 0centimetres and slant height 15 cm?
4) In two square pyramids of the same volume, the base edge of one is half the base edge of the other. How many times the height of the pyramid with larger base is the height of the other?
5) The base edges of two square pyramids are in the ratio 1:2 and their heights are in the ratio 1:3. The volume of the first pyramid is 180 cubic cm. What is the volume of the second?
6) The radius and height of a right circular solid cone are 7 cm and 24 cm

respectively. Find its curved surface area and total surface area.

7) If the vertical angle and the radius of a right circular cone are $60^0$ and 15 cm respectively, then find its height and slant height.

8) If the circumference of the base of a solid right circular cone is 236 cm and its slant height is 12 cm, find its curved surface area.

9) A heap of paddy is in the form of a cone whose diameter is 4.2 m and height is 2.8 m. If the heap is to be covered exactly by a canvas to protect it from rain, then find the area of the canvas needed.

10) What is the base-radius and slant height of the cone made by rolling up a sector of radius 10 centimetres and central angle 60°?

11) What is the central angle of the sector needed to make a cone of base-radius 10 centimetres and slant height 25 centimetres?

12) What is the ratio of the base-radius and slant height of a cone made by rolling up a semicircle?

13) The central angle and radius of a sector of a circular disc are $180^0$ and 21 cm respectively. If the edges of the sector are joined together to make a hollow cone, then find the radius of the cone.

14) What is the curved surface area of a cone of base radius 12centimetres and slant height 25 centimetres?

15) What is the curved surface area of a cone of base diameter 30 centimetres and height 40 centimetres?

16) A cone shaped firework is of base-diameter 10 centimetres and height 12 centimetres. 10000 such fireworks are to be wrapped in colour paper. The price of paper is 2 rupees per square metre. What is the total cost of wrapping?

17) Prove that for a cone made by bending a semicircle, the curved

surface area is double the base area.

18) The base radius of a cylindrical block of wood is 15 cm and its height is 40 cm. What is the volume of the largest cone that can be carved out from this?

19) A solid metal cylinder is of base-radius 12 cm and height 20 centimeters. By melting and recasting, how many cones of base-radius 4 cm and height 5 cm can be made?

20) A sector of central angle 216° is cut out from a circle of radius 25 cm and it is rolled up into a cone. What is the base radius and height of this cone? What is its volume?

21) The ratio of the base-radii of two cones is 3:5 and their heights are in the ratio 2:3. What is the ratio of their volumes?

22) Two cones have the same volume and their base radii are in the ratio 4:5. What is the ratio of their heights?

23) If the curved surface area of solid a sphere is 98.56 $cm^2$, then find the radius of the sphere.

24) If the curved surface area of a solid hemisphere is 2772 sq.cm, then find its total surface area.

25) Radii of two solid hemispheres are in the ratio 3:5. Find the ratio of their curved surface areas and the ratio of their total surface areas.

26) Find the curved surface area and total surface area of a hollow hemi-sphere whose outer and inner radii are 4.2cm and 2.1 cm respectively.

27) The volumes of two spheres are in the ratio 27:64. What is the ratio of their radii?

28) A metal cylinder of base-radius 4 cm and height 10centimetres is melted and recast into spheres of radius 2cm. How many such spheres are got?

29) A solid is in the shape of a cylinder surmounted on a hemisphere. If the diameter and the total

height of the solid are 21 cm, 25.5 cm respectively, then find its volume.

30) A capsule is in the shape of a cylinder with two hemispheres stuck to each of its ends. If the length of the entire capsule is 14 mm and the diameter of the capsule is 5 mm, find its surface area.

31) A tent is in the shape of a right circular cylinder surmounted by a cone. The total height and the diameter of the base are 13.5 m and 28 m. If the height of the cylindrical portion is 3 m, find the total surface area of the tent.

32) Using clay, a student made a right circular cone of height 48 cm and base radius 12 cm. Another student reshapes it in the form of a sphere. Find the radius of the sphere.

33) The radius of a solid sphere is 24 cm. It is melted and drawn into a long wire of uniform cross section. Find the length of the wire if its radius is 1.2 mm.

34) A right circular conical vessel whose internal radius is 5 cm and height is 24 cm is full of water. The water is emptied into an empty cylindrical vessel with internal radius 10 cm. Find the height of the water level in the cylindrical vessel.

35) A solid sphere of diameter 6cm is dropped into a right circular cylindrical vessel with diameter 12 cm, which is partly filled with water. If the sphere is completely submerged in water, how much does the water level in the cylindrical vessel increase?

## CHAPTER 09

1) The centre of a circle is (3,4) and it passes through the point (2, 5). What is its radius?

2) A circle of radius 3 is drawn with centre at (-2, 1). Find out whether the point (4, 1) lies on the circle, within the

circle or outside the circle.

