

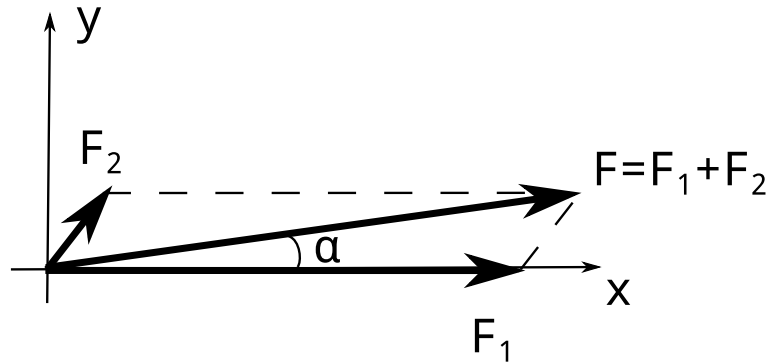
Task. Two forces 50 kilo newton and 10 kilo newton act at a point 'O'. The included angle between them is 60 degree. Find the magnitude and direction of the resultant?

Solution. Choose coordinates (x, y) so that the first force F_1 is parallel to x -axis, so $\vec{F}_1 = (50, 0)$. Then the second force constitute the angle 60 degree, and has length 10. Therefore

$$\vec{F}_2 = (10 \cos 60^\circ, 10 \sin 60^\circ) = \left(10 \cdot \frac{1}{2}, 10 \cdot \frac{\sqrt{3}}{2}\right) = (5, 5\sqrt{3}).$$

Therefore the resultant

$$\vec{F} = \vec{F}_1 + \vec{F}_2 = (50 + 5, 0 + 5\sqrt{3}) = (55, 5\sqrt{3}).$$



The length of this vector is

$$F = \sqrt{55^2 + (5\sqrt{3})^2} = \sqrt{55^2 + 25 * 3} = \sqrt{3100} = 10\sqrt{31} \approx 55.68.$$

Let α be the angle between vector \vec{F} and x -axis. Then

$$\cos \alpha = \frac{55}{|F|} = \frac{55}{10\sqrt{31}} = \frac{5.5}{\sqrt{31}} \approx 0.98783$$

whence

$$\alpha = \arccos(0.98783) \approx 8.96^\circ.$$

Answer. Magnitude of the resultant: $|F| = 10\sqrt{31} \approx 55.68$.

Direction of the resultant: the angle between F and F_1 is 8.96° .