

Name: \_\_\_\_\_

Seat Assignment: \_\_\_\_\_

Specify your **EXAM ID** on the right. Use 000 if you do not know your exam ID.Circle your **LAB SECTION**

	102	212	216	217	218
8:10	<b>A102</b> Jackson	<b>A212</b> Adam	<b>A216</b> Min	<b>A217</b> Siavash	<b>A218</b> Erik
9:40	<b>B102</b> Jackson	<b>B212</b> Dhruv	<b>B216</b> Min	<b>B217</b> Siavash	<b>B218</b> Erik
11:10	<b>C102</b> Savannah	<b>C212</b> Adam	<b>C216</b> Will	<b>C217</b> Siavash	<b>C218</b> Erik
12:40	<b>D102</b> Savannah	<b>D212</b> Min	<b>D216</b> Will	<b>D217</b> Teague	<b>D218</b> Eric
2:10	<b>E102</b> Savannah	<b>E212</b> Adam	<b>E216</b> Dhruv	<b>E217</b> Teague	<b>E218</b> Eric
3:40	<b>F102</b> Jackson	<b>F212</b> Will	<b>F216</b> Dhruv	<b>F217</b> Teague	<b>F218</b> Eric

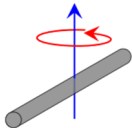
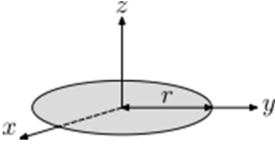
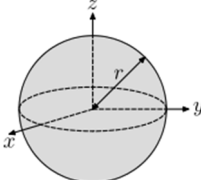
0 ○	0 ○	0 ○
1 ○	1 ○	1 ○
2 ○	2 ○	2 ○
3 ○	3 ○	3 ○
4 ○	4 ○	4 ○
5 ○	5 ○	5 ○
6 ○	6 ○	6 ○
7 ○	7 ○	7 ○
8 ○	8 ○	8 ○
9 ○	9 ○	9 ○

**Instructions**

- Sit in your assigned seat.
- Do not open the exam until instructed to do so.
- Completely color in the dot for your chosen answers on multiple choice.
- Do not leave if there is less than 5 minutes to go in the exam.
- When time is called, immediately stop writing, remain seated, and pass your exam to the center aisle.
- Working after time is called results in an automatic deduction.

**Guidelines**

- Assume 3 significant figures for all given numbers unless otherwise stated
- Show all of your work – no work, no credit
- Write your final answer in the box provided
- Include units for all answers and directions for all vectors

Thin rod 	Solid disk 	Solid sphere 
$I_{center} = \frac{1}{12}mL^2$	$I_z = \frac{1}{2}mr^2$	$I = \frac{2}{5}mr^2$

1. (1 pt) The volume of a person is approximately:

1 m <sup>3</sup>	0.1 m <sup>3</sup>	0.01 m <sup>3</sup>	0.001 m <sup>3</sup>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. (1 pt) The angle of the vector
- $(12\hat{i} - 5.1\hat{j})$
- ft counterclockwise from the x-axis is:

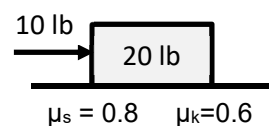
113°	157°	293°	337°
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3. (1 pt) In a FBD of box sitting on a flat surface, are the weight and normal force 3
- <sup>rd</sup>
- law partners?

Yes	No
<input type="radio"/>	<input type="radio"/>

4. (1 pt) The value of the friction force is:

10 lb	12 lb	16 lb
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



5. (1 pt) A spring loaded gun shoots a ball with a speed of 1.0 m/s.
- 
- If the spring is compressed 3 times as far, the speed of the ball will be:

1.0 m/s	3.0 m/s	9.0 m/s
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

6. (1 pt) The area under a force-time graph gives:

change in velocity	change in kinetic energy	change in momentum
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

7. (1 pt) A wheel is rotating in a clockwise direction with a constant angular velocity of 20 rev/sec.
- 
- What is true about the net torque acting on the wheel?

