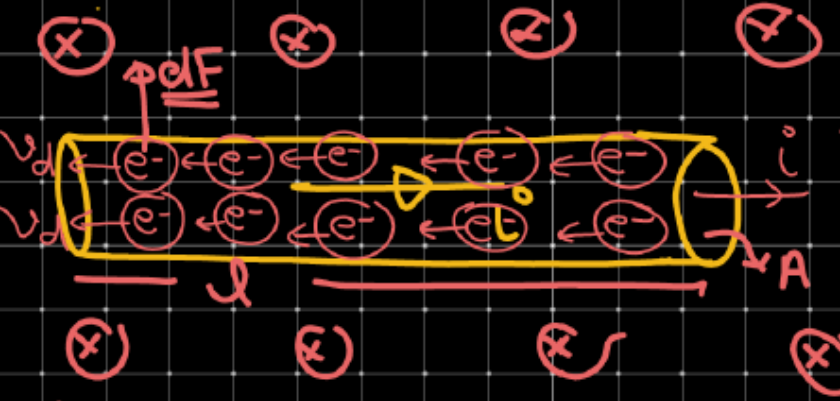
Magnetic Force on current Carrying wire In External magnetic field.



$n \rightarrow$ number of electron per unit volume

$i = neAv_d$

$\vec{f_m} = q\vec{v} \times \vec{B}$

total charge on rod $= nAle = q$

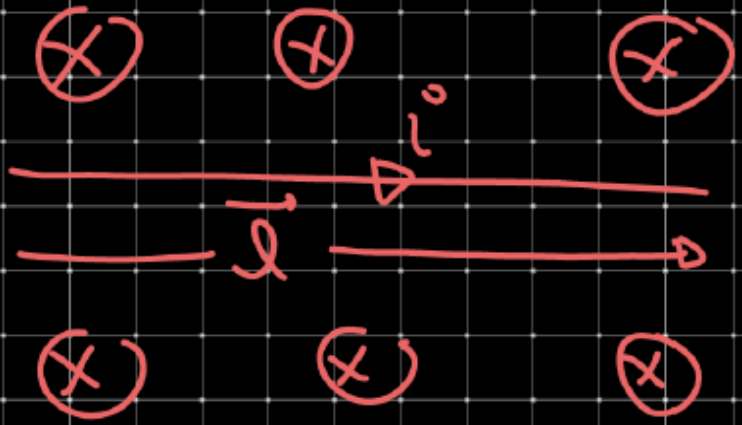
$F_m = (neAl)v_d B \sin\theta$

$= (neAv_d) lB \sin\theta$

$F_m = ilB\sin\theta$

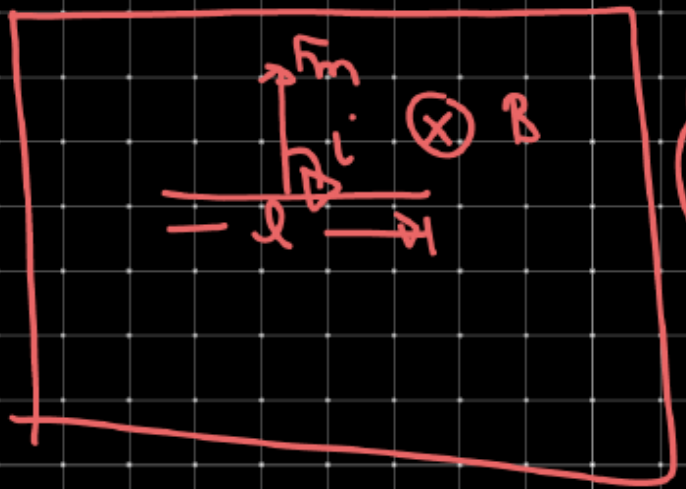
