Answer on Question#79137 - Physics - Other

Two forces of 75N and 100N acts at an angle of 63°. Find the resultant and the angle it makes at F1 and F2.

Solution:

The resultant force F can be found by summing vectors of forces F_1 and F_2 (parallelogram law):



According to the cosine rule the magnitude of the resultant force is given by

$$F = \sqrt{F_1^2 + F_2^2 - 2F_1F_2\cos(180^\circ - 63^\circ)} = \sqrt{F_1^2 + F_2^2 + 2F_1F_2\cos63^\circ} = \sqrt{(75 \text{ N})^2 + (100 \text{ N})^2 + 2 \cdot 75 \text{ N} \cdot 100 \text{ N}\cos63^\circ} = 150 \text{ N}$$

Lets consider the upper triangle (with vectors F_2 and F). According to the sine law we have

$$\frac{F}{\sin(180^\circ - 63^\circ)} = \frac{F_2}{\sin \angle FF_2}$$
$$\sin \angle FF_2 = \frac{F_2}{F} \sin 63^\circ = \frac{100 \text{ N}}{150 \text{ N}} \sin 63^\circ = 0.6$$
$$\angle FF_2 = 36.44^\circ$$

Thus

$$\angle FF_1 = 63^\circ - 36.44^\circ = 26.56^\circ$$

<u>Answer:</u> $F = 150 \text{ N}, \angle FF_2 = 36.44^\circ, \angle FF_1 = 26.56^\circ.$

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