Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Hr \_\_\_\_\_\_\_\_

**Force Notes**

* A \_\_\_\_\_\_\_\_\_ is a push or pull, or an \_\_\_\_\_\_\_\_that has the ability to change motion.
* \_\_\_\_\_\_\_\_\_ can increase or decrease the speed of a moving object.
* Forces can also change the \_\_\_\_\_\_\_\_\_\_ in which an object is moving.

**How are forces created?**

\_\_\_\_\_\_\_\_\_\_ are created in many ways.

For example, your muscles create force when you swing a baseball bat; wind creates a force against an object; gravity.

**Units of force**

* The \_\_\_\_\_\_\_\_\_\_ is a unit of force commonly used in the United States.
* For smaller amounts, pounds are divided into \_\_\_\_\_\_\_\_\_\_ (oz.).
* There are \_\_\_ ounces in 1 pound.

When you measure weight in \_\_\_\_\_\_\_\_\_ on a postal scale, you are measuring the \_\_\_\_\_\_\_\_\_ of \_\_\_\_\_\_\_\_\_\_ acting on an object.

* Although we use pounds all the time in our everyday life, scientists prefer to measure forces in \_\_\_\_\_\_\_\_\_\_.
* The *newton* (N) is a \_\_\_\_\_\_\_\_ unit of \_\_\_\_\_\_\_\_.

One \_\_\_\_\_\_\_\_\_ is the \_\_\_\_\_\_\_\_\_\_ it takes to change the \_\_\_\_\_\_\_ of a 1 kilogram mass by 1 m/s per second.

**1 N = 1 kg m/s2**

One pound (lb) is about the \_\_\_\_\_\_\_\_\_ of 0.454 kg of \_\_\_\_\_\_\_\_.

One newton is the \_\_\_\_\_\_\_\_\_ it takes to change the speed of a 1 kg \_\_\_\_\_\_\_\_ by 1 m/s in 1 second.

Recall: change in \_\_\_\_\_\_\_\_\_ in an interval of time is \_\_\_\_\_\_\_\_\_\_\_\_\_. So one newton is the \_\_\_\_\_\_\_\_ to \_\_\_\_\_\_\_\_\_\_\_ 1 kilogram by 1m/s2.

* The newton (N) is a \_\_\_\_\_\_\_\_\_\_\_ unit of force than the \_\_\_\_\_\_\_\_\_\_ (lb).
* One \_\_\_\_\_\_\_\_\_\_ of \_\_\_\_\_\_\_\_ equals 4.448 newton, so a 100 lb person weighs 444.8 newton.

**Force Vectors**



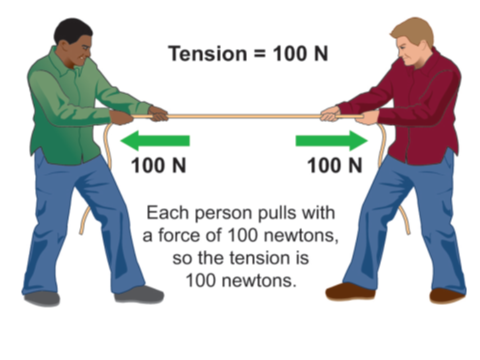
* We use arrows, called \_\_\_\_\_\_\_\_\_\_\_, to represent the direction and magnitude of \_\_\_\_\_\_\_\_\_.
* The \_\_\_\_\_\_\_\_\_ of the arrow shows how \_\_\_\_\_\_\_ the force is (its magnitude).
* The direction that the arrow points shows the \_\_\_\_\_\_\_\_ in which the \_\_\_\_\_\_\_\_ is acting.

**How forces act**

* One way forces act is the result of \_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_.
* A contact \_\_\_\_\_\_\_\_\_\_ is transmitted by matter directly \_\_\_\_\_\_\_\_\_\_\_\_ other matter, such as wind acting to slow a parachute.
* The force of \_\_\_\_\_\_\_\_\_ between Earth and Moon appears to be what people once called “action-at-a-distance”.
* Today we know that the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ is carried from the Earth to the Moon by a \_\_\_\_\_\_\_\_\_\_  *\_\_\_\_\_\_\_\_\_.*

**Contact forces from ropes and springs**

* Ropes and springs are often used to make and apply \_\_\_\_\_\_\_\_.
* Ropes are used to transfer \_\_\_\_\_\_\_\_ or change their \_\_\_\_\_\_\_\_\_\_\_\_.
* The pulling force carried by a rope is called \_\_\_\_\_\_\_\_\_\_\_.
* Tension always acts along the direction of the rope.

**Which of these springs is designed to be stretched?**

**Which is designed to be compressed?**

**Spring Forces**

Springs are used to make or control \_\_\_\_\_\_\_\_.

The force from a spring always acts to return the spring to its \_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_.

**Classify these forces as contact forces or the result of force fields:**

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**Gravity**

* The force of acceleration of \_\_\_\_\_\_\_\_\_ acting on an object’s mass is called \_\_\_\_\_\_\_\_\_\_.
* At Earth’s surface, gravity exerts a force of \_\_\_\_\_ N on every kilogram of mass.

**Weight vs. Mass**

* *Weight and mass are \_\_\_\_\_\_ the same.*
* Mass is the *amount of \_\_\_\_\_\_\_\_\_* in an object measured in \_\_\_\_\_\_\_\_\_\_\_\_ *(kg).*
* Weight is a \_\_\_\_\_\_\_\_\_\_measured in \_\_\_\_\_\_\_\_\_\_\_\_(N*).*
* \_\_\_\_\_\_\_\_\_\_\_ depends on mass and strength of acceleration of \_\_\_\_\_\_\_\_\_\_.

Weight depends on mass and gravity. A 10-kilogram rock has the same \_\_\_\_\_ no matter where it is in the universe. On Earth, the 10 kg rock *weighs* 98 N. On the moon, the same rock only \_\_\_\_\_\_\_16 N.



**The Weight Formula**

The weight equation can be rearranged into three forms to calculate \_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_, or the strength of acceleration of gravity.

|  |  |  |
| --- | --- | --- |
| **Use:** | **To find:** | **When you know:** |
| **W = m x g** | **\_\_\_\_\_\_\_\_\_\_\_ (W)** | **mass (m) & acceleration of gravity (g)** |
| m = W  g | \_\_\_\_\_\_\_\_ (m) | weight (W) & acceleration of gravity (g) |
| **g = W**  **m** | **\_\_\_\_\_\_\_\_\_\_\_\_ of gravity (g)** | **weight (W) & mass (m)** |

**Calculate the weight of a 60-kilogram person on Earth, where g = 9.8 m/s2 and**

**on Mars, where g = 3.7 m/s2.**

1. **Looking for: \_\_\_\_\_\_\_\_\_** of person on both planets
2. **Given:** mass = 60 kg; g= 9.8 m/s2 on Earth; g = 3.7 m/s2 on Mars; we know that

1 N= 1 kg m/s2

1. **Relationships:** W = m x *g*
2. **Solution:**

**60 kg x 9.8 m/s2= 588 N on Earth**

**60 kg x 3.7 m/s2 = 222 N on Mars**

**Practice: Do the Practice Mass, Weight, and Gravity Practice problems!**