Nc
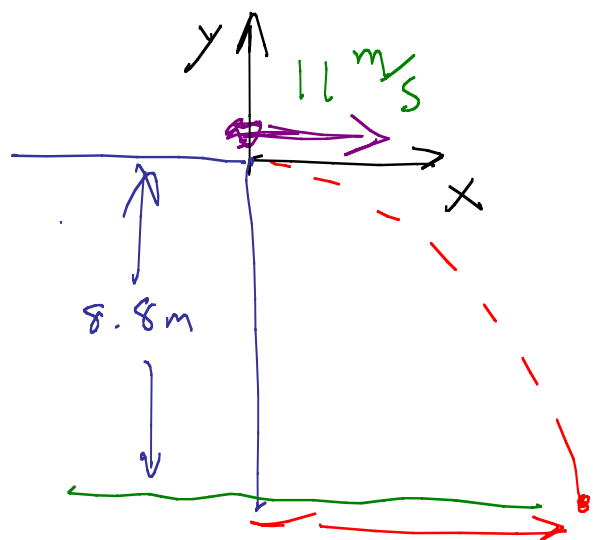
A carpenter tosses a shingle horizontally off an 8.8–m high roof at $11\,\frac{m}{s}$. (a) How long does it take the shingle to reach the ground? (b) How far does it move horizontally?

a) Hits when $y = -8.8\,m$ $V_{yo} = 0$

$$y = y_0 + V_{yo}t + \tfrac{1}{2}a_y t^2 \qquad V_{xo} = 11\,\tfrac{m}{s}$$

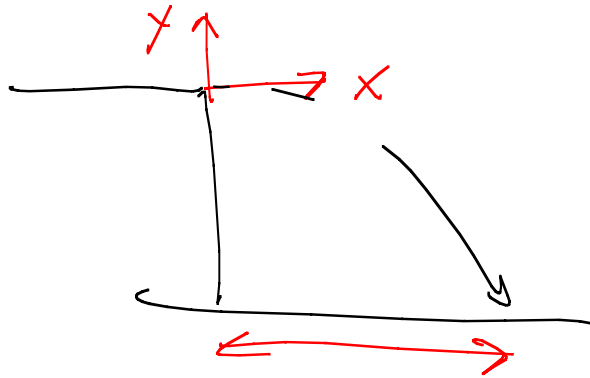$$-8.8\,m = 0 + 0t + \tfrac{1}{2}\left(-9.8\,\tfrac{m}{s^2}\right)t^2$$

$$8.8\,m = \tfrac{1}{2}\,9.8\,\tfrac{m}{s^2}\,t^2 \qquad \text{Take sq. root}$$

$$t^2 = \frac{2(8.8\,m)}{\left(9.8\,\tfrac{m}{s^2}\right)} = 1.80\,s^2 \qquad t = 1.34\,s$$

$$= \boxed{1.3\,s}$$

b)

Time when it hits is
$$t = 1.34 \, s$$

What is x at $t = 1.34 \, s$?

$$x = x_0 + v_{x_0} t + \tfrac{1}{2} a_x t^2$$

$$= 0 + (11 \tfrac{m}{s}) t + \tfrac{1}{2} 0 \, t^2 \qquad a_x = 0$$

Plug in $t = 1.34 \, s$

$$x = (11 \tfrac{m}{s})(1.34 \, s) = 14.7 m \boxed{= 15 m}$$