

**Question:** an object is thrown horizontally from a height of 20 m with velocity  $10 \frac{m}{s}$ . Find its velocity after 1 s ( $g = 10 \frac{m}{s^2}$ ).

**Solution:** the object is thrown horizontally, so it means that velocity is directed horizontally and has only the  $x$  component  $v_x$ . Since there is no force that acts on the object in this direction,  $v_x = v_0 = \text{constant}$ . The gravitational force is acting on the body in the  $y$  direction, so it is moving with constant acceleration  $g$ . In this case  $v_y = gt$ , because initial value in this direction  $v_{0y} = 0$ . Thus the total value of velocity at the time  $t$  is

$$v = \sqrt{v_x^2 + v_y^2} = \sqrt{v_0^2 + g^2 t^2} = \sqrt{10^2 + 10^2 \cdot 1^2} \cong 14 \frac{m}{s}$$

**Answer:**  $v = \sqrt{v_0^2 + g^2 t^2} = 14 \frac{m}{s}$ .