

wk.8.review

1. A vector has a magnitude of 100 and is pointed at an angle of 70° above horizontal. What are the **i** and **j** components of this vector? **Show work**

2. The **i** and **j** components of a vector are $-150 \mathbf{i} + 75 \mathbf{j}$. What is this vector in polar coordinates? **Show work**

3. What is the SI unit for force?

- | | | | | | |
|-----------|-------------|-----------|----------|-------------------|---------|
| a. meters | b. newtons | c. joules | d. m/s | e. m/s^2 | f. amps |
| g. volts | h. coulombs | i. farads | j. watts | k. kilograms | l. ohms |

4. What is the SI unit for electric charge?

- | | | | | | |
|-----------|-------------|-----------|----------|-------------------|---------|
| a. meters | b. newtons | c. joules | d. m/s | e. m/s^2 | f. amps |
| g. volts | h. coulombs | i. farads | j. watts | k. kilograms | l. ohms |

5. You use a meter stick to measure the diameter of a wooden dowel. If your measurement is 36.5 cm, what is the percent uncertainty of your measurement? **show work**

6. The accepted value for the acceleration due to gravity near the earth's surface is 9.81 m/s^2 . You use a photo-gate to measure the fall of an object and measure the following values for the acceleration of gravity. (a) Calculate the % error of each measurement, (b) the average of all the trials, and (c) the % error of the average of the trials. **Show work only for part "c"**

	A	B
1		% error
2	9.87	
3	10.2	
4	9.34	
5	9.85	
6	9.65	
7	8.92	
8	11.3	
9	9.33	
10	AVERAGE VALUE OF "g"	% error of average
11		

7. You are given a force table. Two weights are hung from the table

- 200 grams at 130° _____ **i** _____ **j**
- 145 grams at 47° _____ **i** _____ **j**

Find the resultant and the equilibrant. **Show work**

8. You are given a force table with the following three weights hung.

- 50 grams at 45° _____ **i** _____ **j**
- 75 grams at 130° _____ **i** _____ **j**
- 200 grams at 90° _____ **i** _____ **j**

Find the resultant and the equilibrant. **Show work**

9. Your mass is 45 kg.

(a) (2 pts) What is your weight on the earth?

(b) (2 pts) What is your mass on the moon?

(c) (2 pts) What is your weight on the moon where “g” is equal to 1.6 m/s^2 ?

10. A 50 kg. mass is held at a height of 30 m above the ground. How much gravitational potential energy does it possess?

11. A bowling ball of mass 10 kg. is thrown at a velocity of 20 m/s. How much kinetic energy does it possess?

12. A 350 gram weight is held 200 cm above the floor. How much gravitational potential energy does it possess?

13. A mass m moves at a velocity v . If the velocity is doubled, by what factor does the kinetic energy of the mass change?

- A. It does not change
- B. It doubles
- C. It increases by a factor of four
- D. It decreases to half its original value
- E. You must know the value of m

14. A marble is dropped from a height of 20 m. What is its velocity (or speed) just before it strikes the ground?

15. A marble is dropped from a height of 20 m. How long does it take for the marble to hit the ground?

16. A mousetrap car accelerates for 16.6 ± 0.3 ft in 4.45 s.

(a) What is the % uncertainty of the distance. (You do not need to put units in showing your work for % uncertainty and % error)

(b) What is the distance in meters? **Show work with units**

(c) What is the acceleration of the mousetrap car? **Show work with units**

2. What is the maximum velocity that the mousetrap car reaches? **Show work with units**

17. What is the average velocity of the mousetrap car during the acceleration? **Show work with units**

18. A 20 kg mass is hung from a spring causing it to extend 4.2 cm.

(a) In what direction does the restoring force point?

(b) What is the weight of the mass that is hung?

(c) What is the spring constant of the spring?

19. A dart gun has a spring constant k of 27 N/m. The spring is compressed 9.0 cm. If the gun is pointed straight up in the air and fires a dart of mass 25 g,

(a) To what maximum height will the dart go?

