1

ARITHMETIC SEQUENCE

- Common difference(d)=X_2-X_1
- a,b,c …..is consecutive terms of an arithmetic sequence ∴ $b = \frac{(a+c)}{2}$
- Algebraic form(n^{th} term)= $X_n=dn+(f-d)$

$X_1+(n-1)d$

an+b(where first term=a+b)

- Number of terms(n)= $(X_n-X_1)\div d+1$

$\frac{d}{2}n^2 + (f-\frac{d}{2})n$

- Term difference = Position difference × d
- Sum of n terms= $n \div 2(X_1+X_n)$

Number of terms × middle term(odd numbers)

n^2(1+3+…..+(2n-1)=n^2(odd numbers)

Number of pairs × sum of a pair(even numbers)

1+2+.....+n=n(n+1)÷2(natural numbers)

- Difference of sum of first n terms and next n terms= n^2d

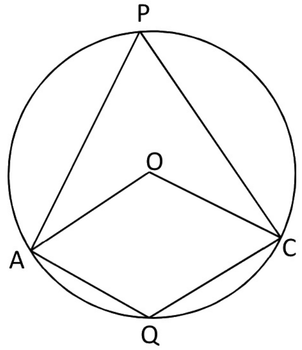
2

CIRCLES

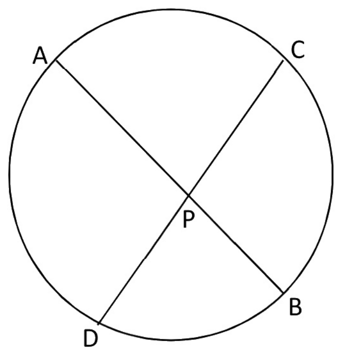
- Angle in the same segment are equal.

$APC = \frac{1}{2}\times < AOC$

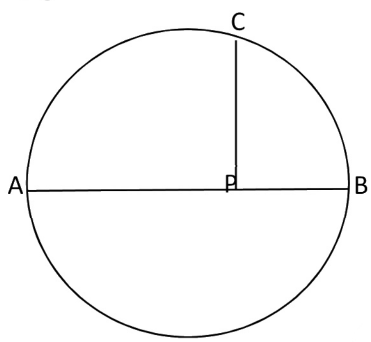
$AQC = 180-<APC$



- $PA \times PB = PC \times PD$



- $PA \times PB = PC^2$



3

MATHEMATICS OF CHANCE

- A bag contains ‘M’ number of green balls and another bag contains ‘N’ number of red balls.If we take one ball in random :

  P(green balls) = $\frac{M}{M+N}$

  P(red balls) = $\frac{N}{M+N}$

- A bag contains ‘M’ number of green balls and ‘N’ number of red balls.Another bag contains ‘P’ number of green balls and ‘Q’ number of red balls.If we take one ball from each in random :

  Total number of pairs = $(M+N) \times (P+Q)$

  P(green balls only) = $\frac{M \times P}{(M+N)\times(P+Q)}$

  P(red balls only) = $\frac{N \times Q}{(M+N)\times(P+Q)}$

P(one red and one green) = (Total pairs-both are green-both are red)÷Total pairs

P(at least one green) = (Total pairs-both are red)÷Total pairs

P(at least one red) = (Total pairs-both are green)÷Total pairs

4

SECOND DEGREE EQUATIONS

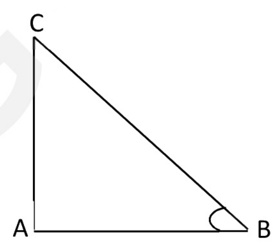
- Solution(X) of a second degree equation in the form $ax^2+bx+c=0 = \frac{-b\pm\sqrt{b^2-4ac}}{2a}$
- Number added to convert X^2+bx in to perfect square=(coefficient of X ÷2)^2= (b÷2)2= b^2÷4
- Perimeter of a rectangle = 2(l+b)

