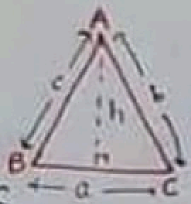
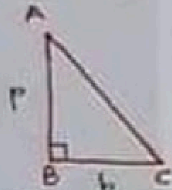
MENSURATION

TRIANGLE

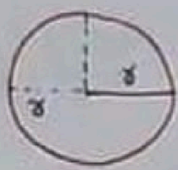


- Area $\Delta = \frac{1}{2} b \times h$
- Perimeter $= 2s = a+b+c$
- Semi-Peri $= s = \frac{a+b+c}{2}$



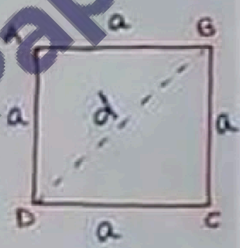
- Area $\Delta = \frac{1}{2} pb \sin\theta$
- Heron's $= \sqrt{s(s-a)(s-b)(s-c)}$
- formulae

CIRCLE



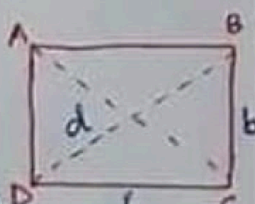
- Area $= \pi r^2$
- Area of semi- $= \frac{1}{2}\pi r^2$
- Area of Quadrant $= \frac{1}{4}\pi r^2$
- Perimeter $= 2\pi r$
- Semi-Peri $= \pi r + 2r$

SQUARE



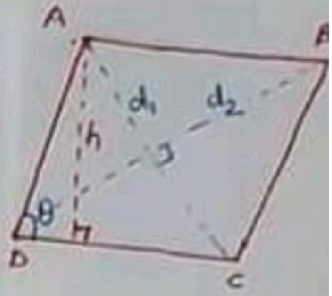
- Area $= (\text{side})^2$
- Perimeter $= 4(\text{side})$
- Diagonal $= \sqrt{2}(\text{side})$

RECTANGLE



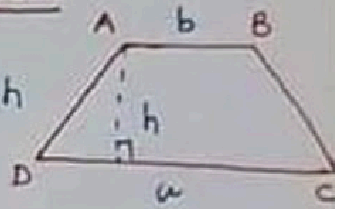
- Area $= l \times b$
- Perimeter $= 2(l+b)$
- Diagonal $= \sqrt{l^2+b^2}$
- Area of Four sides of wall $= 2(l+b)h$
  or
  Area of 4-walls.

RHOMBUS



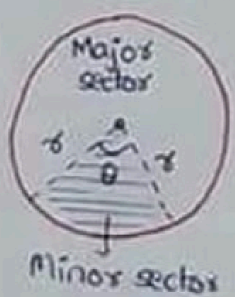
- Area $= \frac{1}{2} d_1 d_2$
  $= a^2 \sin\theta$
- Perimeter $= 4a$
- Height $= \frac{d_1 \times d_2}{\sqrt{d_1^2+d_2^2}}$
- side $= \frac{1}{2}\sqrt{d_1^2+d_2^2}$

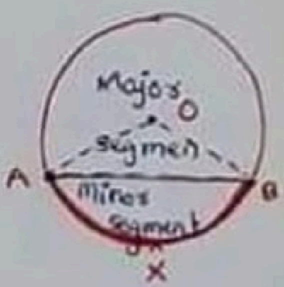
TRAPEZIUM



Area $= \frac{1}{2}(a+b) \times h$

SECTOR, SEGMENT, LENGTH of ARC

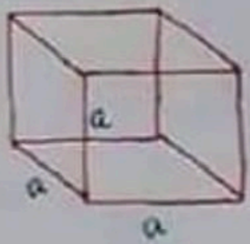




- Area of sector $= \frac{\theta}{360°} \times \pi r^2 = \frac{1}{2} l r$
- Length of Arc (l) $= \frac{\theta}{360} \times 2\pi r$
- Area of $\Delta OAB = \frac{1}{2} r^2 \sin\theta$
- Area of Segment AXB $= \frac{\theta}{360}\pi r^2 - \frac{1}{2} r^2 \sin\theta$
- Perimeter of sector $= \frac{\theta}{360} \times 2\pi r + 2r$
-

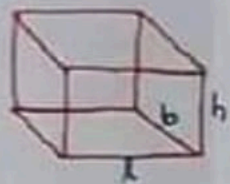
Surface Areas And Volumes

1. Cube



- T.S.A $= 6a^2$
- C.S.A $= 4a^2$
- Volume $= a^3$
- Diagonal $= a\sqrt{3}$

2. Cuboid



- T.S.A $= 2(lb+bh+hl)$
- C.S.A $= 2(l+b)h$
- Volume $= l \times b \times h$
- Diagonal $= \sqrt{l^2+b^2+h^2}$

