Basic Program Structure
Data Type, Variable

Lesson Objectives

At the end of this lesson, you should be able to:

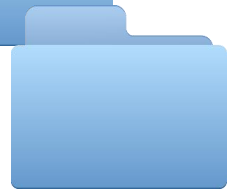
- Explain the following concepts:
  - Variables
  - Assignment operator
  - Arithmetic operators
  - Basic numeric data types
- Use variables, assignment operator, arithmetic operators, and basic numeric data types in coding

Topic Outline

Variables

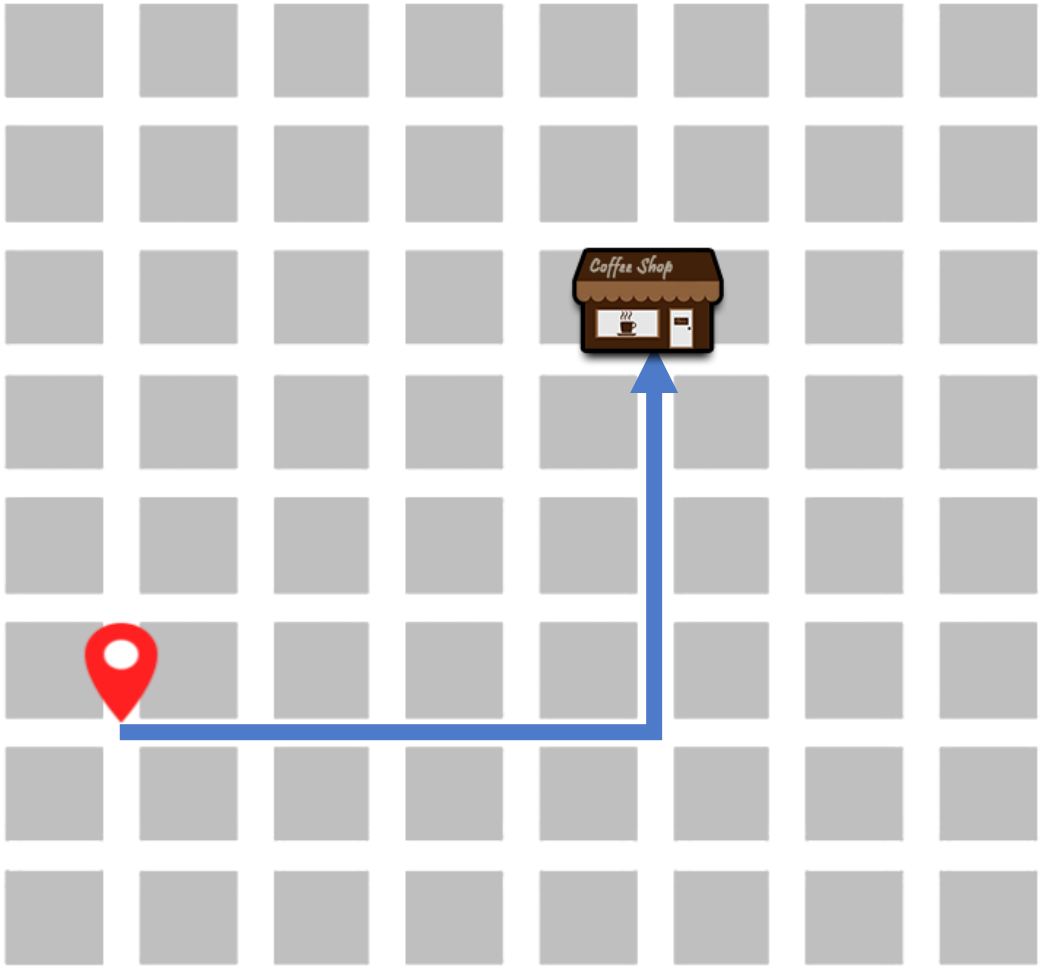
Assignment Operator

Arithmetic Operators

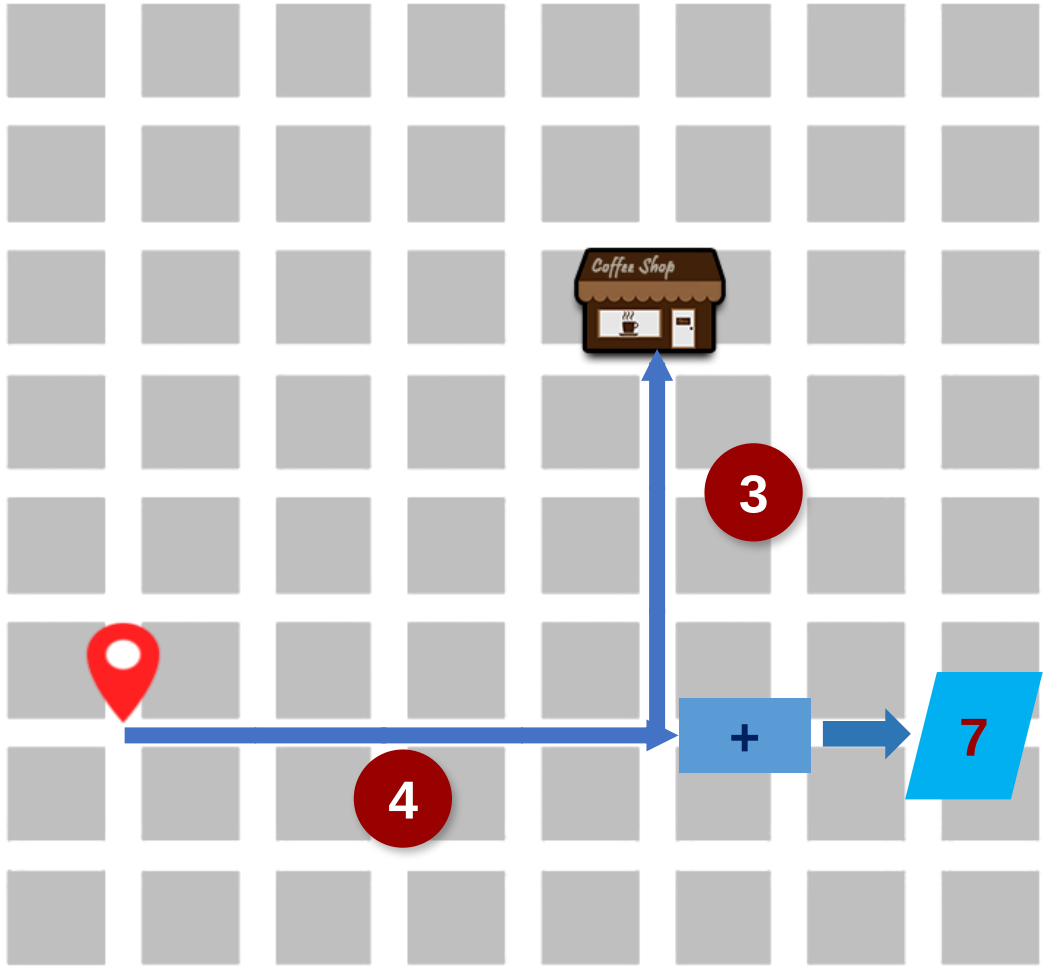


Basic Numeric Data Types

Scenario 3: Find the Distance Traveled



Scenario 3: Find the Distance Traveled



Variables

In most computer programs, we need data storage to represent and store data temporarily.

A **variable** is like a labeled box that contains a value inside it.

Why **abstraction** (give names to values of expression)?

- Reuse names instead of values
  - Helpful in keeping track of useful information without needing to remember a bunch of numbers

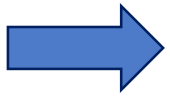
- Easier to change the code later

Variable Names and Values

Each variable has its:

- **Name**: e.g., *priceOfChickenRice*
- **Value**: e.g., 2.8

priceOfChickenRice = 2.8



Name	Value
priceOfChickenRice	2.8

Expressions

Expression: anything that produces/ returns a value

- combination of values (e.g., literal, variables, etc.) and operations (e.g., operators, functions, etc.)



