## DPP – 1

## Solution

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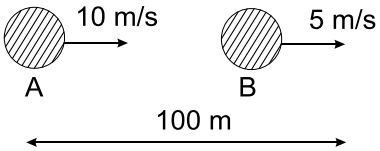
**1.**




$v_{AB} = v_A - v_B = 10 - 5 = 5$ m/s.

time taken by $A$ to meet $B$.

$t = \frac{100}{5} = 20\text{sec}$

compare value of ' $t$ ' with given eq$^x$ is

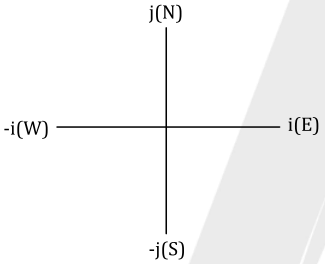
$2^{k-2} + 4 = 20$

$2^{k-2} = 16 \Rightarrow 2^{k-2} = 2^4$

$k - 2 = 4$

$\Rightarrow k = 6$

**2.**




$v_S = 12i$ ...(i)

velocity of ship

$v_{WS}$ = velocity of women w.r.t. ship

$v_{\omega s} = v_\omega - v_s$ ...(ii)

$v_{\omega s} = 5j$ ..(ii)

put equation (1) and (3) value in equation (2)

$v_{\omega s} = v_\omega - v_s$

$5j = v_\omega - 12i$

$v_\omega = 12i + 5j$

$|v_\omega| = \sqrt{(12)^2 + (5)^2} = \sqrt{169}$

$|v_\omega| = 13$

compare with given eq$^n$ $\frac{13}{2}n$

ie $\frac{13}{2}n = 13 \Rightarrow n = 2$

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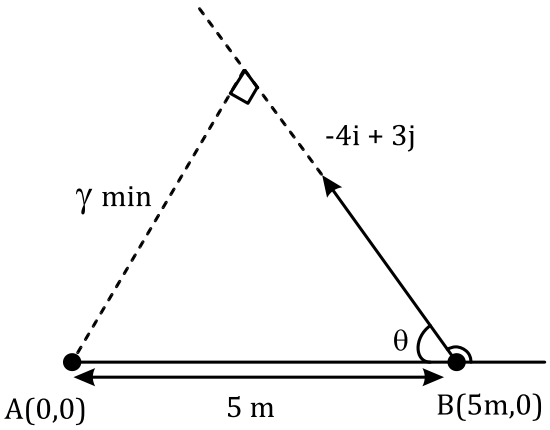
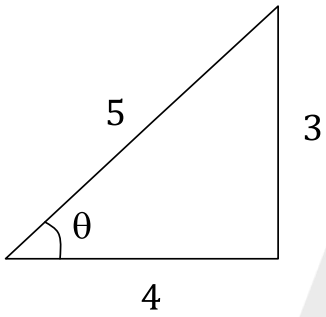
**3.**




$\theta = \tan^{-1}\left(\frac{3}{4}\right) = \tan^{-1}\left(\frac{3}{4}\right) = \tan^{-1}\left(\frac{3}{4}\right)$

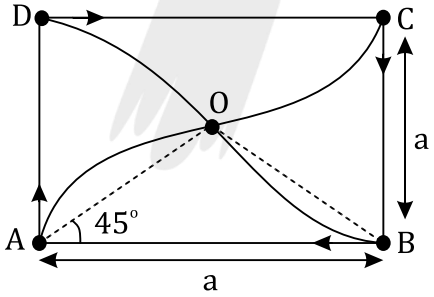
$\frac{\gamma \text{ min}}{5} = \sin\ \theta \Rightarrow \gamma \text{ min} = 5\sin\ \theta$

$\gamma \text{ min} = 5 \times \frac{3}{5} = 3$

compare with given eqⁿ

$3^{\alpha+\beta} = 3 \Rightarrow \alpha + \beta = 1$

**4.**




$OA = a\cos\ 45° = a/\sqrt{2}$

Relative velocity between particles $A$ and $B$ will be $\frac{v}{\sqrt{2}}$

time $(t) = \frac{a/\sqrt{2}}{v/\sqrt{2}} = \frac{a}{v}$

compare the value of $t$ with given eqⁿ.

