Center of Gravity CG Moment of Inertia MI

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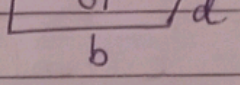
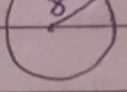
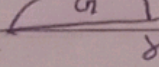
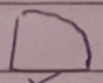
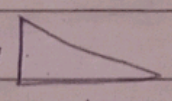
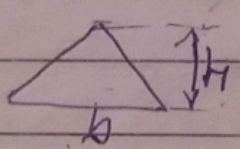
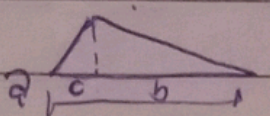
CG & MI

Center of Gravity ÷ CG is that point through which the whole body weight acts. the CG of a body doesn't change for any position of the body.
Centroide of a plane lamina is the point through which the total area must be considered to be concentrated.

$$\bar{x} = \frac{a_1x_1 + a_2x_2 + a_3x_3 + \cdots}{a_1 + a_2 + a_3 + \cdots} = \frac{\sum a_i x_i}{\sum a_i} = \frac{\sum_{i=1}^{n} a_i x_i}{\sum_{i=1}^{n} a_i}$$

$$\bar{y} = \frac{a_1y_1 + a_2y_2 + a_3y_3 + \cdots}{a_1 + a_2 + a_3 + \cdots} = \frac{\sum a_i y_i}{\sum a_i} = \frac{\sum_{i=1}^{n} a_i y_i}{\sum_{i=1}^{\infty} a_i} \quad (\bar{x}, \bar{y})$$

most ask Imp.	figure	Symbol	
(1)	Rectangle		G(b/2, d/2)
(2)	Circle		G(r, r)
(3)	Semicircle		G(r, 4r/3π)
(4)	Quarter Circle		G(4r/3π, 4r/3π)
(5)	Triangle		G(b/3, h/3)
			G(b/2, h/3)
			G((c+b)/3, h/3)

Centroid - Area - cen

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$I = f d^2$

$I = f + \bar{x}^2$

$d = \bar{x}$

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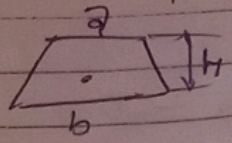
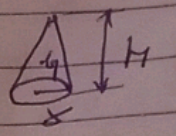
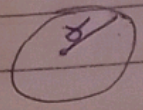
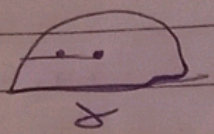
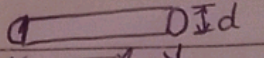
$(\bar{x}, \bar{y})$

Imp	figure	Symbol	
(6)	Trapezium		$G\left(\frac{b}{2}, \frac{H}{2}\left(\frac{b+2a}{b+a}\right)\right)$
(7)	Right Circular Solid Cone		$G\left(r, \frac{h}{4}\right)$
(8)	Sphere		$G(r, r)$
(9)	Hemisphere		$\left(r, \frac{3I}{8}\right)$
(10)	Uniform rod		$G\left(\frac{l}{2}, \frac{d}{2}\right)$

Moment of Inertia :-

MI is the second moment of a plane lamina or mass to the desired reference ~~access~~ axis

