

A picture containing text, businesscard, envelope

Description automatically generated

**GAME2005 – Game Physics Assignment 2**

**Friction, Ramps, and Forces**

10.14.2021

**─**

Samuel Beaudoin 100883341 & Ethan Dolman 101302124

**Overview**

Consider a metal loot crate, at the top of a frictionless ramp. If the mass of the loot crate is 12.8kg and the ramp has a rise of 3m and a run of 4m, then compute the following.

a) Compute the free body diagram of the loot crate a time 0. (i.e. when the loot crate is at the top of the ramp.)

b) Compute the net force and the acceleration of the loot crate at time 0. Given the frictionless surface what do we know about the acceleration as the object moves down the ramp?

c) Consider the loot crate as it leaves the ramp and moves onto a flat surface that now has some friction. Compute the free body diagram for this situation. If coefficient of kinetic friction is 0.42 (steel on steel), calculate the new net force and acceleration.

d) If we assume that the force of friction is constant after this point, how long will it take for the loot crate to stop moving? At what distance in meters will the loot crate stop?

**Initial Findings**

1. Our ramp is frictionless
2. Mass of crate is 12.8kg
3. Our ramp is the shape of a Pythagorean Triple, with lengths 3, 4, 5
4. The ground after the ramp has a coefficient of kinetic friction equaling 0.42

**a) Fancy Picture**

A picture containing text, antenna

Description automatically generated

**b) Computing Force and Acceleration**

First let’s find the easy stuff.

Angles: or X =

With our angle we can now find the acceleration.

Since our normal force cancels out the force in the Y direction all that’s left for Net Force is to find the force in the X direction

**c) New Net Force and Acceleration**

**c - 1) Free body diagram (Fancy Picture V2)**

Chart, box and whisker chart

Description automatically generated

Once the crate hits the ground the forces and acceleration affecting or crate start acting against the current velocities

First, Acceleration :

Then Force :

**d) How Long / Far Will It Slide?**

First we will need the find the velocity of the crate when it first comes in contact with the ground. We can find this by calculating the time it takes for the box to slide the 5m hypotenuse

With time we can find the final Velocity at the end of the ramp:

Now that we have an Initial Velocity for the crate while on the ground that has friction, we can find the time it takes to stop:

With Initial Velocity, Time, and Acceleration we can find the displacement:

m