CS100: CPADS

Programming Concepts, Variables & Expressions

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Programming Constructs

- **Almost any program can be broken down into five basic operations:**
  - Getting **input** - obtain data from a source such as a user or a file
  - Generating **output** - provide results, typically on a display or written to a file
  - Performing **computations** - mathematical manipulation of data using expressions
  - Making **decisions** - check logical conditions to select between alternative operations
  - Doing **repetitions** - execute a sequence of statements multiple times often with some variation between iterations

Programming Concepts

- **Before writing any software, define the problem specifications (i.e. what is the program required to do?)**

- **Converting program specifications into programming constructs is algorithm design**

Variables

- **Literal - a specific value to be used in a program (e.g. `4`, `'Hello World!'`)**

- **Variable - a storage location for a literal**
  - Has a particular type depending on the literal it can store (e.g. int, float, string)
  - Referred to by an identifier (a name)
    - Variable names must begin with a letter and cannot contain spaces or special characters
    - Variable names cannot be the same as keywords (words that are reserved by the programming language . . **printf**, **lambda**, **if** . .)
  - Associated with a literal via an assignment statement (i.e. typically the = symbol)

```
course_name = 'cs100'
num_students = 19
exam_average = 37.12
```

Expressions

- **An expression combines literals and variables using operators**
  - **Math operators**

    `+` `-` `*` `/` `//` `%` `**` `( )`

    - Examples:

```
x = y + 7

z = 3 * (x + y)

x = x + 1
```

Expressions (Cont.)

- **An expression combines literals and variables using operators**
  - **String operators**
    - **+ ***
    - Examples:

```
message = 'Hello'
new_message = message + 'World'
new_message2 = message * 2
```