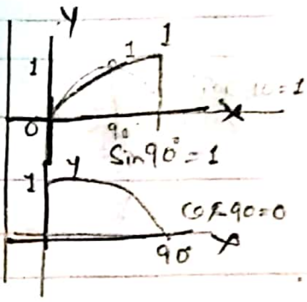
Trigonometry

- $\sin\theta = \frac{1}{\operatorname{cosec}\theta}$
- $\operatorname{cosec}\theta = \frac{1}{\sin\theta}$
- $\tan\theta = \frac{1}{\cot\theta}$
- $\cot\theta = \frac{1}{\tan\theta}$
- $\sec\theta = \frac{1}{\cos\theta}$
- $\cos\theta = \frac{1}{\sec\theta}$
- $\tan\theta = \frac{\sin\theta}{\cos\theta}$
- $\cot\theta = \frac{\cos\theta}{\sin\theta}$.

	0°	30°	45°	60°	90°
$\sin\theta$	0	$1/2$	$1/\sqrt{2}$	$\sqrt{3}/2$	1
$\cos\theta$	1	$\sqrt{3}/2$	$1/\sqrt{2}$	$1/2$	0
$\tan\theta$	0	$1/\sqrt{3}$	1	$\sqrt{3}$	∞



- $\sin(90-\theta) = \cos\theta$
- $\cos(90-\theta) = \sin\theta$
- $\tan(90-\theta) = \cot\theta$
- $\cot(90-\theta) = \tan\theta$
- $\sec(90-\theta) = \operatorname{cosec}\theta$
- $\operatorname{cosec}(90-\theta) = \sec\theta$.

IDENTITIES

$\sin^2\theta + \cos^2\theta = 1$ $\quad$ $\operatorname{cosec}^2\theta - \cot^2\theta = 1$ $\quad$ $\sec^2\theta - \tan^2\theta = 1$

- $\cos^2\theta = 1 - \sin^2\theta$
- $\operatorname{cosec}^2\theta = 1 + \cot^2\theta$
- $\sec^2\theta = 1 + \tan^2\theta$
- $\sin^2\theta = 1 - \cos^2\theta$
- $\cot^2\theta = \operatorname{cosec}^2\theta - 1$
- $\tan^2\theta = \sec^2\theta - 1$.

- $(a+b)^2 = (a-b)^2 + 4ab$
- $(a-b)^2 = (a+b)^2 - 4ab$
- $(a+b)^2 = a^2 + b^2 + 2ab$
- $(a-b)^2 = a^2 + b^2 - 2ab$
- $(a^2+b^2) = (a+b)^2 - 2ab$
  $= (a-b)^2 + 2ab$
- $a^2 - b^2 = (a+b)(a-b)$
- $(a^3+b^3) = (a+b)(a^2-ab+b^2)$
- $(a^3-b^3) = (a-b)(a^2+ab+b^2)$

Note:
- Square और Cube वाले equation में identities का प्रयोग करते हैं। $\sin^2\theta + \cos^2\theta = 1$ etc.
- sec, cosec, cot को fundamental form – cos, sine, tan में change कर solve करते हैं
- opposite converter एक साथ होने पर । $\sin\theta \cdot \operatorname{cosec}\theta = 1$ or $\cos \cdot \sec = 1$ or $\tan \cdot \cot = 1$
- If $\frac{A+B}{C}$, then $\frac{A+B}{C} = \frac{A}{C} + \frac{B}{C}$

Mensuration

Cuboid:

TSA = $2(lb + bh + lh)$

Area of four walls of a room = $2(l+b)h$.

Volume = $l \times b \times h$.

Cube: TSA = $6a^2$

CSA = $4a^2$

Volume = a^3

Right Circular Cylinder: T.S.A = $2\pi r(r+h)$.

C.S.A. = $2\pi rh$

Volume = $\pi r^2 h$

Hollow Cylinder:– T.S.A = $2\pi(R+r)(R+h-r)$

C.S.A. = $2\pi h(R+r)$

Volume = $\pi h(R^2 - r^2)$.

