# Unit 6.1: Forces, Newton’s Laws

**Notes for/from class**

**Further Reference: 12.1 Newton’s Laws and 12.3 Newton’s Third Law**

**FORCE**

1. Force is\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   1. You must have a force to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. Things will continue in motion unless a \_\_\_\_\_\_\_\_\_\_\_\_\_ acts on that object.

**Newton’s First Law**

1. Newton’s First Law:
   1. What are 3 outside forces that could act on an object?
2. Inertia is property of an object to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   1. The inertia of an object \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ because it depends on the \_\_\_\_\_\_\_\_\_\_\_\_ of the object
3. Object who’s mass is large has \_\_\_\_\_\_\_\_\_\_\_\_ inertia and is \_\_\_\_\_\_\_\_\_\_\_ to stop
4. Object who’s mass is small has \_\_\_\_\_\_\_\_\_\_\_\_ inertia and is \_\_\_\_\_\_\_\_\_\_\_ to stop

**NEWTON’S SECOND LAW**

1. Newton’s second law:
2. Newton’s second law formula:

In words In symbols

Words symbols

1. Force is measured in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (\_\_\_)
   1. 1 \_\_\_\_\_\_\_ = 1\_\_\_\_\_\* 1\_\_\_\_\_\_\_

**Practice Problems:** Include a formula. Show your work. Include units.

1. What is the acceleration of a boy on a skateboard if the met force acting on the boy is 15N, assuming the total mass of the boy and the skateboard together is 58kg.

2. What is the mass of an object if a force of 34N produces an acceleration of 4.0m/s2?

**Notes for/from class**

1. The more \_\_\_\_\_\_\_\_\_\_ you have, the bigger the \_\_\_\_\_\_\_\_\_\_\_\_\_\_ required to move you

**Newton’s Third Law: ACTION - REACTION FORCES**

1. Newton’s 3rd Law:
   1. Forces always act in \_\_\_\_\_\_\_\_\_\_\_
      1. These forces are \_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_
   2. Newton’s 3rd law includes forces acting on \_\_\_\_\_\_\_\_\_\_\_\_\_\_ instead of just \_\_\_\_\_\_\_\_\_\_\_\_\_
   3. The action reaction forces do not \_\_\_\_\_\_\_\_\_\_\_\_\_\_ because they are acting on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Recap! Which of Newton’s Law’s is this?**

1. Balloon is blown up with air, and then let go. The balloon flies forward as long as air is exiting the balloon?
2. A bowling ball, once thrown down a greased up bowling lane, will continue traveling unchanged until it hits the pins or the backstop.
3. Cannon fires a cannonball. The cannon moves backward as it is fired, while the cannonball shoots forward.

# Unit 6.2: Weight, Mass, Friction, and Free Body Diagrams

**Notes for/from class**

**Further Reference: 12.2 Gravity and 11.3 Motion and Forces**

**WEIGHT AND MASS**

1. Weight is:
   1. g = \_\_\_\_\_\_m/s2
2. Weight is a \_\_\_\_\_\_\_\_, and thus the SI units for weight is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Your \_\_\_\_\_\_\_\_\_\_\_\_\_\_ will be different on Earth and Mars because weight changes with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Weight Equation:

In words In symbols

**Practice Problems:** Show the formula. Show your work. Show your units.

1. If you have a mass of 22kg on Earth (9.8m/s2), what is your weight?
2. If you have a mass of 22kg on Mars (with 1/3 the gravity of Earth), what is your weight on Mars?
3. Mass is a measure of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   1. The units for mass are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. Your \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ will be the exact same on Earth or Mars, because you have the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ everywhere.

**The Force of Friction**

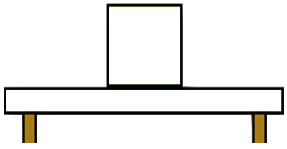
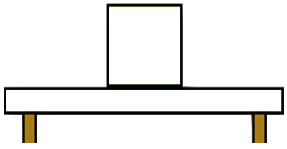
1. Friction is:
2. Friction occurs because the surface of any object is \_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Unwanted friction can be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   1. List 2 real world examples:
4. Helpful friction can be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   1. List 2 real world examples:

**Balanced and Unbalanced Forces**

**Notes for/from class**

1. There will always be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ force acting on an object at one time.
   1. Net force is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. There are two options for net forces.
   1. Balanced forces occur when all forces on an object are \_\_\_\_\_\_\_\_\_\_\_\_\_ and no \_\_\_\_\_\_\_\_\_\_\_\_\_ occurs
      1. Describe a scenario where balanced forces are occurring.
   2. Unbalanced forces the \_\_\_\_\_\_\_\_\_\_ does not \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. Motion will occur in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      1. Describe a scenario where unbalanced forces are occurring.

**Free Body Diagrams—HONORS ONLY**

1. What forces are acting on the box all the time?
2. What other forces COULD act on the box?
3. How do we represent these forces, and what is special about the way we represent them?
4. On the box/table below, draw me a gravitational force of 8N, a normal force from the table of 8N, a push of 19N to the right, and a friction force of 4N in the opposite direction.
5. On the box/table below, draw me a gravitational force of 5N, a normal force from the table of 5N, a push of 11N to the left, and a friction force of 3N in the opposite direction.