General Physics
Physics 101
Test #2 – Fall 2012
Friday 10/26/12
Prof. Bob Ekey

Name (print):_____

I hereby declare upon my word of honor that I have neither given nor received unauthorized help on this work.

Signature:_____

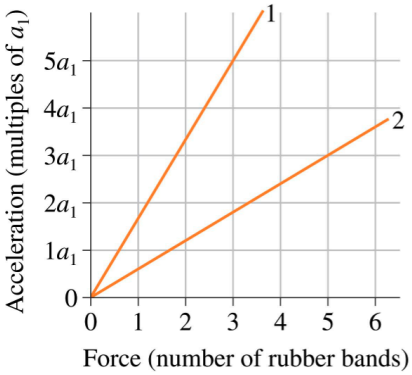
Part I. Multiple Choice (3 pts each)

Instructions:

Please clearly circle one and only one answer for each of the following.
Show all of your work. Partial credit may be given if you include your work.

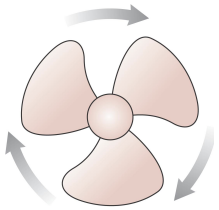
Questions:

1. For the following acceleration vs. force graph, which mass is the smallest?



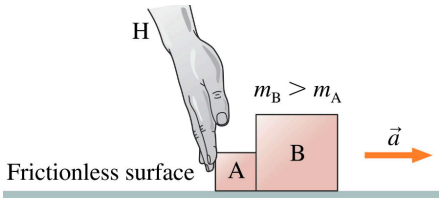
(a) mass 1.
(b) mass 2.
(c) they are equal.
(d) need more information.

2. The fan blade shown is slowing down. What are the signs of ω and α?

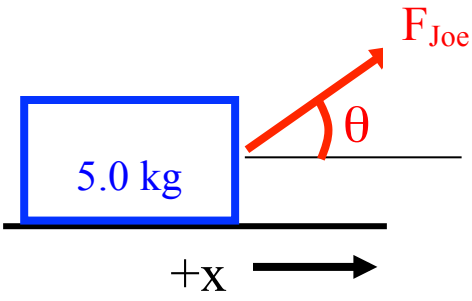


(a) ω is positive and α is positive.
(b) ω is positive and α is negative.
(c) ω is negative and α is positive.
(d) ω is negative and α is negative.

3. Two blocks with masses m_A=5.00 kg and m_B = 10.0 kg are pushed on a frictionless surface with a force of 15.0 N as shown. Determine the net force (mag & dir) acting on mass A.



(a) 15.0 N
(b) -10.0 N
(c) – 5.00 N
(d) +5.00 N



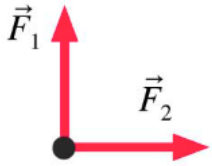
4. Joe is sliding a 5.0 kg box across the floor and the box is moving with a constant velocity. Joe is pulling with a force with components of 15N in the y-direction and 26 N in the x-direction. What is coefficient of kinetic friction?

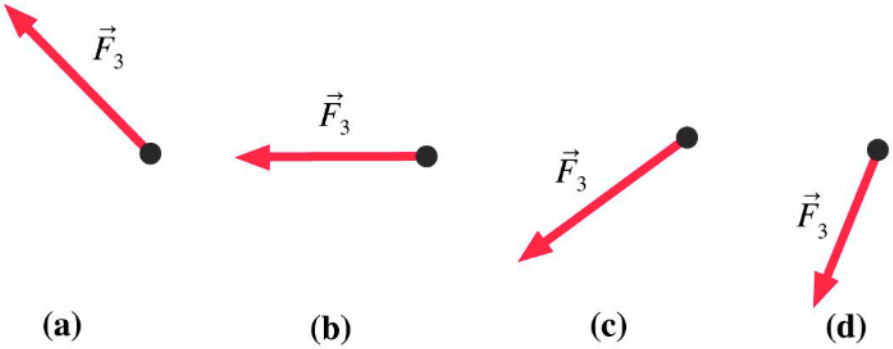
(a) $\mu_k = 0.31$
(b) $\mu_k = 0.76$
(c) $\mu_s = 0.53$
(d) $\mu_k = 0.44$ N

5. Spinning a basketball on your finger requires spinning the ball through a half-revolution from rest to an angular speed of 5.0 rad/s. What angular acceleration did you apply to the ball to make the ball spin?

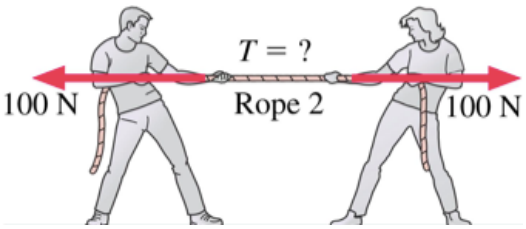
(a) 3.978 m/s^2
(b) 0.80 rad/s^2
(c) 4.0 rad/s^2
(d) 25 rev/s^2

6. Two of three forces are shown. If the net force points to the right, which vector could represent the third force?





7. Two people are playing tug-of-war, and are presently at a stand-still. What is the tension in the rope? Ignore the mass of the rope, and assume it is equally stretched.



(a) 200 N
(b) 100 N
(c) -200 N
(d) 0 N

8. A block pushed along the floor with velocity, *v*, slides a distance, d, after the pushing force is removed. What initial velocity is necessary, if you want the block to travel a distance of 2d before stopping?

