

# CS100: CPADS

## Programming Concepts, Variables & Expressions

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# Programming Constructs

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- **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

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- **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

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- **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

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

- **Math operators**

**+      -      \*      /      %      ( )**

- **Examples:**

**x = y + 7**

**z = 3 \* (x + y)**

**x = x + 1**

# Expressions (Cont.)

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

- **String operators**

+      \*

- **Examples:**

```
message = 'Hello'
```

```
new_message = message + 'World'
```

```
new_message2 = message * 2
```

# Expressions (Cont.)

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

- **Logical operators**

>   >=   <   <=   ==   !=   ~=

- **Examples:**

**x > 4.0**

**a == 3**