Net torque is positive	Net torque is negative	Net torque is zero
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

8. (1 pt) The direction of the torque vector is:

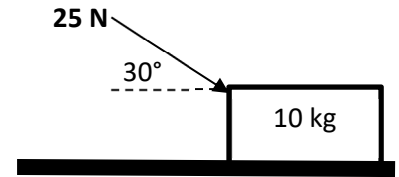
parallel to $\vec{F}$	parallel to $\vec{r}$	perpendicular to plane containing $\vec{r} \times \vec{F}$
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

9. ( 3 pts ) A cylindrical drinking glass has a diameter of 2.5 in and is 5.5 in tall. What is the volume of the drinking glass in cubic centimeters? (2.54 cm = 1.00 in)

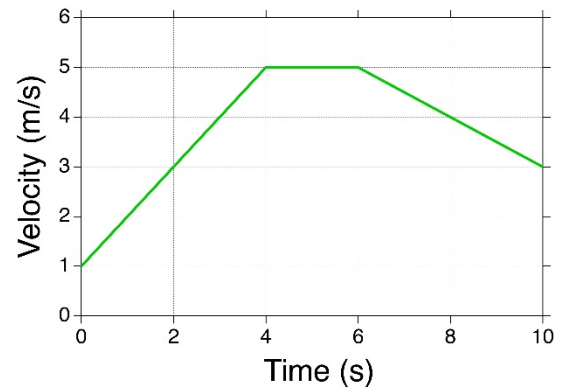
10. ( 3 pts ) A car makes a 100 km trip. It travels the first 50 km at an average speed of 70 km/hr. How fast must it travel the second 50 km so that its average speed is 90 km/hr?

11. ( 3 pts ) Jeremy Pruitt climbs to the top of Neyland Stadium and drops a football over the side. It falls 80 m to the ground below. How long is the ball in the air before it hits the ground? (assume negligible air resistance)

12. ( 3 pts ) Michael pushes a 10 kg box across a level floor at a constant speed. He pushes with a force of 25 N as shown. What is the coefficient of kinetic friction between the box and the floor?



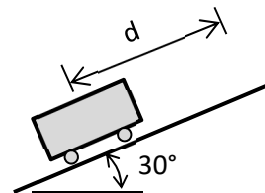
13. ( 3 pts ) The graph below shows the velocity of a 5 kg object. What is the net force exerted on the object at  $t = 2$  s?



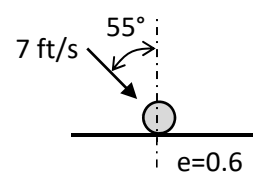
14. ( 3 pts ) A car travels around a flat horizontal curve with a radius of 200 ft. What is the maximum constant speed that the car can go around this curve without sliding ( $\mu_k = 0.6$ ,  $\mu_s = 0.8$ )?

15. ( 3 pts ) A force of  $(3\hat{i} + 5\hat{j})\text{lb}$  acts through a displacement of  $(-6\hat{i} + 12\hat{j})\text{ft}$ . Determine the amount of work that was done.

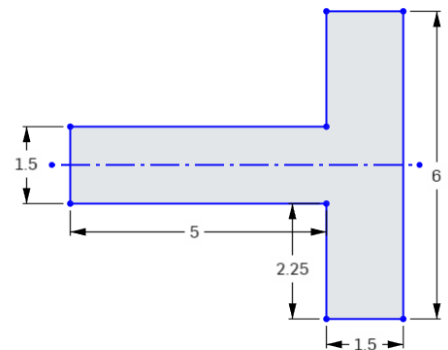
16. ( 3 pts ) A 4 kg cart is traveling at 12 m/s. Determine the maximum distance  $d$  the cart can go up the incline if there is an energy loss of 50 J.



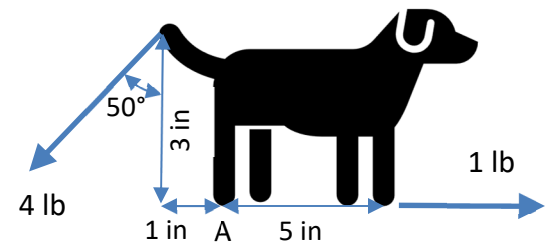
17. ( 3 pts ) Determine the magnitude of the velocity of the ball after it bounces off the floor.



