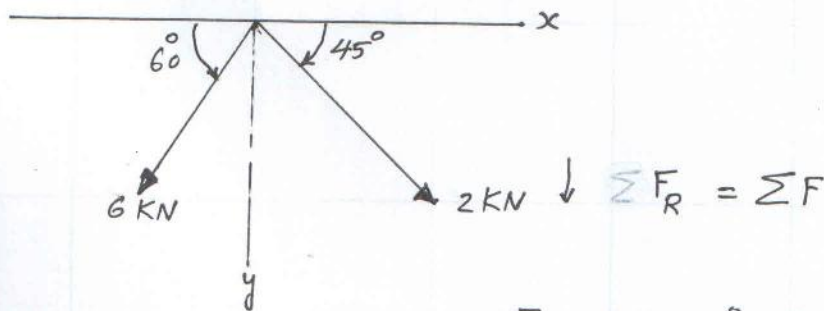


Magdy Saeb

F 2.1

Free Body Diagram (FBD)



$$\mathbf{F}_1 = 2 \cos 45^\circ \underline{i} + 2 \sin 45^\circ \underline{j}$$

$$\mathbf{F}_2 = -6 \cos 60^\circ \underline{i} + 6 \sin 60^\circ \underline{j}$$

$$\therefore \mathbf{F}_1 = 1.414 \underline{i} + 1.414 \underline{j}$$

$$\mathbf{F}_2 = -3 \underline{i} + 5.196 \underline{j}$$

$$\mathbf{F}_R = -1.586 \underline{i} + 6.610 \underline{j}$$

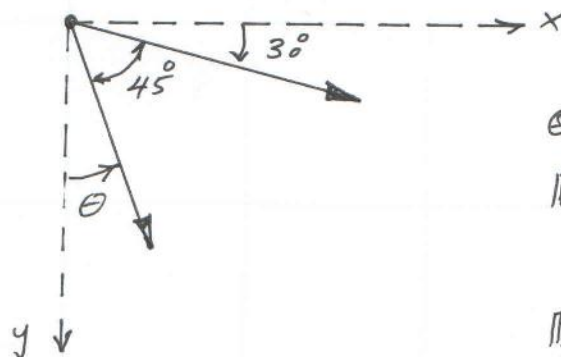
$$|\mathbf{F}_R| = 6.797 \approx 6.80 \text{ KN} \blacktriangleleft$$

$$\theta = \tan^{-1} \frac{6.610}{-1.586} = -76.5^\circ$$

$$\phi = 103.5^\circ \blacktriangleleft$$

F 2.2

FBD



$$\theta = 90 - (30 + 45) = 20^\circ$$

$$\mathbf{F}_1 = 200 \cos 30^\circ \underline{i} + 200 \sin 30^\circ \underline{j}$$

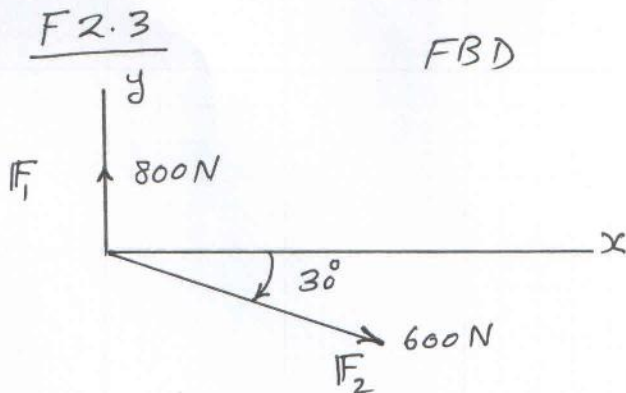
$$= 173.2 \underline{i} + 100 \underline{j}$$

$$\mathbf{F}_2 = 500 \sin 20^\circ \underline{i} + 500 \cos 20^\circ \underline{j}$$

$$= 171 \underline{i} + 469.8 \underline{j}$$

$$\therefore \mathbf{F}_R = 344.2 \underline{i} + 569.8 \underline{j}$$

$$\therefore |\mathbf{F}_R| \approx 666 \text{ N}, \theta \approx 59^\circ \blacktriangleleft \quad \therefore \mathbf{F}_R \approx 344 \underline{i} + 570 \underline{j} \blacktriangleleft$$

