Fundamentals of Python 3rd edition Lambert Solutions Manual

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Solution and Answer Guide

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CHAPTER 1, INTRODUCTION

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EXERCISE SOLUTIONS

EXERCISE 1.1

1. List three common types of computing agents.

   Solution:

   Human beings, desktop computers, cell phones

2. Write an algorithm that describes the second part of the process of making change (counting out the coins and bills).

   Solution:

   There are various ways to do this, but here is one:

   Repeat
   Select the largest unit of money that is less than or equal to the remaining change
   Subtract this unit from the remaining change
   Until the remaining change is 0
   The collection of units selected represent the change

3. Write an algorithm that describes a common task, such as baking a cake.

   Solution:

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There are various ways to do this, but here is one:

Preheat an oven to 375 degrees
Add 1 cup of water and 1 egg to a mixing bowl
Beat the liquid mixture in the bowl until the ingredients are blended
Add the contents of a boxed cake mix to the mixing bowl
Beat the mixture in the bowl until the ingredients are blended
Pour the contents of the mixing bowl into a lightly greased cake pan
Bake the cake in the oven for 45 minutes

4. Describe an instruction that is not well defined and thus could not be included as a step in an algorithm. Give an example of such an instruction.

Solution:

Attempting to divide a number by 0

5. In what sense is a laptop computer a general-purpose problem-solving machine?

Solution:

A laptop computer is a general-purpose problem-solving machine because it is programmable and can solve any problem for which there is an algorithm.

6. List four devices that use computers and describe the information that they process. (*Hint:* Think of the inputs and outputs of the devices.)

Solution:
Digital camera—images, music player—sound, cell phone—text, ATM—numbers

EXERCISE 1.2

1. List two examples of input devices and two examples of output devices.

Solution:
Input devices—keyboard and mouse, output devices—monitor and speakers

2. What does the central processing unit (CPU) do?

Solution:
The CPU fetches, decodes, and executes instructions.

3. How is information represented in hardware memory?

Solution:
Information is represented using binary notation, which in hardware is a pattern of voltage levels.

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4. What is the difference between a terminal-based interface and a graphical user interface?

   Solution:
   A terminal-based interface supports only the input and output of text with a keyboard and monitor. A graphical user interface supports the output of images and the manipulation of them with a pointing device, the mouse.

5. What role do translators play in the programming process?

   Solution:
   A translator converts a program written in a high-level language (human readable and writable) to an equivalent program in a low-level language (machine readable and executable).

EXERCISE 1.3

1. Describe what happens when the programmer enters the string **"Greetings!"** in the Python shell.

   Solution:

   Python reads the string **`"Greetings!"`**, evaluates it, and displays this string (including single quotes) in the shell.

2. Write a line of code that prompts the user for their name and saves the user's input in a variable called **`name`**.

   Solution:
   ```
   name = input("Enter your name: ")
   ```

3. What is a Python script?

   Solution:

   A Python script is a complete Python program that can be run from a computer's operating system.

4. Explain what goes on behind the scenes when your computer runs a Python program.

   Solution:

   If the program has not already been translated, Python's compiler translates it to byte code. The Python virtual machine then executes this code.

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REVIEW QUESTIONS ANSWERS

1. Which of the following is an example of an algorithm?

   a. A dictionary

   b. A recipe

   c. A shopping list

   d. The spelling checker of a word processor

   Answer: b

   Feedback:

   a. **Incorrect**. A dictionary is a data structure.
   b. **Correct.** A recipe is a set of instructions that describes a process that halts with a solution to a problem.
   c. **Incorrect.** A shopping list is a data structure.
   d. **Incorrect.** A word processor is a program that consists of instructions and data.

2. Which of the following contains information?

   a. An audio CD

   b. A refrigerator

   c. An automobile

   d. A stereo speaker

   Answer: a

   Feedback:

   a. **Correct.** The information on an audio CD represents sound.
   b. **Incorrect.** A refrigerator contains just food, if it's not empty.
   c. **Incorrect.** An automobile contains a steering wheel, engine, exhaust pipe, and so on.
   d. **Incorrect.** A stereo speaker contains a magnetic coil, wires, and so on.

3. Which of the following is a general-purpose computing device?

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a. A smartphone

b. A portable music player

c. A microwave oven

d. A programmable thermostat

Answer: a

Feedback:

a. **Correct.** A smartphone is capable of running any program.
b. **Incorrect.** A portable music player is dedicated to the specialized tasks of playing digital music.
c. **Incorrect.** A microwave is dedicated to the task of heating food.
d. **Incorrect.** A programmable thermostat is dedicated to the specialized tasks of climate control.

4. Which of the following is an input device?

a. Speaker

b. Microphone

c. Printer

d. Display screen

Answer: b

Feedback:

a. **Incorrect.** A speaker is a device for the output of sound.
b. **Correct.** A microphone is a device for the input of sound.
c. **Incorrect.** A printer is a device for the output of words or graphics on paper.
d. **Incorrect.** A display screen is a device for the output of images and text.

5. Which of the following are output devices?

a. A digital camera

b. A keyboard

c. A flatbed scanner

d. A monitor

Answer: d

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Feedback:

a. **Incorrect.** A digital camera is a device for the input of images.

b. **Incorrect.** A keyboard is a device for the input of characters and commands via keystrokes.

c. **Incorrect.** A flatbed scanner is a device for the input of images from paper.

d. **Correct.** A monitor is a device for the visual display or output of words and graphics.

