

Python Review: Math, Input/Output, Data Types, Randomness

Answer the following questions.

1. Define each of the following data types, and provide an example of each.
 - a. Integer
 - b. Float
 - c. String
2. Explain the purpose of each action, and provide an example of each.
 - a. Typecasting
 - b. Using the `import` statement
 - c. Nesting
3. Define each of the following types of errors, and provide an example of when each might occur.
 - a. Syntax error
 - b. Run-time error
 - c. Logical error

Write programs that accomplish each task. Use proper conventions for variable names, input prompts, output statements, and program structure. At this point in time, assume that the user will do exactly what you tell them to do.

4. Obtain two integers, a and b , from the user and calculate the value $a^3 - \frac{b+1}{2}$. For example, using $a = 4$ and $b = 13$ produces the value 57.
5. Obtain a decimal value from the user, representing the cost of an item, and apply 13% HST to it. Round to 2 decimals. For example, an item costing \$5.79 would have an after-tax cost of \$6.54.
6. Have the user enter a value, L (in metres), representing the length of a ladder leaning against a wall, and an angle, A (in degrees), representing the angle it makes with the ground. Calculate the vertical height of the ladder, given by $L \cdot \sin A$, and the horizontal distance from the wall, given by $L \cdot \cos A$. Remember that all trigonometric functions in Python operate in radians, so A will need to be converted. For example, a 5 m ladder at an angle of 30° will have a vertical height of 2.5 m, and a horizontal distance of 4.33 m.
7. Generate three random integers, using functions in the `random` module, then calculate the sum of the largest and smallest values. For the values 13, 18 and 29, the sum is $13 + 29 = 44$.
8. Generate a random postal code, A9A 9A9 (where A is any letter and 9 is any digit), and store it as a single string.