Show the formula that equates elastic potential energy to gravitational potential energy

(b) How fast will the dart be traveling just as it leaves the gun?

Show the formula that equates elastic potential energy to kinetic energy

20. How many radians are there in 292° ? **show conversion factor**

21. How many degrees are there in 1.26 radians? **show conversion factor**

22. Convert 1500 rpm to rads/s **show conversion factor**

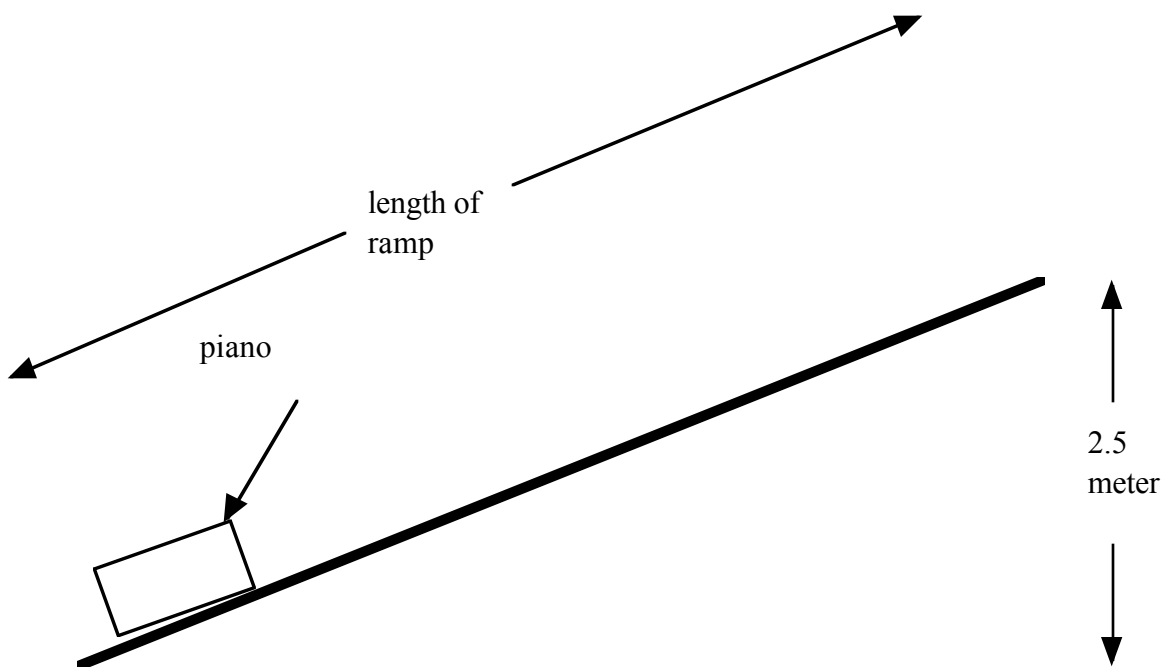
23. Convert 340 rads/s to rpms. **show conversion factor**
24. The wheels of the mousetrap car are 12 inches in diameter. Through how many rotations do they turn if the car travels 50 feet?
25. How many radians is this?
26. A student pushes on a table with a force of 75 N and pushes it in the same direction for 24 m. How much work does the student do?
27. If all of this work is converted to kinetic energy of the table and the table has a mass of 4.5 kg. how fast is the table moving?
28. A person pushes a block with a force of 50 N in a direction horizontal to the floor. The block moves a distance of 10 m but its velocity does not increase. What can be said about the frictional force on the block?
- A. There is negligible friction between the block and the floor
 - B. The frictional force between the block and the floor is equal to 50 N and is pointing in the same direction that the person is pushing the block.
 - C. The frictional force between the block and the floor is equal to 500 joules
 - D. The frictional force between the block and the floor is equal to 50 N and is pointing in the opposite direction that the person is pushing the block.
29. A small child of mass 35 kg sits on one end of a seesaw 1.4 m from its center. A larger child of mass

85 kg. wants to sit on the opposite side of the seesaw so that his weight balances the weight of the smaller child.