$$\vec{F_m} = i\vec{l} \times \vec{B}$$

$\vec{C} = \vec{A} \times \vec{B}$ $\quad C \perp A$ & $C \perp B$



$\vec{F}_m = i\,\vec{l} \times \vec{B}$

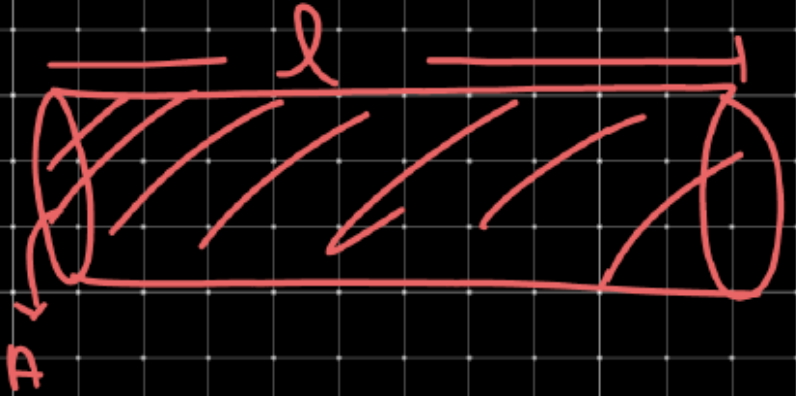
$F_m = i l B \sin\theta$



$\vec{F}_m = i\,\vec{l} \times \vec{B}$, $\vec{F}_m \perp \vec{l}$

$F_m = i l B \sin 90$ $\quad \vec{F}_m \perp \vec{B}$

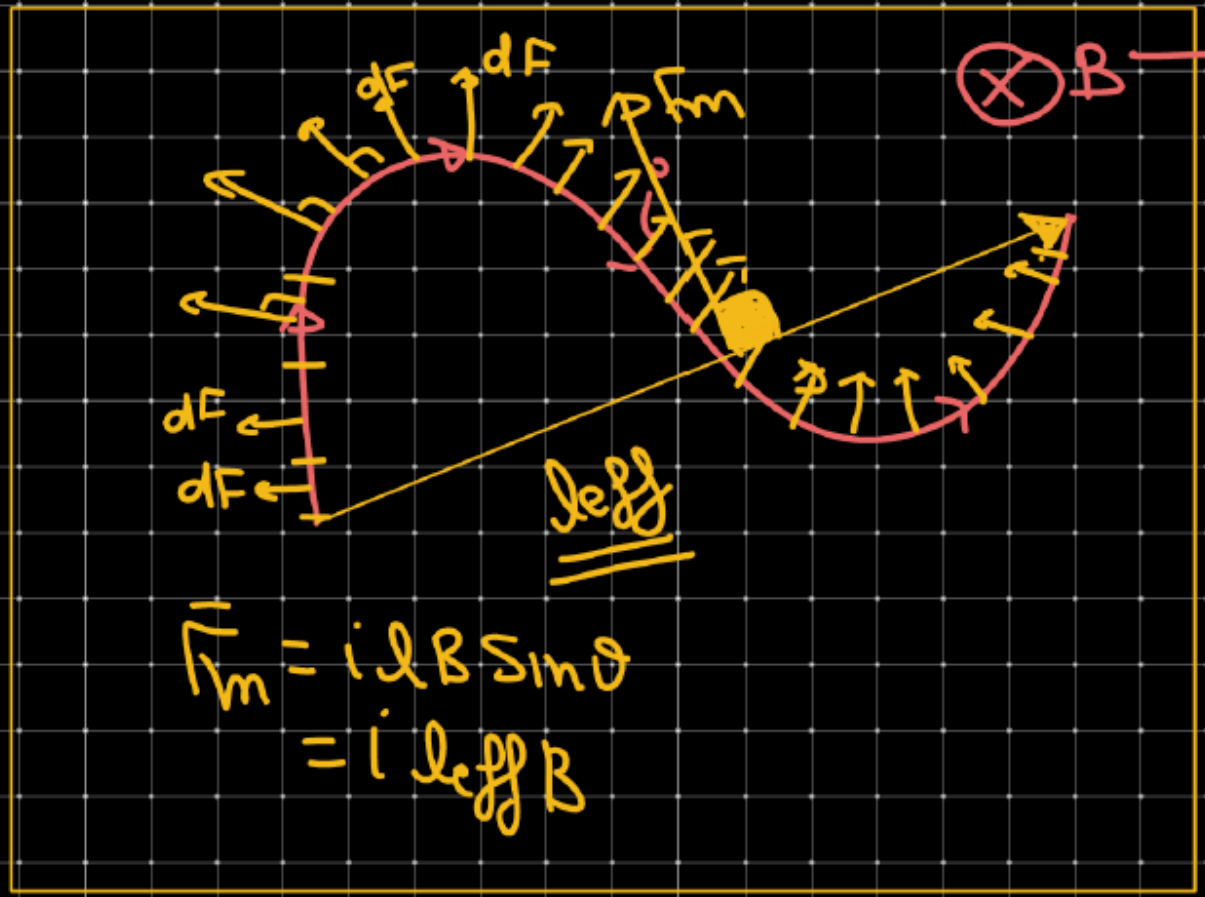
$= i l B$



n = no of electron Per Unit volume. $/m^3$.

