In an attempt to score a goal in soccer, a forward launches a kick 30.0 m in front of the goal with a launch velocity of 18.0 m/s making an angle of 37.0° above the horizontal. The goal bar is 2.44 m above the ground.

A. [10 pts.] How long does it take for the ball to reach the goal after being kicked?

\[ V_0 = 18.0 \text{ m/s} \]
\[ \theta = 37.0° \]
\[ V_{0x} = V_0 \cos \theta = 14.4 \text{ m/s} \]
\[ V_{0y} = V_0 \sin \theta = 10.8 \text{ m/s} \]
\[ x = x_0 + V_{0x} t \]
\[ x = 30.0 \text{ m} \]
\[ t = \frac{x}{V_{0x}} = \frac{30.0 \text{ m}}{14.4 \text{ m/s}} \approx 2.08 \text{ s} \]

B. [10 pts.] How high above the ground is the ball when it crosses the goal line?

\[ a = -9.8 \text{ m/s}^2 \]
\[ y_0 = 0 \]
\[ y_0 = y_0 + V_{0y} t + \frac{1}{2} a_y t^2 \]
\[ y = (10.8 \text{ m/s})(2.08 \text{ s}) + (-9.8 \text{ m/s}^2)(2.08 \text{ s})^2 \]
\[ y = 1.26 \text{ m} \]

C. [15 pts.] What is the speed of the ball at the instant the ball crosses the goal line?

\[ V_x = 14.4 \text{ m/s} \]
\[ V_y = V_{0y} + a_y t \]
\[ V_y = 10.8 \text{ m/s} - 9.8 \text{ m/s}^2 (2.08 \text{ s}) \]
\[ V_y = -9.58 \text{ m/s} \]
\[ V = \sqrt{V_x^2 + V_y^2} = \sqrt{(14.4 \text{ m/s})^2 + (-9.58 \text{ m/s})^2} \]
\[ V = 17.3 \text{ m/s} \]