1) a football team plans for a field goal from the 45m line. crossbar is 3m above and it must clear it to be counted. he strikes it off the ground at a velocity of 25m/s (30*)

A) will it clear the crossbar, explain?

B) what was the velocity when it pasts the post?

Solution:
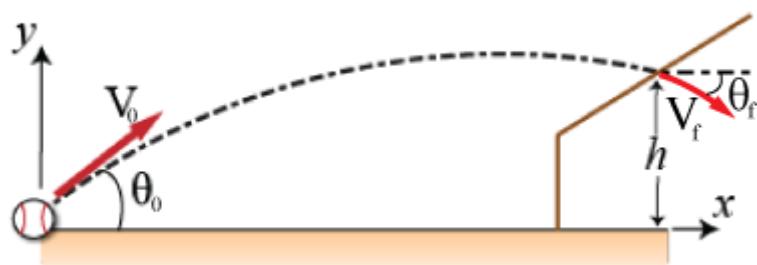
Neglecting air resistance, the projectile is subject to a constant acceleration g=9.81 m/s², due to gravity, which is directed vertically downwards.

We use x-y coordinates with origin at the release point.

A)

For x coordinate:

$$[x = x_0 + (v_x)_0 t]$$
$$45 = 0 + (25 \cos 30°)t$$

We now find the flight time

$$t = \frac{45}{25 \cos 30°} = 2.078 \text{ s}$$

For y coordinate:

$$\left[y = y_0 + (v_y)_0 t - \frac{1}{2}gt^2\right]$$

$$y = 0 + (25 \sin 30°) \times 2.078 - \frac{9.81}{2}(2.078)^2 = 4.8 \text{ m}$$

The ball will clear the crossbar, because $y > h$.

B)

The kinematic equation that describes an object's motion in vertical direction is:

$$v_y = v_{oy} - gt = (25 \sin 30°) - 9.81 \cdot 2.078 = -7.9 \text{ m/s}$$

The horizontal component of velocity is $25 \cos 30° = 21.65 \text{ m/s}$ m/s and the vertical component of velocity is -7.9 m/s.

The final speed is

$$v_f = \sqrt{v_x^2 + v_y^2} = \sqrt{21.65^2 + 7.9^2} \approx 23.0 \text{ m/s}$$

Answer: A) The ball will clear the crossbar, because $4.8 \text{ m} > 3 \text{ m}$;

B) 23.0 m/s.

Answer provided by https://www.AssignmentExpert.com