

## **Project 1**

### **Objectives**

1. Understand the design, implementation and use of programs based on functions
2. Identify and use the adequate control structures to provide accurate solutions to problems
3. Apply strings for data processing
4. Gain experience implementing applications using layers of increasing complexity and fairly complex code

### **Project Overview**

In this project, you will develop a small program to perform base conversions. The valid bases are 2, 8, 10 or 16. The program will enable the user to make the following conversions:

1. Decimal to binary, octal or hexadecimal
2. Binary, octal or hexadecimal to decimal
3. Binary, octal or hexadecimal to binary, octal or hexadecimal

The program will use the listing above to present a menu to the user, like this one:

Welcome to base conversion program. Please, choose an option

1. Decimal to binary, octal or hexadecimal
2. Binary, octal or hexadecimal to decimal
3. Binary, octal or hexadecimal to binary, octal or hexadecimal
4. Exit

Enter option:

When the user picks an option the base conversion starts. If the user picks option 4, then the program ends with the message: “Thanks for using the base conversion program”. Upon choosing an option for conversion, the program will prompt the user to enter a the number to be converted.

The following sequence illustrates the process:

Welcome to the base conversion program. Please, choose an option:

1. Decimal to Binary, Octal or Hexadecimal
2. Binary, Octal or Hexadecimal to Decimal
3. Binary, Octal or Hexadecimal to Binary, Octal or Hexadecimal
4. Exit

Enter option: 1

Enter the number to be converted: 23  
Enter the output base: 2  
The decimal number 23 is 10111 in base 2.

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Welcome to the base conversion program. Please, choose an option:

1. Decimal to Binary, Octal or Hexadecimal
2. Binary, Octal or Hexadecimal to Decimal
3. Binary, Octal or Hexadecimal to Binary, Octal or Hexadecimal
4. Exit

Enter option: 3  
Enter the number in its base: 1111  
Enter the input base: 2  
Enter the output base: 16  
The number 1111 in base 2 is F in base 16

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Welcome to the base conversion program. Please, choose an option:

1. Decimal to Binary, Octal or Hexadecimal
2. Binary, Octal or Hexadecimal to Decimal
3. Binary, Octal or Hexadecimal to Binary, Octal or Hexadecimal
4. Exit

Enter option: 4  
Thanks for using the base conversion program!

### **Additional Information:**

A source code is provided under the name project1.py. The file contains some of the functions to perform the described task.. Here some details of the functions:

1. print\_program\_menu() prints the options menu
2. identify\_option(option) verifies if the entered option is valid. The function will return -1 if the option is invalid and 1 if the entered option is valid.
3. process\_conversion(numericOption) handle the menu selections

### **Your tasks:**

- Create two intermediate functions:
  - hex\_to\_decdigit(decdig) that receives a hex digit (0-F) and returns the corresponding decimal number (0-15). This function will help to carry out the task of converting hexadecimal numbers to decimal numbers.
  - dec\_to\_hexdigit(hexdigit) that receives a decimal digit (0-15) and returns the corresponding hexadecimal digit (0-F). This function will help to carry out the tasks of converting from decimal to hexadecimal.
- Create the function: convert\_decimal\_to\_base(dec\_num,base)

- receives two parameters a decimal number and a *base* (2, 8, 16 or 10). The function returns a string equivalent to the number in the new base
- Inside the function use conditional structures so that the function `dec_to_hexdigit(hexdigit)` is called when appropriate according to the user input.
- Create the function `convert_base_to_decimal(bnum, base)`
  - receives two parameters: a string that represent a number in a *base* and the base of the number. The function returns the equivalent decimal number
  - Call the function `hex_to_decdigit(decdig)` when appropriate
- Create the function `convert_base1_to_base2(b1num,b1,b2)`
  - Receives three parameters: a string representing the number in its base, an integer that represents the input base and an integer that represents the output base.
  - The function returns a string representing the number in the new base.
  - Inside the function body, call the functions `convert_decimal_to_base(dec_num,base)` and `convert_base_to_decimal(bnum, base)` to return a string representing the number in the new base.
- Complete the body of the `process_conversion(numericOption)` function to process all the selections from the menu.
- Create a `main()` function to print the menu, verify the user input if the input is invalid print the message : Invalid option

If the option is a valid integer and different to 4 it be will be processed by invoking the function `process_conversion(numericOption)`. If the user enters 4 it will print the message  
Thanks for using the base conversion program!

### Submission details:

You will submit a single file to the provided link for the project 1. Your file name must have the following format: LastnameFirstname\_Section\_p1. For example, a student named Jose Perez from section 016 would submit the following 2 files: `PerezJose_016_p1.py` (please use only one name and one last name).

**PROJECT DUE DATE: 11:59 PM – April 3, 2020**

**NOTE: Projects that do not compile on the Python interpreter will get a score of 0.**