Length + breadth (l+b) = Perimeter ÷2

5

TRIGNOMETRY

- sin B = opposite ÷hypotenuse = $\frac{AC}{BC}$
- cos B = adjacent ÷hypotenuse = $\frac{AB}{BC}$
- tan B = opposite ÷adjacent = $\frac{AB}{AC}$



RATIO OF SIDES OF TRIANGLES

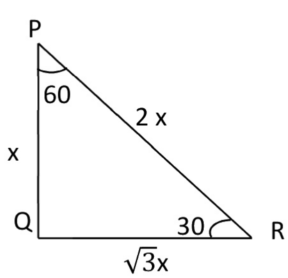
(a) having angles 30° , 60° , 90°

Angles = 30:60:90

Sides = PQ : QR : PR

=x: $\sqrt{3}$x : 2x

=1 : $\sqrt{3}$: 2



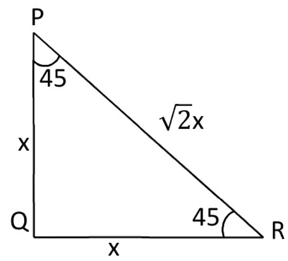
(b) having angles 45° , 45° , 90°

Angles = 45:45:90

Sides = PQ : QR : PR

$= x : x : \sqrt{2}x$

$= 1 : 1 : \sqrt{2}$



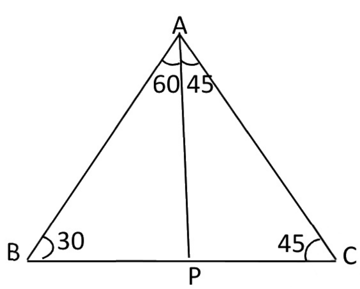
(c) having angles 30° , 45° , 105°

Angles = 30 : 45 : 105

Sides = AC : AB : BC

$= \sqrt{2}x : 2x : (\sqrt{3}+1)x$

$= \sqrt{2} : 2 : (\sqrt{3}+1)x$



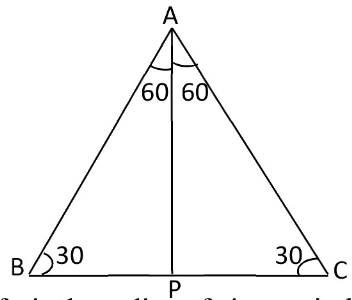
(d) having angles 30° , 30° , 120°

Angles = 30 : 30 : 120

Sides = AB : AC : BC

$= 2x : 2x : 2\sqrt{3}x$

$= 1 : 1 : \sqrt{3}$

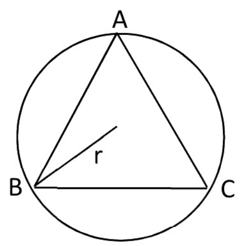


- If r is the radius of circumcircle

BC = 2r sin A

AC = 2r sin B

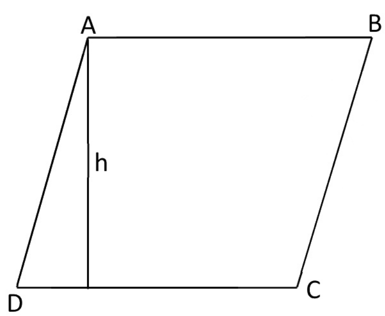
AB = 2r sin C



- Find h

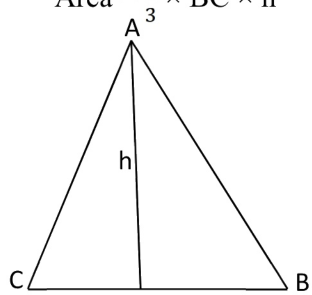
Area = base × h

= CD × h



- Find h

Area = $\frac{1}{3}$ × BC × h



- Area of Rhombus = $\frac{1}{2} \times d_1 \times d_2$

6

C0-ORDINATE GEOMETRY

- Co-ordinate of centre = (0,0)
- Co-ordinate of Y on X axis = 0
- Co-ordinate of X on Y axis = 0
- Y co-ordinate of any point on line parallel to X axis are same.
- X co-ordinate of any point on line parallel to Y axis are same.
- Distance between the point $A(x_1,y_1)$ and $B(x_2,y_2)$ is :

$$AB = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$$

- Isosceles Triangle : Any two sides are equal.
- Equilateral Triangle : All sides and angles are equal.
- Right angled Triangle : The sum of squares of smaller sides gives the square of larger side.