Area of each base = $\pi(R^2 - r^2)$

Right Circular Triangle: (Cone) T.S.A = $\pi r(l+r)$

C.S.A = $\pi r l$

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

(Slant hight) = length = $l = \sqrt{h^2 + r^2}$

Sphere:

Surface Area = $4\pi r^2$

Volume = $\frac{4}{3}\pi r^3$

Hemisphere:

~~Outer~~ Surface Area = $2\pi r^2$

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

Total Surface Area = $3\pi r^2$

Frustum:

T.S.A = $\pi l(r_1 + r_2) + \pi(r_1^2 + r_2^2)$

C.S.A = $\pi l(r_1 + r_2)$

Volume = $\frac{1}{3}\pi h(r_1^2 + r_2^2 + r_1 r_2)$

$l = \sqrt{h^2 - (r_1 - r_2)^2}$

Area Related To Circles

Circumference $= 2\pi r$ $\qquad d = r/2$ — diameter

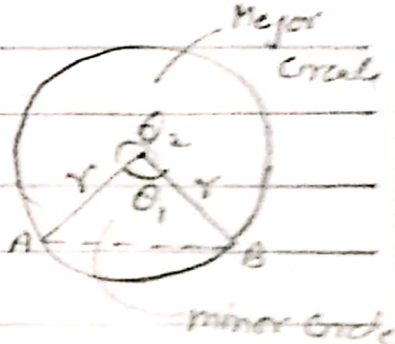
Area $= \pi r^2 = \pi\left(\frac{d}{2}\right)^2 = \frac{1}{4}\pi d^2$

Area of quadrant of a circle $= \frac{1}{4}\pi r^2$

Area of Semi-Circle $= \frac{1}{2}\pi r^2$

- **Wheel:-** No of Revolution (in one minutes) × Circumference = distance.

- **Sector:-**



length of mejor cicle(sector) $= \frac{(360-\theta)}{360} \times 2\pi r$

length of minor sector $= \frac{\theta}{360} \times 2\pi r$.

Area of sector $= \frac{\theta}{360} \times \pi r^2$.

- Area of Segment = Area of Sector − Area of Triangle.

$$= \frac{\theta}{360}\pi r^2 - \frac{1}{2} r^2 \sin\theta \qquad \{\sin\theta = 2\sin\tfrac{\theta}{2}\cos\tfrac{\theta}{2}$$

Arithmetic Progression

a = first term. $\quad d$ = Common difference $\quad l$ = last term

$a_n = a + (n-1)d$ → from begining.

n^{th} term from end $= l - (n-1)d$

$$S_n = \frac{n}{2}(2a + (n-1)d) = \frac{n}{2}(a + a_n) = \frac{n}{2}(a + l)$$

$$a_n = S_n - S_{n-1}$$

finding middle term → odd $= \left(\frac{n+1}{2}\right)^{th}$ term $= a + \left(\frac{n+1}{2} - 1\right)d$

→ even $= \left(\frac{n}{2}\right)^{th}$ term $= a + \left(\frac{n}{2} - 1\right)d$

No. of terms	Terms	Common difference
3	$a-d$; a ; $a+d$	d
4	$a-3d$; $a-d$; $a+d$; $a+3d$	$2d$
5	$a-2d$; $a-d$; a ; $a+d$; $a+2d$	d
2	$a-d$; $a+d$	$2d$

STASTICS

Mean :-

(i) Direct Method → $\frac{\Sigma f_i x_i}{\Sigma f_i}$

(ii) Assumed Mean → $a + \frac{\Sigma f_i d_i}{\Sigma f_i}$

(iii) Step deviation → $a + \frac{\Sigma f_i u_i}{\Sigma f_i} \times h$

(f_i → frequency) (Class mark (x_i) → $\frac{\text{upper} + \text{lower limit}}{2}$)

(A → Middle of x_i) ($d_i \to x_i - A$)

($u_i \to \frac{d_i}{h}$) (h – upperlimit – lowerlimit)

Ogive

Less than – Adding from top to the bottom. And take UPPER Limit

for more than Vice-Versa

Mode :- $l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$

Modal class – Max.

l – lower limit of modal class

h → class size

f_1 → frequency of modal class

f_0 → freq. of preceding ——

f_2 → f. of class succeeding ——

Median :- $l + \left(\frac{\frac{n}{2} - cf}{f}\right) \times h$

Median class → cumulative frequency greater than $\frac{n}{2}$, $n = \Sigma f_i$

n → no. of observation | h – class size

f → f_i of median class

cf → cf of class preceding median class.