$\left[\frac{a}{v}\right]\frac{5}{p} = \frac{a}{v}$

$p = 5$

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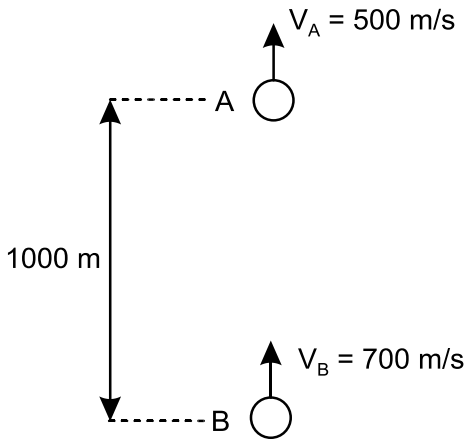
**5.**




total time taken by particle B.

$0 = 700 - 10t_B \Rightarrow t_B = 70$sec.

time taken by particle 'B' to reach maximum height $t = \frac{t_B}{2} = \frac{70}{2} = 35$ seconds

height covered by particle $B$ in 35 seconds $= 35 \times 700 = 24{,}500$ meter

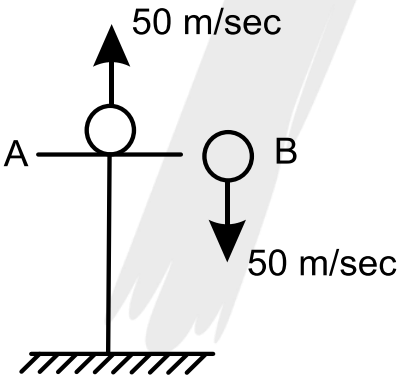
Gap between particle $A$ and $B = 24{,}500 - 1000 = 23{,}500$ meter

Acceleration of aeroplane

$23{,}500 = 500 \times 35 + \frac{1}{2}a(35)^2$

$a = 9.79 \simeq 10$ m/sec$^2$

**6.**




$v_A = u_A - gt$

$\because$ at maximum height $v_A = 0$

$\therefore 0 = 50 - 10t$

$t = 5$ seconds.

velocity of particle $B$ after 5 seconds.

$-V_B = -V_B - gt$

$V_B = 50 + 10 \times 5 = 100$ m/sec.

$V_B - V_A = 100 - 0$ (Relative speed).

$V_{BA} = 100$ m/sec

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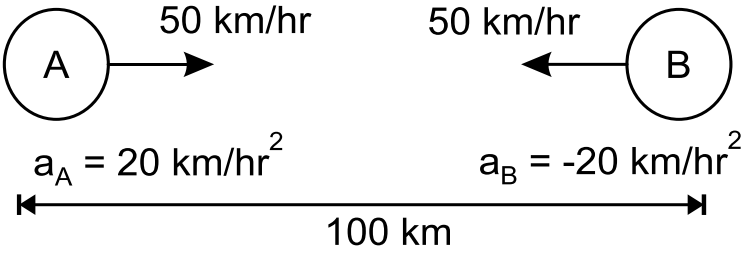
**7.** From graph we can understand that $P_1$ acceleration is greater than $P_2$ acceleration. so magnitude of relative velocity of $P_1$ and $P_2$ will increase continuously.

**8.**




$S_A = u_A t + \frac{1}{2} a_A t^2$

$S_A = 50t + \frac{1}{2} \times 20 \times t^2$

$S_B = U_B t + \frac{1}{2} a_B t^2$

$S_B = 50t + \frac{1}{2}(-20)t^2$

Total distance covered by both train

$\Rightarrow S_A + S_B =$ Total distance $= 100$

$100t = 100$

$t = 1\text{hr}$

Distance travelled by train $A$ in 1 hour

$S_A = 50 \times 1 + \frac{1}{2} \times 20 \times (1)^2$

$S_A = 60$ km

**9.** As we know relative velocity means difference between two velocities.

ie $v_{\text{rel}} = v_1 - v_2$

so if $V_2$ direction is opposite to $v_1$ then we can take -ve sign with $V_2$

ie $v_{\text{re}} L = (v_1 - (-v_2))$

$V_{\text{reL}} = v_1 + v_2$

ie angle between then will $\pi(180°)$.

