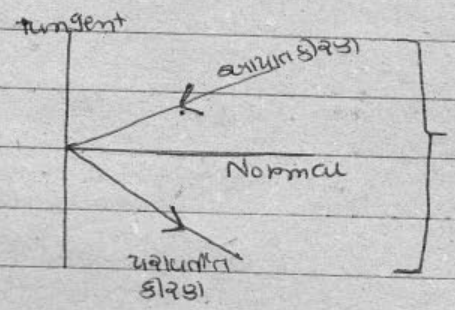
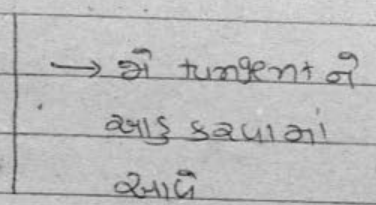
Reflection.

Reflection એટલે કોઈપણ વસ્તુ નું Result મળવું
અહીં કોઈપણ કિરણ નું Result મળે તે Reflection

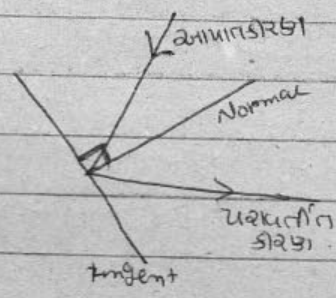


Plane mirror ની જે સ્પર્શતુ હોય તે tangent અને tangent ને લંબ હોય તે Normal.

→



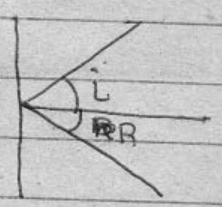
→ એ tangent ને આડુ કરવામાં આવે



Normal પણ tangent ને ઉ૦ એજ રહે છે.

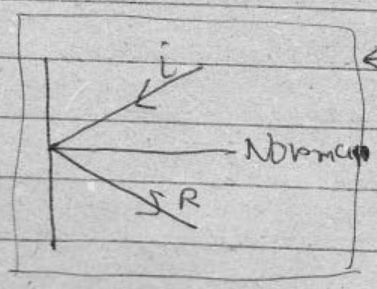
Condition for Reflection

① ∠ incident angle = ∠ Reflection angle



i = R

② incident, Reflection, Normal ત્રણે એક જ Plane માં હોય.



← ત્રણે એક જ Plane મા

⇒ કોઈપણ incident કિરણ નું Reflection થાય ત્યારે ----

Velocity → No change $\left(\because c = 3\times10^{8}\,m/s\right)$

Wavelength → No change $\left(V = \text{same then } \lambda \text{ same}\right)$

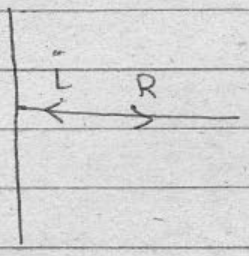
frequency → No change $\left(f = \frac{V}{\lambda}\right\}$ બંને same → f same$\right)$

Intancity → Change

∵ light ને સમતલ પાડીએ અને અરીસામાંથી પ્રતિબિંબ પાડીએ તો પ્રતિબિંબ માં પ્રકાશ ઓછો છે.

---

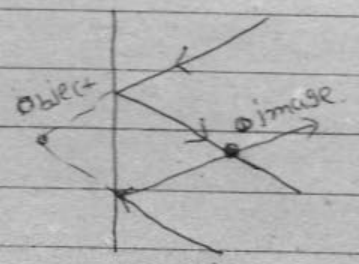
1 ⇒



આપાત કિરણ એ સીધી દિશામાં આવે તો પરાવર્તિત કિરણ પણ તેજ દિશામાં પાછુ જાય.

Mirror gives
- → Virtual image for Real object
- → Real image for virtual object

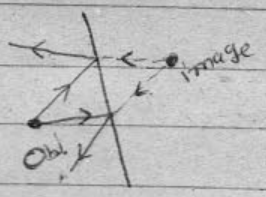
Image and object.



(object માંથી પસાર કીરણો આપાત પતાવીએ.