Total electron in rod = nAl

$$q = neAl$$



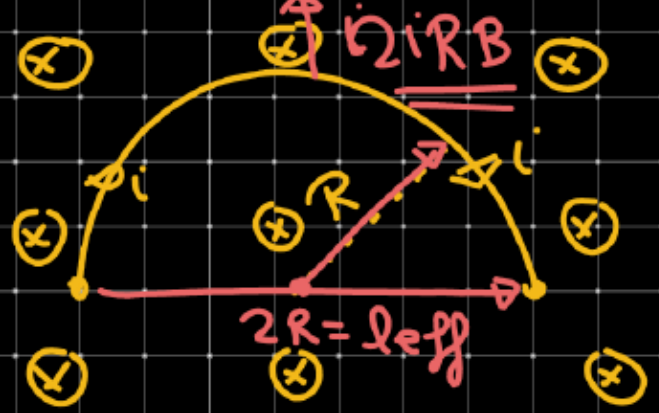
$\vec{B}$ → Uniform

$$\vec{F}_m = i\vec{l}\times\vec{B}$$

$$\vec{F}_m = i\vec{l}_{eff}\times\vec{B}$$

$$F_m = ilB\sin\theta$$
$$= i\,l_{eff}B$$

Q1



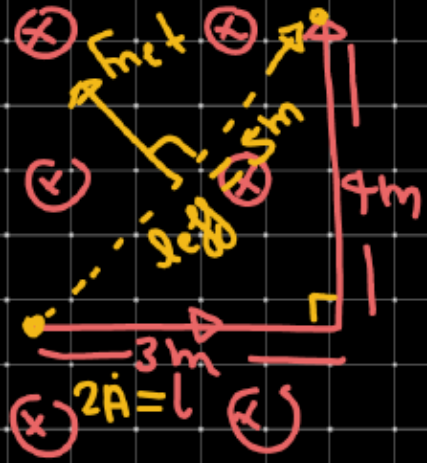
$\vec{F_m} = i\,\vec{l_{eff}} \times \vec{B}$

$= i\, l_{eff} B \sin\theta$

$= i\,(2RB\sin 90^\circ)$

$= 2iRB$

Q2)



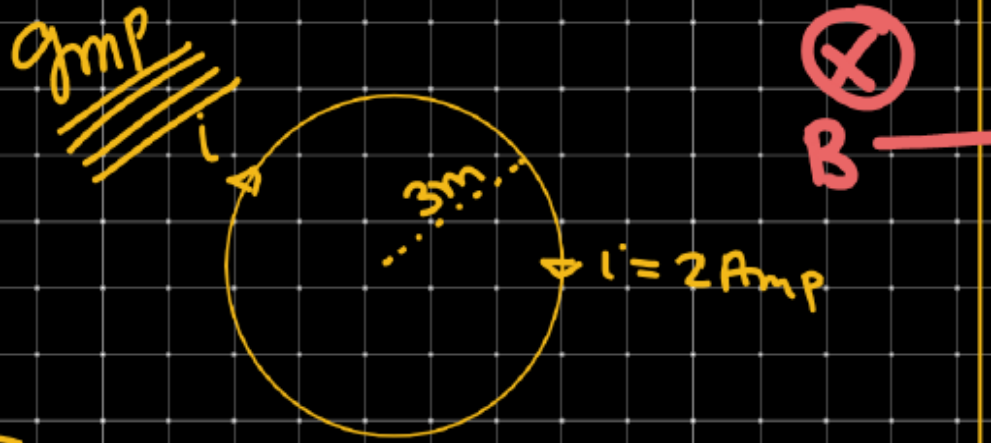
B = 2 T.

