1) A ball is thrown upward with an initial velocity of 10.0 m/s from the top of 50.0 m tall building.

(a) With what velocity will the ball strike the ground?

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

⇒ given :- $y = 50.0\ m$ (displacement)

$v_0 = +10.0\ m/s$.

Find (a) & (b) $v$

The

(a) $v^2 = v_0^2 - 2gy = (+10.0\ m/s) - 2(9.80\ m/s^2)(-50.0\ m) = 1.08 \times 10^3\ m^2/s^2$

so,

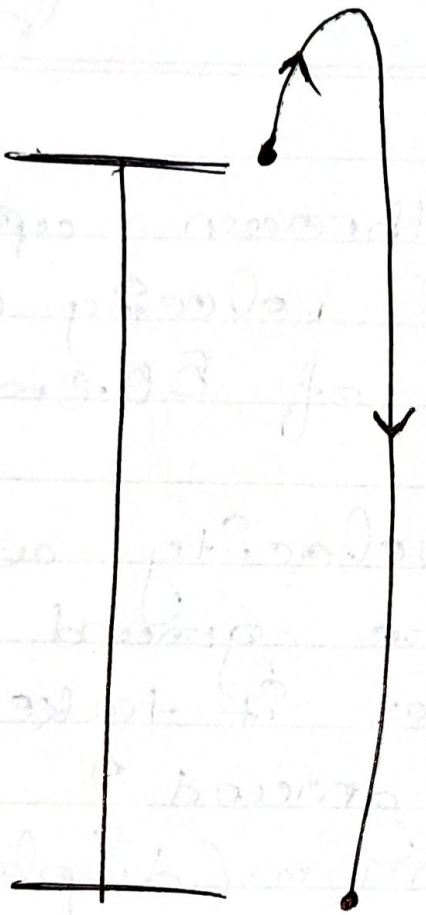
$v = \sqrt{10.8 \times 10^3\ m^2/s^2} = \pm 32.9\ m/s$

$\therefore v = -32.9\ m/s$ (as moving downward)

(b) From $v = v_0 - gt$, we have

$t = \dfrac{v_0 - v}{g} = \dfrac{(+10.0\ m/s) - (-32.9\ m/s)}{9.80\ m/s^2}$

$\Rightarrow \dfrac{42.9\ m/s}{9.80\ m/s^2} = 4.38\ s.$



$y = 50.0\ m.$

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

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

(ii) distance covered by stone in last second ($g = 9.8\ m/s$)

*) $u = 0,\ g = 9.8\ m/s,\ t = 5s$

(i) $h = ut + \frac{1}{2}gt^2$

$\Rightarrow h = 0 \times 5 + \frac{1}{2} \times 9.8 \times (5)^2$

$\Rightarrow 9.8 \times \frac{25}{2} = 122.5\ m.$

$\therefore$ It is 122.5 m.

(ii) Distance in last second :-

$S(t) = u + g/2(2t - 1)$ :

$\Rightarrow 0 + 1/2 \times 9.8 \times (2 \times 5 - 1)$

$\Rightarrow 44.1\ m$

3) A tennis ball is struck with a racket, firing it straight upward at 22 m/s. After how much time will it be falling at 15 m/s?

$\Rightarrow$ given :-

$u = 22\ m/s$, $v = 0$, $g = -9.8$

find $t$,

$\Rightarrow v = u + gt$,

$\Rightarrow 0 = 22 + (-9.8) \times t$

$0 = 22 - 9.8 \times t_1$

$9.8t = 22$

$t_1 = 2.24$ secs.

∴ This is case 1.

Case 2 :-

$u = 0,\ v = 15\ m/s,\ g = 9.8$

find $t_2$

$v = u + gt_2$

$15.0 + 9.8t_2$

$15 = 9.8\ t_2$

$t_2 = 1.53$ secs

∴ $t = t_2 + t_1 = 2.24 + 1.53$

$= 3.77 = 3.8$ secs.