1. Two identical sinusoidal waves each of amplitude 10 mm with a phase difference of 90^o are travelling in the same direction in a string. The amplitude of the resultant wave is
   a. $5\ mm$ b. $10\sqrt{2}\ mm$ c. $10\ mm$ d. $20\ mm$
2. The displacement of an elastic wave is given by the function $y = 3sin\ \omega t + 4cos\omega t$, where y is in cm and t is in sec. The resultant amplitude is
   a. $3\ cm$ b $4\ cm$ c. 5 cm d. $7\ cm$
3. Two waves produced displacement at a point given by: $y_1 = a \sin \omega\, t$ & $y_2 = a\ sin(wt + \pi/2)$. The resultant amplitude is:
   a. 0 b. $2a$ c. $\sqrt{2}a$ d. $a/\sqrt{2}$

Applications of principle of superposition in wave phenomena:

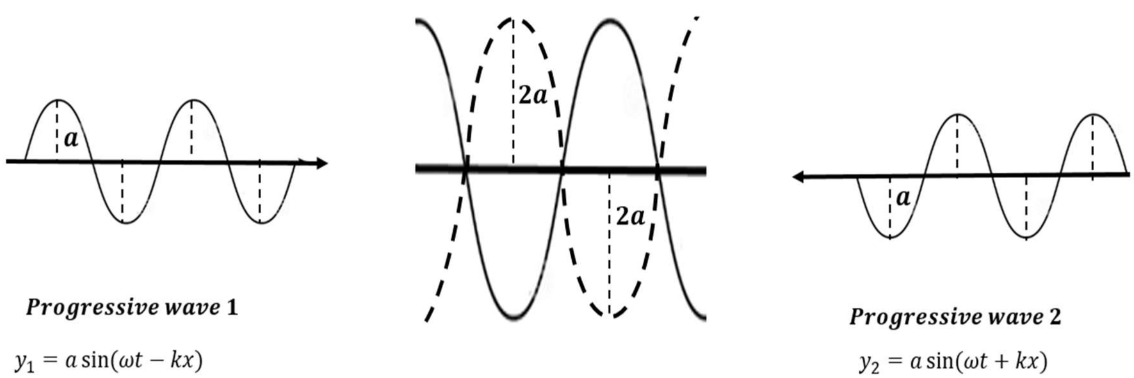
1. In the formation of stationary wave
2. In the interference of waves
3. In the diffraction of waves
4. In the formation of beats etc.

Stationary wave (Standing wave):

When two progressive waves of same frequency and same amplitude travelling in opposite direction with same speed superpose (interact) each other, the resultant wave thus produced is called as stationary wave. The term stationary is in the sense that there is no net flow of energy along the wave (however, the wave seems to be moving).

Equation of stationary wave:

Consider two progressive waves of amplitude (a) and frequency (f) are travelling in opposite direction (one along +X axis and another along -X axis) with same speed.



Stationary wave

The equation of first wave is written as: $y_1 = a\sin(\omega t - kx)\ \ldots\ldots\ldots (1)$

And, the equation of second wave is written as: $y_2 = a\sin(\omega t - kx)\ \ldots\ldots\ldots (2)$

When these two waves superpose each other, then a stationary wave is formed. According to principle of superposition, the resultant displacement (y) is:

$$y = y_1 + y_2$$