Homework

(2) Given:- $y = -50.0\,m$ (displacement),
$v_0 = +10.0\,m/s$.
Find:- (a) t (b) v
The y in the kinematic equations stands for displacement from the launch point, not distance. When the ball strikes the ground, it will displace $-50.0\,m$, or $50\,m$ below the launch point.

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

So, $v = \sqrt{1.08 \times 10^3\,m^2/s^2} = \pm 32.9\,m/s$.
The positive answer is discarded since the ball is falling when it lands (moving downward).
Therefore, $v = -32.9\,m/s$

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

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

$$= \frac{42.9\,m/s}{9.80\,m/s^2} \rightarrow 4.38\,s$$

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(2) (i) Given,

Initial speed = u = 0 m/s

Time = t = 5sec.

Distance travelled = h m

From 2nd equation of motion :-

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

$= 0 \times t + \frac{1}{2} \times 9.8 \times 5 \times 5 h = 122.5 m$

∴ The height of the bridge from water level is 122.5m.

(ii) Distance travelled in 4sec.

$= \left(\frac{1}{2} \times 9.8 \times 4 \times 4\right) = 16 \times 4.9 = 78.4$ m.

Distance travelled in last second :-

= Distance travelled in 5 sec. - Distance travelled in 4sec. = 122.5 − 78.4 = 44.1m.

∴ The distance covered by stone in the last second is 44.1m.

(3) $v = 0$

$u = 19 m/s$

$a = g = -9.8$

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

distance = $(v^2 - u^2) / 2 \cdot a$

$s = \frac{(0 - 225)}{2 \times -9.8}$

$s = \frac{225}{19.6}$ = 11.48m.