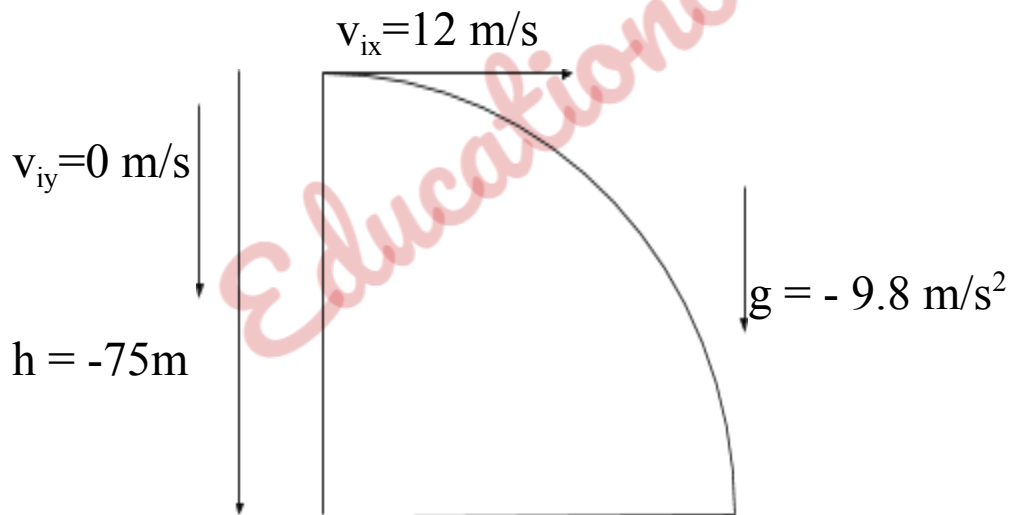A rock is projected horizontally from a cliff of height 75m with an initial velocity of 12 m/s. Calculate the time taken by the rock to strike the ground.

Given:

Displacement in the downward direction: $h = -75m$

Since the rock is projected horizontally:
Horizontal component of initial velocity: $v_{ix} = 12$ m/s

Vertical component of initial velocity : $v_{iy} = 0$ m/s

Acceleration is acceleration due to gravity in the downward direction: $g = -9.8$ m/s²

Determine: time taken by the rock to strike the ground: Δt

Use the equation of motion:

$$h = v_{iy}(\Delta t) + \tfrac{1}{2}(g)(\Delta t)^2 \text{ -------------}(1)$$

Substituting for h, v_{iy} and g in (1):

$$-75 = (0)(\Delta t) + \tfrac{1}{2}(-9.8)(\Delta t)^2$$

$$(\Delta t)^2 = -75*2 / (-9.8) = 150 / 9.$$

$$\Delta t = 3.9 \text{ s}$$