Answer on question #60489, Physics / Other

Question A ball which is thrown vertically upwards reaches the roof of a house 100 m high. At the moment this ball is thrown vertically upward, another ball is dropped from rest vertically downwards from the roof of the house. At which height will the balls pass each other? (g = 9.8 m/sec2)

Solution First we find initial velocity of the ball that is thrown upward. It can be found from the conservation energy law:

$$mv_0^/2 = mgh$$

$$v_0 = \sqrt{2gh} = \sqrt{2 \cdot 9.8 \cdot 100} \approx 44.3\, m/s$$

Now let us write down equation of relative motion of the two balls:

$$s = v_0 t - gt^2/2 + gt^2/2 = v_0 t$$

So, the time of passing is

$$t_1 = \frac{s}{v_0} = \frac{100}{44.3} \approx 2.26\, s$$

Hence, the height of the second ball will be

$$h = 100 - gt_1^2/2 = 100 - 9.8 \cdot 2.26^2/2 \approx 75\, m$$

So, answer is 75 m.