(a) How much does each child weigh in proper SI units

(b) How far from the center of the see saw should the larger child sit?

30. You wish to lift a piano 2.5 meter above the ground but the piano weighs 5000 newtons. Therefore you use a ramp. You can push with a force of about 300 newtons (weakling).



(a) If one kg = 9.8 newtons and 2.2 lbs. equals one kilogram, how much does the piano weigh in lbs. (a lb. is a measure of force, not mass). **Show conversion factors**

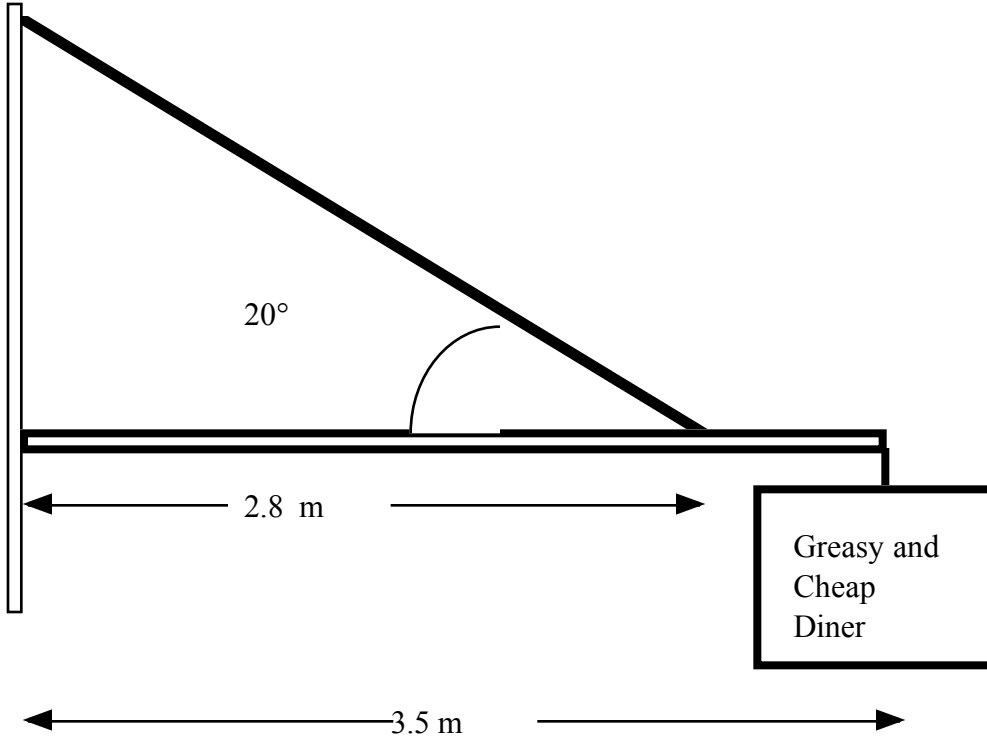
(b) With what force can you push in lb.? **Show conversion factors**

(c) How much work is done in lifting the piano up 2.5 meters?

(d) How long does the ramp need to be for you to do this much work with the force that you can apply?

(e) At what angle must the ramp be tilted to horizontal?

31. An engineer wishes to design a sign for a restaurant. The sign hangs from a vertical beam as in the figure below.



The length of the horizontal pole from which the pole hangs is 3.5 m. The pole has a weight of 700 N and the sign has a weight of 2000 N. The weight of the pole acts at its center and the weight of the sign acts at the end of the pole. Both of these weights cause a torque that makes the pole rotate clockwise about the point at which the pole is attached to the wall. The engineer attaches a wire 2.8 m from the wall and extends it at a 20° angle back to the wall above the point of attachment.

- Find the tension in the wire
- Find the Reaction force in the vertical direction.
- Find the horizontal reaction force
- Find the net reaction force (angle and magnitude)