→ જે બાજુ બધા આપાત કીરણો એક Point પર ભેગા થાય તો તે object.

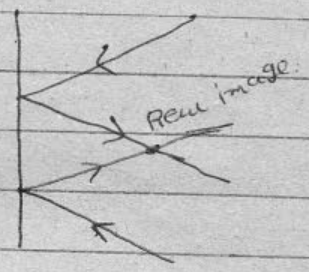
(object ના આપાત કીરણો જ્યાં ભેગા થાય તે Image



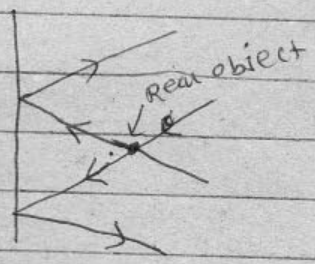
→ જે બાજુ બધા Reflection કીરણો એક Point પર ભેગા થાય તો તે image.

Image and object

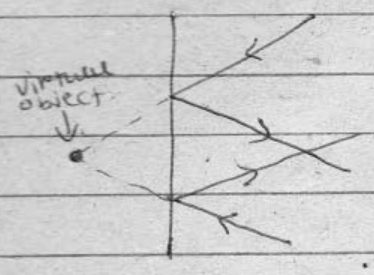
- Virtual image
  - Virtual object
- Real image
  - Real object



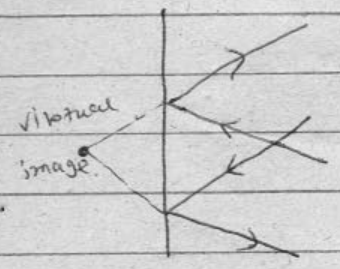
જે પરાવર્તીત કીરણો પોતેજ એક Point પર ભેગા થાય તો તે Real image



જે આપાત કીરણો પોતેજ એક Point પર ભેગા થાય તો Real object.



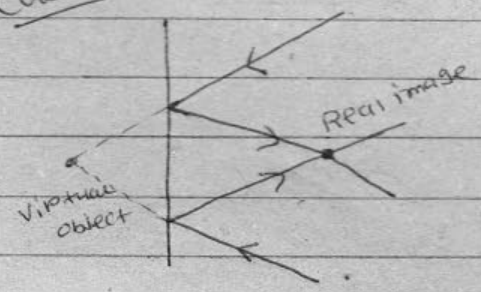
જે આપાત કીરણો આભાસી રીતે એક Point પર મેળવાય તો તે Virtual object.



જે પરાવર્તીત કીરણો આભાસી રીતે એક Point પર મેળવાય તો તે Virtual image

Case of Real and Virtual image

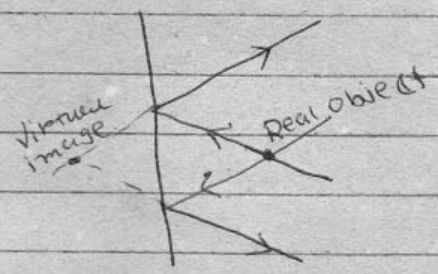
case-①



અહી પરાવર્તીત કીરણો વાસ્તવિક રીતે ભેગા થાય → Real image

અહી આપાત કીરણો આભાસી રીતે ભેગા થાય → Virtual object.

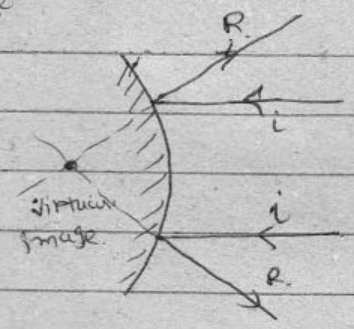
case-②



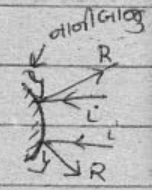
અહી પરાવર્તીત કીરણો આભાસી રીતે ભેગા થાય → Virtual image

અહી આપાત કીરણો વાસ્તવીક રીતે ભેગા થાય → Real object.

case-③

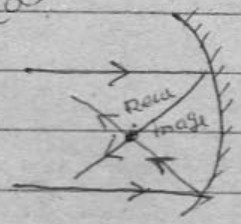


બહીર્ગોળ માં હંમેશા નાની બાજુ Reflected Ray મળે.