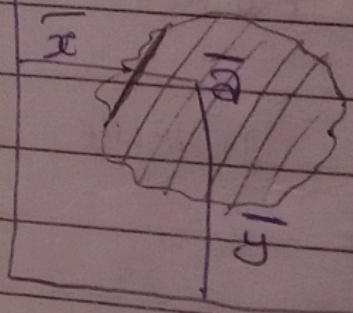
$M = f \times d \times d$

$I = f \times d^2$

$I = f I^2$

$I_{xx} = a\bar{y}^2$

$I_{yy} = a\bar{x}^2$



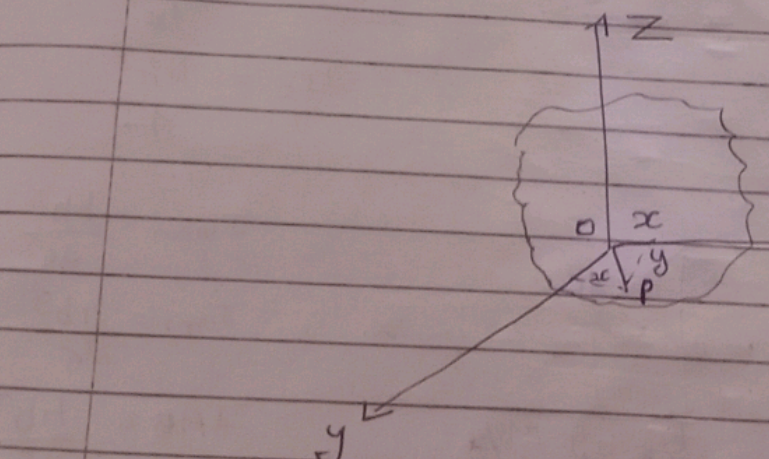
$I_{xx} = a\bar{y}^2$

$I_{yy} = a\bar{x}^2$

Theorem

① Perpendicular axis theorem It states If I_{xx} and I_{yy} be the moment of Inertia of a plane section about to (1) axis meeting at O, The MoI at ZZ ⊥ to the plane and Passing through the intersection of xx and yy is equal to the I_{xx} and I_{yy} mathematically

$$I_{zz} = I_{xx} + I_{yy}$$



$I_{xx} = ay^2$

$I_{yy} = ax^2$

$I_{xx} + I_{yy} = ay^2 + ax^2$

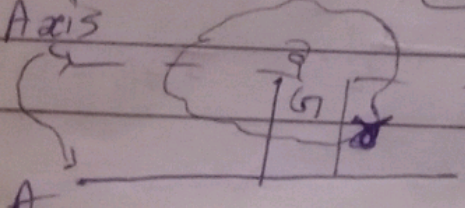
$= a(y^2 + x^2)$

$I_{xx} + I_{yy} = aI^2 = I_{zz}$

MoI of P about xx

② Parallel axis theorem It states If the MoI of a plane area about an axis passing through center of gravity is denoted by I_G and the MoI of the area about axis AB ∥ to the Centroidal axis is given by

$$I_{AB} = I_G + aI^2$$



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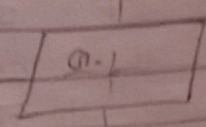
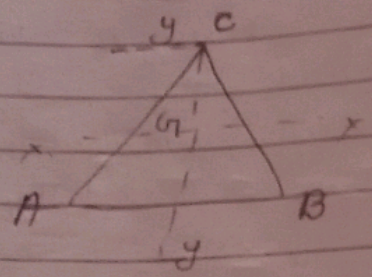
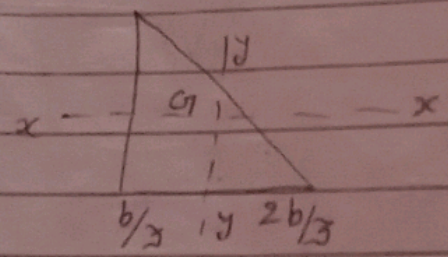
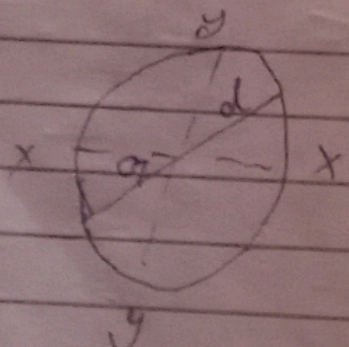
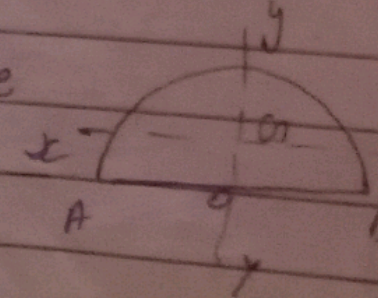
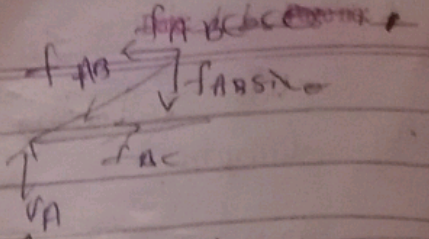
Lamina	Diagram	formula
① Rectangle		$I_{GXX} = \frac{bd^3}{12}$ $I_{GYY} = \frac{db^3}{12}$
② Triangle		$I_{GXX} = \frac{bh^3}{36}$ $I_{GYY} = \frac{hb^3}{36}$ $I_{AB} = \frac{bh^3}{12}$ $I_C = \frac{bh^3}{4}$
③ Right angle triangle		$I_{GXX} = \frac{bh^3}{36}$ $I_{GYY} = \frac{hb^3}{36}$ $I_{AB} = \frac{hb^3}{12}$ $I_C = \frac{bh^3}{4}$
④ Circle		$I_{GXX} = \frac{\pi d^4}{64} = I_{GYY}$
⑤ Semi circle		$I_{GXX} = 0.11 r^4$ $I_{GYY} = 0.393 r^4$ $I_{AB} = 0.393 r^4$

