Mass vs. Weight

In physics, it is important to learn how to distinguish between closely related concepts.

_________ is the quantity (or amount) of matter in an object. This property is equivalent to **inertia** which tells us how much an object resists a force. You can think of it as the "laziness" of matter – an object's inherent resistance to change in motion.

___________ is usually defined as the measurement of gravitational force.

$Weight = mg$ where m is mass and g is gravitational acceleration ($9.8\ m/s^2$ in the downward direction).

Objects with ____________ masses experience *more* gravitational force than objects with _____________ masses. This is why it is easy to confuse mass and weight.

Mass is independent of the *celestial body* ("an object in space") on which an object is placed. In other words, mass is the same _______________.

The gravitational constant g changes depending on the mass of the celestial body. The heavier the celestial body, the stronger the pull of gravitational acceleration at its surface. This is why you weigh more on the earth than you do on the moon. The moon has much less mass than the earth and therefore a much lower g value. On the moon g is about $1.6\ m/s^2$ as opposed to 9.8! An object floating in empty space will have no weight at all, but it will still have the same mass.

It is possible to think about weight beyond the concept of gravitational force. If a pilot makes a sharp banking turn, the weight of his/her body pressing down on the seat might become 3 or 4 times the force of gravity on earth. This is exactly why they call it "g-force." A g-force of 4 g (not grams) represents the force of 4 times the gravitational acceleration on earth.