બહીર્ગોળમાં Virtual image મળે object મળેનહી.

case-④



અંતર્ગોળમાં Real image મળે object મળે નહી

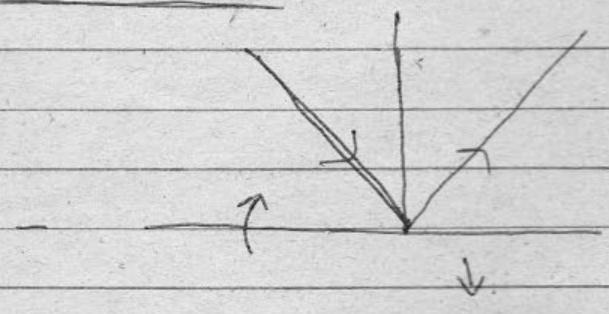
અંતર્ગોળ મારીનાની નાનીબાજુ આ પાટ.

Plane mirror

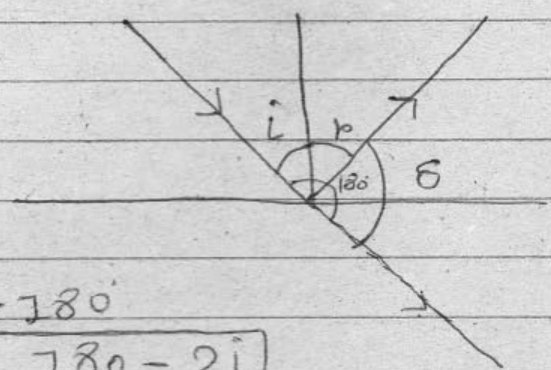
→ Image formed by Plane mirror =

1. Virtual
2. erect (સીધું)
3. latterally invarted (આજુબાજુ ઉલટા)
4. equal size
5. distance equal to distance of object from mirror

☆ Deviation



Deviation એટલે Ray પોતાની મૂળ દિશામાં ગયેલું તે દિશાથી કેટલું વળે છે (angle)



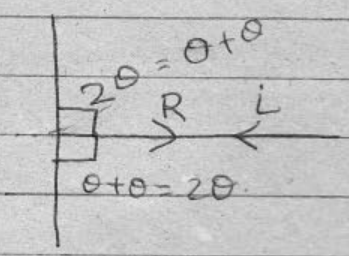
$i = r$

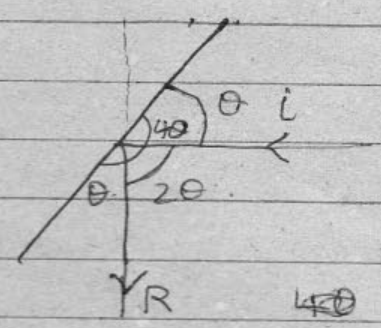
total angle = 180°

$$\boxed{\delta = 180 - 2i}$$

☆ Rotation

→ If Plane mirror rotate through angle θ keep fixed incedent ray than Reflected ray turned through angle 2θ





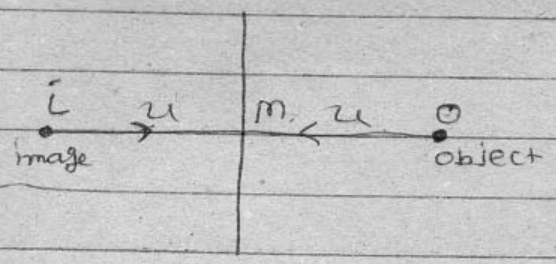
~~Reflected angle = total angle -~~

Reflected angle = total angle − incedent angle − mirror Rotation angle

$= 4\theta - \theta - \theta = \boxed{2\theta}$

☆ If object moves with speed u towards (or away) from Plane mirror → then image also move towards (or away) from Plane mirror at speed u

