Pre-Comp Review Questions- 8th Grade

Section 1- Units

1. Fill in the missing SI and English Units

Measurement	SI Unit	SI Symbol	English Unit	English Symbol
Time	second			s.
Temperature		K	Fahrenheit	
Length				ft.
Volume (solid)	Cubic Meter			ft^3
Weight (Force)		N.	Pounds	
Mass	Kilogram			sl

2. Fill in the missing metric prefix and/or numerical value

Metric Prefix	Symbol	Numerical Multiplier	Exponential Multiplier (scientific notation)
Tera			10^{12}
	G		
	M		
Kilo			
	h		
		10	10^1
Base Unit	_____	1	10^0
Deci	d		
			10^{-2}
Milli			
	μ	0.000001	
	n		10^{-9}
			10^{-12}

3. Convert 7651 pm to cm

4. Convert 1.54kg to cg

5. Convert 7.38 TC to hC

6. Convert 25cm^3 to m^3

7. Convert 30 m/s to mi/hr

Section 2- Motion

For the following words, write the definition and equation when applicable, and indicate if the quantity is a vector or a scalar

1. Reference Point _____

_____

_____

2. Motion _____

_____

_____

3. Distance _____

_____

_____

Vector or Scalar? _____

Equation:

4. Displacement _____

_____

_____

Vector or Scalar _____

Equation:

5. Speed _____

_____

_____

Vector or Scalar _____

Equation:

6. Average Speed _____

_____

_____

Vector or Scalar _____

Equation:

7. Velocity _____

_____

_____

Vector or Scalar _____

Equation:

8. Instantaneous Velocity _____

_____

_____

9. Acceleration _____

_____

_____

Vector or Scalar _____

Equation:

10. Directly Proportional _____

_____

Example of 2 quantities that are directly proportional:

11. Inversely Proportional _____

_____Example of 2 quantities that are inversely proportional:

12. What are the 3 ways an object can accelerate?

13. Indicate whether the object will be speeding up, slowing down, or not changing speed given the directions of velocity and acceleration

Velocity	Acceleration	Speeding up/ Slowing down/ No change
+	+	
+	-	
+	0	
-	+	
-	-	
-	0	

14. Give an example of when an object has a velocity of 0 m/s but is accelerating

Problems

15. An object moves in the y direction with a position as a function of time given by the equation $y(t)=10+6t-4.9t^2$.
    a. What is the initial position of the object?

    b. What is the initial velocity of the object?

    c. What is the position of the object after 2s?

    d. What is the acceleration of the object?

16. A person hikes 2120 meters east in 25mins, takes a break for lunch for half hour, and hikes back 1640m west in 20 mins. What was the person's distance, displacement, and average speed for the trip (in m/s)?

17. A car moves around a circular track with a radius of 10m. The car travels at a constant speed of 30 m/s. If the car travels ¾ of the way around the track, find the cars
    a. distance travelled

    b. displacement

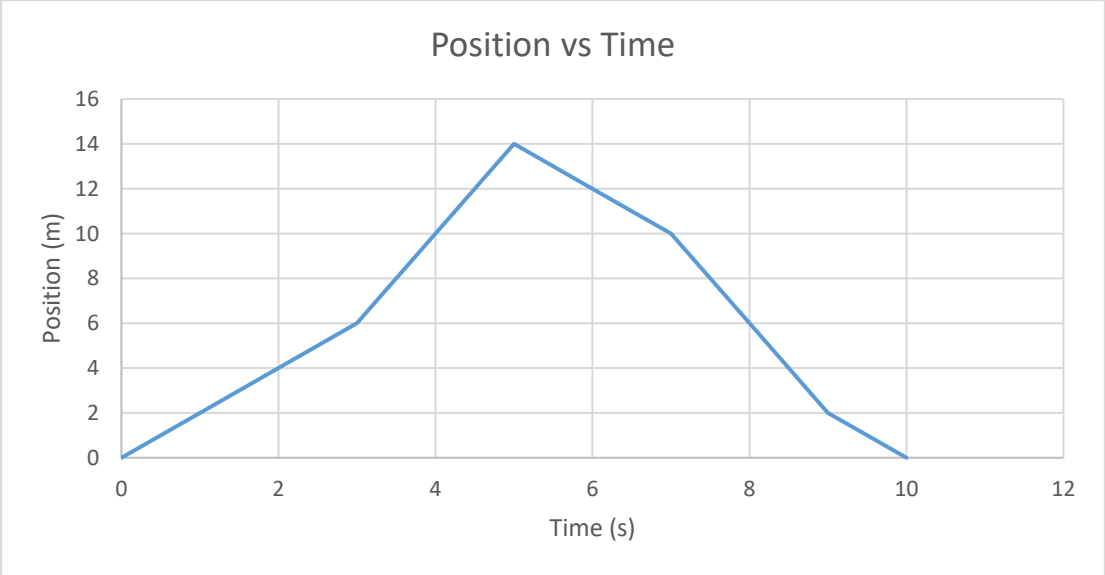
    c. If the car returns to the place it started, what will be its distance and displacement then?

