FORCES SUMMARY

Unit 2: Forces

October 26, 2016

CHAPTER 3 NEWTON'S LAWS OF MOTION

- What is a force?
- 4 Fundamental forces
- Types of forces
- FBD's
- Newton's 1st Law of Motion
- Newton's 2nd Law of Motion
- Newton's 3rd Law of Motion

CHAPTER 4 APPLICATION OF FORCES

- Force of gravity
- Mass vs. Weight
- Friction
  - Static Friction
  - Kinetic Friction

SOME THINGS TO KEEP IN MIND !!

- The only force that can make an object accelerate is a ????
- If you have a situation where 2 objects are connected and both are moving you must set the direction of motion as positive for each object (the big problem we did yesterday)
- If 2 objects are connected they must accelerate at _____.
- If 2 objects are connected by a string, rope, cable, etc., the

PG. 177 #1

1. A 0.170 kg hockey puck is initially moving at 21.2 m/s [W] along the ice. The coefficient of kinetic friction for the puck and the ice is 0.005. T/I
   (a) What is the speed of the puck after travelling 58.5 m? [ans: 21.1 m/s]
   (b) After being played on for a while, the ice becomes rougher and the coefficient of kinetic friction increases to 0.047. How far will the puck travel if its initial and final speeds are the same as before? [ans: 6.24 m]

PG. 177 #2

2. A snowmobile is used to pull two sleds across the ice. The mass of the snowmobile and the rider is 320 kg. The mass of the first sled behind the snowmobile is 120 kg and the mass of the second sled is 140 kg. The ground exerts a force of 1500 N [forward] on the snowmobile. The coefficient of kinetic friction for the sleds on ice is 0.15. Assume that no other frictional forces act on the snowmobile. Calculate the acceleration of the snowmobile and sleds. T/I C [ans: 1.9 m/s^2 [forward]]

PG. 177 #4

4. An electric motor is used to pull a 125 kg box across a floor using a long cable. The tension in the cable is 350 N and the box accelerates at 1.2 m/s^2 [forward] for 5.0 s. The cable breaks and the box slows down and stops. T/I C
   (a) Calculate the coefficient of kinetic friction. [ans: 0.16]
   (b) How far does the box travel up to the moment the cable breaks? [ans: 15 m]
   (c) How far does the box travel from the moment the cable breaks until it stops? [ans: 11 m]

PG. 178 #2

2. In an action movie, an actor is lying on an ice shelf and holding onto a rope. The rope hangs over a cliff to another actor who is hanging on in midair. The actor on the ice shelf has a mass of 55 kg and the actor hanging in midair has a mass of 78 kg. Neither actor can grab onto anything to help stop their motion, yet in the movie neither one is moving. T/I A
   (a) Calculate the minimum coefficient of static friction.
   (b) Is your answer to (a) reasonable considering that the surface is ice? Explain.
   (c) What could the director do to make the scene more realistic? Explain your reasoning.

PG. 178 #3

3. In a physics experiment on static friction, two objects made of identical material are tied together with string. The first object has a mass of 5.0 kg and the second object has a mass of 3.0 kg. Students measure the maximum force of static friction as 31.4 N to move both objects across a horizontal surface. T/I
   (a) What is the coefficient of static friction?
   (b) What is the magnitude of the tension in the string if they pull on the first object?
   (c) A student pushes the 3.0 kg object with a force of 15.0 [down]. What are the magnitudes of the maximum force of static friction and the tension now?
   (d) Will your answers to (c) change if the student pushes down on the 5.0 kg object instead? Explain.

PG. 178 #4

4. A student puts a 0.80 kg book against a vertical wall and pushes on the book toward the wall with a force of 26 N [R]. The book does not move. T/I
   (a) Calculate the minimum coefficient of static friction.
   (b) Describe two ways the student could make the book accelerate down without changing the applied force.

PG. 178 #5

5. A string is tied to a 4.4 kg block and a 120 g hanging bucket (**Figure 13**). Students add 20 g washers one at a time to the bucket. The students are unaware that the coefficient of static friction for the block on the table is 0.42. T/I
   (a) What is the maximum force of static friction for the block?
   (b) How many washers can the students add to the bucket without moving the block?
   (c) Will this investigation yield an accurate result if they use it to find the coefficient of static friction? Explain your reasoning.
   (d) The coefficient of kinetic friction is 0.34. Calculate the acceleration of the block when the final washer is placed in the bucket and the objects start to move.

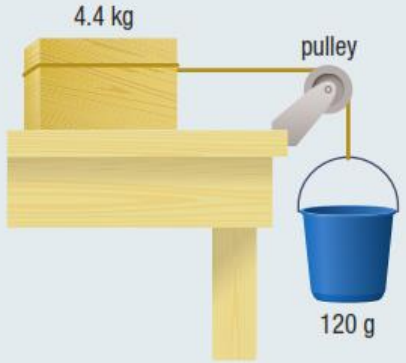

Figure 13

REMINDERS

- Quiz tomorrow (Thursday) – there will be no pulley question
- Unit Test – Monday, October 31
- Read Sections 4.4 and 4.5 (pages 179 – 188)
  - Fair game for MC questions on test
- A few questions to prepare for quiz
  - Pg. 200 # 34, 36-38
- Test prep