Distance

Probability

$P(E) = \frac{\text{Favourable number of elementary}}{\text{Total number of elementary events}}$

Total outcome in case of
(i) die ⇒ 6^n
(ii) coin ⇒ 2^n

$P(E) + P(\bar{E}) = 1$

Probability of sure event is 1 and immpossible event is 0.

Playing Cards Total = 52 + 1 Joker (Not in use)

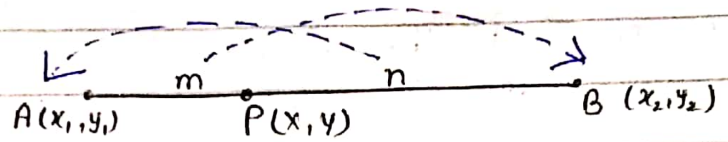
Suits	Sape	Colour.	face Card: King	Queen	Jack	No – 2, 3, 4, 5, 6, 7, 8, 9, 10	Ace = A	Total
Spades	♤	Black	1	1	1	9	1	= 13
Clubs	♧	Black	1	1	1	9	1	= 13
Heart	♡	Red	1	1	1	9	1	= 13
Diamonds	♢	Red.	1	1	1	9	1	= 13
			King = 4	Queen = 4	Jack = 4	Number's Card = 36	Ace = 4	

K Q J 10 9 8 7 6 5 4 3 2 A

Co-Ordinate Geometry

x = abscissae
y = Ordinate

Distance B/w Two Points $P(x_1, y_1)$ and $Q(x_2, y_2)$
then $PQ = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$



→ $x = \dfrac{mx_2 + nx_1}{m+n}$ $y = \dfrac{my_2 + ny_1}{m+n}$.

→ If P is mid point then $x = \left(\dfrac{x_1+x_2}{2}\right)$ $y = \left(\dfrac{y_1+y_2}{2}\right)$

→ Area of Triangle $= \frac{1}{2}[x_1(y_2-y_3) + x_2(y_3-y_1) + x_3(y_1-y_2)]$

→ If Three point (x_1, y_1) ; (x_2, y_2) ; (x_3, y_3) are collinear then

$\Rightarrow x_1(y_2-y_3) + x_2(y_3-y_1) + x_3(y_1-y_2) = 0$

TRIANGLES THEOREMS

→ B.P.T (Basic Propotionality Theorem) :- If a line is drawn parallel to one side of a triangle to bisect other two sides at distinct points, then the line is parallel to the third side other two sides are divided into equal ratio.

⇒ Converse B.P.T :- If a line divides any two sides of a triangle in same ratio, than the line is parallel to the third side.

⇒ Similarity of Triangle :- The ratio of area of two similar triangles is equal to the square of the ratio of their corresponding sides.

⇒ Pythagoras Theorem :- In a right triangle, the square of the hypotnuse is equal to the sum of square of other two sides.

⇒ Converse Pythagoras Theorem :- In a triangle, if square of one side is equal to the sum of square of the other two sides, then the angle angle opposite to first is a right angle.

CIRCLES

→ Tangent to a circle is a line that intersects the circle at only one point.

→ Secant to a circle is a line that intersects the circle at two points.

1) Theorem :- Tangent at any point of a circle is perpendicular to the radius through the point of contact.

2) Theorem :- The lengths of tangents drawn from an external point to a circle are equal.

⇒ The sum of the digits of a two digit number = $\boxed{x+y}$

⇒ The sum of a two digit number and the number obtained by reversing the order of its digits

⇒ $\boxed{(10x+y)+(10y+x).}$