PH211 General Physics with Calculus
## Homework 5
Instructor: MacKenzie Lenz

Due 7/25/19 @ 11:59 pm

1. **Problem 1:** 3rd Law Pair

Two blocks are pushed to the right so that they move together with increasing speed. Block B remains at the height shown. Ignore friction between the ground and block A but not between block A and block B. The mass of block A is $10kg$ and the mass of block B is $2kg$. System S consists of both blocks A and B. (Use $g = 10m/s^2$.)
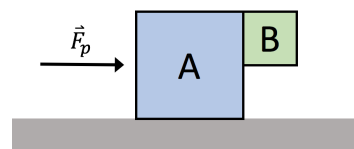
   (a) Draw and label a free body diagram for each block. Mark all forces that are Newtons 3rd Law pairs.

   (b) Calculate the magnitude of the force exerted on block A by the ground. Show all steps in your problem-solving process.

Suppose the friction between the two blocks is reduced so that block B slides down as the blocks move to the right. The downward component of the acceleration of block B is $1m/s^2$.

   (c) Draw and label a free body diagram for each block. Mark all forces that are Newton's 3rd Law pairs.

   (d) *Sensemaking:* Is the magnitude of the force exerted on block A by the ground in this case greater than, less than, or equal to the force exerted on block A by the ground in part B? Explain your reasoning.

   (e) Calculate the magnitude of the force exerted on block A by the ground. Show all steps in your problem-solving process.

2. **Problem 2:** Pulleys

The $10.2kg$ block in the figure below is held in place by a force applied to a rope passing over two massless, frictionless pulleys. Find the tensions T_1 to T_5 and the magnitude of force F.
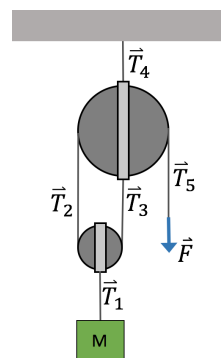
   (a) Draw a Free Body Diagram for the block, the small pulley, and the large pulley.

   (b) Find T_1.

   (c) Find T_5.

   (d) Find F.

   (e) Do some *Sensemaking* about your answers.