But Relative speed of image $= 2u$



~~$x_{oi} = v$~~

$x_{oi} = x_{om} + x_{mi}$

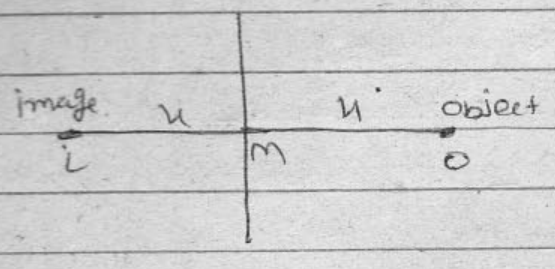
$\frac{dx_{oi}}{dt} = \frac{dx_{om}}{dt} + \frac{dx_{mi}}{dt}$

$V_{oi} = V_{om} + V_{mi}$

$= u + u$

$\boxed{V_{oi} = 2u}$

★ When mirror moves towards stationary object with speed u then image move with speed 2u



$V_{oi} = V_{om} + V_{oim}$

$V_{io} = V_{mo} + V_{mi}$

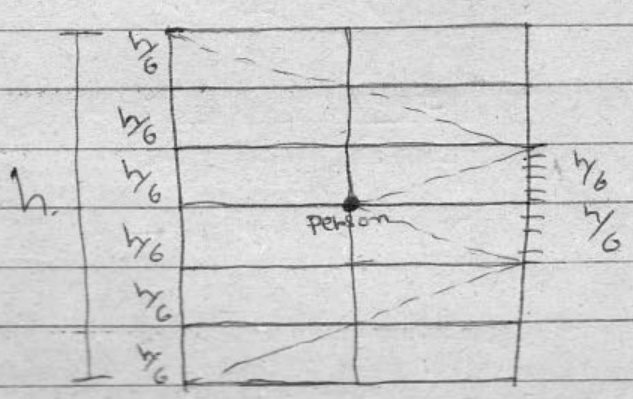
$= u + u$

$V_{io} = \boxed{2u}$

★ A man of height h requires a mirror of length at least h/2 to see his own complete image

★ To see complete wall (height h) behind the person need a minimum h/3 height of mirror

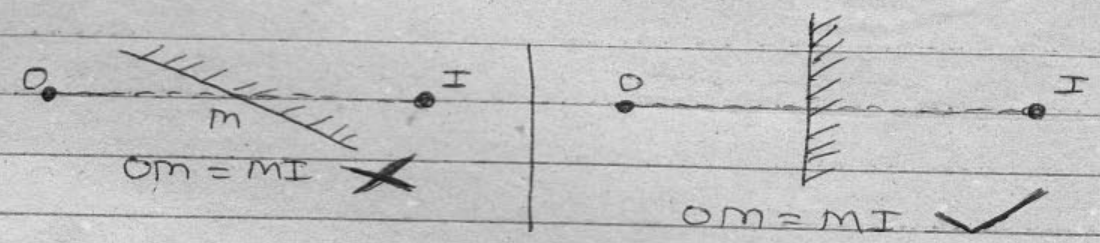
Note that person standing at middle of mirror and wall



$h/6 + h/6 = h/3$

A) The reflection from denser medium causes additional Phase change of π or Path change $\lambda/2$

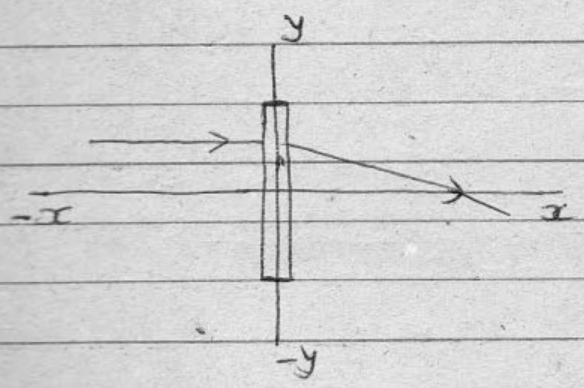
A) To find location of object from an Inclined Plane mirror.
See Perpendicular distance of object from the mirror



★ Why we see object?