$moneyInWallet$ $priceOfChickenRice$ $priceOfCoffee$

Examples

- 3.14
- 100*15
- Result *100

Assignment Operator

Assignment Operator: binds variables and values

The '=' sign is the **assignment operator**, **not** the **equality** in mathematics.

When we see:	We mean:
x = 7.1	We have a variable called **x** and a value of 7.1 assigned to it.
x = 7 * 2 – 5	We evaluate the value of the expression (7*2 -5), that is 9 and assign a value of 9 to **x**.
x = x + 7	We recall the value of **x**, add 7 to it, and assign the expression result to **x**.

Assignment Operator

Basic Syntax

Left Hand Side (LHS) = Right Hand Side (RHS)

a variable **an expression**

Assignment means:

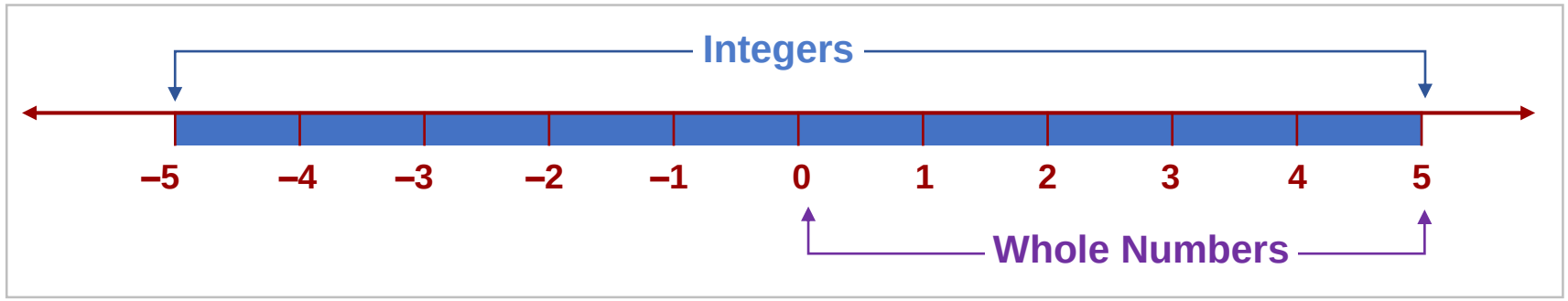
1. Evaluate the expression on RHS
2. Take the resulting value and assign it to the name (variable) on the LHS.

Basic Numeric Data Types: Integers and Floats

Integers

- are like whole numbers, including the negative numbers
- can be negative {–1, –2, –3, – 4, – 5, …}, positive {1, 2, 3, 4, 5, …}, or zero {0}

Integers: {…, –5, –4, –3, –2, –1, 0, 1, 2, 3, 4, 5, …}

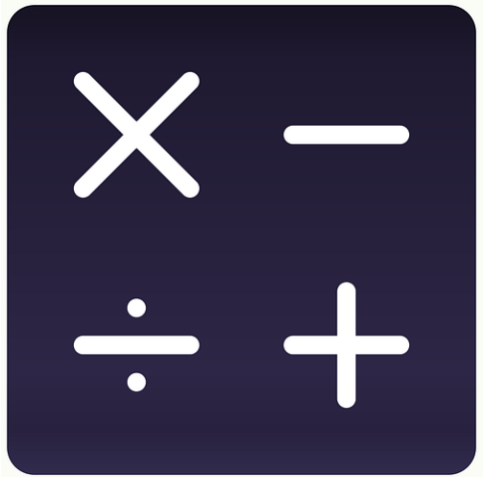


Floats

Represent real numbers; allow fractions (e.g., 2.8, 7.1, 9.0001)

