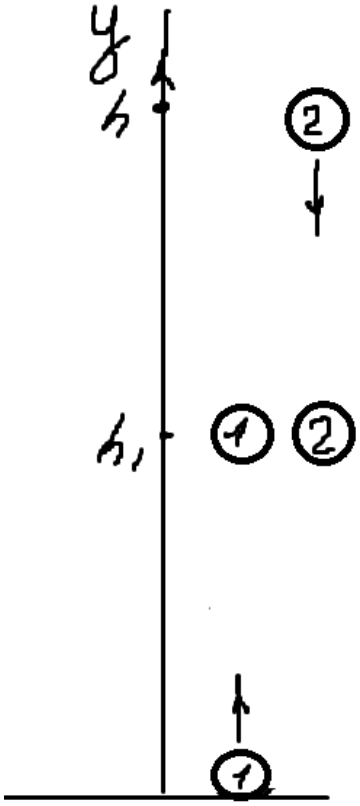
when a body is thrown up to the roof of the room from bottom, another body is thrown from roof to bottom, height of roof is 100 m. at what distance both the bodies meet each other?

Solution:



The general equation of motion for first body is:

$$\overrightarrow{r_1} = \overrightarrow{r_1^0} + \overrightarrow{v_1^0}t + \frac{\vec{a}t^2}{2}$$

The projection on the y-axis is given by

$$y_1 = v_1^0 t - \frac{gt^2}{2}$$

The general equation of motion for second body is:

$$\overrightarrow{r_2} = \overrightarrow{r_2^0} + \overrightarrow{v_2^0}t + \frac{\vec{a}t^2}{2}$$

The projection on the y-axis is given by

$$y_2 = h - v_2^0 t - \frac{gt^2}{2}$$

At the point of the meeting is necessary to equate the ordinate:

$$y_1 = y_2$$

We find the time when one body meets another body

So -> $v_1^0 t_m - \frac{gt_m{}^2}{2} = h - v_2^0 t_m - \frac{gt_m{}^2}{2} \rightarrow t_m = \frac{h}{v_1^0 + v_2^0}$

And the distance both the bodies meet each other:

$$y_m = h - v_2^0 \frac{h}{v_1^0 + v_2^0} - g\frac{\left(\frac{h}{v_1^0 + v_2^0}\right)^2}{2}$$

Answer:

$$y_m = h - v_2^0 \frac{h}{v_1^0 + v_2^0} - g\frac{\left(\frac{h}{v_1^0 + v_2^0}\right)^2}{2}$$