Answer on Question #68696 Physics / Mechanics / Relativity

From 100m high tower a ball is dropped and other ball is thrown vertically upward with the velocity of 50m per sec.
1:After what time the two balls will cross each other?
2:Calculate the time for both balls to hit the ground?

Solution:

1) The law of motion for the balls are

$$x_1 = h - \frac{gt^2}{2}$$

$$x_2 = v_{\text{initial}}t - \frac{gt^2}{2}$$

When two balls will cross each other

$$x_1 = x_2$$

So

$$h - \frac{gt^2}{2} = v_{\text{initial}}t - \frac{gt^2}{2}$$

$$t = \frac{h}{v_{\text{initial}}} = \frac{100}{50} = 2 \text{ s}.$$

2) When ball to hit the ground

$$x_1 = 0 \text{ and } x_2 = 0.$$

Thus

$$t_1 = \sqrt{\frac{2h}{g}} = \sqrt{\frac{2\times100}{9.8}} = 4.5 \text{ s}$$

$$t_2 = \frac{2v_{\text{initial}}}{g} = \frac{2\times50}{9.8} = 10.2 \text{ s}$$

Answers:

(1) 2 s;

(2) 4.5 s, 10.2 s.