

Section 4.2 Notes: *Mass and Weight*



1. What is **gravity**?
2. What determines the force of gravity between two masses?
3. The force of gravity, if unbalanced, will cause an object...
4. Little "g" is
 - the *acceleration due to gravity* or *gravitational field strength*
5. Compare **weight** and **mass**?

weight	mass
The measure of the force of gravity on an object. <u>Depends on</u> the value of "g"	The amount of matter in an object. <u>Depends on</u> the number and kind of atoms in it
<u>Units:</u> newtons (N) English units= pounds 1 N \approx 1/4 pound	<u>Units:</u> grams (g) or kilograms (kg) 1 kg weighs 2.2 pounds 1 pound \approx 4.5 N
Weight = mass x gravitational field strength $F_g = m g$ ($F = m a$)	One kg weighs 9.8 newtons $m = F/a$
Depends on where you are... You <u>weigh less</u> on the moon since its gravity is 1/6 th that of Earth You <u>weigh more</u> on Jupiter since its gravity is about 2.5 times Earth	Mass does NOT change with changes in gravity...you have the same mass on Earth, moon, Jupiter ...everywhere!

6. Problems:
What is the **weight** of each of the following object?

- a. 0.113-kg hockey puck
- b. 108-kg football player
- c. 870-kg automobile
- d. 275-g object

Find the **mass** of each of these weights?

- e. 98 N
- f. 80 N

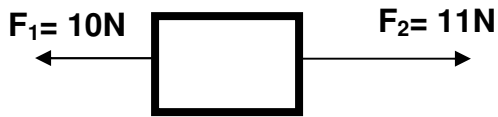
An astronaut with mass **75 kg** travels to Mars. What is her weight..

- a. on Earth?

- b. on Mars ($g = 3.8 \text{ m/s/s}$)

Arnold needs to lift a **35.0-kg** rock. If he exerts an upward force of **502 N** on the rock, what is the rock's acceleration? (draw a free body diagram)

Calculate the acceleration of the **0.30-kg** box:



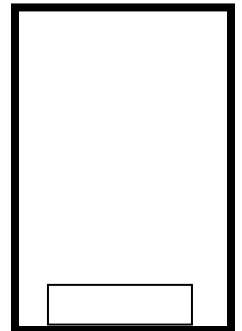
- 7. Apparent weight:

- 8. weightlessness:

- 9. Your mass is **75.0 kg** and you are standing on a scale in an elevator. What does the scale read for each of the following examples...

- a. when it is accelerating upward at 2.00 m/s/s ?

- b. when the elevator is a constant velocity?



- c. when it is accelerating downward at 2.00 m/s/s ?

- d. when it is accelerating downward at 9.80 m/s/s ?