$V_A + V_f = 5$ ① 17/06/25

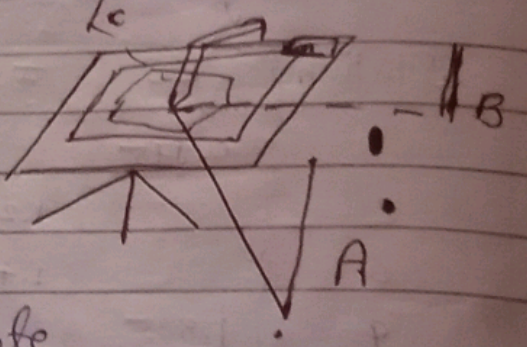
$5 \times 9 + 3 \times 8 - V_f \times 11 = 0$

$V_f = ?$



Planetable Surveying

It is the type of Surveying in which both observation & recording is done simultaneously. It can be adobtaded only when will be survey in small and tallanted



Instrument use

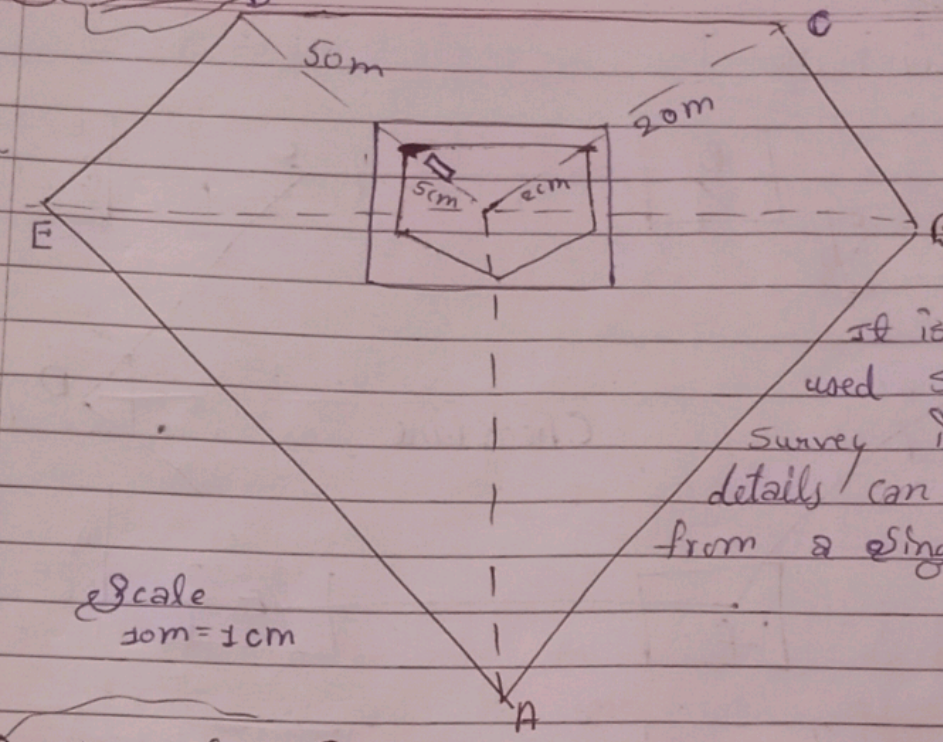
① Plane table, ② Adegate
③ plumping fork ④ compass, ⑤ Ranging rod
⑥ Plane sheet, ⑦ staf, ⑧ Reveal tube
⑨ tricode

Method involve in plane table survey

① Radiation, ② Intersection, ③ traverse sing
④ Resepion

1st two mtd are used to collect the details of the object & later to mtd's are used to locating the position of the plane table station over the drawing sheet

