Here, AC in compression, AB in compression

4. The hook shown is subjected to two forces, $\bar{F}_1$ and $\bar{F}_2$. If it is required that the resultant force have a magnitude of 150 N and be directed horizontal towards right, determine (a) the magnitudes of $\bar{F}_1$ and $\bar{F}_2$ provided $\theta = 40°$ and (b) the magnitudes of $\bar{F}_1$ and $\bar{F}_2$ if $\bar{F}_1$ is to be minimum.

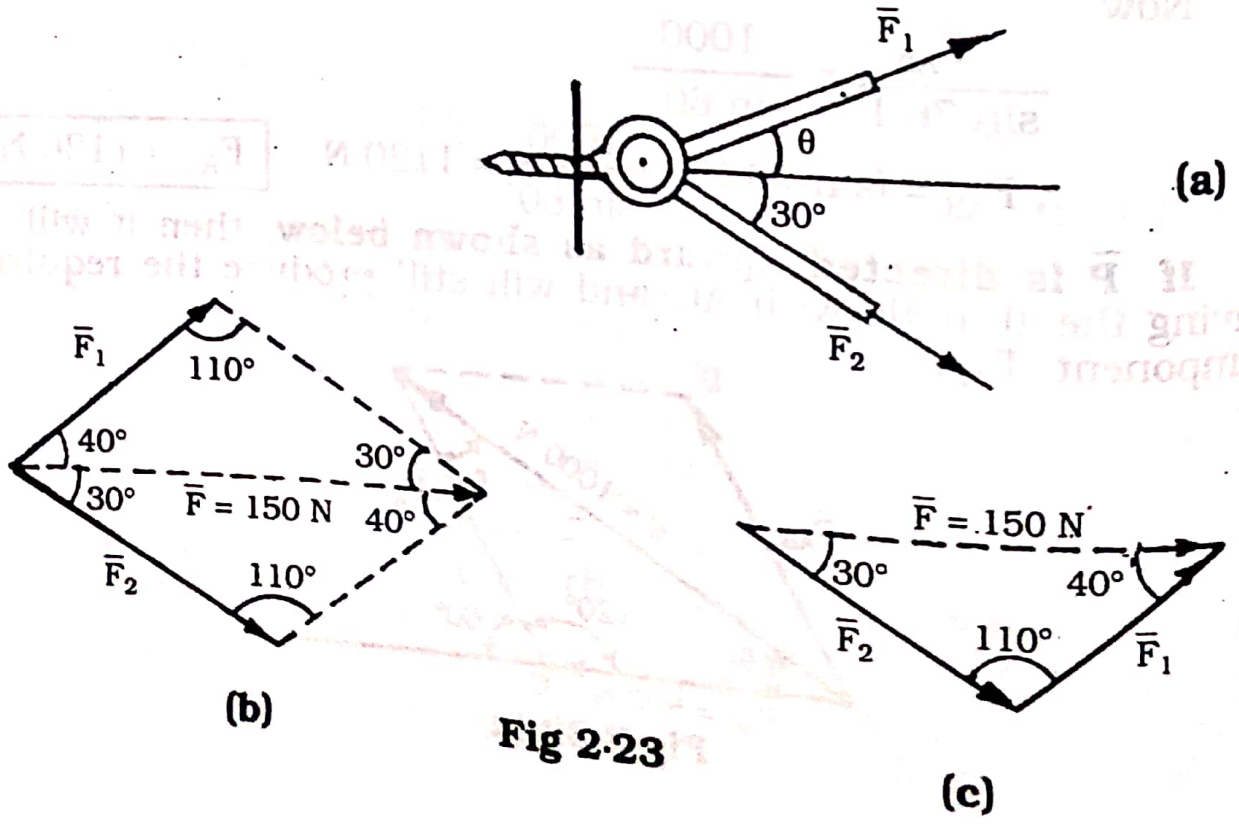

Fig 2·23

(a) Vector addition according to the parallelogram law is shown in Fig 2·23 (b). From the vector triangle, the unknowns F_1 and F_2 can be determined by using the law of sines.

$$\frac{F_1}{\sin 30°} = \frac{F}{\sin 110°}$$

$$\frac{F_1}{\sin 30°} = \frac{150}{\sin 110°}$$

$$\boxed{F_1 = 79{\cdot}81 \text{ N}}$$

$$\frac{F_2}{\sin 40°} = \frac{F}{\sin 110°}$$

$$\frac{F_2}{\sin 40°} = \frac{150}{\sin 110}$$

$$\boxed{F_2 = 102{\cdot}61 \text{ N}}$$

(b) Here F_1 should be minimum. The direction of F_2 remains unchanged.

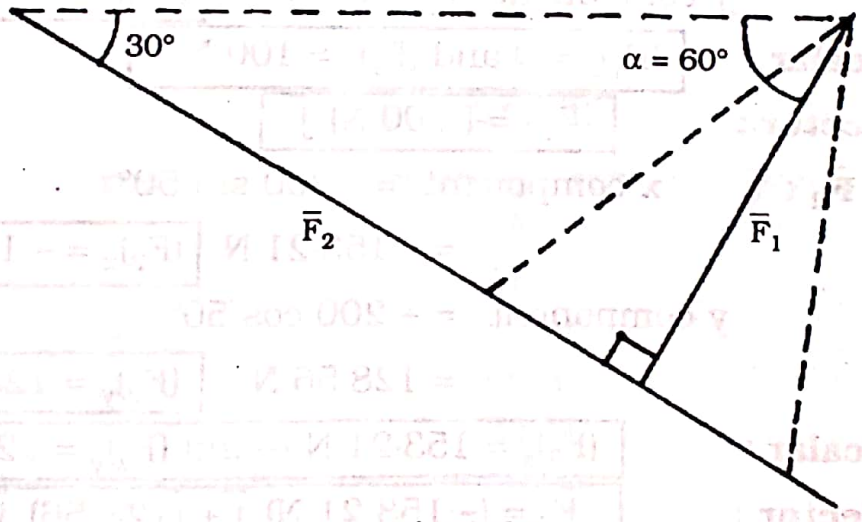

Fig 2·24

From the vector triangle, we can see that there are various ways to obtain F_1 and F_2. For the fixed direction of F_2, the force F_1 will be having minimum length when F_1 is perpendicular to F_2, i.e. $\alpha = 60°$.

$$\sin 30° = \frac{F_1}{F} = \frac{F_1}{150}$$

$$\boxed{F_1 = 75 \text{ N}}$$

$$\cos 30° = \frac{F_2}{F} = \frac{F_2}{150}$$

$$\boxed{F_2 = 129{\cdot}90 \text{ N}}$$