**Force and Motion Review Sheet**

Dynamics= the connection between force and motion

Force= a push or pull upon an object, capable of accelerating that object, resulting from that object’s interaction with another object. Forces only exist as a result of interaction. Measured using the Newton.

**Overview of Types of Forces**

1. Applied Force= force applied to an object by a person or another object. Example: a person pushes a desk across the room, applied force acting upon the desk.
2. Gravity=force by which the earth, moon, or any other planet/massive object attracts another object toward itself. Downward pull towards the center, on earth.
3. Normal Force= support force exerted upon an object that is in contact with another stable object.

Example: an object is resting on a surface, then the surface is exerting an upward force upon the object in order to support its weight.

1. Friction Force= force exerted by a surface as an object moves across it. The two types of friction are kinetic and static friction.
2. Air Resistance= acts upon objects as they travel through the air. Often opposes the motion of an object, but is frequently neglected due to negligible magnitude. Example: the force that slows a skydiver while he is falling.
3. Tension=transmitted through a string, rope, cable or wire when pulled tight by forces from opposite ends
4. Spring Force= force exerted by a compressed or stretched spring upon any object that is attached to it. The object that is compressed or stretched is also acted upon by a restoring force that restores it to rest or equilibrium position (Hooke’s Law)

Mass= refers to the amount of matter contained by the object; never altered by location, the pull of gravity, speed, or any other force. The unit of mass is the kilogram (kg) in SI units.

Weight= the force of gravity acting on an object, depends on which planet is exerting the pull

**Newton’s First Law of Motion**= An object at rest remains at rest, unless acted upon by some net force. An object in motion remains in motion unless acted upon by some net force. Sometimes called the law of inertia.

Example 1: an ice hockey puck will continue to move with the same velocity until it hits the boards.

Example 2: A car comes to a sudden stop, a package in the car continues to slide forward because it continues in its state of motion, maintaining its velocity as the car decreases its velocity.

Net force= sum of all forces acting on a body

Inertia=the tendency of an object to move at a constant velocity

**Newton’s Second Law of Motion**= the acceleration of an object is directly proportional to the net force acting on it, and is inversely proportional to its mass. The direction of the acceleration is the direction of the net force acting on it

**Newton’s Third Law of Motion**=to every action, there is an equal and opposite reaction. Every push produces two forces. Example: when you push a box forward, you also feel the box pushing at your hand.

Example: When a person walks, with each step, he exerts force on the ground with his foot and the ground exerts force back on the person’s foot.

**Friction Overview:**

Kinetic Friction= the force between two surfaces moving relative to one another. Once an object is moving, this force pushes in the opposite direction to slow the object to rest.

Static Friction= the force between two surfaces that are not moving relative to one another. Opposes movement of an object as it is pushed from rest.

\*It is more difficult to start moving an object from rest than it is to keep pushing with a constant velocity because:

**Freebody Diagrams:**

**Practice Problems**

1. An object sits on a frictionless surface. A 16-N force is applied to the object, and it accelerates at 2.0 m/s2. What is the mass of the object?
2. Starting from rest, a 4.0-kg body reaches a speed of 8.0 m/s in 2.0 s. What is the net force acting on the body?
3. A person on a scale rides in an elevator. If the mass of the person is 60.0 kg and the elevator accelerates downward with an acceleration of 4.90 m/s2, what is the reading on the scale?
4. What is the mass of an object that weighs 250 N on the surface of the Earth where the acceleration due to gravity is 9.8 m/s2? What about the mass of a 250 N object on the Moon (g=1.7 m/s2)? On Mars (g=3.7 m/s2)?
5. A net force of 265 N accelerates a bike + rider at 2.30 m/s2. What is the mass of the bike + rider?
6. How much tension must a rope withstand if used to accelerate a 960-kg car horizontally along a frictionless surface at 1.20 m/s2?
7. If the coefficient of kinetic friction between a 38.0 kg crate and the floor is 0.25, what horizontal force is required to move the crate at a steady speed across the floor? What horizontal force is required if μk is zero?
8. A force of 20.0 N is required to start a 2.4 kg box moving across a horizontal floor. What is the coefficient of static friction between the box and the floor? …If the 20.0 N force continues, the box accelerates at 0.50 m/s2. What is the coefficient of kinetic friction?
9. A box is given a push so that it slides across the floor. How far will it go, given that the coefficient of kinetic friction is 0.23 and the push imparts a speed of 3.7 m/s?
10. A box of mass 10.0 kg is resting on a frictionless horizontal surface. Determine the weight of the box and the normal force exerted by the table….When someone pushes down on the box with a force of 40.0 N. Determine the weight and the normal force.

Works Cited

Henderson, Tom. "The Physics Classroom." *The Physics Classroom*. N.p., 1996. Web. 01 Sept. 2012. <http://www.physicsclassroom.com/>.

Giancoli, Douglas C. *Physics: Principles with Applications*. Upper Saddle River, NJ: Prentice Hall, 2005. Print.