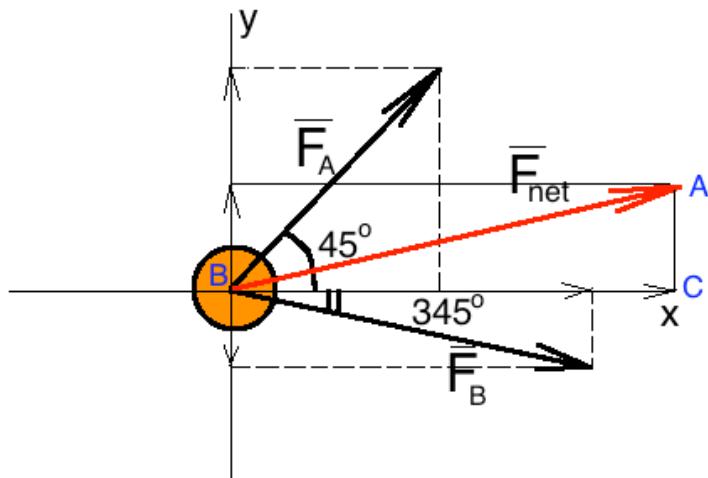


### Answer on Question #41292 – Physics – Mechanics

Two people, A and B are pulling on a tree with ropes while person C is cutting the tree down. Person A applies a force of 80.0 N [45.0°] on one rope. Person B applies a force of 90.0 N [345°] on the other rope. Calculate the net force on the tree?

**Solution:**



$F_A = 80.0 \text{ N}$  – force applied by person A;

$F_B = 90.0 \text{ N}$  – force applied by person B;

$F_{\text{net}}$  – net force of the tree;

Formula for the net force:

$$\vec{F}_{\text{net}} = \vec{F}_A + \vec{F}_B$$

Projections of forces on the X-axis:

$$\begin{aligned} x: F_{\text{net}X} &= F_{AX} + F_{BX} = F_A \cos 45^\circ + F_B \cos 345^\circ = 80N \cdot \cos 45^\circ + 90N \cdot \cos 345^\circ \\ &= 143.5 \text{ N} \end{aligned}$$

Projections of forces on the Y-axis:

$$\begin{aligned} y: F_{\text{net}Y} &= F_{AY} + F_{BY} = F_A \sin 45^\circ + F_B \sin 345^\circ = 80N \cdot \sin 45^\circ + 90N \cdot \sin 345^\circ \\ &= 33.3 \text{ N} \end{aligned}$$

From the right triangle ABC ( $\alpha$  – angle that net force makes with X – axis):

$$\begin{aligned} \tan \alpha &= \frac{F_{\text{net}Y}}{F_{\text{net}X}} \Rightarrow \alpha = \arctan \left( \frac{F_{\text{net}Y}}{F_{\text{net}X}} \right) = \arctan \left( \frac{33.3 \text{ N}}{143.5 \text{ N}} \right) = 13^\circ \\ F_{\text{net}}^2 &= F_{\text{net}X}^2 + F_{\text{net}Y}^2 \\ F_{\text{net}} &= \sqrt{F_{\text{net}X}^2 + F_{\text{net}Y}^2} = \sqrt{(143.5 \text{ N})^2 + (33.3 \text{ N})^2} = 147.3 \text{ N} \end{aligned}$$

**Answer:** net force on the tree is equal to 147.3N [13°]