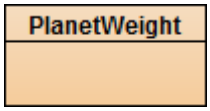
07.04 Assignment Instructions

Instructions: Write a program that calculates your weight on each planet in the solar system.



1. Read the Background section below to learn how to calculate your weight on other planets in our solar system.
2. Continue working in the 07 Defining New Methods project folder.
3. Create a class called PlanetWeight in the project.
4. Use static methods to break your program down into functional sections. For each method, determine whether parameters are needed or a return value.
5. Assign the names of the planets to an array.
6. Read the surface gravity data for each planet from the text created by running the PlanetGravity program. Store the values into an array.
7. Make the program interactive by asking the user to provide a weight in pounds.
8. Calculate your weight in pounds on each planet.
9. Display the information in a neatly formatted table. (See sample output.)

Note: This is the second part of an assignment that began in the previous lesson. If you have not completed the previous assignment, please do so before continuing. You need the data file generated by the earlier program in that assignment.

Expected Output: When your program runs correctly, the output should resemble the following screen shot:

My Weight on the Planets		
Planet	**Gravity**	**Weight (lbs)**
Mercury	3.70	37.79
Venus	8.87	90.60
Earth	9.79	100.00
Mars	3.70	37.79
Jupiter	24.78	253.12
Saturn	10.44	106.64
Uranus	8.86	90.50
Neptune	11.13	113.69

Background: Mass vs. Weight

The definition of mass, roughly speaking, is how much “stuff” (i.e. matter) there is in an object. Is there any *more* of you on Earth than there would be on Jupiter? No. It doesn’t *matter* which planet you are on…your mass doesn’t change, but your weight does.

Your weight on Earth is determined by how strongly your mass is attracted by the force of gravity. Step on a scale and you know your weight.

weight = (mass) x (surface gravity)

For all practical purposes, your Earth weight is your mass. However, mass is measured in metric units, so we first have to convert pounds to grams (1 pound = 453.59237 grams).

After re-arranging the terms and applying a conversion factor for pounds to grams, the equation for mass is the following. (Notice how closely this resembles a Java arithmetic expression.)

mass = (weight) * (453.59237) / (surface gravity)

If a person weighs 150 pounds on Earth, what is the person’s mass in grams?

mass = (150) * (453.59237) / (9.8 / 9.8)
= 68038.86 grams

On other planets, your weight would be different from your mass because each has a different surface gravity. You would be much more strongly attracted by gravity on Jupiter than you would be on Mars. Therefore, you (actually your mass) would weigh more on Jupiter than Mars.

newWeight = (mass) x (surface gravity / 9.8) / 453.59237

Note: You may have noticed the surface gravity values are divided by 9.8 (Earth's surface gravity) in each equation. This is to make planet's surface gravity value a ratio to Earth's. The reason for this is well beyond the scope of this course. In case you’re curious, an explanation for this adjustment can be found by doing some astronomy research. But it is just Algebra, so divide by 9.8, and your answers will be correct.
