Answer on Question #70473-Physics-Other

An agitated llama may spit to assert dominance, or to ward off threats. Llamas can spit a considerable distance, and people handling them need to keep this in mind.

If the spittle from a llama is launched from an initial height of 1.7 m with a speed of 6.4 m/s, and at an angle of 13 degrees above horizontal, how far will it travel horizontally?

Solution

The vertical equation of motion of projectile is

$$y = y_0 + v_0 \sin \theta \, t - \frac{gt^2}{2}.$$

On the ground:

$$y = 0 = y_0 + v_0 \sin \theta \, t - \frac{gt^2}{2}$$

$$1.7 + 6.4 \sin 13 \, t - \frac{(9.8)t^2}{2} = 0$$

$$t = 0.754 \, s.$$

The other root of quadratic equation ($t = -0.46 \, s$) is impossible.

The horizontal equation of motion of projectile is

$$x = v_0 \cos \theta \, t.$$

$$x = 6.4 \cos 13 \, (0.754) = 4.7 \, m.$$

Answer: $4.7 \, m$.