Answer on Question #69386, Physics / Mechanics | Relativity

In the javelin throw at a track-and-field event, the javelin is launched at a speed of 33.0 m/s at an angle of 34.0 ° above the horizontal. As the javelin travels upward, its velocity points above the horizontal at an angle that decreases as time passes. How much time is required for the angle to be reduced from 34.0 ° at launch to 10.5 °?

Solution:

The horizontal speed remains constant,

$$v_x = v_0 \cos\theta_0 = 33.0 \cos 34° = 27.36\ m/s$$

Vertical speed is

$$v_y = v_{y0} - gt = 33.0 \sin 34° - 9.8t = 18.45 - 9.8t$$

$$\tan\theta = \frac{v_y}{v_x} = \frac{18.45 - 9.8t}{27.36}$$

$$9.8t = 8.45 - 27.36 \tan 10.5°$$

So, time is

$$t = \frac{8.45 - 27.36 \tan 10.5°}{9.8} = 0.3448 \approx 0.345\ s$$

Answer: $0.345\ s$