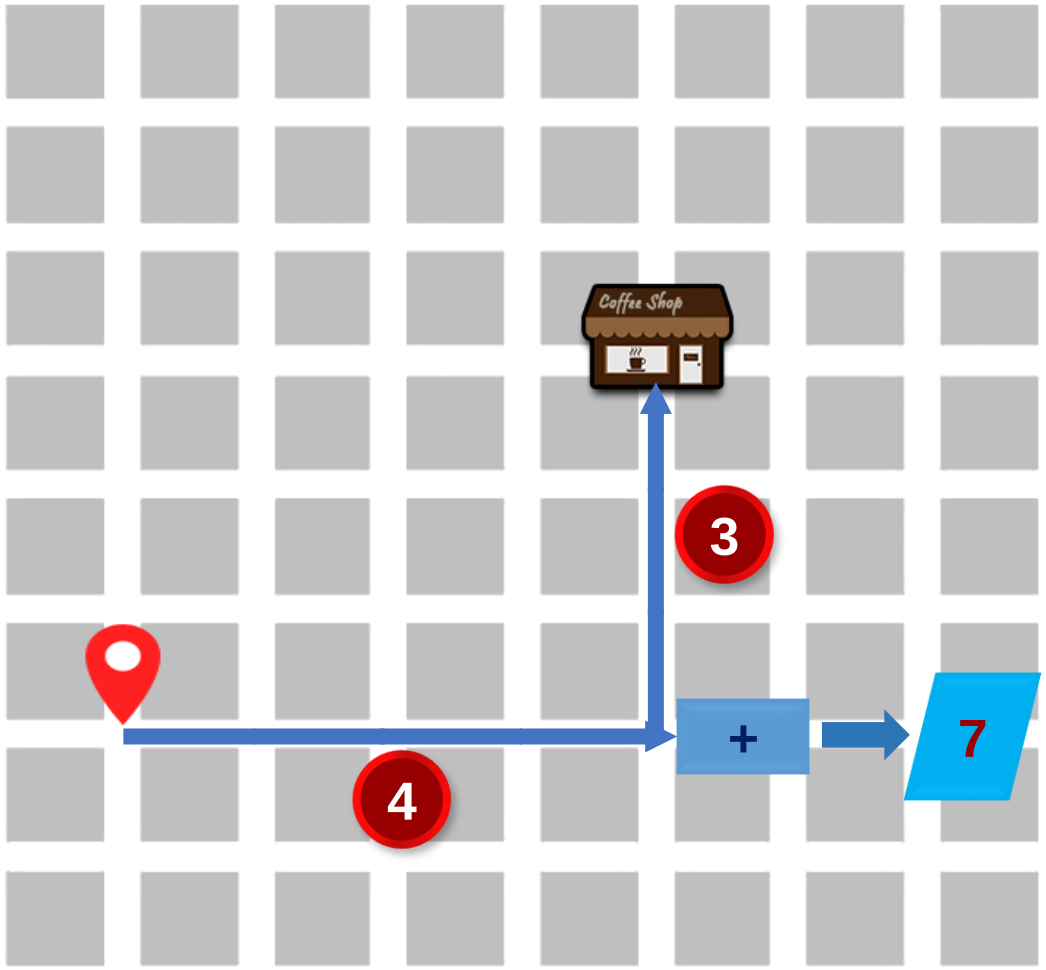
Arithmetic Operators

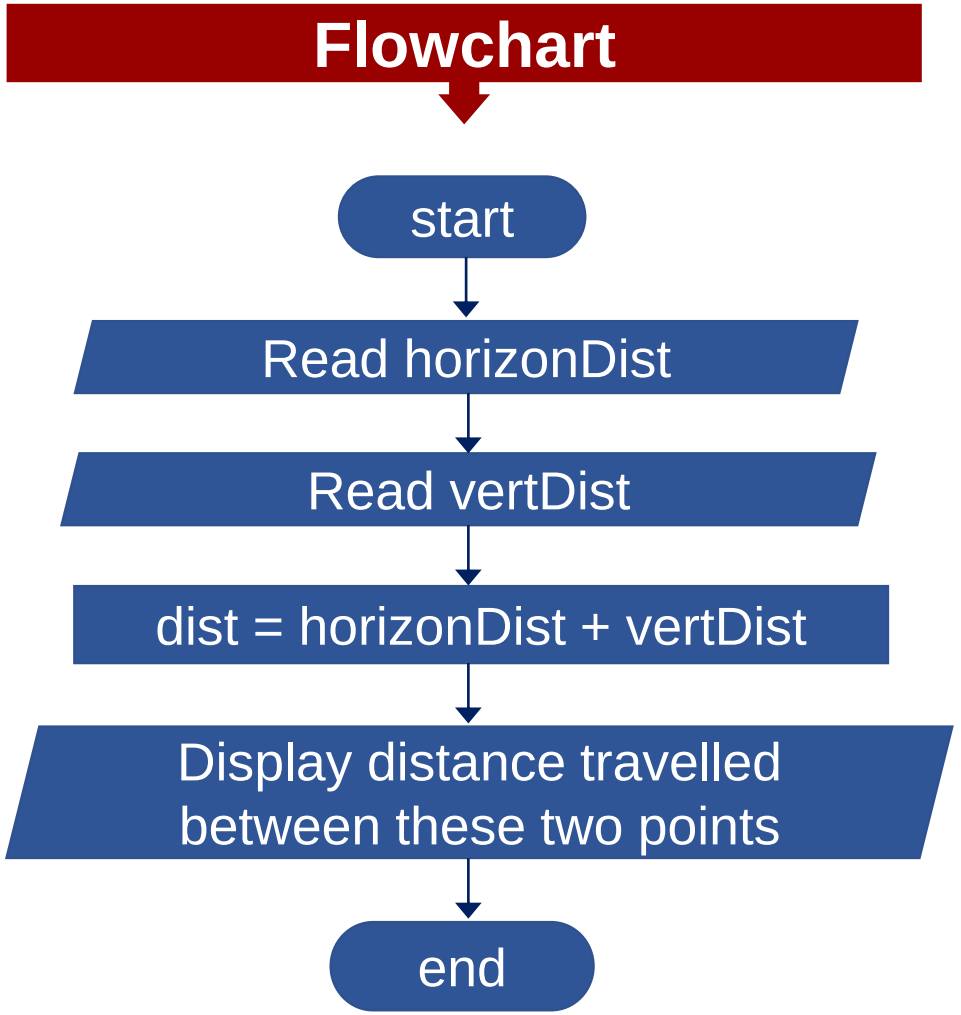
- Used in common **arithmetic**
- Each arithmetic operator is a **mathematical** function that takes one/ two operand(s) and performs a calculation on them
- Most computer languages contain a set of such **operators** that can be used within equations to perform a number of types of sequential calculation



*Different programming languages support **arithmetic operators** in different ways.*

