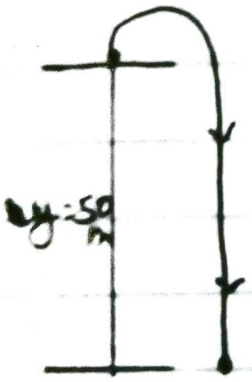
HOME ASSIGNMENT

A ball is thrown upward with an initial velocity of $10\,ms^{-1}$ from the top of a 50m tall building.

(a) with use what velocity will the ball strike the ground?

(b) How long does it take the ball to strike the ground?



Given,

(a) $u = 10\,ms^{-1}$

$s = -50\,m$

$a = -g = -10\,ms^{-2}$

$2as = v^2 - u^2$

$\Rightarrow 2 \times -10 \times -50 = v^2 - 100$

$\Rightarrow 1100 = v^2$

$\Rightarrow v^2 = 1100$

$\Rightarrow v = \sqrt{1100} = 10\sqrt{11}$

$\Rightarrow v = 10 \times 3.21 = 32.1\,ms^{-1}$

(b) $s = ut + \frac{1}{2}at^2$

$\Rightarrow -50 = 10t + \frac{1}{2} \times -10 \times t^2$

$\Rightarrow -50 = 10t - 5t^2$

$\Rightarrow -50 = 5(2t - t^2)$

$\Rightarrow t^2 - 2t - 50 = 0$

$\Rightarrow t = 2s$

2. A stone is dropped freely in the river from a bridge. It takes 5s to reach the water surface in the river.
Calculate :-

(i) the height of the bridge from water level.

(ii) the distance covered by stone in last second ? ($g = 9.8 ms^{-2}$)

(i) Given,

$t = 5s$

$a = -g = -9.8 ms^{-2}$

$u = 0 ms^{-1}$

(i) $s = ut + \frac{1}{2}at^2$

$\Rightarrow s = \frac{1}{2} \times -9.8 \times 5^2$

$\Rightarrow s = -4.9 \times 25$

$\Rightarrow s = -12.25 m$

$\Rightarrow s = -h = -(-12.25 m)$

$\Rightarrow h = 12.25 m$

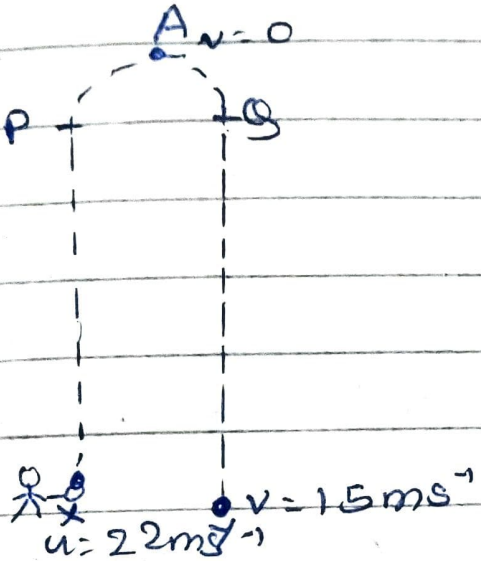
(ii) Distance travelled in last second = S_{nth}

$\Rightarrow S_{5th} = 0(5) + \frac{1}{2}(-9.8)(9)$

$\Rightarrow S_{5th} = -44.1 \times 9^2$

$\Rightarrow S_{5th} = -44.1 ms^{-1}$

3. A tennis ball is stuck with a racket, fixing it straight upward at 22 meters per second. After how much time will it be falling at $15ms^{-1}$?



Case-1

$u = 22ms^{-1}$

$v = 0ms^{-1}$

$a = -9.8ms^{-1}$

$t_1 = ?$

$\Rightarrow t_1 = \frac{v-u}{a}$

$= \frac{0-22}{-9.8}$

$= \frac{-22}{-9.8}$

$= 2.24s$

∴ The tennis ball takes 2.24s to go up at a velocity of $22ms^{-1}$.

Case-2

$u = 0\ ms^{-1}$

$v = 15\ ms^{-1}$

$a = -9.8\ ms^{-2}$

$t_2 = \frac{v-u}{a}$

$= \frac{15}{-9.8}$

$= -1.53s$

$= 1.53s$ ($\because$ t_2 can't be -ve)

Total time $= t = t_1 + t_2 = 2.24 + 1.53$

$= 3.77s$

$= 3.8s$ (approx.)

$= x =$