(a) $2v$
(b) $4v$
(c) $\frac{1}{4}v$
(d) $\sqrt{2}v$

9. A 50.0 kg box hangs from a rope. What is the tension in the rope if the box has v_y=2.50 m/s and is slowing down at 5.00 m/s^2?

(a) 240 N
(b) 740 N
(c) 490 N
(d) 2.5 x 10^2 N

10. Riding a Ferris wheel, you estimate the radius of the big wheel to be 15 m and you time that each loop around takes 25 s, when traveling at a constant angular speed. What magnitude of acceleration do you experience as you ride the wheel?

(a) 3.8 m/s^2
(b) 0.0 m/s
(c) 0.95 m/s^2
(d) 0.25 rad/s^2

11. An explosion occurs, and an object is split into two pieces one that has a larger mass than the other. During the explosion which block experiences a bigger magnitude of acceleration?

(a) They experience the same magnitude.
(b) The smaller piece.
(c) The larger piece.
(d) Need more information.

12. A 2.0 kg wooden block is launched up a wooden ramp that is inclined at a 30º angle. The block's initial speed is +10 m/s. What net force does the block experience as it travels up the ramp? Define up the ramp as the positive direction.

(a) – 13 N
(b) 9.8 N
(c) – 1.3 N
(d) – 6.4 N

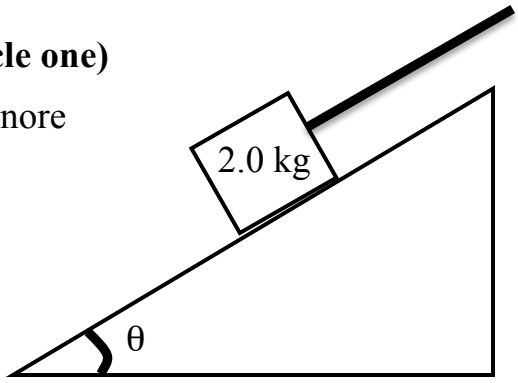
Part II. Short answer problems (12 pts each)

Instructions:

Solve three of the following four problems. If you try to solve all four problems, please clearly indicate which problems you wish to have graded. If you do not indicate this, I will assume you want me to grade problems one, two and three.

Please show all of your work, including equations without numbers.
Please provide units with all answers.
Partial credit may be given if you include your work.

Question 1. **Grade this problem? Yes or No (circle one)**



You are pulling a 2.0 kg box up a 30º "slippery" incline (ignore friction). Your pull force is parallel to the ramp. The box accelerates at 1.0 m/s^2 up the ramp.

(a) What is the net force acting upon the box (mag + dir)?

(b) What is the magnitude of the force that you are pulling up the ramp?

(c) The incline angle is changed and you are pulling with the same force, but the box is now motionless. What is the angle of the incline?

(d) Unfortunately, you let go of the box and it slides down the ramp colliding with a mirror waiting to be brought up the ramp. The mirror is destroyed, but the box is intact. From this result, which was greater in magnitude, the force of the box on the mirror or the force of the mirror on the box? Please justify and explain your answer.

Question 2. **Grade this problem? Yes or No (circle one)**

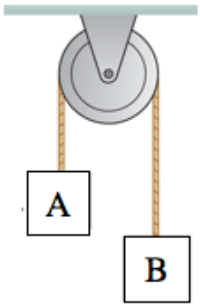
I was riding the "Conservation Carousel" at the Akron Zoo with my son, and thought, "hey, this is some good circular motion". My son sat on the penguin, which was on the outer track, approximately 5.0 m from the axis of rotation. When at "operational speed" the period of the rotation was 15 seconds, which corresponds to a constant angular velocity of 0.42 rad/s.

(a) What centripetal acceleration did my son experience when the ride was at "operational speed"? Explicitly state the direction of the acceleration.

(b) I stood next to my son at a smaller distance from the axis of rotation. When at "operational speed", who experienced the larger tangential acceleration, me or my son? Justify your answer with words and possibly equations.

(c) If the carousel went from its operational speed, to a stop in 25 seconds, what is the angular acceleration (mag + dir) during the "stop"?

(d) What angle did my son travel during the "stop" part of the motion?



Question 3. **Grade this problem? Yes or No (circle one)**

In lab, you experimented with an Atwood's machine. The setup is shown, with A and B having mass 1.0 kg and 2.0 kg respectively.

(a) Draw a force diagram showing all forces acting on both masses including the net force. Be sure to label each force appropriately and define the direction of motion. Ignore friction and the mass of the pulley.

(b) Write an equation for the net force acting on both masses, and determine the acceleration of the system.

(c) Starting with an equation for the net force acing on one of the masses (A or B) calculate the tension in the string.

(d) If the masses after release traveled a total displacement of 1.75m in the direction of motion, how long did it take to move?

Question 4. **Grade this problem? Yes or No (circle one)**

You have a 10 kg box is sitting in the bed of your truck. The truck traveling at 10 m/s comes to rest in 5.0 s, and the box does not slide.

(a) Is the box in static equilibrium, dynamic equilibrium or not in equilibrium at all? Explain/justify your answer using words and possibly equations.
A force diagram may help.

(b) What is the magnitude of the normal force exerted on the box?

(c) What is the net force acting on the box (mag + dir) ?

(d) What is the coefficient of friction between the box and truck bed?