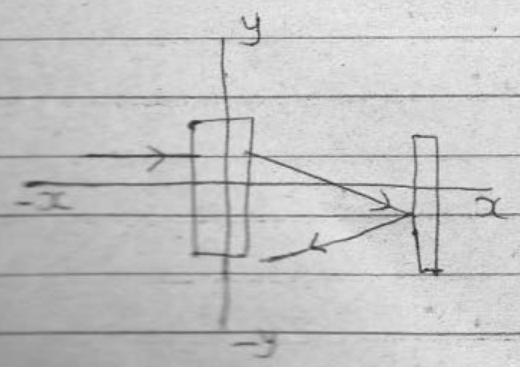
→ કોઈપણ વસ્તુ પર ~~પ્રતિબ~~ પ્રકાશના કિરણો પડે તે તેના પરથી પરાવર્તન થઈને આપણી આંખ ~~પર પડે~~ પર પડે અને તેનાથી આંખના રેટીના માં એ વસ્તુ ની image તૈયાર થાય.

★ SIGN convention



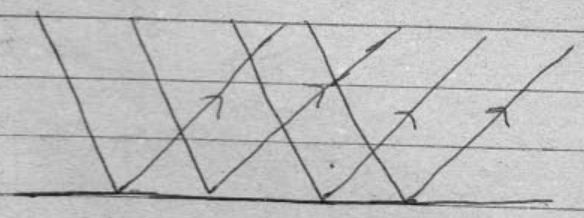
Positive x direction માં જો Ray ~~આવ~~ આવતું હોય તો તેને Positive ગણવું

→ જો ઉપરની સીસ્ટમની આગળ કોઈ એક mirror રાખી દેવામાં આવે તો

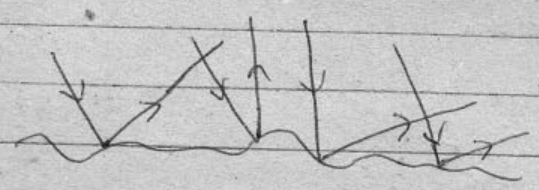


જો આ રીતે system રખાય તો બીમ mirror માં ભટકાઈ ફરીથી પરાવર્તન થાય અને તેનાથી તેની sign negative થઈ જાય

☆ Regular, Irregular Reflection

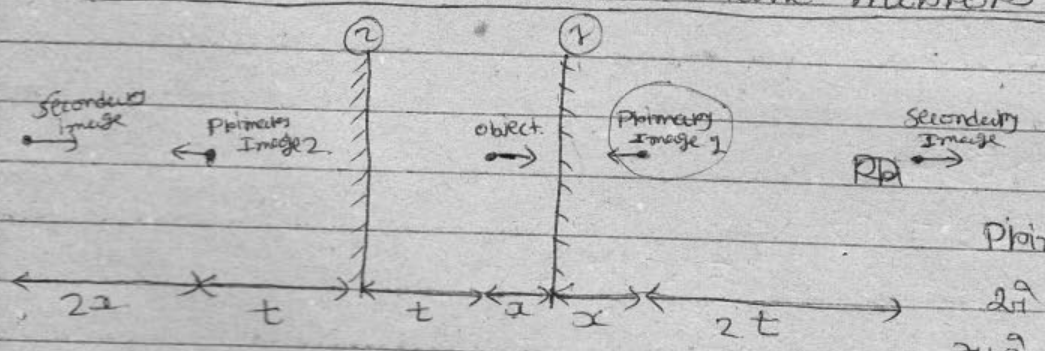


→ Regular Surface માં બધા normal એ Plane surface ની 90° હોય તેથી તેના પરાવર્તન Same Image બને.



