

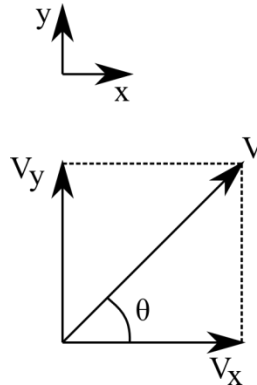
### Answer on Question 63145, Physics, Mechanics

#### Question:

At takeoff, the horizontal and vertical velocities of a high jumper are  $2.0$  and  $3.9 \text{ m/s}$ , respectively. What are the resultant velocity and angle of takeoff?

#### Solution:

Here's the sketch of our task:



Here,  $v$  is the resultant velocity of the high jumper;  $v_x$ ,  $v_y$  are the projections of the resultant velocity of the high jumper on axis  $x$  and  $y$ , respectively;  $\theta$  is the angle of takeoff.

a) We can find the resultant velocity from the Pythagorean theorem:

$$v = \sqrt{v_x^2 + v_y^2} = \sqrt{\left(2.0 \frac{\text{m}}{\text{s}}\right)^2 + \left(3.9 \frac{\text{m}}{\text{s}}\right)^2} = 4.38 \frac{\text{m}}{\text{s}}.$$

b) We can find the angle of takeoff from the triangle:

$$\tan \theta = \frac{v_y}{v_x},$$
$$\theta = \tan^{-1} \left( \frac{v_y}{v_x} \right) = \tan^{-1} \left( \frac{3.9 \text{ m/s}}{2.0 \text{ m/s}} \right) = 62.8^\circ.$$

#### Answer:

a)  $v = 4.38 \text{ m/s}$

b)  $\theta = 62.8^\circ$ .