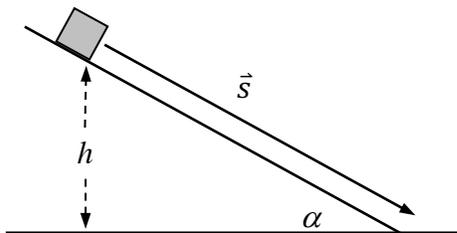

PHYS 1210 Worksheet. Work

1. A block of mass m is released from rest on a frictionless ramp at an angle α and height h . The block slides down the ramp, along a displacement vector \vec{s} ending at the bottom of the ramp. The forces acting on the block are its weight \vec{w} and the normal force \vec{N} .



- A. Next to the diagram of the block on the ramp, draw a free-body diagram for the block.
- B. Find a formula for s , the magnitude of \vec{s} , in terms of h and α .
- C. Find a formula for x , the horizontal component of \vec{s} , also in terms of h and α .
- D. Analyze the system using both inclined (parallel and perpendicular to the ramp) and plumb (vertical and horizontal) coordinates. For each set of coordinates, find the x - and y -components of the indicated vectors.

Inclined coordinates

Plumb coordinates

$$w_x =$$

$$w_x =$$

$$w_y =$$

$$w_y =$$

$$N_x =$$

$$N_x =$$

$$N_y =$$

$$N_y =$$

$$\Sigma F_x =$$

$$\Sigma F_x =$$

$$\Sigma F_y =$$

$$\Sigma F_y =$$

$$s_x =$$

$$s_x =$$

$$s_y =$$

$$s_y =$$

E. Find the indicated dot products from the vector components.

Inclined coordinates

Plumb coordinates

$$\vec{w} \cdot \vec{s} =$$

$$\vec{w} \cdot \vec{s} =$$

$$\vec{N} \cdot \vec{s} =$$

$$\vec{N} \cdot \vec{s} =$$

$$\Sigma \vec{F} \cdot \vec{s} =$$

$$\Sigma \vec{F} \cdot \vec{s} =$$

2. Your cousin Throckmorton, $m = 20$ kg, plays on a $R = 1.5$ -m swing. He swings from an angle $\theta = \pi/6$ from vertical down to $\theta = 0$ (vertical).

a. What is the net force on Throcky as a function of θ ?

b. How far (total path length) does he travel?

c. Set up the integral for the total work done on him.

d. Evaluate the integral.

e. Is the result $mg\Delta y$? Should it be?