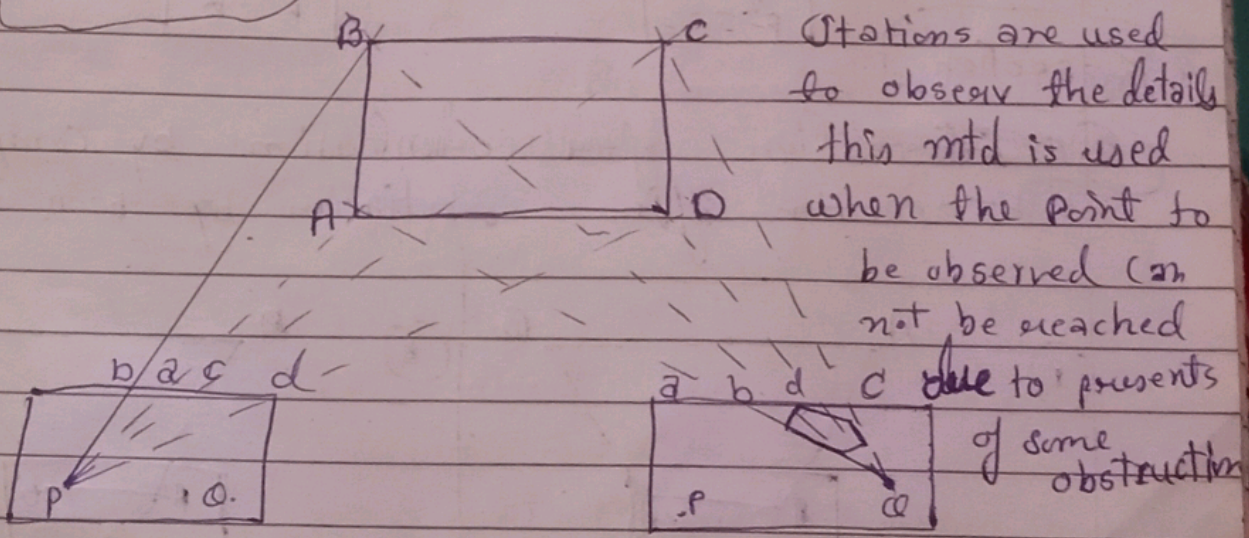
(1) Radiation



It is generally used small area survey in which details can be collected from a single station

Scale
10m = 1cm

(2) Intersection



In this mtd two stations are used to observe the details this mtd is used when the point to be observed can not be reached due to presents of some obstruction

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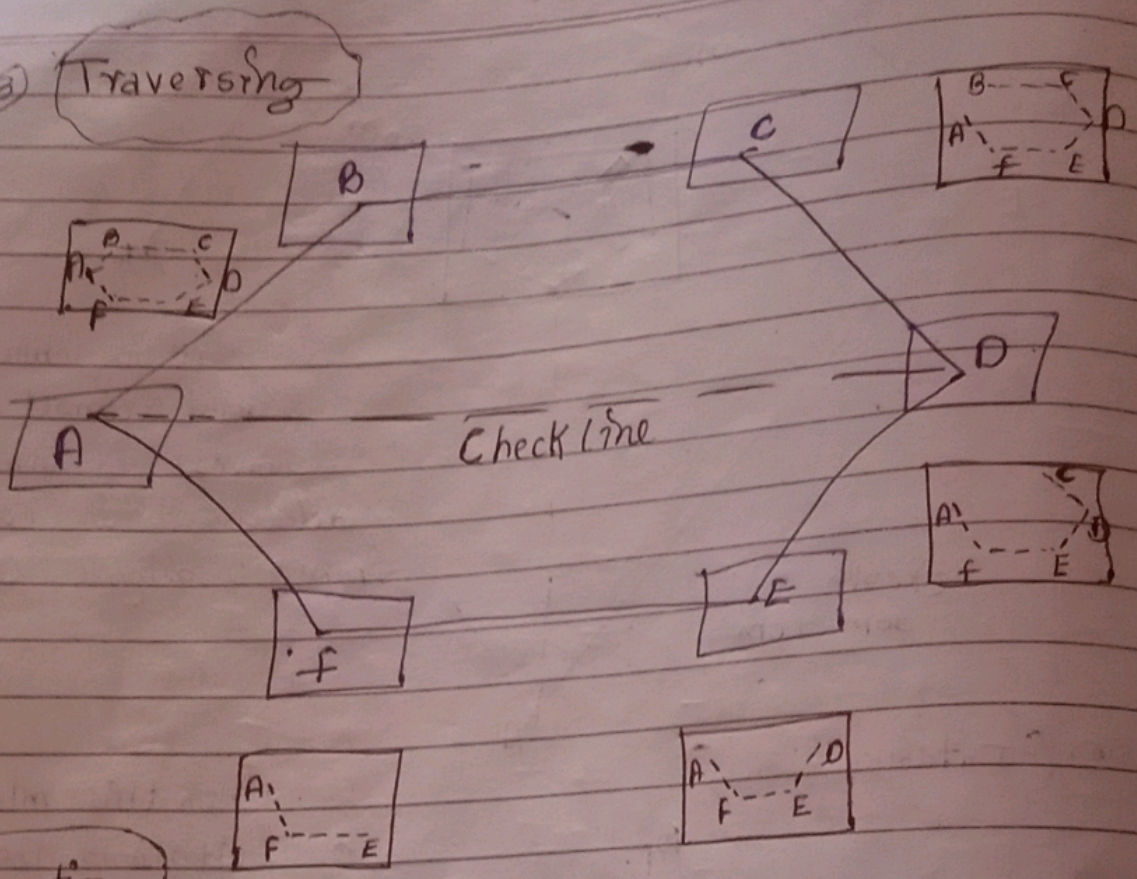
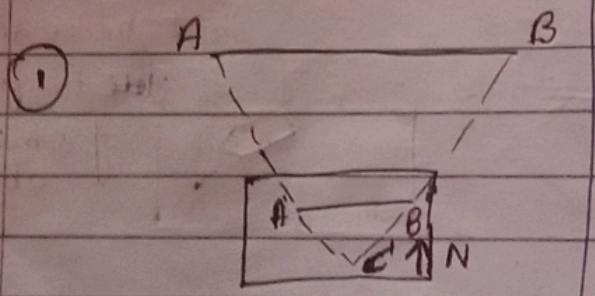
(3) Traversing