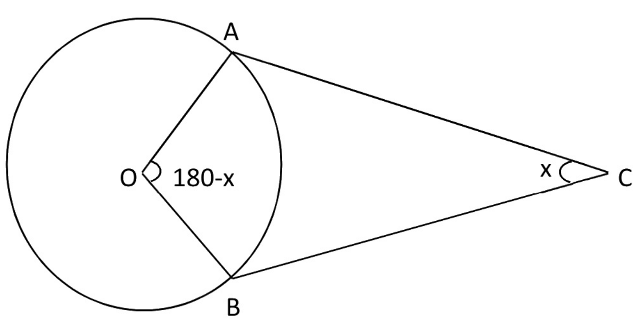
  The sum of smaller anglesgives 90°.

- Parallelogram : Opposite sides are equal.
- Rhombus : All sides are equal.

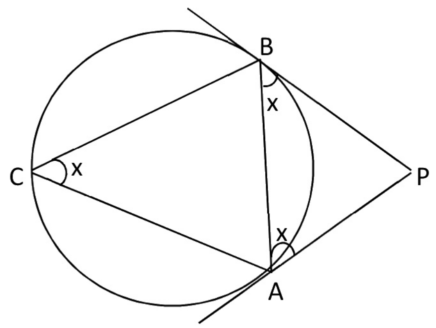
7

TANGENTS

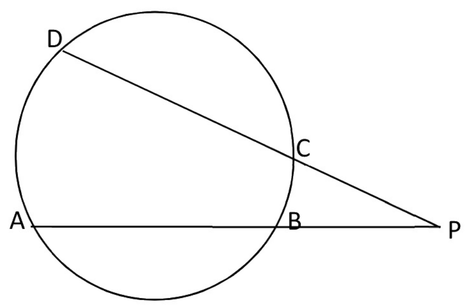
- <ACB = x
- AOB = 180-x



- <PBA = <PAB =<ACB



- PA × PB = PC × PD



If area of triangle is A and S is half the perimeter of the triangle.Then ,

Inradius = r =$\frac{A}{S}$

8

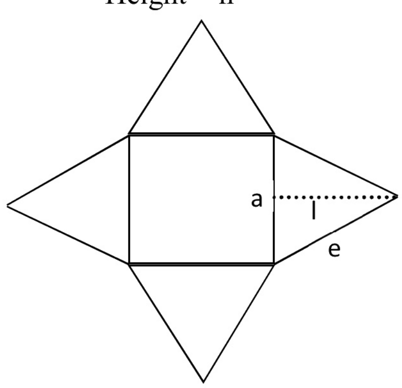
SOLIDS

- Slant height = l

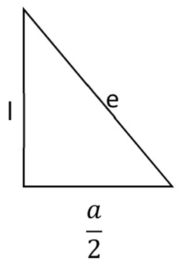
  Base edge = a

  Lateral edge = e

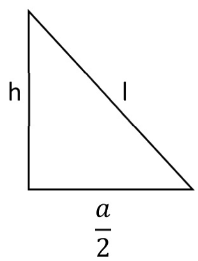
  Height = h



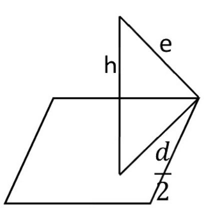
- $e^2 = l^2 + (\frac{a}{2})^2$



- $l^2 = h^2 + (\frac{a}{2})^2$



- $e^2 = h^2 + (\frac{d}{2})^2$



- **VOLUME**

▪Any pyramid = $\frac{1}{3}$ × base area × h

▪ Square pyramid = $\frac{1}{3} a^2 h$

- In pyramid, there are four lateral surfaces which are triangles.

