**Unit 8 – Forces
Newton’s 1st and 2nd Laws Review**

1. Have you ever been riding in a car when a driver stopped suddenly? How did your body move as the car came to a stop? Did it feel like your body was moving forward? When you felt this happening you experienced Newton’s first law of motion. Newton’s first law of motion says that
2. In the car your body was in motion, traveling at the same speed as the car. When the car stopped suddenly, your body stayed in motion. What would happen if you were not wearing a seatbelt and the car was traveling very fast?
3. This idea is called INERTIA. Explain what inertia is **and** why your body feels like it is being pushed back when the cars starts to accelerate again:
4. If a ping pong ball and a basketball were both dropped at the same time from the roof of PV, which would hit the ground with a greater force?
5. What causes the difference in the different forces?
6. Newton stated this relationship in his second law, that
7. List two other situations where Newton’s 2nd Law may apply:

1. Imagine a rocket is being launched from the earth. Hot gases are pushed out form the bottom of the rocket as the rocket is pushed upward. The force of the gases pushing against the surface of the earth is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to the force with which the rocket moves upward. The motion of the rocket can be explained by Newton’s 3rd Law of Motion:

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| **Law** | **Description/Definition** | **Everyday Example** |
| 1st Law of Motion |  |  |
| 2nd Law of Motion |  |  |

1. What is a force? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What is friction? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. What is gravity? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. What is the metric unit for gravity? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. Gravity acts on the mass of an object, causing the object to have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
6. What is Earth’s gravitational pull on all objects?
7. Ms. Vandersee pushes a car with a force of 65 N. The force of friction between the wheels and the floor is 15 N. What is the net force Ms. Vandersee pushes the cart with?
8. Draw a picture of 2 balanced forces. Show the NET FORCE.
9. Draw a picture of 2 unbalance forces. Show the NET FORCE.
10. Draw a picture of 2 forces working together.
11. Draw a picture of 2 forces working against each other.
12. A tennis player runs across the court and into the net with a force of 95 Newtons. What is her acceleration if she has a mass of 70 kg?

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| Givens | Solving For |
| Equation | Substitution | Answer with Units |

1. A net force of 10 N is applied to an object having a mass of 2 kg. What is the acceleration of the object?

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| Givens | Solving For |
| Equation | Substitution | Answer with Units |

1. A net force of 20 N is applied to an object having a mass of 2 kg. What is the acceleration of the object?

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| Givens | Solving For |
| Equation | Substitution | Answer with Units |

*Directions: Answer the following questions in full and complete answers.*

1. How can you double the acceleration of an object if you cannot alter the object’s mass?
2. An elephant and a mouse would both have a weight of 0 N in gravitational-free space. However, they would still retain their “amount of matter” or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. If they were moving toward you with the same speed, would they bump into you with the same affect? Why?
3. COMPARE AND CONTRAST weight and mass.
4. If a large book has a weight of 25 N, what is its mass?

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| Givens | Solving For |
| Equation | Substitution | Answer with Units |

1. Explain why Jupiter’s gravity is greater than the Earth’s, but the Moon’s gravity is less than the Earth’s.
2. A rocket travels to the Moon and drops a land rover down to the surface. The acceleration due to gravity is about 1.6 m/s2 on the Moon. What is the land rover’s weight if it has a mass of 605kg?

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| Givens | Solving For |
| Equation | Substitution | Answer with Units |

**3rd Law Problems**

1. What is Newton’s 3rd Law of Motion?
2. What is an action force?

1. What is a reaction force?
2. Draw a picture of an action/reaction pair of forces.
3. What happens when action/reaction forces cancel out?
4. What happens when action/reaction forces do not cancel?
5. Can be any forces acting on a skateboard moving in a straight line with a constant speed? Explain the forces that are at work.
6. Explain why when you close a door, you don’t move if the force on the door and you are the same?
7. I push on my best friend with a force of 20 N.

\*\*What is the action force?

\*\*Draw in the reaction force and explain in words what is going on.

 20 N

1. A fly flies along and runs into the teeth of a talkative teen on a bike. Which force is stronger: the force of the teeth hitting the fly or the force of the fly hitting the teeth? Why?
2. Identify the action and reaction force in each of the following situations. The first one is done for you.

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| **Example** | **Action**  | **Reaction** |
| http://www.glenbrook.k12.il.us/gbssci/phys/Class/newtlaws/u2l4a5.gif | The baseball pushes the bat to the **left** *(an action).* | The bat pushes the ball to the **right** *(the reaction).* |
| glove | Baseball pushes glove to the left. |  |
| bowling | Bowling ball pushes pin to the left. |  |
| balloon | Enclosed air particles push the wall of the balloon outwards. |  |

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| footballAction-Reaction Pair #1:Action-Reaction Pair #2:Identify **BOTH** action-reaction pairs in this situation with Foot A, Ball B, and Foot C |

1. While driving, Mr. Litchfield observed a bug striking the windshield of his car. Consider one force to be the bug hitting the windshield.

a. What is the Newtons’s Third Law pair to this force?

 b. Which of the two forces is greater?

1. A gun recoils when it is fired. As the gases from the gunpowder explosion expand, the gun pushes the bullet forwards and the bullet pushes the gun backwards. How do these two forces compare?
2. The force of the gun on the bullet is larger.
3. The force of the bullet on the gun is larger.
4. The forces are the same.
5. The acceleration of the recoiling gun is
6. Greater than the acceleration of the bullet.
7. Smaller than the acceleration of the bullet.
8. The same size as the acceleration of the bullet