

CS 171 - Programming Assignment 2

Mark Boady - Drexel University

October 9, 2017

1 Overview

The goal of this assignment is to create a unit conversion program. The key programming feature explored in this assignment is dictionaries. You will use a dictionary to store reference information.

2 Unit Conversions

There are many different units of length. Converting between units is error prone. This can cause some major problems.

<http://www.cnn.com/TECH/space/9909/30/mars.metric.02/>

In this assignment, you will write a program that converts between different units of length.

For consistency, we will always use the plural form of the units. For example, 1 feet instead of 1 foot. This will simplify your programming.

Your program must support the following U.S. Units. The below league measurement is for land leagues not nautical leagues.

Units	Relationship to other Units
1 inches	2.54 centimeters
1 feet	12 inches
1 yards	3 feet
1 miles	1760 yards
1 leagues	3 miles

Your program must support the following S.I. Units.

Units	Relationship to other Units
1 centimeters	0.01 meters
1 decimeter	10 centimeters
1 meters	10 decimeters
1 decameters	10 meters
1 hectometers	10 decameters
1 kilometers	10 hectometers

If asked to convert 2 feet into centimeters, we can compute

$$2 \text{ feet} * 12 \text{ inches/feet} = 24 \text{ inches} \quad (1)$$

$$24 \text{ inches} * 2.54 \text{ centimeters/inches} = 60.96 \text{ centimeters} \quad (2)$$

All of the relationships given above are relative. You cannot go directly from inches to miles without multiple steps.

For your programming project, you **must** create a dictionary of measurements. You should pick a single unit of measurement to be your **base**. Then make a dictionary where the key is the unit of measure and the value is the relationship to your base unit. For example, if you selected miles as your base unit, then the dictionary position for “inches” should store how many miles are equal to 1 inch. (Note: miles would not be a good base unit to select.)

With this dictionary, you will be able to convert between any of the units above using only two steps.

1. Convert value in **from units** to **base units**
2. Convert value in **base units** to **to units**

3 Programming Project

Develop a Python program `unit_conversion.py`. The program should ask the user for three inputs. First, ask for the value to be converted as a float. Next, ask for the type of units the value is currently in. Finally, ask to the target units to convert to.

Your program will then print out the unit conversion.

You **must** store all your unit conversions in a dictionary. (See Section 2)

You are not required to do any error checking. If the user enters invalid units, it is acceptable that your program crashes. You may assume all inputs given will be valid.

Your program must print out all the units it supports so the user knows exactly what to type. If the output does not make it clear what the correct spelling/capitalization is for each unit then points will be deducted. We can only assume the user will give valid input if they understand what input is expected.

You must show at least 4 decimal digits if they are significant. Rounding errors will be accepted as long as they are reasonably small.

You can check your answers using the google. For example, search for “200 centimeters in yards” in google to see a conversion. Google will assume nautical leagues which is not what we are using.

4 Example Execution Trace

You are not required to exactly match the below layout, but your content and results must be the same.

The below execution traces do not test all possible types of units. Only a few examples are shown. You are expected to do additional testing on your own.

4.1 Example 1

```
Welcome to the length conversion wizard.
This program can convert between any of the following lengths.
inches
feet
yards
miles
leagues
centimeters
decimeters
meters
decameters
hectometers
kilometers
Note: You must use the units exactly as spelled above.
```

```
Enter value:
25
Enter from units:
inches
Enter to units:
feet
25.0 inches is 2.083333333333335 feet
```

4.2 Example 2

```
Welcome to the length conversion wizard.
This program can convert between any of the following lengths.
inches
feet
yards
miles
leagues
centimeters
decimeters
meters
decameters
hectometers
kilometers
Note: You must use the units exactly as spelled above.
```

```
Enter value:
91
Enter from units:
leagues
Enter to units:
kilometers
91.0 leagues is 439.35091199999994 kilometers
```

4.3 Example 3

```
Welcome to the length conversion wizard.
This program can convert between any of the following lengths.
inches
feet
yards
miles
leagues
centimeters
decimeters
meters
decameters
hectometers
kilometers
Note: You must use the units exactly as spelled above.
```

```
Enter value:
2.45
Enter from units:
feet
Enter to units:
hectometers
2.45 feet is 0.0074676000000000005 hectometers
```

5 Grading

There are no strict guidelines for how to write your code or develop your user interface. You will be graded on the quality of your design and execution.

- Correct Unit Conversions: (66 points)
 1. centimeters: 6 points
 2. decimeters: 6 points
 3. meters: 6 points
 4. decameters: 6 points
 5. hectometers: 6 points

- 6. kilometers: 6 points
- 7. inches: 6 points
- 8. feet: 6 points
- 9. yards: 6 points
- 10. miles: 6 points
- 11. leagues: 6 points
- Program inputs correct: 9 points
 - Reads float: 3 points
 - Reads from units: 3 points
 - Reads to units: 3 points
- Output is well formatted and easy to read: 3 points
- File name is correct: 1 point
- Name in comments: 1 point
- Lab Section in comments: 1 point
- Code is well commented: 3 points
- Variables are used: 3 points
- Variables names are not confusing: 3 points
- Unit Conversions stored in a Dictionary: 10 points

If your code has any runtime errors, a 50% deduction will be taken. Only portions of the code that execute without errors will be graded.

6 Resources

You can learn more about the calculations at these websites.

[https://www.calculateme.com/Length/Leagues\(Land\)/ToKilometers.htm](https://www.calculateme.com/Length/Leagues(Land)/ToKilometers.htm)

[https://en.wikipedia.org/wiki/League_\(unit\)](https://en.wikipedia.org/wiki/League_(unit))

https://en.wikipedia.org/wiki/Unit_of_length