Resection

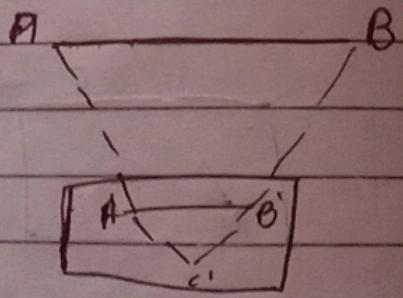
(1) Resection after orientation by Compass
(2) Resection after orientation by back sighting

(1)



→ orientation is done by Compass and Resection is done after orientation of Plane table.

(2)



→ Assume any point of the table c" and orient the table after the draw the sector from p'

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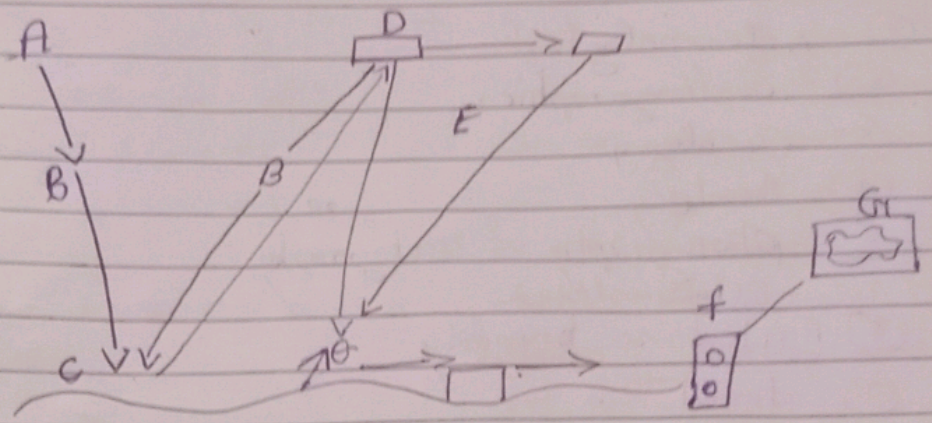
Remote Sensing:



Remote Sensing is to collect data on dangerous or inaccessable area its applicn includes monitoring deforestation, effect of climate change deaped sounding of Postal & Portion desk, Collection data for millitry purpose It is also replaces costly & slow data collection on the ground and to insuring the process that area or object are not distrub

A → Energy or illumination
B → Radiation at the atmosphere
C → Interaction with the target
D → Recording of Energy by the sensor
E → transmission, reception & processing
F → Interpretation and analysis
G → Application

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Application of Remote Sensing

1. Meteorological
2. Costiongraphic
3. Geology
4. Geodecy
5. photography & cartography (map) (Localized area)
6. Agriculture boundary
7. forest
8. Botney
9. hydrology
10. disaster management
11. Planing Application
12. oil lion neutrel Expension
13. Millatry
13. Urban
14. Climate
15. Space programming