  Area of one lateral surface = $\frac{1}{2} \times a \times l$

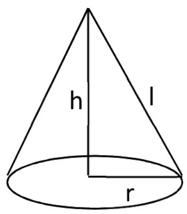
  $= \frac{al}{2}$

  Area of lateral surfaces = $4 \times \frac{al}{2} = 2al$

L.S.A = 2al

- Total surface area(T.S.A) of any pyramid = base area + lateral surface area
- Total surface area(T.S.A) of square pyramid = $a^2 + 2al$

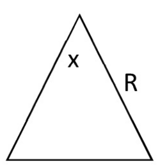
- **CONE**

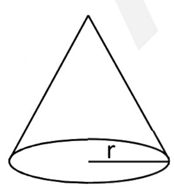


- $l^2 = h^2 + r^2$
- C.S.A of a cone = πrl
- T.S.A of a cone = $\pi r^2 + \pi rl$
- Volume of a cone = $\frac{1}{3}\pi r^2 h$
- We make cone by folding a sector.So,
- Slant height of cone= Radius of sector

$$l = r$$

- If we fold a sector having central angle x° and radius 'R' to make a cone of radius 'r' :





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

- **SPHERE**

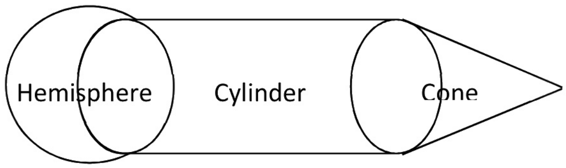
- Surface area = $4\pi r^2$
- Volume = $\frac{4}{3}\pi r^3$

- **HEMISPHERE**

- Surface area = $3\pi r^2$
- Volume = $\frac{2}{3}\pi r^3$

- **SURFACE AREA AND VOLUME OF COMBINED SOLID**

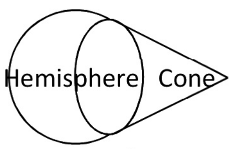
▪ HEMISPHERE + CYLINDER + CONE :



Surface area = $2\pi r^2 + 2\pi rh + \pi rl$

Volume = $\frac{2}{3}\pi r^3 + \pi r^2 h + \frac{1}{3}\pi r^2 h$

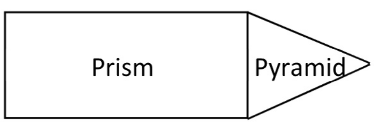
▪ HEMISPHERE + CONE :



Surface area = $2\pi r^2 + \pi rl$

Volume = $\frac{2}{3}\pi r^3 + \frac{1}{3}\pi r^2 h$

▪ SQUARE PRISM + SQUARE PYRAMID :



Surface area = $4bh + 2bl$

Volume = $b^2h + \frac{1}{3}b^2h$

9

ALGEBRA AND GEOMETRY

- Slope of the line AB with $A(x_1,y_1)$ and $B(x_2,y_2)$:

▪ $m = (y_2-y_1)\div(x_2-x_1)$

- Midpoint of line AB with $A(x_1,y_1)$ and $B(x_2,y_2)$:

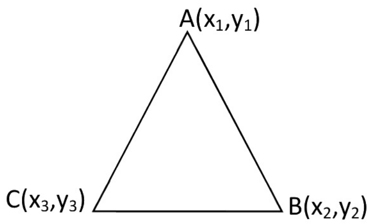
(x_1,y_1) ________________________ (x_2,y_2)

▪ Midpoint = $(((x_1+x_2)\div 2),((y_1+y_2)\div 2))$

- Co-ordinates of the point on the line which divides the line segment joining $A(x_1,y_1)$ and $B(x_2,y_2)$ in the ratio m : n

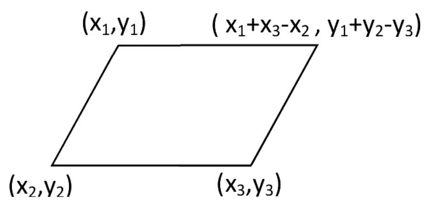
$(((mx_2 + nx_1) \div (m+n)), ((my_2 + ny_1) \div (m+n)))$

