Name _____ Hour _____

Forces Review

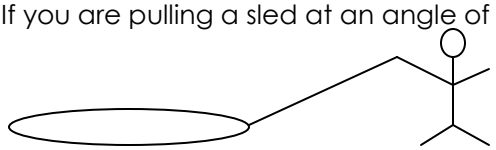
____	____	____
5 +	10	= 15
p. 1-2	3-4	TOTAL
11/17	11/18	

Forces Test _____ Format _____, _____ pts

Basics of Force:
The units of Force are _____ , which is the same as a _____

Show how the units cancel and what you end up with if you divide **force** by **mass**.

Force is a **vector** so it has _____ and _____.
If you are pulling a sled at an angle of 35° N of E with 25 N of force, find the force the sled feels.



You push a stack of books to the right at 10 N and your friend lifts it upwards with a force of 12 N. Find the total force (F) (the resultant) acting on the books and the ANGLE it is lifted at.

When an object is **falling**, what outside force slows it down? _____
List 2 examples of friction.

Why is the force of friction **negative**? (F=ma, F ends up negative)

Newton's Laws of Motion:

Newton's 1st Law is the law of _____

What is the definition of inertia? _____

Newton's 2nd Law is the math equation F = _____

Newton's 3rd Law states for every action there is an _____ and _____ reaction

F = ma:
What does each **variable** in the F=ma equation stand for and what are their **units**?

If you divide force by acceleration, what unit do you have? _____
If you divide force by mass, what unit are you left with? _____
If you divide weight by acceleration, what quantity are you left with? _____

If a large truck and a small car collide with the same force, which will experience the greatest acceleration? _____

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In the **rollerblade lab**, we applied a constant force of 20 N and 30N to various students on rollerblades.

a. What happened to their **speed** along the course? _____

b. What happened to their **acceleration** along the course? (Or what should have happened if was a perfect world ☺)

c. If the force is constant and mass is increased, what happens to a?_____

d. If the mass is constant and the force is increased, what happens to a?_____

e. Mass and acceleration are _____ related. (inversely or directly)

f. Force and acceleration are _____ related. (inversely or directly)

g. A truck has a mass 10 x greater than a car. If they use the same force when accelerating, what can you say about the acceleration of the car?

h. Constant force produces a constant velocity or acceleration

Mass vs. Weight:

a. Explain the **difference** between mass and weight and include their **units**.

b. Convert 155 lbs into Newtons.

c. Which changes when you change locations, mass or weight? _____

d. Your weight on earth is 145 lbs. Calculate your mass and weight (N) on the moon. (gravity = -1.63 m/s^2)

Equilibrium:

a. If an object is a rest, are there any forces acting upon it? Explain.

b. If you push on a wall with 50 N of force, with what force will the wall push back? Which of **Newton's laws** does this illustrate?

c. What is the total force on an object in equilibrium?_____

d. What are the 2 times when an object is in equilibrium?

G-forces:

a. What is a g-force?_____

b. What does it mean if you feel 3 g's? _____

c. What does it mean if you feel .25 g's? _____

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Problems:

1. If you are in a car accident where you (mass = 50 kg) and your friend (mass = 75 kg) both undergo -7050 N of force, how many g's is that for each of you? (14.4 g's, 9.6 g's)

2. The maximum force a Target bag can withstand and not rip is -350 N. If 25 kg of Halloween candy are in the bag and are lifted from the floor with an acceleration of -3.75 m/sec^2, will the bag hold or break? Use F = m (-9.8 + a) (-339, hold)

3. You weigh 155 lbs at rest. You go in an elevator and on the way up find your weight to be 168 lbs and on the way back down your weight is 105 lbs.
    a. Find the **acceleration of the elevator** on the way up and how many **g-forces you experience**. (a will be negative) (-0.80 m/sec^2, 1.08 g's)

    b. Find the **acceleration of the elevator** on the way down and how many **g-forces you experience**. (3.16 m/sec^2, 0.68 g's)

4. A freight train has a mass of 3.3 x 10^7 lbs. If the train can exert a constant pulling force of 7.5 x 10^5 N, how long (Δt) does it take to accelerate the train from rest to 50 mph? (447 sec)

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5. You (155 lbs) are skating across a frozen pond in your boots. You start with a velocity of 12 m/s and come to a stop after 22 m. Calculate the force of friction that stops you. (-231 N)

6. Your balloon car traveled 2.0 meters in 0.85 sec and had a mass of 14.5 **grams**.
   a. Find the force exerted backwards by the air if $V_i = 0$. (0.08 N)

   b. Find the weight of your car in Newtons.

   c. The force of the air leaving caused your car to move forward. This is an example of which of Newton's Laws of motion?

7. The mass of a bottle rocket is 2.5 lbs and the force it is launched with is 27.2 N.
   a. What is the acceleration of the bottle rocket as it is launched? (23.9 m/s^2)

   b. What force will eventually slow the rocket down if it is shot straight up?

8. You karate chop a block of wood with a velocity of 12 m/s. If the mass of your hand is 0.75 kg and it takes 0.0023 sec to stop your chop, what is the force exerted on your hand by the block of wood? (-3913 N)