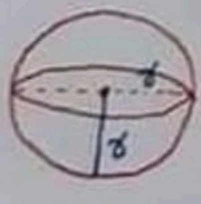
3. Cylinder

- T.S.A $= 2\pi r(h+r)$
- C.S.A $= 2\pi rh$
- Volume $= \pi r^2 h$

4. Cone

- T.S.A $= \pi r(l+r)$
- C.S.A $= \pi rl$
- Volume $= \frac{1}{3}\pi r^2 h$
- $l = \sqrt{r^2+h^2}$ (slant height)

5. Sphere



- T.S.A $= 4\pi r^2$
- C.S.A $= 4\pi r^2$
- Volume $= \frac{4}{3}\pi r^3$

6. Hemisphere

- T.S.A $= 3\pi r^2$
- C.S.A $= 2\pi r^2$
- Volume $= \frac{2}{3}\pi r^3$

7. Frustum of a Cone

- Volume $= \frac{1}{3}\pi h\left(r_1^2 + r_2^2 + r_1 r_2\right)$
- T.S.A (solid) $= \pi\left\{r_1^2 + r_2^2 + l(r_1+r_2)\right\}$
- C.S.A $= \pi l(r_1+r_2)$
- slant height $(l) = \sqrt{h^2+(r_1-r_2)^2}$
- T.S.A. of bucket (Top is open) $= \pi l(r_1+r_2) + \pi r_1^2$

Regular Polygon

- No of diagonal $= \frac{n(n-3)}{2}$
- Each exterior $\angle = \left(\frac{360}{n}\right)^\circ$
- Each interior $\angle = 180 -$ exterior
- Angle of R-Poly $= \frac{(n-2)}{n} \times 180$
- Perimeter $= n \cdot a$
- Area of R-Hexagon $= 6 \times \frac{\sqrt{3}}{4} a^2$
- Area $= \frac{\text{Total cost}}{\text{Per unit cost}}$
- Length of carpet $= \frac{\text{Total cost}}{\text{Per unit cost}}$

In Convex Polygon:

- Sum of all exterior angles $= 360^\circ$
- Sum of all interior angle $= (n-2) \times 180^\circ$

★ Sum of all exterior angles of any poly. $= 360^\circ$

TRIGONOMETRY

- $\sin(A+B) = \sin A\cdot\cos B + \cos A\cdot\sin B$
- $\sin(A-B) = \sin A\cdot\cos B - \cos A\cdot\sin B$
- $\cos(A+B) = \cos A\cdot\cos B - \sin A\cdot\sin B$
- $\cos(A-B) = \cos A\cdot\cos B + \sin A\cdot\sin B$
- $\tan(A+B) = \dfrac{\tan A + \tan B}{1 - \tan A\tan B}$
- $\tan(A-B) = \dfrac{\tan A - \tan B}{1 + \tan A\cdot\tan B}$
- $\cot(A+B) = \dfrac{\cot B\cot A - 1}{\cot B + \cot A}$
- $\cot(A-B) = \dfrac{\cot B\cdot\cot A + 1}{\cot B - \cot A}$
- $\sin C + \sin D = 2\cdot\sin\left(\frac{C+D}{2}\right)\cdot\cos\left(\frac{C-D}{2}\right)$
- $\sin C - \sin D = 2\cos\left(\frac{C+D}{2}\right)\cdot\sin\left(\frac{C-D}{2}\right)$
- $\cos C + \cos D = 2\cos\left(\frac{C+D}{2}\right)\cdot\cos\left(\frac{C-D}{2}\right)$
- $\cos C - \cos D = -2\sin\left(\frac{C+D}{2}\right)\cdot\sin\left(\frac{C-D}{2}\right)$

  $= 2\sin\left(\frac{C+D}{2}\right)\cdot\sin\left(\frac{D-C}{2}\right)$
- $\sin 2x = 2\sin x\cdot\cos x = \dfrac{2\tan x}{1+\tan^2 x}$
- $\cos 2x = \cos^2 x - \sin^2 x = 2\cos^2 x - 1$

  $= 1 - 2\sin^2 x = \dfrac{1-\tan^2 x}{1+\tan^2 x}$
- $\tan 2x = \dfrac{2\tan x}{1-\tan^2 x}$

- odd $F(x) \Rightarrow f(-x) = -f(x)$
- Even $f(x) \Rightarrow F(-x) = +F(x)$

$\cos(-x) = \cos x$ | $\sec(-x) = \sec x$
$\sin(-x) = -\sin x$ | $\mathrm{cosec}(-x) = -\mathrm{cosec}\,x$
$\tan(-x) = -\tan x$ | $\cot(-x) = -\cot x$

