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Review for Quiz: Force and Newton's Laws of Motion

1. What is Newton's 1st Law?

An object at rest will stay at rest & an object in motion will stay in motion until an outside (unbalanced) force acts on it.

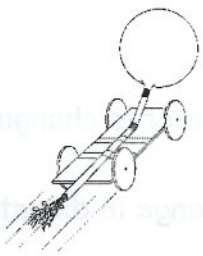
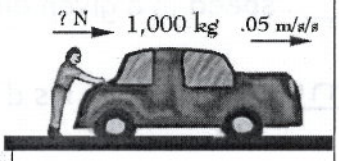
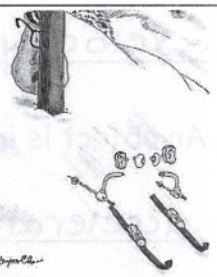
2. What is Newton's 2nd Law? (include the formula)

Acceleration depends on the object's mass and all the forces acting on it. $\text{Acceleration} = \frac{\text{force}}{\text{mass}}$ OR Force = mass · acceleration

3. What is Newton's 3rd Law?

For every action, there is an equal and opposite reaction.

4. Which law is demonstrated by each of the following pictures? Also <u>EXPLAIN</u> your choice.

A	B	C	D
 A balloon powered car moves forward as the air flows out the back of the balloon.	  Both of these guys are competing in a bike race.	 Mr. Bittner's car broke down and now he has to push it home!	 Mr. Potato Head was skiing downhill until he ran into a tree! Mr. Potato Head stops, but the skis keep going…
Law Demonstrated by this picture (and explain!) #3 Action is the air coming out of the balloon. Reaction is the car moving forward.	**Law Demonstrated by these pictures (and explain!)** #2 The biker with less mass will accelerate faster than the biker with more mass. The more mass, the more force is required for acceleration.	**Law Demonstrated by this picture (and explain!)** #2 The more mass, the more force must be applied to generate forward movement.	**Law Demonstrated by this picture (and explain!)** #1 The tree was an outside force that stopped Mr. PH's movement. The skis were traveling at the same speed but no force acted on them.

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Vocabulary Check

Fill in the blanks for the definitions below using the words in the word bank.
Use each word only once.

motion	**friction**	**inertia**	**velocity**	**force**	**speed**	**Newton**	**balanced forces**
weight	**net force**	**momentum**	**gravity**	**acceleration**	**unbalanced forces**	**mass**	

1. mass: the amount of matter in an object

2. inertia: tendency of an object to resist a change in motion

3. speed: measurement of the distance an object travels in one unit of time.

4. unbalanced: type of force that can change an object's motion

5. velocity: speed in a given direction

6. An object is in motion when its distance from another object is changing.

7. acceleration: an increase or decrease in speed or change in direction

8. force: a push or a pull

9. weight: the force gravity exerts on an object

10. Newton: unit used to measure force

11. balanced: type of force that will not change an object's motion

12. net force: sum of all forces acting on an object

13. gravity: invisible force that pulls objects together (force that keeps us on Earth)

14. friction: force that one surface puts on another when they rub against each other

15. momentum: the product of an object's mass and velocity

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Mass versus Weight:

A new planet has recently been discovered- Planet Blacklee. The gravitational force of this new planet is much stronger than Earth's gravitational force. Mr. Bowers will be traveling to Planet Blacklee this summer, and he has some questions for you:

1. Would his **weight** *increase*, *decrease*, or stay the *same* on Planet Blacklee?

   Increase Why? The gravitational force is stronger on the new planet.

2. Would his **mass** *increase*, *decrease*, or stay the *same* on Planet Blacklee?

   Same Why? Mass is not affected by gravity

Calculating Net Force:

3. When the **net force** acting on an object **equals 0:**

   a. Is it a **balanced** or **unbalanced** force? balanced
   b. Will the object's motion change? (Yes or No) No

4. When the **net force** acting on an object does **not equal** 0:

   a. Is it **balanced** or **unbalanced** force? unbalanced
   b. Will the object's motion change? Yes

5. Label the following examples as **balanced (B)** or **unbalanced (U)** forces:

   a. A dog pulls on the leash to go forward, but the owner pulls back with the same amount of force. B
   b. Mr. Mullins rollerblades down LPMS's parking lot. U
   c. Mrs. Boyd's clock hanging on a nail in her wall. B
   d. Mrs. Raman pulls Mr. Eisenhower down the hallway in a chair. U

6. Mr. Beidleman, Mrs. Higdon and some friends have challenged Mr. Eisenhower, Mr. Mullins and some of their friends to a tug-o-war contest. The picture below shows their contest. Using the picture, calculate the **net force**, and **explain the results** of the contest. Is this an example of a **balanced or unbalanced** force?

Net force = 300 - 150 = 150 N
Mr. Beidleman + Mrs. Higdon WIN
Unbalanced force

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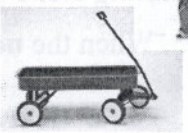
7. Ms. Kron and Ms. Reed both want to show a movie to their classes. The TV is in the doorway between their rooms. Ms. Kron pulls the TV towards her room with **70N** of force while Ms. Reed pulls back with **45N** of force towards her classroom. What is the **net force** and in what **direction** does the TV move?

Net force = 70 - 45 = 25 N

TV moves towards Ms. Kron

8. Ms. Nelson is visiting her sisters in Wheaton. Their dogs, Snickers (15kg) and Louie (35kg), are playing out in the yard. Ms. Nelson decides to pull Snickers around the neighborhood in her wagon. As Ms. Nelson starts running away from the house with Snickers in the wagon, Louie spots them and decides he wants to ride in the wagon too! Louie runs up and jumps in the wagon. Since Ms. Nelson's arms are not very strong, she can't pull the wagon any harder than she was with just Snickers in it, so she has to slow down to a walk to finish pulling the dogs through the neighborhood. Identify which of **Newton's Laws of Motion** most closely relates to this situation and **explain** your choice.



Law #2

The mass of the wagon increased, but the force stayed the same. According to the formula, the acceleration decreases as mass increases.

9. Mr. Beidleman wasn't paying attention as he drove one of his cats to the vet. He was going 50 mph when a light suddenly turned red. When Mr. Beidleman slammed on his brakes to stop the car, he had to put out his arms to catch his cat as it flew forward. Identify which of **Newton's Laws of Motion** most closely relates to this situation and **explain** your choice.

Law #1

The car and the cat traveled at the same speed. The brakes were the force that stopped the car, but the cat did not have a force acting on it so Mr. Beidleman had to stop it.