18. An airplane starts from rest and reaches a speed of 70 km/h in 50s before taking off.
    a. What was the airplanes acceleration (in m/s^2)?

    b. How far does the airplane travel in that time? (you must use kinematic equations to get the correct answer)

19. An object is moving at a constant velocity of 10m/s east for 20s. What is the acceleration of the object?

20. Use the graph below to answer the following questions



a. What is the object's distance travelled between 0 and 4 sec?

b. What is the object's displacement between 0 and 4 sec?

c. What is the object's distance travelled between 4 and 8 sec?

d. What is the object's displacement between 4 and 8 sec?

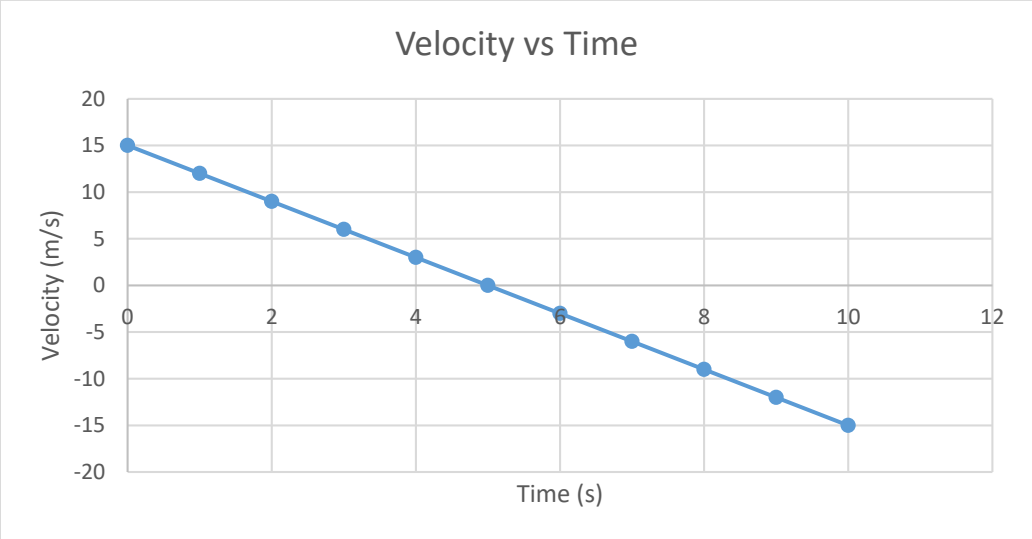
e. What is the object's distance travelled between 0 and 10 sec?

f. What is the object's displacement between 0 and 10 sec?

g. In what time interval is the objects displacement negative: 0-3 sec, 3-5 sec, or 8-10sec?

h. What is the objects average acceleration between 0-10s (hint- no calculation required)

21. Use the graph below to answer the following questions. Remember, displacement can be negative!!!



a. What is the object's acceleration during this time?

b. What is the object's displacement from 0-3s?

c. What is the object's displacement from 5-7s?

d. What is the object's displacement from 0-10s?

