Question #79874, Physics / Other

A stone is dropped from a top a tower and one second later, a second stone is thrown vertically downward with a velocity 20m/s. The second stone will overtake the first after travelling a distance of

Solution

Write the displacement equations:

$$s_1 = \frac{1}{2}gt^2$$

$$s_2 = 20(t-1) + \frac{1}{2}g(t-1)^2$$

and

$$s_1 = s_2$$

$$20(t-1) + \frac{1}{2}g(1-2t) = 0$$

$$20t - 20 + 5 - 10t = 0$$

so

$$t = \frac{3}{2}\ s$$

Thus,

$$s_1 = \frac{1}{2}gt^2 = \frac{1}{2}10\left(\frac{3}{2}\right)^2 = 11.25\ m.$$

Answer: 11.25 m.