Find Magnetic force

$F_{net} = 2 \times 5 \times 2 \times \sin 90^\circ$

$= 10 \times 2 = 20\,N$

#

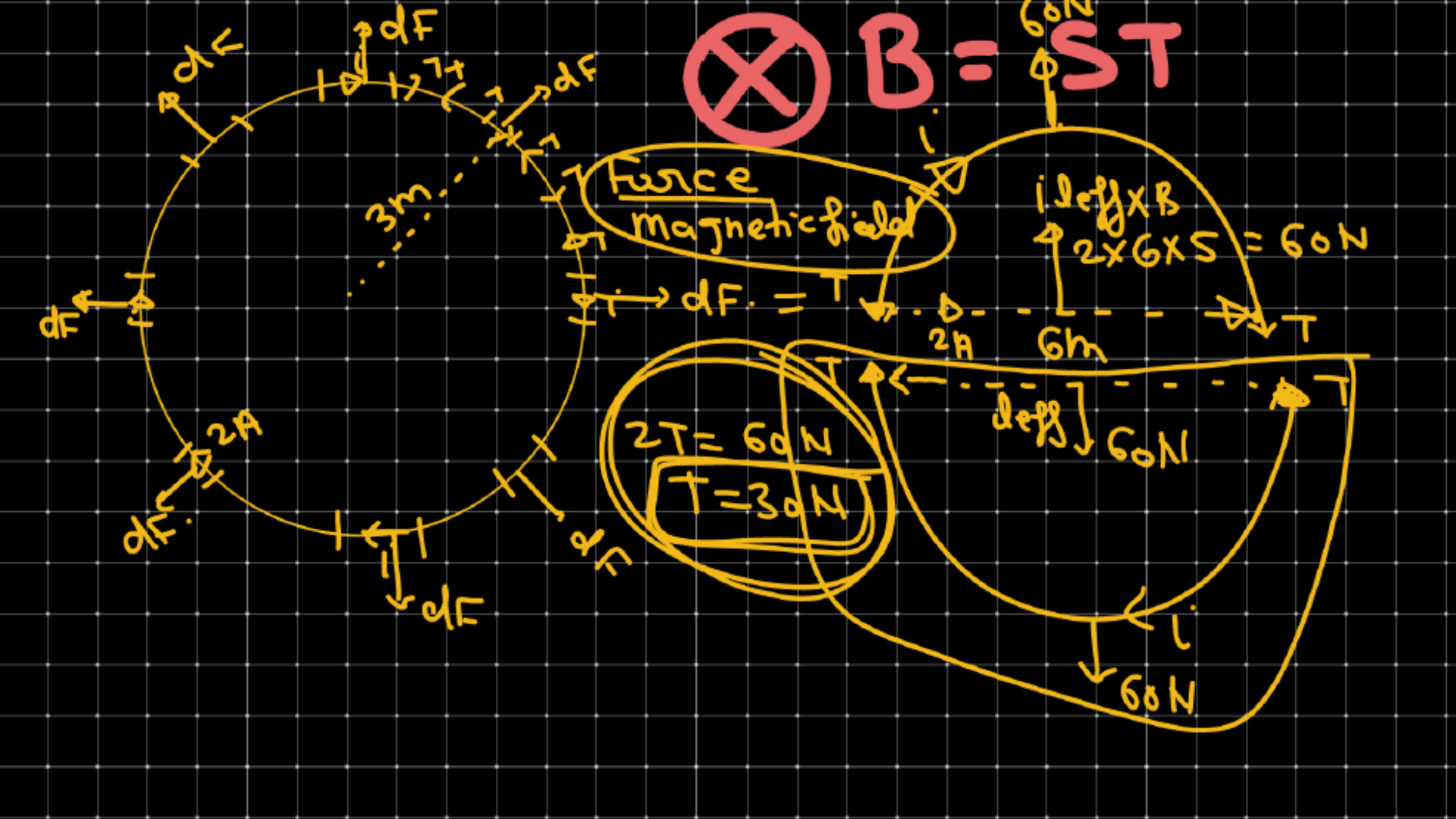


B → ST.

