03 Checkpoint: Writing Functions

Purpose

Check your understanding of writing your own functions with parameters and then calling those functions.

Problem Statement

Many vehicle owners record the fuel efficiency of their vehicles as a way to track the health of the vehicle. If the fuel efficiency of a vehicle suddenly drops, there is probably something wrong with the engine or drive train of the vehicle. In the United States, fuel efficiency for gasoline powered vehicles is calculated as miles per gallon. In most other countries, fuel efficiency is calculated as liters per 100 kilometers.

The formula for computing fuel efficiency in miles per gallon is the following:

$$mpg = \frac{end - start}{gallons}$$

where *start* and *end* are both odometer values in miles and *gallons* is a fuel amount in U.S. gallons.

The formula for converting miles per gallon to liters per 100 kilometers is the following:

$$lp100k = \frac{235.215}{mpg}$$

Assignment

Write a Python program that asks the user for three numbers:

1. A starting odometer value in miles
2. An ending odometer value in miles
3. An amount of fuel in gallons

Your program must calculate and print fuel efficiency in both miles per gallon and liters per 100 kilometers. Your program must have three functions named as follows:

1. `main`
2. `miles_per_gallon`
3. `lp100k_from_mpg`

All user input and printing must be in the `main` function. In other words, the `miles_per_gallon` and `lp100k_from_mpg` functions must not call the the `input` or `print` functions.

Helpful Documentation

- The prepare content for the previous lesson explains how to call a function.
- The prepare content for this lesson explains how to write a function.

Steps

Copy and paste the following code into a new program named `fuel_usage.py`. Use the pasted code as a design as you write your program. Write code for each of the functions.

```
def main():
    # Get an odometer value in U.S. miles from the user.

    # Get another odometer value in U.S. miles from the user.

    # Get a fuel amount in U.S. gallons from the user.

    # Call the miles_per_gallon function and store
    # the result in a variable named mpg.

    # Call the lp100k_from_mpg function to convert the
    # miles per gallon to liters per 100 kilometers and
    # store the result in a variable named lp100k.

    # Round the miles per gallon to one digit after the decimal.

    # Round the liters per 100 km to two digits after the decimal.

    # Display the results for the user to see.
    pass


def miles_per_gallon(start_miles, end_miles, amount_gallons):
    """Compute and return the average number of miles
    that a vehicle traveled per gallon of fuel.

    Parameters
        start_miles: An odometer value in miles.
        end_miles: Another odometer value in miles.
        amount_gallons: A fuel amount in U.S. gallons.
    Return: Fuel efficiency in miles per gallon.
    """
    return


def lp100k_from_mpg(mpg):
    """Convert miles per gallon to liters per 100
    kilometers and return the converted value.

    Parameter mpg: A value in miles per gallon
    Return: The converted value in liters per 100km.
    """
    return


# Call the main function so that
# this program will start executing.
main()
```

Testing Procedure

Verify that your program works correctly by following each step in this testing procedure:

1. Run your program and enter the inputs shown below. Ensure that your program's output matches the output below.

```
> python fuel_usage.py
Enter the first odometer reading (miles): 30462
Enter the second odometer reading (miles): 30810
Enter the amount of fuel used (gallons): 11.2
31.1 miles per gallon
7.57 liters per 100 kilometers
```

Sample Solution

When your program is finished, view the sample solution [↓] for this assignment to compare your solution to that one. Before looking at the sample solution, you should work to complete this checkpoint program. However, if you have worked on it for at least an hour and are still having problems, feel free to use the sample solution to help you finish your program.

Ponder

After you finish this assignment, congratulate yourself because you wrote a Python program with three user-defined functions named `main`, `miles_per_gallon`, and `lp100k_from_mpg`. Is it important that you know how to write your own functions? Why?

Submission

When complete, report your progress in the associated I-Learn quiz.