H/W
4/07/21

Date
Page

Numericals

1) A ball is thrown upward with an initial velocity of 10.0 m/s from the top of a 50.0 m tall building.
   (a) with what velocity will the ball strike the ground?
   (b) How long does it takes the ball to strike ground?

Sol: (a) $y = -50\ m$ (displacement)
$v_0 = +10\ m/s$
to find (a) t and (b) v

(a) $v^2 = v_0^2 - 2gy = (+10.0\ m/s)^2 - 2(9.80\ m/s^2)(-50\ m)$
$= 1.08 \times 10^3\ m^2/s^2$
$v = \sqrt{1.08 \times 10^3\ m^2/s^2} = \pm 32.9\ m/s$

(b) $v = v_0 - gt$, we get

$$t = \frac{v_0 - v}{g} = \frac{(+10\ m/s) - (-32.9\ m/s)}{9.80\ m/s^2} = \frac{42.9\ m/s}{9.80\ m/s^2} = 4.38\ s.$$

02) A stone is dropped freely in the river from a bridge 71 takes 7s to touch the water surface in the river. calculate
(i) height of the bridge from water level.
(ii) the distance covered by stone in the last second ($g = 9.8\ m/s^2$)

Ans) given $u = 0$, $t = 5s$, $a = -10\ m/s^2$

$\Rightarrow -s = ut + \frac{1}{2}at^2 \Rightarrow -s = \frac{1}{2} \times -10 m/s^2 \times 5s^2$

$\Rightarrow -s = -5m \times 25$

$\Rightarrow -s = -125\ m \Rightarrow s = 125\ m$

(i) hence height of bridge is 125 m.

(ii) $u = 0$, $a = -10$, $s = 125$, find v

$v^2 = u^2 + 2as \Rightarrow v^2 = 2 \times -10 \times 125 \quad v^2 = 2500 \quad v = 50 m/s$

distance covered is 125 m.

Q3) 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?

Ans) $u = 22m/s \quad v = -15\ m/s \quad g = a = -10\ m/s^2$

$v = u + gt$

$t = \frac{v-u}{g} = \frac{-15\ m/s - 22\ m/s}{-10\ m/s^2}$

$= -3.7\frac{m}{s} \div -10\frac{m}{s^2} = 3.7\frac{m}{s} \times \frac{s^2}{10m} = 3.7s$

Ans = 3.7s.