

CS 570: Programming Foundations

Fall 2017

Homework Assignment #5

Due date: Wednesday, November 8, 2017 by 11:59 PM.

Note: This and all assignments given in this course can be and must be solved using **only** the materials that have been discussed in class. Do not look for alternative methods that have not been covered as part of this course.

Program (60 points):

We are going to write a program that allows the user to calculate his/her weight on any given planet in the solar system. Here is the data you will need:

Planet	Planet Surface Gravity
Mercury	0.39
Venus	0.91
Earth	1.00
Mars	0.38
Jupiter	2.87
Saturn	1.32
Uranus	0.93
Neptune	1.23
Pluto	0.03

Note: yes, Pluto is a planet (a dwarf planet):

<https://www.nasa.gov/audience/forstudents/k-4/stories/nasa-knows/what-is-pluto-k4.html>

For example, if your weight on Earth is 120 pounds, then your weight in Venus is $120 * 0.91 = 109.2$ pounds; and your weight in Pluto is 3.6 pounds.

Program Details

For this assignment you will need to use: arrays, loops, selection statements, and write some methods.

You will store the names of the planets in an array of Strings, and the planets' surface gravity factors in an array of doubles.

The program will have a menu with the following options:

- Enter 1 to find your weight on a given planet.
- Enter 2 to see your weight on all planets.
- Enter 3 to display all planets and gravity factors.
- Enter 4 to show this menu again.
- Enter any other number to exit the program.

The user will enter his/her choice and the program will complete the appropriate tasks.

For option 1: the program must ask the user to enter his/her weight in pounds and the code for the planet he/she wants. You can use the index of the elements in the array as the code for the planets (so for example 0 corresponds to Mercury, 1 to Venus, and so on). The inputs provided by the user must be validated: do not allow weights less than 1, or invalid codes for planets. Once you have valid data, invoke a method that will calculate and return the weight of the user in the desired planet.

For option 2: the program must ask the user to enter his/her weight in pounds (do not allow weights less than 1). Once you have a valid weight invoke a method that will display a table with all the planets' names and the corresponding weights on the planets.

For option 3: invoke a method that will display the names of the planets and their surface gravity factors.

Here is a sample run of a typical solution to this problem:

Welcome to the Planet Calculator!

Enter 1 to find your weight on a given planet.
Enter 2 to see your weight on all planets.
Enter 3 to display all planets and gravity factors.
Enter 4 to show this menu again.
Enter any other number to exit the program.

Your choice: 1

Enter your weight on Earth, in pounds: 0
Weight must be a value greater than zero.

Enter your weight on Earth, in pounds: 200
Enter the code number of the planet your want: 99
Planet code must be a value between 0 and 8.

Enter the code number of the planet your want: 5
Your weight in Saturn is 264

Welcome to the Planet Calculator!

Enter 1 to find your weight on a given planet.
Enter 2 to see your weight on all planets.
Enter 3 to display all planets and gravity factors.
Enter 4 to show this menu again.
Enter any other number to exit the program.

Your choice: 2|

Enter your weight on Earth, in pounds: 125.50

Planet	Weight

Mercury	48.95
Venus	114.2
Earth	125.5
Mars	47.69
Jupiter	360.19
Saturn	165.66
Uranus	116.72
Neptune	154.37
Pluto	3.76

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Welcome to the Planet Calculator!
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Enter 1 to find your weight on a given planet.
Enter 2 to see your weight on all planets.
Enter 3 to display all planets and gravity factors.
Enter 4 to show this menu again.
Enter any other number to exit the program.

Your choice: 3
Planet          Gravity Factor
-----
Mercury         0.39
Venus           0.91
Earth           1.0
Mars            0.38
Jupiter         2.87
Saturn          1.32
Uranus          0.93
Neptune         1.23
Pluto           0.03

Welcome to the Planet Calculator!
-----
Enter 1 to find your weight on a given planet.
Enter 2 to see your weight on all planets.
Enter 3 to display all planets and gravity factors.
Enter 4 to show this menu again.
Enter any other number to exit the program.

Your choice: 4

Welcome to the Planet Calculator!
-----
Enter 1 to find your weight on a given planet.
Enter 2 to see your weight on all planets.
Enter 3 to display all planets and gravity factors.
Enter 4 to show this menu again.
Enter any other number to exit the program.

Your choice: 5
Have a nice day!

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Note: Please make sure to submit well-written programs for these programming tasks. Good identifier names, useful comments, indentation, and spacing will be some of the criteria that will be used when grading this assignment.

Sorting Algorithms (40 points):

For the following list of numbers:

9 0 11 10 5 8 6 7

- a) Show the sequence of changes the Bubble Sort algorithm makes to sort the list of numbers.
- b) Show the sequence of changes the Selection Sort algorithm makes to sort the list of numbers.
- c) Show the sequence of changes the Insertion Sort algorithm makes to sort the list of numbers.
- d) Show the sequence of changes the Merge Sort algorithm makes to sort the list of numbers.

For examples, please refer to the slides in week 5 and examples on your textbook (Chapter 10, section 4)

Grading

Criteria for the Program	Points
Code Compiles Correctly – no compilation errors	15
Code runs properly on several tests and produces the correct results	10
Program Construction: all the required parts are there and logical flow is correct, including calculations, input validation, the use of selection statements and loops, and required methods.	10
Correct implementation of arrays	15
User Interface: the program provides clear instructions for the user so he/she understands what the program does, what input need to be provided and what the output of the program means.	5
Code Style: good identifier names, named constants as needed, comments, indentation and spacing	5

Sorting Algorithms	Points
Bubble Sort algorithm walkthrough	10
Selection Sort algorithm walkthrough	10
Insertion Sort algorithm walkthrough.	10
Merge Sort algorithm walkthrough.	10

How to submit your assignment

- Assignments must be submitted via Blackboard Learn.
 - Please note that assignments submitted via email will not be accepted.
 - Late assignments will not be accepted. Your work must be uploaded and submitted by 11:59 PM on the date it's due.
- For this assignment you must submit:
 - For the planets problem, submit the corresponding .java file.
 - For the sorting problem, submit a .pdf file that shows your work.
 - Do not submit files in any other formats – if you do, your assignment will not be graded.

Academic Honesty

You must be the sole original author of the solution you submit. You must compose all program and written material yourself. All material taken from outside sources must be appropriately cited.