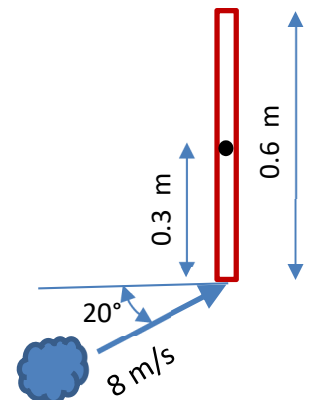
18. ( 3 pts ) Your Rube Goldberg device has a Power T made out of a flat piece of wood with the dimensions shown. At what horizontal distance from the left edge should you place a hole on the dashed line so the T will be balanced when supported at the hole? (all dimensions are in inches)



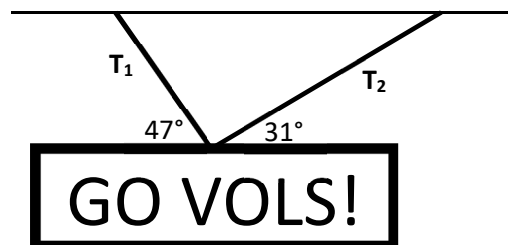
19. ( 3 pts ) Your Rube Goldberg device has a dog-shaped trigger. What is the net torque about point A with the forces applied as shown? (counterclockwise positive)



20. ( 3 pts ) Your Rube Goldberg device has a velcro covered blob (53g) being shot at a velcro covered rod (89g) hanging vertically and pivoting about its center as shown. What is the rotational speed of the rod/blob combination the instant after the blob hits the end of the rod and they stick together?

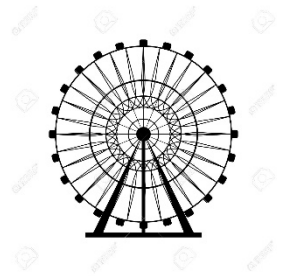


21. ( 7 pts) Two ropes support a 100 lb sign as shown. The system is in equilibrium. What is the magnitude of  $T_1$ ?

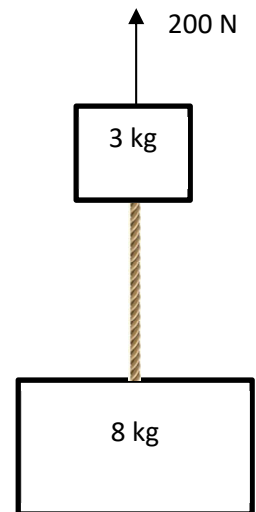


22. ( 7 pts ) A child throws a ball with an initial speed of 8.0 m/s at an angle of  $40^\circ$  above the horizontal. The ball leaves her hand 1.0 m above the ground. Ignoring any effects from air resistance, determine how long the ball is in flight before it hits the ground.

23. ( 7 pts ) A Ferris wheel with a radius of 14.0 m is turning about a horizontal axis through its center. The linear speed of a 60 kg passenger on the rim is constant and equal to 6.00 m/s. What is the magnitude of the force exerted by the seat on the passenger when she is at the lowest point on the Ferris wheel? (**FBD = KD Required**)

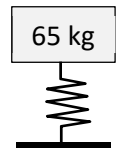


24. ( 7 pts ) The two blocks are connected by a light rope. An upward force of 200 N is applied as shown. What is the tension in the rope connecting the two blocks? (**Two FBD = KD Required**)





25. ( 7 pts ) A 65 kg mass is dropped and has a speed of 23 m/s when it hits a spring with a stiffness of 5000 N/m. Assuming that the spring is not compressed at all before the mass hits it, determine the maximum amount the spring compresses.



26. ( 7 pts ) A 20 pound cart moving to the right at 6 ft/s collides with a 25 pound cart that is initially at rest. After the collision, the 20 pound cart is moving to the right at 2 ft/s. Determine the coefficient of restitution of the collision.

27. ( 7 pts ) A Rube Goldberg device has a marble (solid sphere) rolling up a ramp with an elevation change of 15 cm. What is the speed of the marble at the bottom in order for it to reach the top of the ramp with a speed of 0.8 m/s?

28. ( 7 pts ) A Rube Goldberg device consists of an electric motor that will rotate a 0.1 m radius solid disk with a mass of 420g. The motor is 85% efficient. What is the angular acceleration when disk is spinning at 1900 rpm and the power input to the motor is 3.0 watts?