Pre-Comp Review Questions- 7th 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 643nm to cm

4. Convert 12kg to hg

5. Convert 7.5µC to daC

6. Convert 25km/h to m/s

7. Convert 343 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. Average Velocity_____

_____

Equation:

10. Acceleration _____

_____

Vector or Scalar _____

Equation:

11. Directly Proportional _____

_____

Example of 2 quantities that are directly proportional:

12. Inversely Proportional _____

_____

Example of 2 quantities that are inversely proportional:

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

14. 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	

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

Problems

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, average speed, and average velocity for the trip (in m/s)?

17. A person is walking on the moving walkway at the airport with a velocity of 2.4 m/s east and the walkway is moving at 1.6 m/s east. What is the person's resultant velocity?

18. 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. average velocity

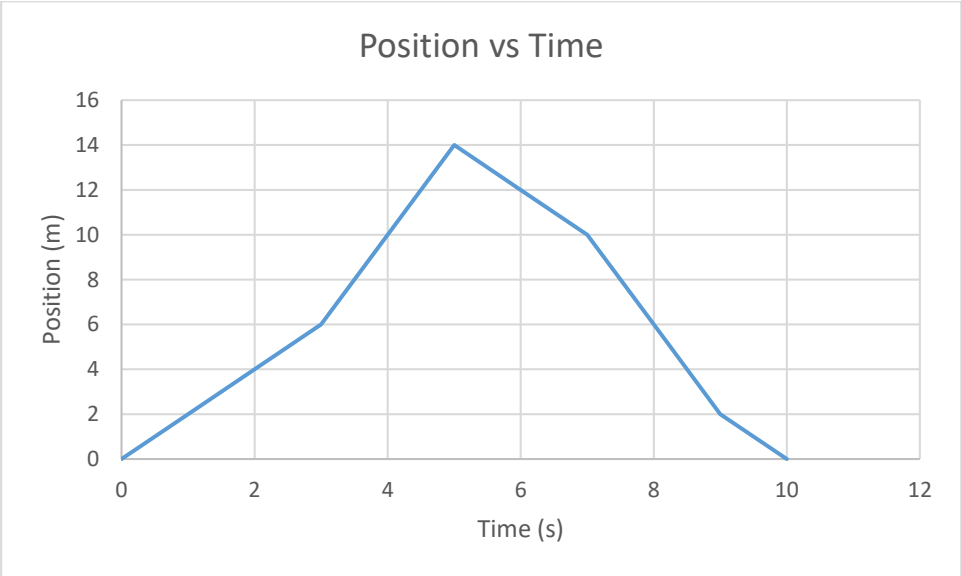
    d. If the car continues to drive and ends at the place it started, what will be its distance, displacement, and average velocity then?

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

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

21.

22. 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?

<u>Section 3- Forces and Newton's Laws</u>

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. Newton's Law of universal gravitation (NLUG) equation

F_g = _____

G= _____

M_1, m_2 = _____

r = _____

11. Friction Force _____

_____

_____

Equation:

12. Static Friction _____

_____

13. Kinetic Friction _____

_____

14. Net Force _____

_____

_____

Equation:

15. Conditions for Equilibrium

1. _____
2. _____

16. 4 steps in drawing a Free-Body Diagram

a. _____
b. _____
c. _____
   i_____
   ii _____
d. _____

17. Draw a free-body diagram for 6kg object falling through the air

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

19. Draw a free body diagram for a pendulum with a mass of 60g suspended from a string.

20. What are the 4 fundamental forces in the universe? List from weakest to strongest

21. Contact force _____

_____

Example:

22. Action-at-distance Force _____

_____

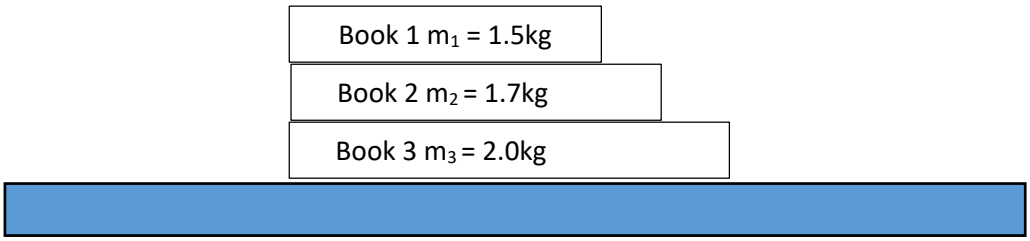
Example:

Problems

23. Two people are separated by a distance of 0.6m. Each person has a mass of 60kg.
    a. What is the gravitational force between the 2 people?

    b. If the distance between them is halved, what will the force between them be?

24. 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 (hint- addition)?

25. 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. Find the acceleration of the ball

    d. 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?

26. What are the units of all forces?

27. Bart is riding on his skateboard on a rough sidewalk (meaning there is friction). He is applying a force of 15N East and the force of friction acting on the skateboard is 7N west.
    a. Draw a free body force diagram for all of the forces acting on the skateboard

    b. Find the net force acting on the skateboard.

    c. If his mass and the mass of the skateboard is 55kg, find his net acceleration.

    d. Find the coefficient of friction.

28. 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?)

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. Chemical Potential Energy _____

_____

Example:

10. Kinetic Energy _____

Equation:

11. Thermal Energy _____

Problems-

12. 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?

13. 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)

14. 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)

15. A battery converts _____ _____ energy to _____ energy, which causes the electrons in a circuit to move and gain _____ energy.

16. A ball with a mass of 0.8kg is launched from ground level with a velocity of 22.4 m/s. Find the balls gravitational potential energy at a height of 3m.