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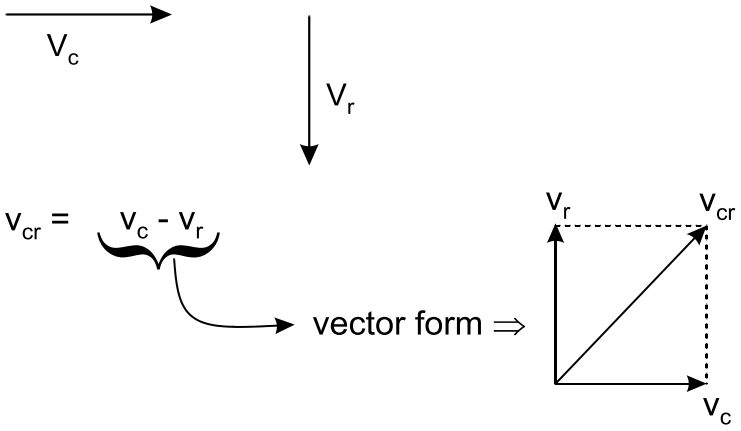
**10.**




$(v_{cr})^2 = v_c^2 + v_r^2$

$(20)^2 = v_c^2 + (10)^2$

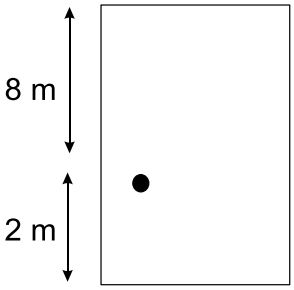
$(v_c)^2 = 400 - 100$

$v_c = 10\sqrt{3}$ m/sec

**11.** Acceleration of lift is greater than gravitational acceleration ie coin will hit top of the lift with acceleration

$10 - 11 = -1$ m/se$^2$

-ve sign is showing upward direction




$8 = \frac{1}{2}at^2$

$8 = \frac{1}{2} \times 1 \times t^2$

$t = \sqrt{16} \Rightarrow t = 4$ seconds

**12.** In ' $t$ ' time distance travelled by all three elephants are respectively

$S_A = 5t$

$S_B = ut$

$S_C = 10t$

$d + S_C = S_B$

$d + 10t = ut$ ...(i)

$S_C - S_A = d$

$10t - 5t = d$

$d = 5t$ ...(ii)

from (1) and (2)

$5t + 10t = ut$

$u = 15$ m/sec

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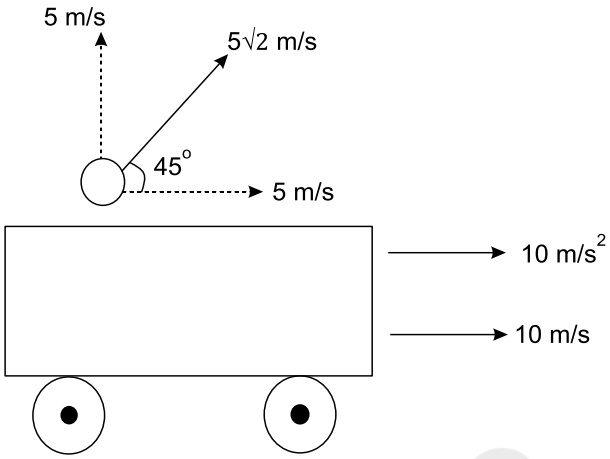
**13.**




Relative speed of ball with respect to truck

$V_{Bt} = 5 - 10$

$v_{Bt} = -5$ m/sec.

only horizontal component of velocity will be responsible for horizontal displacement.

$S = ut + \frac{1}{2}at^2$

$S = -5 \times 1 + \frac{1}{2} \times 10 \times 1^2 \Rightarrow = -5 + 5$

$S = 0$ meter