Question:- The following forces are acting on a particle-
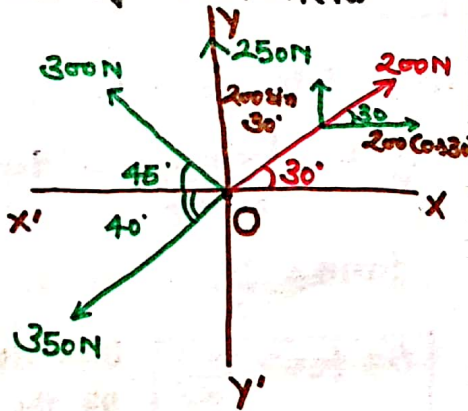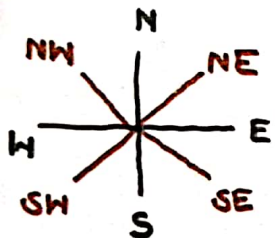
(i) 200 N Force in North-east direction with 30° from east.

(ii) 250N force towards North.

(iii) 300 N force towards North-west.

(iv) 350 N force in south west direction with 40° from west. find Magnitude & direction of resultant (R).

Given data

Resolving all the forces along x-direction

$\Sigma x = 200\cos 30° + 250\cos 90° + 300\cos 135° + 350\cos 220°$

$\Sigma x = 200 \times 0.8660 + 0 - 300\sin 45° - 350\cos 40°$

$= 200 \times 0.8660 - 300 \times 0.7071 - 350 \times 0.7660$

$[\Sigma x = -307.03N]$

Resolving all the forces in Y-direction.

$\Sigma Y = 250\sin 30 + 250\sin 90 + 300\sin 135 + 350\sin 220°$

$\Sigma Y = 200 \times 0.5 + 250 + 300\cos 45 - 350\sin 40.$

$[\Sigma Y = 337.15N]$
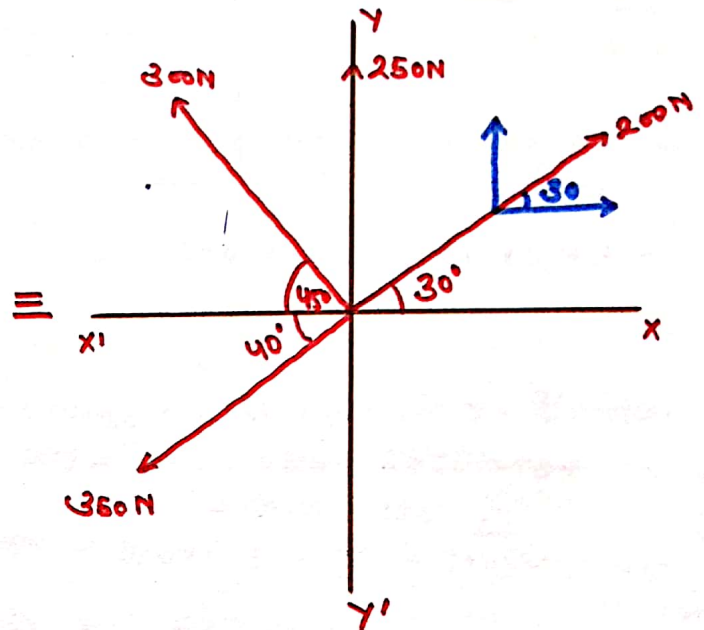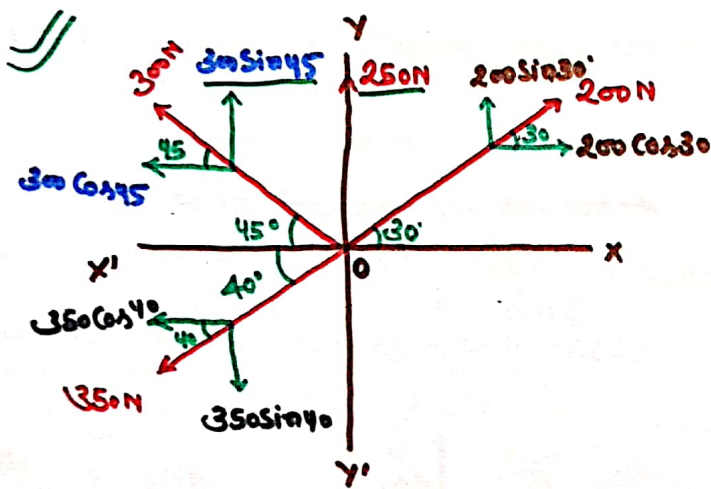
* $R = \sqrt{(\Sigma x)^2 + (\Sigma y)^2} = \sqrt{(-307.03)^2 + (337.15)^2}$

$[R = 456N]$ (magnitude).

* $\tan \theta = \dfrac{\Sigma Y}{\Sigma x} = \dfrac{337.15}{-307.03} = -1.0898$

$[\theta = \tan^{-1}(-1.0898) = 47°42]$ from ox axis direction of R.

* NOTE :-

$$\Sigma X = 200 \cos 30 - 300 \cos 45 - 350 \cos 40$$
$$= 173.2050 - 212.1320 - 268.1155$$
$$= -307.0425 \, N.$$

$$\Sigma Y = 200 \sin 30 + 250 + 300 \sin 45 - 350 \sin 40$$
$$= 337.1563 \, N$$

$$R = \sqrt{(\Sigma x)^2 + (\Sigma y)^2}$$
$$[R = 456.01476 \, N]$$