## Answer on Question\#79137-Physics - Other

Two forces of 75 N and 100 N acts at an angle of $63^{\circ}$. 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

$$
\begin{gathered}
F=\sqrt{F_{1}^{2}+F_{2}^{2}-2 F_{1} F_{2} \cos \left(180^{\circ}-63^{\circ}\right)}=\sqrt{F_{1}^{2}+F_{2}^{2}+2 F_{1} F_{2} \cos 63^{\circ}}= \\
=\sqrt{(75 \mathrm{~N})^{2}+(100 \mathrm{~N})^{2}+2 \cdot 75 \mathrm{~N} \cdot 100 \mathrm{~N} \cos 63^{\circ}}=150 \mathrm{~N}
\end{gathered}
$$

Lets consider the upper triangle (with vectors $F_{2}$ and $F$ ). According to the sine law we have

$$
\begin{gathered}
\frac{F}{\sin \left(180^{\circ}-63^{\circ}\right)}=\frac{F_{2}}{\sin \angle F F_{2}} \\
\sin \angle F F_{2}=\frac{F_{2}}{F} \sin 63^{\circ}=\frac{100 \mathrm{~N}}{150 \mathrm{~N}} \sin 63^{\circ}=0.6 \\
\angle F F_{2}=36.44^{\circ}
\end{gathered}
$$

Thus

$$
\angle F F_{1}=63^{\circ}-36.44^{\circ}=26.56^{\circ}
$$

Answer: $\mathrm{F}=150 \mathrm{~N}, \angle F F_{2}=36.44^{\circ}, \angle F F_{1}=26.56^{\circ}$.
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