General Physics
Physics 101
Test #2 – Spring 2019
Wednesday 3/6/19
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.

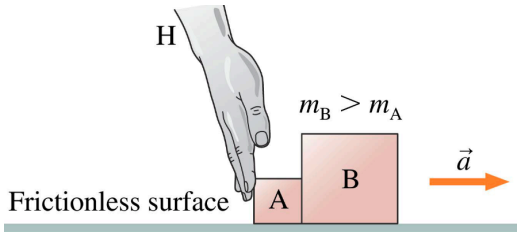
Signature:_____

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:



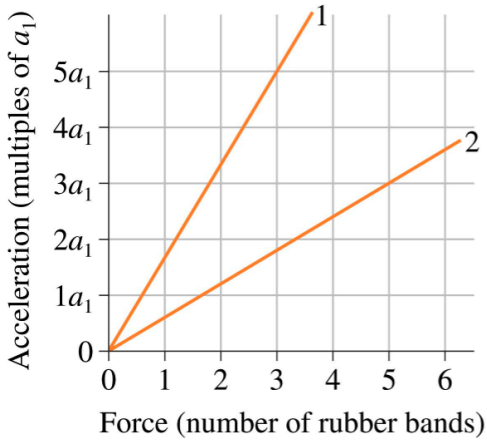
1. Two blocks with masses m_A=2.00 kg and m_B = 4.0 kg are pushed on a frictionless surface with an unknown force. If the force of B on A is -6.0 N, what is the acceleration of the blocks?

(a) 1.0 m/s^2
(b) 1.5 m/s^2
(c) 3.0 m/s^2
(d) Need more information.

2. A space station is constructed as a 1000-m-diameter rotating cylinder that rotates about its axis. To create artificial gravity on the outer deck, what rotation period will provide an acceleration equivalent to "normal" gravity?

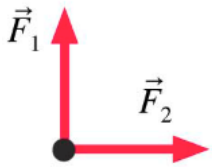
(a) 70 s
(b) 45 s
(c) 64 s
(d) 0.090 s

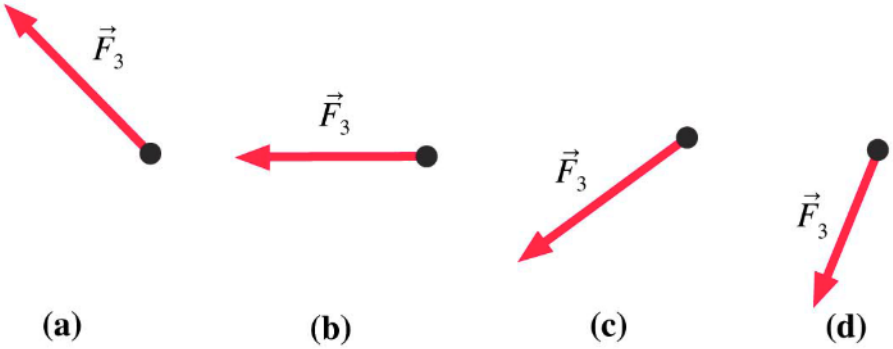
3. The figure shows acceleration versus force graphs for two objects pulled by rubber bands.
What is the mass ratio of m_2 to m_1?



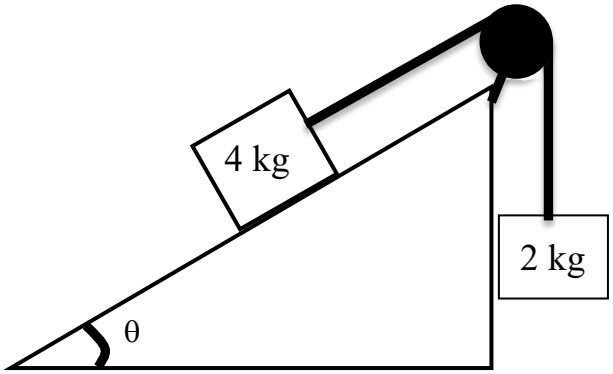
(a) 9/25
(b) 25/9
(c) 5/3
(d) 15/15

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

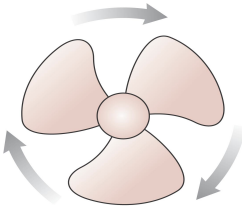




5. A 4.0 kg box is on a frictionless 30º ramp and is connected via a massless string over a massless, frictionless pulley to a hanging 2.0 kg weight. If you gently release the box, which way will it move on the ramp?



