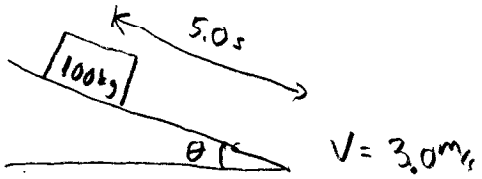
Problem A

Context-Rich Problems: Solutions Outline

FOCUS the PROBLEM

Draw a picture of the situation including ALL the information given in the problem.



Question(s): What is the problem asking you to find?

What angle gives a final speed of 3.0 m/s

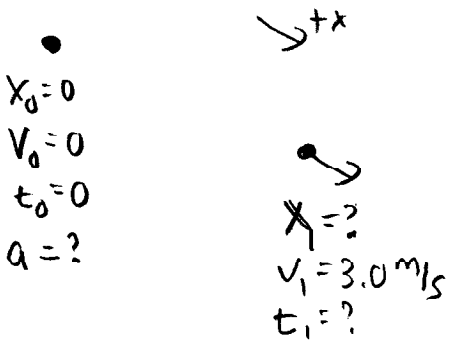
Approach: Outline the approach you will use.

Use kinematic equations to get acceleration, and Newton's second law to Figure out Force. Chose x axis along slope

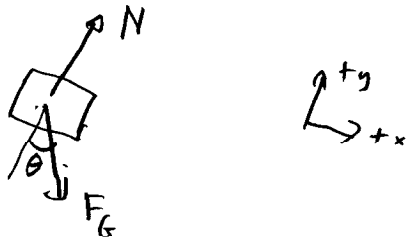
DESCRIBE the PHYSICS

Draw physics diagram(s) and define ALL quantities uniquely.

Kinematics



Dynamics



Which of your defined quantities is your Target variable(s)? θ

Quantitative Relationships: Write equations you will use to solve this problem.

$\Sigma \vec{F} = m\vec{a}$ $\quad v_1 = v_0 + a(t_1 - t_0)$

PLAN the SOLUTION

Construct Specific Equations (Same Number as Unknowns)

$\Sigma F_x = ma$ UNKNOWNS

$F_g \sin\theta = ma$

$mg\sin\theta = ma$

$a = g\sin\theta$ (1) $\boxed{a, \theta}$

Find a

$V_1 = V_0 + a(t_1 - t_0)$

$V_1 = at_1$

$a = V_1/t_1$ (2)

Plug (2) in (1)

$\frac{V_1}{t_1} = g\sin\theta$

$\boxed{\theta = \sin^{-1}\frac{V_1}{t_1 g}}$

Check Units

$\sin^{-1}\dfrac{\frac{[L]}{[T]}}{(T)\frac{(L)}{(T)^2}} =$ No Units

OK

EXECUTE the PLAN

Calculate Target Quantity(ies)

$\theta = \sin^{-1}\dfrac{3.0\ m/s}{(5.0s)(9.8\ m/s^2)} = 3.5^\circ$

EVALUATE the ANSWER

Is Answer Properly Stated?

Yes

Is Answer Unreasonable?

Yes, 5 seconds is quite long, and 3.0 m/s is slow, so it should be a small angle

Is Answer Complete?

Yes

(extra space if needed)