Answer on Question #42670-Physics-Mechanics-Kinematics-Dynamics

A balloon is ascending vertically with an acceleration of 0.2m/s square .two stones are dropped from it at an interval of 2 sec. Find the distance between them 1.5 sec. After the second stone is released

Solution

$$t_1 = 2\ s, t_2 = 1.5\ s, a = 0.2\frac{m}{s^2}.$$

Let V be the velocity of the balloon when the first stone is dropped from A, the velocity of the balloon, when the second stone is dropped from B, is

$$V_1 = V + at_1 = V + 0.2 \cdot 2 = V + 0.4\frac{m}{s}.$$

Then

$$AB = Vt_1 + \frac{at_1^2}{2} = 2V + 0.2 \cdot \frac{2^2}{2} = 2V + 0.4\ m.$$

Both these particles will start moving upwards from A and B with these velocities V and V_1 respectively.

After 3.5 seconds when the first stone was dropped, i.e. 1.5 seconds when the second stone was dropped, let the two stones be at C and D respectively. Obviously D is above C and

$$AC = 3.5V - \frac{1}{2}g \cdot 3.5^2.$$

$$BD = 1.5V_1 - \frac{1}{2}g \cdot 1.5^2.$$

Distance between the two stones at this time

$$CD = AD - AC = (AB + BD) - AC = \left(2V + 0.4 + 1.5(V + 0.4) - \frac{1}{2}g \cdot 1.5^2\right) - \left(3.5V - \frac{1}{2}g \cdot 3.5^2\right)$$
$$= 1 + 5g = 50\ m.$$

Answer: 50 m.