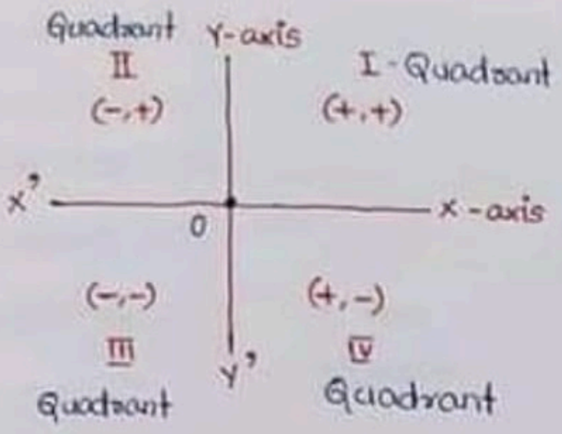
- $2\sin A\cdot\cos B = \sin(A+B) + \sin(A-B)$
- $2\cos A\cdot\sin B = \sin(A+B) - \sin(A-B)$
- $2\cos A\cdot\cos B = \cos(A+B) + \cos(A-B)$
- $-2\sin A\cdot\sin B = \cos(A+B) - \cos(A-B)$
- $\sin(A+B)\cdot\sin(A-B) = \sin^2 A - \sin^2 B$
- $\cos(A+B)\cdot\cos(A-B) = \cos^2 A - \sin^2 B$

• $\sin^2\theta + \cos^2\theta = 1$	$1+\cos 2x = 2\cos^2 x$
• $\sec^2\theta - \tan^2\theta = 1$	$1-\cos 2x = 2\sin^2 x$
• $\mathrm{cosec}^2\theta - \cot^2\theta = 1$	$\tan x = \dfrac{1-\cos 2x}{\sin 2x}$

*General Solution of trigonometry

- $\sin x = 0 \Rightarrow x = n\pi$
- $\cos x = 0 \Rightarrow x = (2n+1)\pi/2$
- $\tan x = 0 \Rightarrow x = n\pi$
- $\sin x = \sin y \Rightarrow x = n\pi + (-1)^n\cdot y$
- $\cos x = \cos y \Rightarrow x = 2n\pi \pm y$
- $\tan x = \tan y \Rightarrow x = n\pi + y$

COORDINATE GEOMETRY



- Coordinate of origin $\Rightarrow (0,0)$
- Cordinate on x-axis $\Rightarrow (x,0)$
- Cordinate on Y-axis $\Rightarrow (0,y)$
- Equation of x-axis $\Rightarrow y=0$
- Equation of Y-axis $\Rightarrow x=0$
- Equation of Line passing through origin $\Rightarrow y=x$
- General equation of Line $\Rightarrow y=mx+c$
- x-axis = x-coordinate = Abscissa
- Y-axis = Y-coordinate = ordinate
- Distance formula $= \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$
- Distance from origin $= \sqrt{x^2+y^2}$
- Section formula internal $= \left(\frac{m_1x_2+m_2x_1}{m_1+m_2}, \frac{m_1y_2+m_2y_1}{m_1+m_2}\right)$
- External $= \left(\frac{m_1x_2-m_2x_1}{m_1-m_2}, \frac{m_1y_2-m_2y_1}{m_1-m_2}\right)$
- Mid-Point formula $= \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$
- Area of $\Delta = \frac{1}{2}\left|x_1(y_2-y_3)+x_2(y_3-y_1)+x_3(y_1-y_2)\right|$

$$= \frac{1}{2}\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix}$$

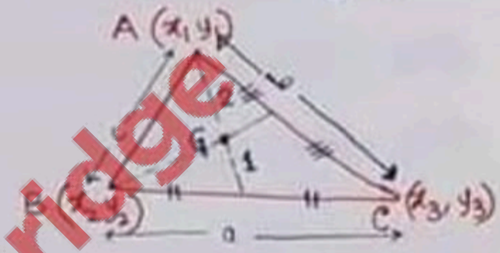
- If points $(x_1y_1), (x_2y_2), (x_3y_3)$ are collinear then

$$\Rightarrow \frac{1}{2}\left|x_1(y_2-y_3)+x_2(y_3-y_1)+x_3(y_1-y_2)\right| = 0$$

$$\Rightarrow \frac{1}{2}\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} = 0$$

- Centroid of a triangle

$$G\left(\frac{x_1+x_2+x_3}{3}, \frac{y_1+y_2+y_3}{3}\right)$$



- Centroid devide the median into 2:1
- Mid-points of diagonal of paralleogram coincide each other
- Distance from circumcentre to the vertex is same.
- Coordinate of in-centre

$$\left(\frac{ax_1+bx_2+cx_3}{a+b+c}, \frac{ay_1+by_2+cy_3}{a+b+c}\right)$$

- Median divides the 3rd side into two equal part.
-