A stone is thrown from ground level at 79 m/s. Its speed when it reaches its highest point is 60 m/s.
Find the angle, above the horizontal, of the stone's initial velocity.
Answer in units of ◦

Solution:

$V_0 = 79\frac{m}{s} -$ initial velocity of the stone;

$V_1 = 60\frac{m}{s} -$ velosity at the highest point;

$\alpha -$ angle, above the horizontal, of the stone's initial velocity;

During flight, acceleration of gravity is directed along the Y-axis, so the horizontal component of velocity does not change. horizontal component from the right triangle ABC:

$$\Delta ABC: \cos\alpha = \frac{V_x}{V_0}$$

$$V_x = V_0 \cdot \cos\alpha \qquad (1)$$

When the stone is located at the top of the trajectory (highest point), the vertical component of the velocity is zero, then all speed - is the horizontal component.

$$V_1 = V_x \qquad (2)$$

$(2)in(1)$:

$$V_1 = V_0 \cdot \cos\alpha$$

$$\cos\alpha = \frac{V_1}{V_0}$$

$$\alpha = \arccos\left(\frac{V_1}{V_0}\right) = \arccos\left(\frac{60\frac{m}{s}}{79\frac{m}{s}}\right) = 41°$$

Answer: angle, above the horizontal, of the stone's initial velocity is $41°$.