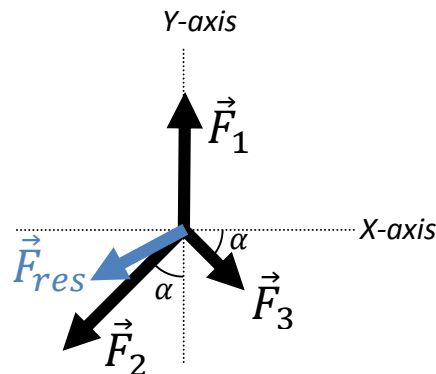


Answer on Question #63909, Physics / Mechanics | Relativity

Question:

Find the resultant of three coplanar concurrent forces; F_1 acting north and of magnitude 8 grams, F_2 of magnitude 12 grams and acting southwest, F_3 of magnitude 5 grams and acting southeast. Find the components of the resultant in an easterly and northerly direction.

Solution:



In Cartesian coordinate system X-axis is equivalent to easterly direction, and Y-axis — to northerly direction. We may decompose these three forces as

$$\vec{F}_1 = (F_1^x; F_1^y) = (0; 8)$$

$$\begin{aligned}\vec{F}_2 &= (F_2^x; F_2^y) = (-12 \cdot \sin \alpha; -12 \cdot \cos \alpha) = (-12 \cdot \sin 45^\circ; -12 \cdot \cos 45^\circ) \\ &= \left(-12 \cdot \frac{\sqrt{2}}{2}; -12 \cdot \frac{\sqrt{2}}{2}\right) = (-6\sqrt{2}; -6\sqrt{2})\end{aligned}$$

$$\vec{F}_3 = (F_3^x; F_3^y) = (5 \cdot \cos \alpha; -5 \cdot \sin \alpha) = \left(5 \cdot \frac{\sqrt{2}}{2}; -5 \cdot \frac{\sqrt{2}}{2}\right) = (2.5\sqrt{2}; -2.5\sqrt{2})$$

The components of the resultant force are:

$$F_{res}^x = F_1^x + F_2^x + F_3^x = 0 - 6\sqrt{2} + 2.5\sqrt{2} = -3.5\sqrt{2} \cong -4.95 \text{ grams}$$

$$F_{res}^y = F_1^y + F_2^y + F_3^y = 8 - 6\sqrt{2} - 2.5\sqrt{2} = 8 - 8.5\sqrt{2} \cong -4.02 \text{ grams}$$

Answer:

-4.95 and -4.02 grams