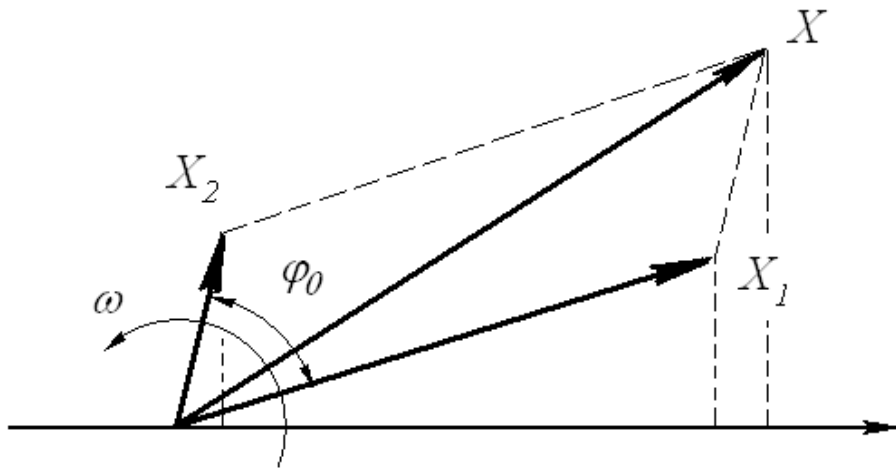Question.

two collinear shms, with amplitudes 5 cm and 12 cm are superposed, calculate
the resultant amplitude when shm differ in phase by 60 degree

Solution

Equations of harmonic oscillations have the form:

$x_1 = X_1 \cdot \cos \omega t$ and $x_2 = X_2 \cdot \cos(\omega t + \varphi_0)$, $X_1 = 12 cm, X_2 = 5 cm$, $\varphi_0 = \pi / 3$.

As we can see from the vector diagram above, the resultant amplitude can be found as

$$X^2 = X_1^2 + X_2^2 + 2 \cdot X_1 \cdot X_2 \cos \varphi_0 = 12^2 + 5^2 + 2 \cdot 12 \cdot 5 \cdot \cos \frac{\pi}{3} = 229.$$

Thus, the $X = \sqrt{229}$ cm.
Answer: $X = \sqrt{229}$ cm.