→ Irregular Surface માં normal એ Plane ની 90° ન હોય પરંતુ તેના image બને નહી. normal એ દરેક Point પર 90° હોય

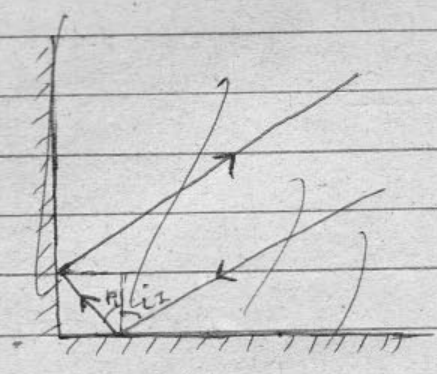
☆ Reflection from two Plane mirrors

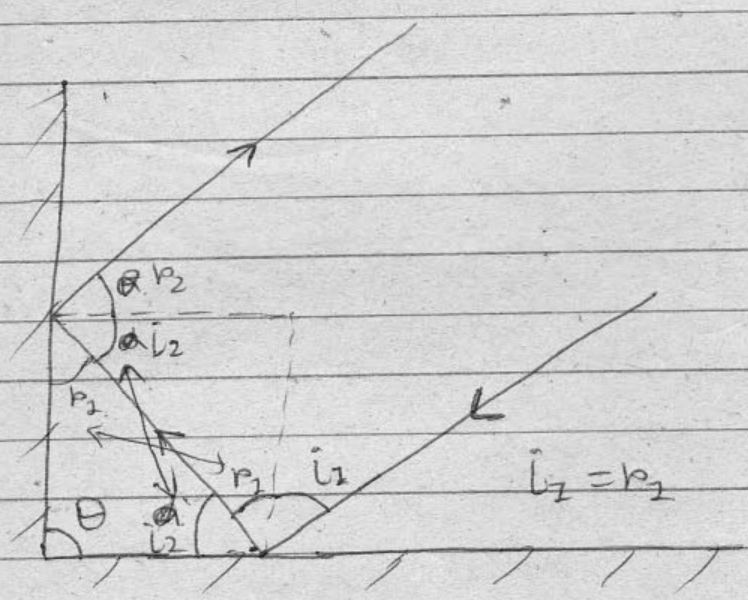


no. of image = ∞

Primary image 1 બન્ને એ સામેના mirror (2) માટે ~~image~~ object તેથી તેની image secondary image બીજી બાજુ જ્યારે Primary image એ બન્ને બાજુના (1) માટે object બનાવે. Secondary image બનાવે

Reflextion from two Plane mirrors





$i_2 = 90 - r_1$

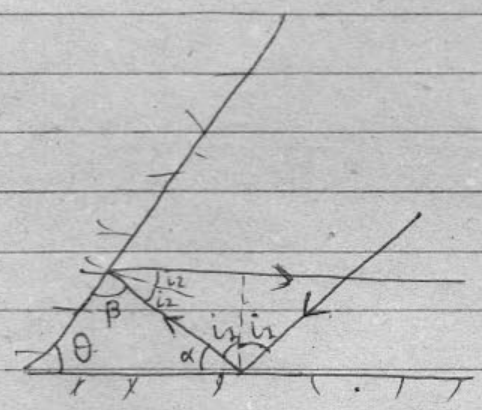
$r_1 = 90 - i_2$

$\cancel{\delta = 180 \theta}$

$$\left.\begin{aligned} \delta &= \delta_1 + \delta_2 \\ &= 180 - 2i_1 + 180 - 2i_2 \\ &= 360 - 2(i_1 + i_2) \end{aligned}\right\} \quad \begin{aligned} \delta_1 &= 180 - 2i_1 \\ \delta_2 &= 180 - 2i_2 \end{aligned}$$

$= 360 - 2(\theta)$

$\theta = i_1 + i_2$ (i_2 ⊕
$= r_1 + i_2 = 90°$ પણ
અને અહ)
θ પણ $90°$ છે



$\alpha + \beta + \theta = 180^\circ$

$(90 - i_1) + (90 - i_2) + \theta = 180^\circ$

$\cancel{90} - i_1 + \cancel{90} - i_2 + \theta = \cancel{180}$

$\boxed{\theta = i_1 + i_2}$

$\beta\alpha = 90 - i_2$

$\alpha\beta = 90 - i_1$