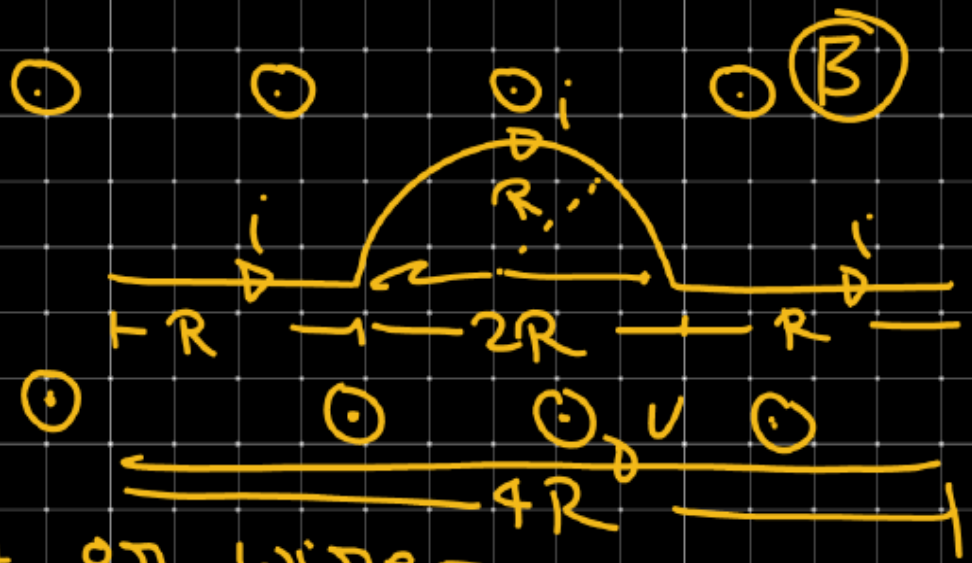
$\vec{F_m} = ?$

$l_{eff} = 0$

$F_m = 0$


B = 5T
Force
magnetic field
dF = T
i l eff x B
2 x 6 x 5 = 60N
2A
6m
T
2T = 60N
T = 30N
l eff
60N
l
60N
3m
dF
2A

Q31)



$4iRB$

Fnet on wire =

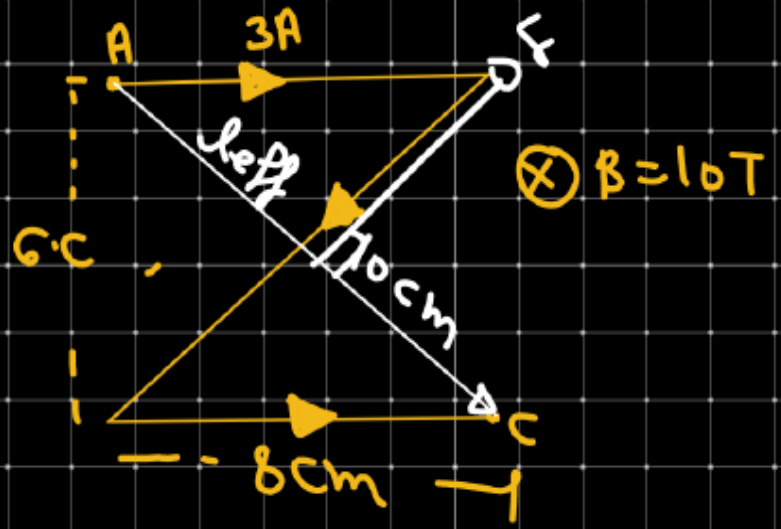
$$F_m = i\,l_{eff} \times B$$
$$= i \times 4R \times B$$
$$= 4iRB$$

Q4) A Current Carrying wire AC is placed in uniform transverse magnetic field. then the force on wire AC.

(a) 3N
(b) 4.2N
(c) 6N
(d) 4 N

$$l_{eff} = \sqrt{6^2 + 8^2}$$
$$= \sqrt{36 + 64} = \sqrt{100}$$
$$= 10\,cm$$
$$= 10^{-1}\,m$$

$$F = 3 \times 10^{1} \times 10^{-1}$$
$$= 3N$$



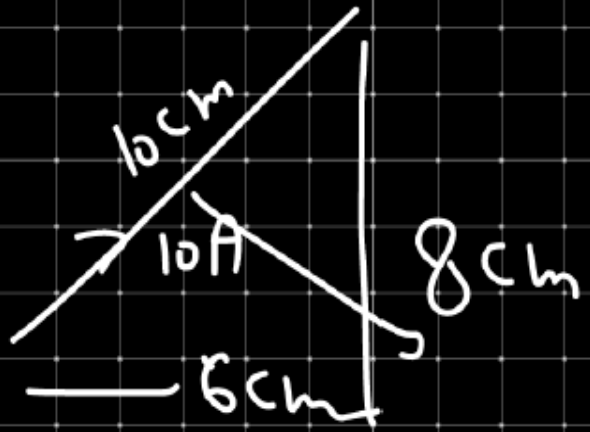
Q5) A wire LN bent as shown in figure is placed in uniform perpendicular magnetic field of 5T. A 10A current flows through the wire. Magnetic force experience by wire is.