Scenario 3: Find the Distance Traveled - Flowchart



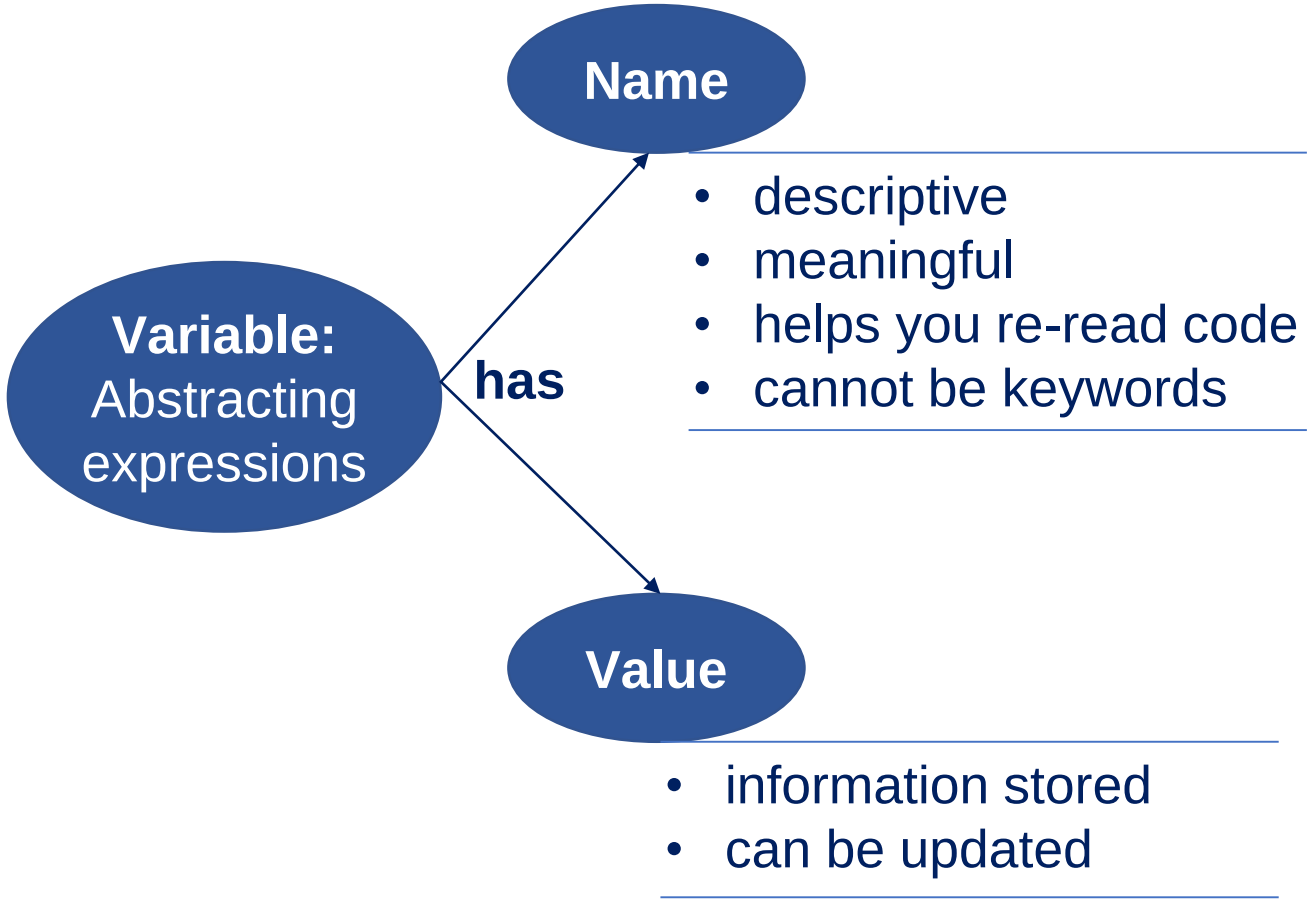


Question to Ponder Before Coding Scenario 3

For the next lesson…

- How many variables should you define?
- What is the data type of each variable?
- Do you need assignment operator in your program?
- Do you need arithmetic operators in your program?

Summary



Binding variables and values

- equal sign is an **assignment** of a value to a variable name
- value is stored in computer memory
- an assignment binds a name to a value
- retrieve value associated with name or variable by invoking the name

Basic Data Types

- integers
- floats

More on this later..

Arithmetic Operators:

+ – × ÷

References for Images

No.	Slide No.	Image	Reference
1	7, 9		Money in the wallet [Online Image]. Retrieved April 18, 2018 from https://torange.biz/money-wallet-1376/.
2	7, 9		By No machine-readable author provided. Terence assumed (based on copyright claims). - No machine-readable source provided. Own work assumed (based on copyright claims)., CC BY 2.5,retrieved April 18, 2018 from https://commons.wikimedia.org/w/index.php?curid=696774.
3	7, 9		Nilsson S. (2014). Cup of coffee [Online Image]. Retrieved April 17, 2018 from https://www.flickr.com/photos/infomastern/14956851150.
4	13		By User:Bobarino - Made by following Information.png, CC BY-SA 3.0, retrieved April 18, 2014 from https://en.wikipedia.org/w/index.php?curid=9180601.
5	15		Question problem [Online Image]. Retrieved April 18, 2018 from https://pixabay.com/en/question-problem-think-thinking-622164/.