# Millar Indices

→ A crystal lattice may be consider as set of parallel equally spaced planes passing through lattice point This planes are called lattice planes.

→ Perpendicular distance between adjacent planes is called as interplanar spa

→ The position and orientation of lattice planes in a crystal are determine by three smallest number, these numbers are denoted by h, k, l known as miller Indices of given plane are any parallel plane to H.

→ finally plane is spelfied by (h, k, l)

# Steps to Find Miller indices

1] Find the intercepts of give planes along three axis.
2] Take reciprocles of these intercepts
3] Find L.C.M of denominators of these reciprocal
4] Mutiple reciprocal of intercept by L.C.M.
5] Reduce resultant fraction to smallest three intger and write in dose bracket without commas (,) and we have miller indices (hkl) eg (4 3 1)

# Steps to draw lattice plane from given miller indices

1] Draw cube with three coordinate axis
2] Take reciprocal of h, k and l value from (h, k, l)
3] Take $\frac{1}{h}$, $\frac{1}{k}$, and $\frac{1}{l}$ as intersepts
4] Mark the interapt and draw line we gob a plane.

# To Draw direction from given miller indices

Note : $(hkl) \Rightarrow$ Plane
$[hkl] \Rightarrow$ Direction

Q#]

# Steps to Draw lattice direction

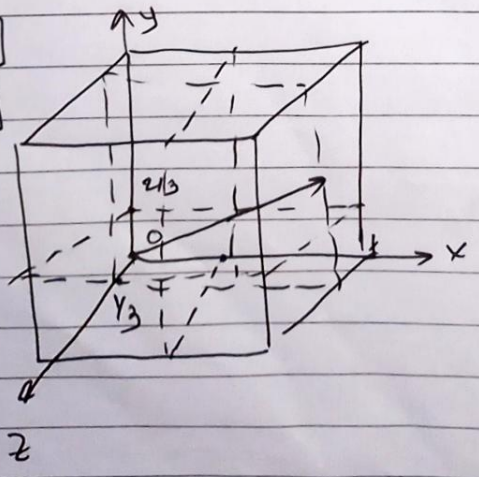
1] Divide all indices (hkl) by the highest index
2] Draw, a cube.
3] Start from origin O, move along x-direction by a distance equal to h/ highest indet.
4] Move along Y direction by a distance equal to k/highest index.
5) Move along z direction by a distance equal to l/highest index

Note : Consider only magnitude while deiding highest No.

∴

1] [3, 2, 1]

[3/3, 2/3, 1/3]
= [1, 2/3, 1/3]

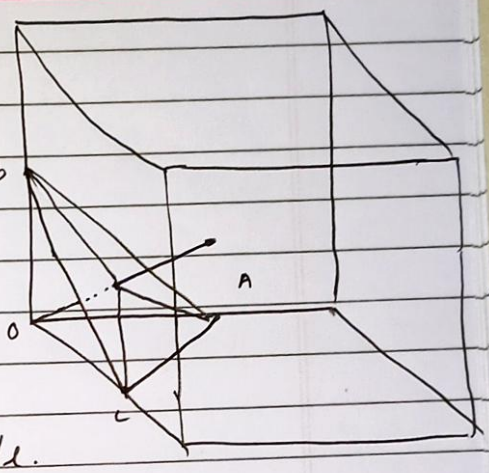



join O, and the intersection of 3 planes and we get the required direction

# Interplaner Distance

(h, k, l)

length of unit cell along x axis is a
" " " " y " " b
" " " " z " " c




But in cubic system.

$a = b = c$

$\therefore OA \Rightarrow \frac{a}{h} \quad OB = a/k \quad OC = a/l.$

$\therefore$ In $\Delta ONA$
$\angle ONA = 90^\circ$
$\angle NOA = \alpha$

$\therefore \cos\alpha = \frac{ON}{OA}$

In $\Delta ONB$
$\angle ONB = 90^\circ$
$\angle NOB = \beta$

$\cos\beta = \frac{ON}{OB}$

In $\Delta ONC$
$\angle ONC = 90^\circ$
$\angle NOC = \gamma$

$\cos\gamma = \frac{ON}{OC}.$

$\therefore \cos^2\alpha + \cos^2\beta + \cos^2\gamma = 1.$

$\therefore \frac{d^2}{(a/h)^2} + \frac{d^2}{(a/k)^2} + \frac{d^2}{(a/l)^2} = 1$

$\therefore d^2 = \frac{a^2}{l^2 + h^2 + k^2}$

$\therefore d = \frac{a}{\sqrt{l^2 + h^2 + k^2}}$