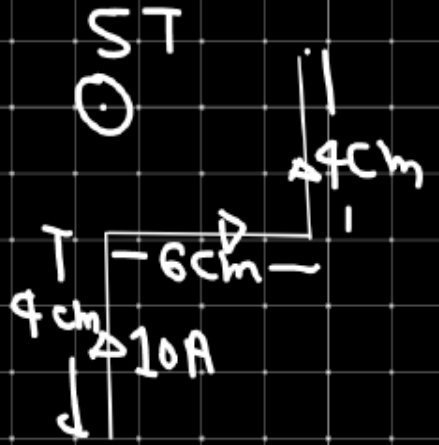
(a) 5N

(b) 10N

(c) 2.5N

(d) 1.2SN





Q6) A current I is flowing through wire PQR. This wire bent in form of an angle and placed in uniform magnetic field B according to figure. If $PQ = \ell$ & $\angle PQR = 60°$. The ratio of magnetic force on PQ to QR respectively

(a) 1 : 2

(b) $\sqrt{3} : 2$

(c) $2 : \sqrt{3}$

(d) 1 : 1

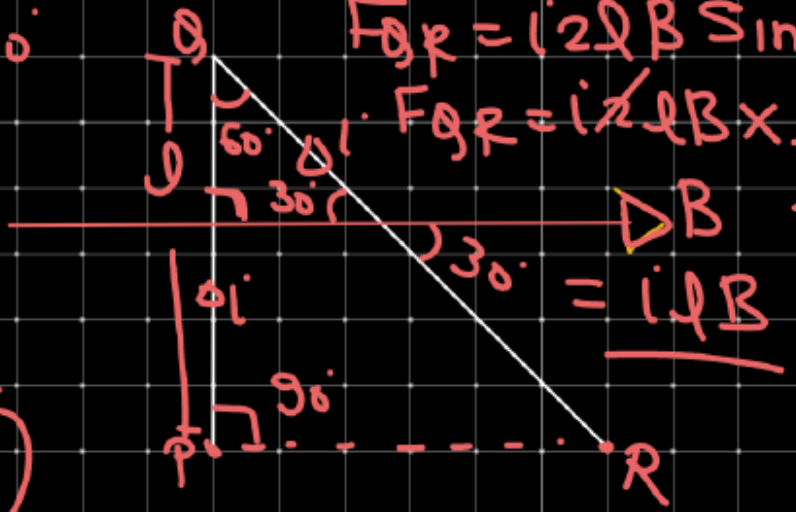
$F_{PQ} = i\ell B \sin 90°$

$\boxed{F_{PQ} = i\ell B}$

$\cos 60° = \frac{\ell}{QR}$

$QR = \frac{\ell}{\cos 60} = \frac{\ell}{\frac{1}{2}}$

$QR = 2\ell$

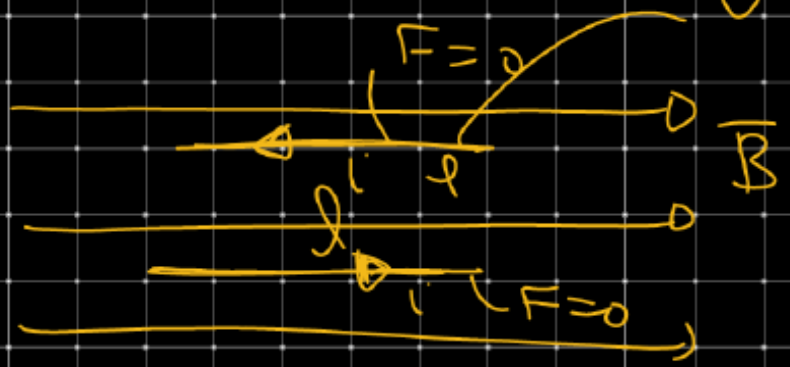


$F_{QR} = i(2\ell)B \sin 30°$

$F_{QR} = i \cancel{2} \ell B \times \frac{1}{\cancel{2}}$

$= i\ell B$

$\theta = 180 \sin 180 = 0$



$\vec{F} = i\,\vec{l} \times \vec{B}$

$= i\,l\,B \sin\theta$

$= 0$