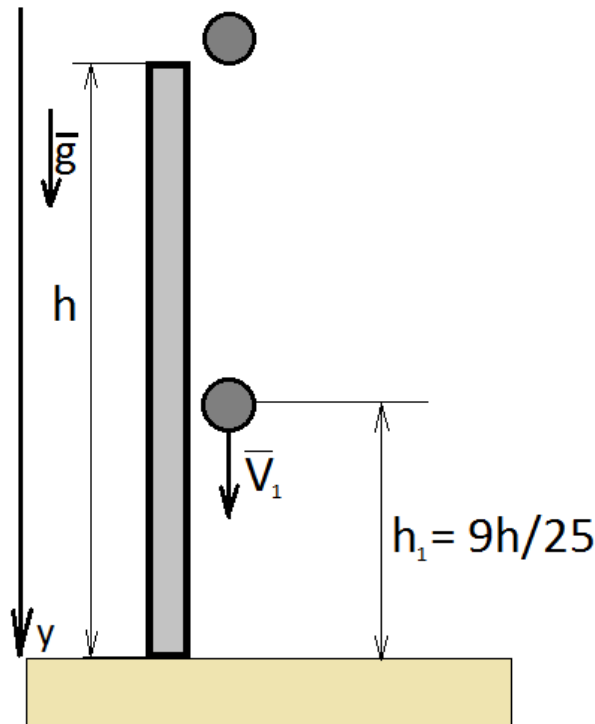


An object is dropped from a height h . During the last second of its journey the object travels a distance $9h/25$. Then, what is the value of 'h'?

Solution:

The equation of motion for the object on the path of all way:

$$h = \frac{gt^2}{2} \Rightarrow t = \sqrt{\frac{2h}{g}} \text{ (1) - time of the journey}$$



The equation of motion for an object that flies time $t - 1$ (after one second object will end movement):

$$h - h_1 = \frac{g(t-1)^2}{2}; h_1 = \frac{9}{25}h$$

$$h - \frac{9}{25}h = \frac{g(t-1)^2}{2}$$

$$\frac{16}{25}h = \frac{g(t-1)^2}{2}$$

$$\sqrt{\frac{16}{25}h} = \sqrt{\frac{g(t-1)^2}{2}}$$

$$\frac{4}{5}\sqrt{h} = \frac{\sqrt{g}(t-1)}{\sqrt{2}} \text{ (2)}$$

$$\text{(1) in (2): } \frac{4}{5}\sqrt{h} = \frac{\sqrt{g}\left(\sqrt{\frac{2h}{g}} - 1\right)}{\sqrt{2}}$$

$$4\sqrt{2}\sqrt{h} = 5(\sqrt{2h} - \sqrt{g})$$

$$\sqrt{h}(5\sqrt{2} - 4\sqrt{2}) = 5\sqrt{g}$$

$$\sqrt{h} = \frac{5\sqrt{g}}{\sqrt{2}} \Rightarrow h = \frac{5g}{2} = \frac{5 * 9.8 \frac{m}{sec^2}}{2} = 24.5m$$

Answer: $h = 24.5m$