Section 3- Forces and Newton's Laws

For the following words, write the definitions and equations when applicable

1. Force- _____

2. Newton's 1st law _____

_____

_____

3. Inertia _____

_____

4. Newton's 2nd Law _____

_____

_____

Equation:

5. Newton's 3rd Law _____

_____

_____

Equation:

6. What is the statement we use to determine the action-reaction force pairs for N3L?

_____

_____

_____

7. Weight _____

_____

Equation:

g on Earth= _____

8. Normal Force _____

_____

Normal forces oppose _____

9. Tension Force _____

_____

Tension Forces oppose _____

10. Friction Force _____

_____

_____

Equation:

11. Static Friction _____

_____

12. Kinetic Friction _____

_____

13. Hooke's Law Equation (spring force)

14. Net Force _____

_____

_____

Equation:

15. Conditions for Equilibrium

1. _____
2. _____

16. Static Equlibrium _____
_____
17. Dynamic Equilibrium _____
_____
18. 4 steps in drawing a Free-Body Diagram
    a. _____
    b. _____
    c. _____
        i_____
        ii _____
    d. _____
19. Draw a free-body diagram for 6kg object falling through the air

20. Draw a free body diagram for a 1.5kg soccer ball rolling along a rough surface

21. Draw a free body diagram for a skier skiing down a slope at an angle of 40˚ above the horizontal with a frictional force acting on it. Assume the skier is not applying a force

22. Contact force _____

_____

Example:

23. Action-at-distance Force _____

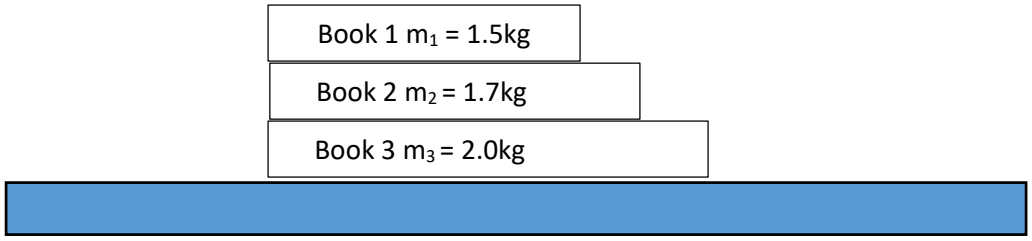
_____

Example:

Problems

24. Two planets are separated by 24Tm and experience a gravitational attraction of 2.6×10^4N. Find the force of gravity between them if the separation is doubled

25. There are 3 books stacked on a table as shown.



a. Find the Normal Force acting on each book.

b. If a person pushes down on the stack with a force of 10N, what will the normal force on book 2 be?

26. A soccer ball is rolling in the grass. It has a mass of 1.65kg. The coefficient of friction between the ball and the grass is 0.8.
    a. Draw a free-body diagram for the soccer ball.

    b. Find the frictional force acting on the ball.

    c. If the ball has an initial velocity of 10 m/s, how much time will it take for the friction force to bring the ball to a stop?

    d. Using the kinematic equations, find the total distance the ball will travel in that time.

27. A mass of 0.65kg is hung from a spring and the spring stretches a distance of 25cm. Find the spring constant of the spring

28. A person has a weight of 655N on Earth. How much would they weigh on Jupiter where the acceleration due to gravity is 26.2 m/s^2

29. An astronaut on the moon weighs 165N. If the action force is the weight of the astronaut, what is the magnitude and direction of the reaction force and what object is the reaction force acting on? (Hint- fill in the blanks "The force on _____ by _____ is equal in magnitude but opposite in direction of the force on _____ by _____." What is object 1 and object 2 in this case?)

30. A person is pushing a shopping cart with a force of 15N. The mass of the shopping cart is 20kg. If the net acceleration of the cart is 0.5m/s^2, find the coefficient of friction between the ground and the cart

Section 4- Work, Power, and Energy

For the following words, write the definition and include the equation when applicable

1. Work _____

   _____

   Equation:

2. Conditions for a force to do work
   a. _____
   b. _____
3. Fill in the blanks:
   a. The work needed to lift an object to a given height is equal to _____ times the _____ _____
   b. When an applied force is at angle to the direction of motion, the work done by the force _____
   c. Forces that are perpendicular to the direction of motion do _____ work.
4. The units of work _____
5. If an object is subject to a _____, it may be set in_____. This means that_____ has been done on the object and its _____ has transferred forms. A moving object has the ability to do _____ on another object.
6. Power _____ _____
   Equation:

