

EXAM 2

Name: _____

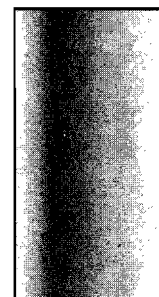
Student ID #: _____

TA (circle one): Golda Kamdem Matthew Michael Paul

A vandal hurls a small rock at an initial speed of $v_0 = 23.0$ m/s at an angle $\theta = 40.0^\circ$ above the horizontal. The vandal is standing at a distance of 30.0 m from the building.

$$v_{0x} = v_0 \cos 40^\circ = 17.6 \text{ m/s}$$

$$v_{0y} = v_0 \sin 40^\circ = 14.8 \text{ m/s}$$



A. [10 pts.] At what vertical distance above the point where the rock leaves the vandal's hand does it strike the left wall of the building?

x-DATA

$$x_0 = 0$$

$$x = 30.0 \text{ m}$$

$$v_{0x} = 17.6 \text{ m/s}$$

$$v_x = 17.6 \text{ m/s}$$

$$a_x = 0$$

$$t = ?$$

y-DATA

$$y_0 = 0$$

$$y = ?$$

$$v_{0y} = 14.8 \text{ m/s}$$

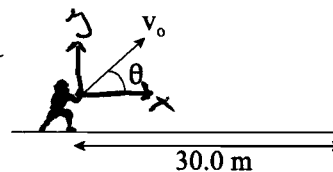
$$v_y = ?$$

$$a_y = -9.8 \text{ m/s}^2$$

$$x = x_0 + v_{0x}t + \frac{1}{2}a_x t^2$$

$$30 \text{ m} = (17.6 \text{ m/s})t$$

$$t = \frac{30 \text{ m}}{17.6 \text{ m/s}} = 1.70 \text{ s}$$



$$y = y_0 + v_{0y}t + \frac{1}{2}a_y t^2$$

$$= 0 + (14.8 \text{ m/s})(1.70 \text{ s}) + (-4.9 \text{ m/s}^2)(1.70 \text{ s})^2$$

$$y = 11.0 \text{ m}$$

B. [10 pts.] What is the speed of the rock just before striking the building?

$$v_x = v_{0x} = 17.6 \text{ m/s}$$

$$v_y = v_{0y} + a_y t = 14.8 \text{ m/s} + (-9.8 \text{ m/s}^2)(1.70 \text{ s})$$

$$v_y = -1.86 \text{ m/s}$$

$$v = \sqrt{v_x^2 + v_y^2} = \sqrt{(17.6 \text{ m/s})^2 + (-1.86 \text{ m/s})^2}$$

$$v = 17.7 \text{ m/s}$$

C. [2 pts.] Is the rock on the way up or on the way down when it hits the building?

SINCE $v_y = -1.86 \text{ m/s}$, ROCK IS ON THE WAY DOWN.