3) Prove that we get a right angled triangle by joining the points (2, 1), (3, 4), (-3, 6).
4) The vertices of a triangle are the points (1, 2), (2, 3), (3, 1). Find the centre and radius of its circmncircle.
5) What is the point at which the line joining (3,1) and (2, -1) meets the x-axis? And they-axis?
6) Prove that the line joining (3,5) and (1,7) passes through the point (5, 3).
7) Does the line joining (2,3) and (3,-1) pass through the point (5, 6)? What about (5, -9)?
8) Prove that the points (2, 3), (7, 5), (9, 8), (4, 6) are the vertices of a parallelogram.
9) If (x,y) are the coordinates of a point on the line joining (3,1) and (5, 2), then $x - 2y - 1 = 0$
10) What is the slope of the line given by the equation $2x - 3y + 4 = 0$?

## CHAPTER 10

1) Is the polynomial $x-2$ a factor of the polynomial? $x^4-x^3-x^2-x-2$
2) Is $x+3$ a factor of $2x^2+3x-5$
3) Is the polynomial $2x-3$ a factor of the polynomial? $2x^2-x-3$
4) What number added to $3x^3-2x^2+5x$ gives a polynomial for which $x-1$ is a factor?
5) Write $x^2+6x+8$ as a product of two first degree polynomials.
6) When $x^3-3x^2-5x+n$ is divided by $(x+3)$ remainder is 5. Find n.
7) If $(x+1)$ and $(x-1)$ are factors of $x^3+2x^2+px+q$, find p and q.
8) Find the remainder when $2x^3-11x^2+3x+5$ is divided by $(x-3)$
9) Prove that $(x+2)$ is a factor of $x^3+3x^2-4x-12$.
10) Is $(x-2)$ a factor of $2x^3-11x^2+17x-6$?

## CHAPTER 11

1) Find the mean of the following distribution.

| x | 10 | 30 | 50 | 70 | 89 |
|---|---|---|---|---|---|
| f | 7 | 8 | 10 | 15 | 10 |

2) If the mean of the following data is 5, find p.

| x | 2 | 3 | 5 | p | 9 |
|---|---|---|---|---|---|
| f | 9 | 4 | 6 | 3 | 8 |

3) The table below classifies the number of days of a month according to the amount of rainfall received in a certain locality. Find the mean daily rainfall.

| Rainfall | Number of Days |
|---|---|
| 54 | 3 |
| 56 | 5 |
| 58 | 6 |
| 55 | 3 |
| 50 | 2 |
| 47 | 4 |
| 44 | 5 |
| 41 | 2 |

4) The table below classifies the members of a committee according to their ages:

| Age | Members |
|---|---|
| 25 - 30 | 6 |
| 30 - 35 | 14 |
| 35 - 40 | 16 |
| 40 - 45 | 22 |
| 45 - 50 | 5 |
| 50 - 55 | 4 |
| 55 - 60 | 3 |

Calculate the mean age of the members of this committee.

5) The table below shows the number of students in Class 10 of a school, classified according to their heights:

| Height | Students |
|---|---|
| 120 - 125 | 19 |
| 125 - 130 | 36 |
| 130 - 135 | 23 |
| 135 - 140 | 23 |
| 140 - 145 | 43 |
| 145 - 150 | 21 |
| 150 - 155 | 23 |
| 155 - 160 | 12 |

Calculate the mean height

6) Calculate the median for the following data:

| x | 10 | 20 | 30 | 40 | 50 | 60 |
|---|---|---|---|---|---|---|
| f | 6 | 15 | 29 | 41 | 60 | 70 |

7) The table below shows the number of employees of an office, classified according to the income-tax paid by them:

| Income Tax | Employees |
|---|---|
| 1000 - 2000 | 8 |
| 2000 - 3000 | 10 |
| 3000 - 4000 | 15 |
| 4000 - 5000 | 18 |
| 5000 - 6000 | 22 |
| 6000 - 7000 | 8 |
| 7000 - 8000 | 6 |
| 8000 - 9000 | 3 |

Compute the median income-tax.

8) The table below classifies the candidates who took an examination, according to the marks scored by them:

| Marks | Candidates |
|---|---|
| 0 - 10 | 44 |
| 10 - 20 | 40 |
| 20 - 30 | 35 |
| 30 - 40 | 20 |
| 40 - 50 | 12 |
| 50 - 60 | 10 |
| 60 - 70 | 8 |
| 70 - 80 | 6 |
| 80 - 90 | 4 |
| 90 - 100 | 1 |

Find the median mark.

-🍎🍎🍎-



Prepared By
Fassal Peringolam
M.Sc, B.Ed
(Maths & Science Tutor)
Brains Moozhikkal
9048 332 443
8281 332 443
Visit: www.sciencetablet.in

Notes