(a) Up the ramp
(b) Down the ramp.
(c) It will not move.
(d) Need more information



6. 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.

7. A 2.0 kg steel block is sliding down a 31° dry steel ramp at constant speed. What is the coefficient of friction between the block and the ramp?

(a) 0.60
(b) 0.80
(c) 0.51
(d) 0.86 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 4d before stopping?

(a) $2v$
(b) $4v$
(c) $8v$
(d) $\sqrt{2}v$

9. A 50 g mass attached to a string is lowered from rest by pulling upward on the string. If it takes 50 ms to travel 1.0 m, what is the net force on the mass?

(a) -40 N
(b) -0.080 kN
(c) 0.49 N
(d) 4.0×10^1 N

10. A coconut filled with a firecracker explodes into two pieces one that has a larger mass than the other. During the explosion which piece experiences a bigger magnitude of acceleration?

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

11. Which of the following statements is false?

(a) In uniform circular motion the acceleration is non-zero.

(b) The friction force does not always act in the opposite direction.

(c) The angular velocity of all points on a spinning wheel are the same.

(d) A box in the back of a car that doesn't slide when it stops is in equilibrium

12. A ball rotates with a clockwise angular velocity of 6.0 rad/s and it experiences a counter-clockwise angular acceleration of 2.0 rad/s^2 for 2.0 s. What is the final angular velocity of the ball?

(a) 4.0 rad/s
(b) -10.0 rad/s
(c) -4.0 rad/s
(d) -2.0 rad/s

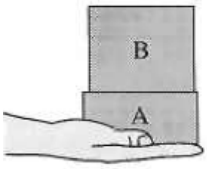
Part II. Short answer problems (12 pts each)

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)



Block A and B are 5.0 kg and 10.0 kg respectively. As shown, these blocks are lifted with a uniform acceleration.

(a) Draw a force diagram for both block A and B. Be sure to include the direction of the net force as well.

(b) If the blocks are lifted from rest and achieve a velocity of 1.2 m/s after having moved a distance of 72 cm, what is the acceleration of the blocks?

(c) What is the magnitude and direction of the force of block B on block A?

(d) What is the net force on block A?

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

On a snowy day, you are pulling your younger sibling along a level road on a sled. You are walking at a steady 1.5 m/s and the rope has +50.0 N of tension in the horizontal direction, and an unknown amount of tension in the vertical direction (could be up or down). The total mass of your sibling and the sled is 50 kg and the coefficient of kinetic friction between the sled and snow is 0.150.

(a) Determine the magnitude and direction of the friction force acting on the sled/sibling system. Please state the direction in words.

(b) Calculate the normal force acting on the sled/sibling system.

(c) Calculate the magnitude and direction of the Tension in the rope in the vertical direction.

(d) You stop and try to pull again with the same force. Unfortunately the sled will not move. Explain why this is the case in terms of net force and the friction force. Words are necessary in your answer, calculations are not.

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

Your 64 cm diameter car tire is rotating at 7.0π rad/s when suddenly you press down hard on the accelerator steadily increasing the car's speed. After traveling 200 m, the tire's rotation has increased to 12π rad/s.

(a) How many revolutions did the tire make during this motion?

(b) What is the angular acceleration of the tire during this motion?

(c) During this acceleration, what happens to the magnitude tangential acceleration of a point on the edge of the tire? Does it increase, decrease or remain the same? Explain in words and equation(s). No calculations are required.

(d) What is the centripetal acceleration of the edge of the tire at the end of the motion? Be sure to state the direction of the acceleration in words.

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

Henry stands on a bathroom scale in an elevator and the scale reads 930 N before the elevator starts moving.
(a) What is Henry's mass?

For the first three seconds after the elevator starts moving, the scale reads 830 N.
(b) What is the acceleration of the elevator?

(c) Determine the velocity the elevator, and explicitly state what direction it is moving.

(d) Explain in what situation the reading on the scale would be zero? No new calculations are needed, but words and a sum of all forces statement are required.