6. What is the purpose of the CPU?

   a. Store information

   b. Receive inputs from the human user

   c. Decode and execute instructions

   d. Send output to the human user

   Answer: c

   Feedback:

   a. **Incorrect.** The purpose of memory is to store information.

   b. **Incorrect.** The purpose of input devices, such as a keyboard, is to receive input from the human user.

   c. **Correct.** The CPU contains circuitry that decodes and executes instructions.

   d. **Incorrect.** The purpose of output devices, such as a monitor, is to send output to the human user.

7. Which of the following translates and executes instructions in a programming language?

   a. A compiler

   b. A text editor

   c. A loader

   d. An interpreter

   Answer: d

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Feedback:

a. **Incorrect.** A compiler translates instructions in a source program to instructions in byte code or machine code.

b. **Incorrect.** A text editor allows a programmer to edit and save source code for a program.

c. **Incorrect**. A loader transfers instructions and data from external memory to random access memory at program startup.

d. **Correct.** An interpreter both translates (compiles) and executes (runs) instructions in a programming language.

8. Which of the following outputs data in a Python program?

   a. The input function

   b. The assignment statement

   c. The print function

   d. The main function

   Answer: c

   a. **Incorrect.** The input statement receives data from a file or at the keyboard and makes these data available to a running program.

   b. **Incorrect.** The assignment statement binds a variable to a value.

   c. **Correct.** The print statement sends data from a running program to a an output device, such as a monitor or a speaker.

   d. **Incorrect.** The main function organizes a program at the top level into a sequence of instructions.

9. What is IDLE used to do?

   a. Edit Python programs

   b. Save Python programs to files

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c. Run Python programs

d. All of the other answers

Answer: d

Feedback:

a. **Correct.** IDLE can be used for all three tasks.

b. **Correct.** IDLE can be used to compile and run programs, too.

c. **Correct.** IDLE can be used to edit and run programs, too.

d. **Correct.t** IDLE can be used to edit and compile programs, too.

10. What is the set of rules for forming sentences in a language called?

a. Semantics

b. Pragmatics

c. Syntax

d. Logic

Answer: c

Feedback:

a. **Incorrect.** Semantics is the set of rules for interpreting the meaning of sentences in a language.
b. **Incorrect**. Pragmatics is the set rules that describe the types of uses to which sentences in a language can be put.
c. **Correct.** Semantics is the set of rules for forming sentences in a language.
d. **Incorrect**. Logic is the set of rules for determining valid or invalid arguments in a language.

PROGRAMMING EXERCISES SOLUTIONS

For all Programming Exercises Solutions, see solution files posted on the Instructor Companion Site.

1. Write a Python program in a file named **myinfo.py** that prints (displays) your name, address, and telephone number. (LO: 1.1)

   Solution: See `myinfo.py` posted on the Instructor Companion Site.

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2. Open an IDLE window and enter the program from Figure 1-7 that computes the area of a rectangle. Save the program to a file named **rectangle.py** and load it into the shell by pressing the F5 key and correct any errors that occur. Test the program with different inputs by running it at least three times. (LO: 1.1)

   Solution: See `rectangle.py` posted on the Instructor Companion Site.

3. Write a program in a file named **triangle.py** to compute the area of a triangle. Issue the appropriate prompts for the triangle's base and height. Then, use the formula **`.5 * base * height`** to compute the area. Test the program from an IDLE window. (LO: 1.1)

   Solution: See `triangle.py` posted on the Instructor Companion Site.

4. Write and test a program in a file named **circle.py** that computes the area of a circle. This program should request a number representing a radius as input from the user. It should use the formula **`3.14 * radius ** 2`** to compute the area and then output this result suitably labeled. (LO: 1.1)

   Solution: See `circle.py` posted on the Instructor Companion Site.

5. A cuboid is a solid figure bounded by six rectangular faces. Its dimensions are its height, width, and depth. Write a Python program in a file named **cuboid.py** that computes and prints the volume of a cuboid, given its height, width, and depth as inputs. The volume is just the product of these three inputs. The output should be labeled as "cubic units."

   Solution: See `cuboid.py` posted on the Instructor Companion Site.

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DEBUGGING EXERCISES SOLUTIONS

1. Consider the following interaction at the Python shell:

```
>>> first = input("Enter the first integer: ")
Enter the first number: 23
>>> second = input("Enter the second integer: ")
Enter the second number: 44
>>> print("The sum is", first + second)
The sum of the two integers is 2344
```

The expected output is 67, but the output of this computation is 2344. Explain what causes this error and describe how to correct it.

Solution
The program prints the value 2344 when given the inputs 23 and 44. The output is the result of applying the **+** operator to the two the input strings “23” and “44” to produce the resulting string “2344”. To produce the arithmetic sum of the integers 23 and 44, one should convert the input strings “23” and “44” to integer values, using the type conversion function **int**. The revised statements

```
first = int(input("Enter the first integer: "))
second = int(input("Enter the second integer: "))
```

accomplish this. Then the **+** operator will perform an arithmetic sum on the two integers, producing the expected integer value of 67.

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