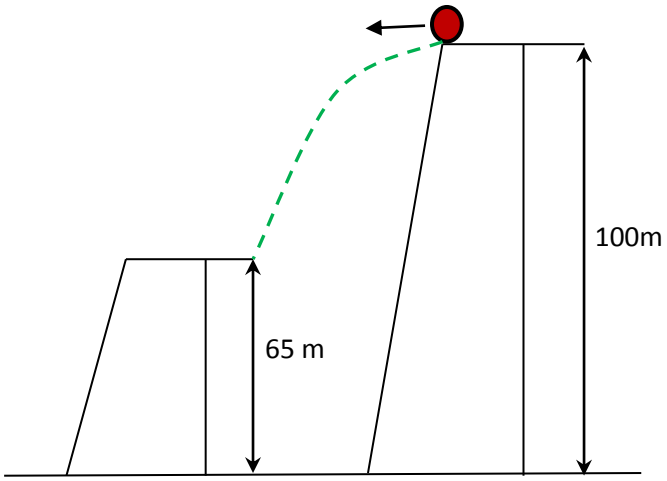
Answer Question #67975 – Physics – Mechanics – Relativity

Two cliffs are separated by a river in an attempt to get supplies from one cliff to the other they were launched from the 100m cliff with a speed of 70m/s. How fast will the supplies be moving when they arrive at the 65m cliff?

Solution.



Consider the motion separately in horizontal and vertical direction (the trajectory shown in figure). In horizontal direction the body is moving uniformly with speed $v_x = 70\frac{m}{s}$. In vertical direction the body is moving uniformly accelerated with acceleration$g = 9.8\frac{m}{s^2}$ downward. Therefore body height at an arbitrary time after the start of the fall, you can find as

$$h(t) = 100 - \frac{gt^2}{2}.$$

in this case the vertical component of velocity equal $v_y = gt$. According to the condition of the problem the height of the body is equal to 65m. Find t:

$$65 = 100 - \frac{9.8t^2}{2} \rightarrow t = \sqrt{\frac{2(100-65)}{9.8}} \approx 2.67s.$$

Respectively the horizontal and vertical components of velocity equal to

$v_x = 70\frac{m}{s}$ and $v_x = 9.8 \cdot 2.67\frac{m}{s} \approx 26\frac{m}{s}$

The speed of the body at this moment is equal to

$$v = \sqrt{v_x^2 + v_y^2} = \sqrt{70^2 + 26^2} \approx 74.7\frac{m}{s}$$

Answer. $v = 74.7\frac{m}{s}$.