

The water drops fall at regular intervals from a tap 5m above the ground. The third is leaving the tap at instant the first drop touches the ground. How far above the ground is the second drop at that instant? take $g=10$

Solution:

$H = 5\text{m}$ – tap height above the ground;

h – height of the second drop when first drop touches the ground;

t – interval of falls;

An equation of motion for the first drop:

$$H = \frac{g(t_1)^2}{2} = \frac{g(2t)^2}{2} = \frac{4t^2g}{2} = 2t^2g \quad (1)$$

An equation of motion for the second drop:

$$d = \frac{g(t_2)^2}{2} = \frac{g(t)^2}{2} = \frac{t^2g}{2} \quad (2)$$

(2) \div (1):

$$\frac{d}{H} = \frac{t^2g}{2} \cdot \frac{1}{2t^2g} = \frac{1}{4}$$

$$d = \frac{H}{4} = \frac{5\text{m}}{4} = 1.25\text{m} \Rightarrow h = H - d = 5\text{m} - 1.25\text{m} = 3.75\text{m}$$

Answer: height of the second drop when first drop touches the ground.

