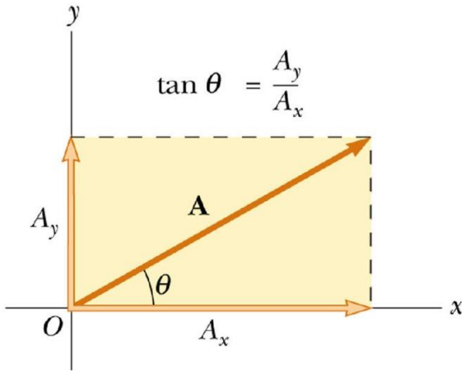
Answer on Question #55089, Physics / Mechanics | Kinematics | Dynamics

If 50 g is suspended at 15°, and 75 g is suspended at 135°, what mass must be suspended at what angle to balance these two forces?

Solution:



Force $F_1 = 50\text{ g } at\ 15°$:

$$\vec{F_1} = (50cos15°, 50\ sin15°) = (48.3, 12.94)$$

Force $F_2 = 75\text{ g } at\ 135°$:

$$\vec{F_1} = (75cos135°, 75\ sin135°) = (-53.03, 53.03)$$

The resultant force is

$$\vec{R} = \overrightarrow{F_1} + \overrightarrow{F_2}$$

$$\vec{R} = (48.3 - 53.03, 12.94 + 53.03) = (-4.73, 65.97)$$

F_3 is the negative of the resultant F_1 and F_2.

So,

$$\overrightarrow{F_3} = -\vec{R}$$

$$\vec{F_3} = (4.73, -65.97)$$

The magnitude of balance force is

$$F_3 = \sqrt{4.73^2 + (-65.97)^2} = 66.14 \approx 66\text{ g}$$

To find direction

$$\theta = \tan^{-1}\left(\frac{F_{3y}}{F_{3x}}\right) = \tan^{-1}\left(\frac{-65.97}{4.73}\right) = -85.9° = 360° - 85.9° = 274.1°$$

Answer: 66 g at 274.1°.