

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
```