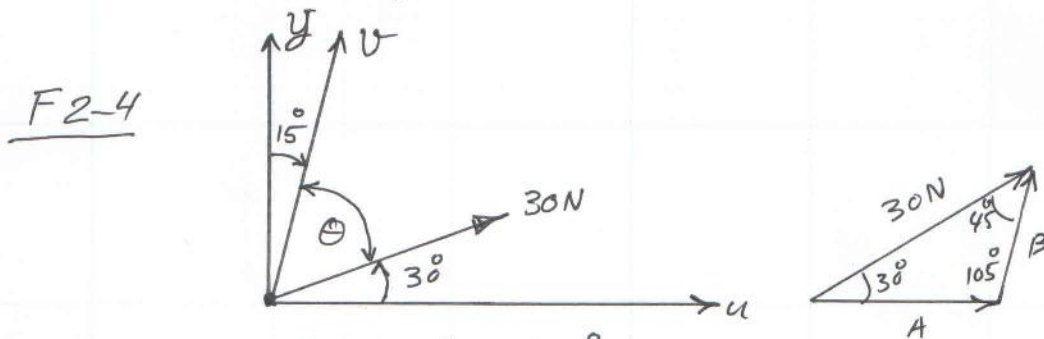


$$\begin{aligned} \mathbf{F}_R &= 600 \cos 30^\circ \mathbf{i} + (800 - 600 \sin 30^\circ) \mathbf{j} \\ &= 519.6 \mathbf{i} + 500 \mathbf{j} \end{aligned}$$

$$\therefore |\mathbf{F}_R| = 720.67 \approx 721 \text{ N}$$

NOTE:  $|\mathbf{F}_R| = \sqrt{(519.6)^2 + (500)^2}$

$$\theta = \tan^{-1} \frac{500}{519.6} \approx 44^\circ$$

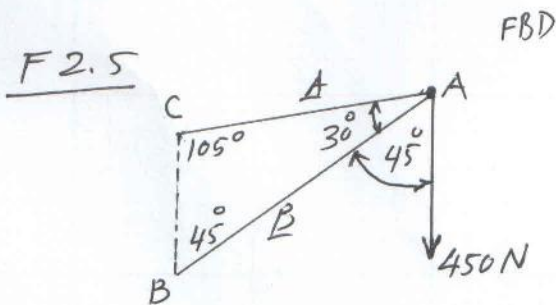


$$\theta = 90 - (15 + 30) = 45^\circ$$

$$\frac{30}{\sin 105^\circ} = \frac{A}{\sin 45^\circ} = \frac{B}{\sin 30^\circ}$$

$$|A_u| = \frac{30}{\sin 105} \cdot \sin 45 = 21.96 \approx 22 \text{ N}$$

$$|B_u| = \frac{30}{\sin 105} \cdot \sin 30 = 15.53 \approx 15.5 \text{ N}$$

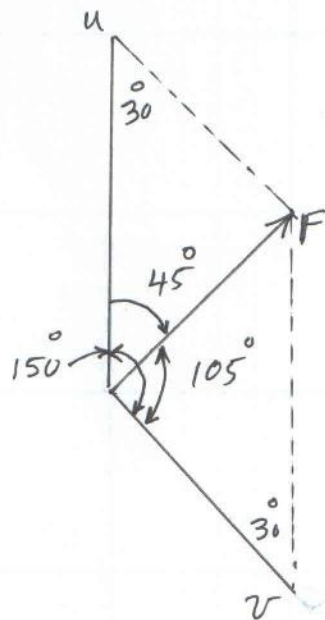


$$\frac{450}{\sin 30} = \frac{A}{\sin 45} = \frac{B}{\sin 105}$$

$$\therefore A = 636.4 \text{ N} \approx 636 \text{ N} \blacktriangleleft$$

$$B = 869.3 \text{ N} \approx 869 \text{ N} \blacktriangleleft$$

F2.6



$$\frac{F}{\sin 30} = \frac{6}{\sin 105}$$

$$F = 3.11 \text{ kN} \blacktriangleleft$$

Points to remember:

- To analyze forces in certain directions, use the sine law.
- To calculate resultant force, use Cartesian coordinates, or sometimes the cosine law
- Your correct final answer "is a must"
- Highlight answers with arrow head  $\blacktriangleleft$
- Draw or sketch the free body diagram accurately.