   Units:

7. Energy- _____

Units of energy _____

Forms of Energy

8. Gravitational Potential Energy _____

_____

Equation:

9. Elastic Potential Energy _____

_____

10. Spring Potential Energy _____

_____

Equation:

11. Kinetic Energy _____

Equation:

12. Total Mechanical Energy _____

_____

Equation:

13. Law of Conservation of Energy_____

_____

Equation for Conservation of Total Mechanical Energy:

14. Work-Kinetic Energy Theorem _____

_____

Equation:

Problems-

15. An object with a mass of 53kg is lifted to a height of 4.2m.
    a. How much work is done to lift the object?

    b. If the object is lifted in 1.1 mins, how much power was used to lift it?

16. A person kicks a soccer ball with a mass of 0.8kg and gives it a velocity of 15 m/s.
    a. What is the kinetic energy of the ball?

    b. If the velocity of the ball is doubled, by what factor does the kinetic energy of the ball increase? (hint, you don't need to recalculate KE)

    c. If the velocity of the ball is halved, by what factor is the kinetic energy of the ball reduced? (hint, you don't need to recalculate KE)

    d. If the distance the ball travels is 20m, find the force of friction that acted on the ball to bring it to a stop (hint Work-KE theorem)

17. A person jumps from a burning building into one of the inflatable rescue mats set up by firefighters. Describe the energy transformations that occur from the time the person jumps to when they reach the lowest point in their motion (Assume they stop bouncing after one bounce and are at ground level)

18. A ball with a mass of 0.8kg is launched from ground level with a velocity of 22.4 m/s.

a. Find the balls total mechanical energy when it is first released.

b. Find the balls gravitational potential energy at a height of 3m

c. Find the ball's velocity at a height of 3m

d. What will the maximum height of the ball be (hint, remember when the ball reaches its' maximum height, it comes to a stop)

19. A spring with a force constant k=150N/m attached to a wall is hooked onto a box with a mass of 1.5kg and stretched 30cm from its equilibrium position and held in place
    a. Draw a diagram of the box-spring system, labeling the springs equilibrium point (x=0) and its' stretched position.

    b. How much elastic potential energy does the system have when the box is stretched to 30cm?

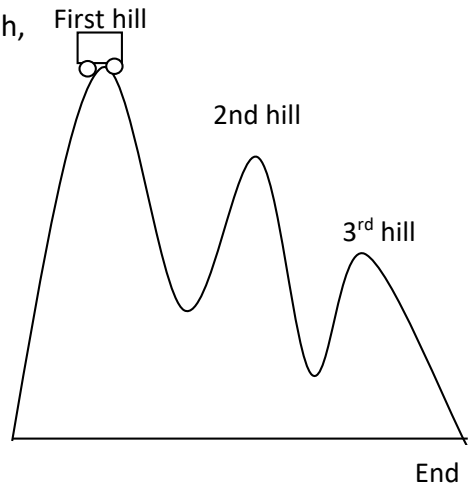
    c. Assume the box is on ground level. How much total mechanical energy does the block-spring system have when the block is held in place at 30cm?

    d. Use conservation of energy to determine the velocity of the box-spring system if the box is released when it reaches the spring's equilibrium

    e. How far past the equilibrium point will the block compress the spring before the block finally comes to a stop?

20. A child pulls a wagon (m=20kg) with a force of 25N along a surface with coefficient of friction 0.1 a distance of 15m. Find the final velocity of the wagon.

21. In the diagram, a 650 kg roller coaster car starts from rest at the top of the first hill of its track, which is 24m high, and glides freely to the end of the ride. [Neglect friction.]



a. Where will the car have the most gravitational potential energy? Why?

b. Where will the car have the most kinetic energy? Why?

c. Calculate the total gravitational potential energy of the car and passenger at the top of the first hill.

d. If the 3rd hill is at a height of 12m, calculate the gravitational potential energy at that point

e. Find the velocity of the car and passengers on top of the 3rd hill

f. How fast will the car be going at the end of the ride?