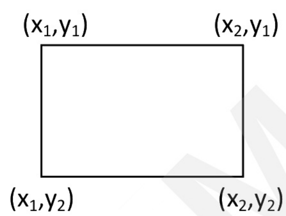
- Centroid of a triangle having vertices $A(x_1,y_1)$, $B(x_2,y_2)$ and $C(x_3 ,y_3)$:



$(((x_1 + x_2 + x_3) \div 3) ,((y_1 + y_2 + y_3) \div 3)))$

- Finding fourth vertex :





- Equation of line :

  $y-y_1 = m(x-x_1)$ [m = slope]

  Equation of any line is of the form $ax + by + c = 0$

Slope $= \frac{-a}{b}$

- To find the point on the line $ax + by + c = 0$ which intersect x axis,take $y = 0$.
- To find the point on the line $ax + by + c = 0$ which intersect y axis,take $x = 0$.

Eg : $2x + 3y + 4 = 0$

If it cuts x axis,$y = 0$. $2x + 4 = 0$ $x = -2$

If it cuts y axis,$x = 0$. $3y + 4 = 0$ $y = \frac{-4}{3}$

- Equation of circle with :

▪Centre(0,0) and radius = r $x^2 + y^2 = r^2$

▪Centre(a,b) and radius = r $(x-a)^2 + (y-b)^2 = r^2$

- Co-ordinate of point on the circle :

▪ Centre(0,0) and radius = r

(r,0) , (-r,0) , (0,r) , (0,-r)

▪ Centre(0,0) and any point on the circle(a,b)

(a,b) , (-a,b) , (b,a) , (b,-a) , (-a,b) ,(-b,a) , (a,-b) ,(-b,a)

▪Centre(a,b) and radius = k

(a+k,b) , (a,b+k) , (a-k,b) , (a,b-k)

- If the equation of a cirle is given as $ax^2 + by^2 + 2ax + 2by + c = 0$

▪ To find the point on the circle which cut x axis, substitute y = 0.

▪ To find the point on the circle which cut y axis, substitute x = 0.

10

POLYNOMIALS

- If P(a) = 0 , (x-a) is a factor of P(x)
- If P(-a) = 0 , (x+a) is a factor of P(x)
- If P(a) $\neq$ 0 , (x-a) is a factor of P(x)-P(a)
- Remainder obtained when P(x) is divided by (x-a) is P(a)
- To factorise $P(x) = ax^2 + bx + c = 0$ into two first degree polynomials :

Find a,b,c

Find b^2-4ac

- If $b^2-4ac<0$, we can't factorise.
- If $b^2-4ac>0$, we can find two values using $x = \frac{-b\pm\sqrt{b^2-4ac}}{2a}$
- Then P(x) = a(x-first value)(x-second value)
- Maximum value of k :

$ax^2 + bx + k = 0$

$b^2-4ac = b^2-4ak>0$

$b^2>4ak$

$b^2\div4a > k$ $\quad$ $k< b^2 \div4a$

- Remainder obtained when P(x) is divided by ax+b is P($\frac{-b}{a}$)
- Remainder obtained when $P(x) = 2x^2 + 3x + 1$ is divided by 2x+1 :

[2x+1 = 0

$2x = -1$

$X = \frac{-1}{2}$]

$P(\frac{-1}{2}) = 2\times(\frac{-1}{2})^2 + 3\times(\frac{-1}{2}) + 1$

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

$= \frac{1}{2} - \frac{3}{2} + 1 = 0$

11

STATISTICS

- Mean is got by dividing the sum of given values by the sum of the values.

  Eg : 1,2,3,4,5

  Mean $= \frac{1+2+3+4+5}{5} = 3$

- Median is the middlemost value while arranging the data either in ascending or descending order.

  Eg : 1,2,3,4,5

  Median = 3

MEDIAN FOR TABULAR DATA

- To find the median position for tabular data ,add 1 to the sum of the given values and then divide it by 2.

  Eg :$\frac{21+1}{2} = 11$

- The value of median for tabular data will be the median position's value.

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