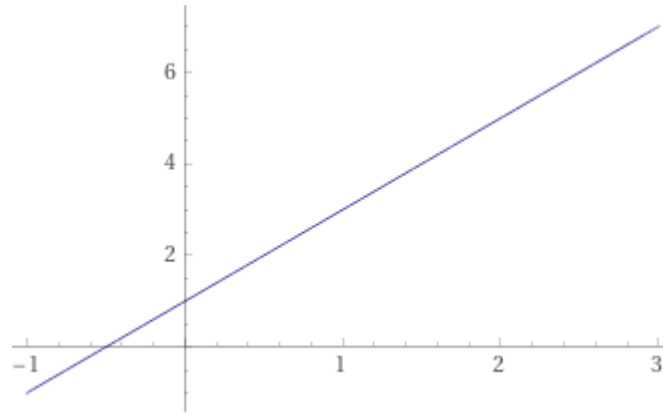


Program Variables



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What is a variable?

- Computer programs use variables to store data
- In math, a variable is a name or symbol that represents some value, usually an unknown value
- In computer science, a variable is a named region of memory used to store a value that can change

What is a variable?

For example: If we have a program that computes the Y intercept of a line, we will create four (4) variables.

X_coordinate

Y_coordinate

Slope

Intercept

$$y = mx + b$$

Each one of these is a name/symbol that we use to reference a value stored in the computer's memory.

What is a variable?

Example program for finding the Y intercept:

1. *Input* **X_coordinate**
2. *Input* **Y_coordinate**
3. *Input* **Slope**
4. Subtract the product of the **X_coordinate** and the **Slope** from the **Y_coordinate**, Store the result in **Intercept**
5. *Output* **Intercept**

What is a variable?

Example program for finding the Y intercept:

1. *Input* **X_coordinate**
2. *Input* **Y_coordinate**
3. *Input* **Slope**
4. **Intercept = Y_coordinate - X_coordinate X Slope**
5. *Output* **Intercept**

What is a variable?

- We (the programmer) do not need to know the details of how the computer manages variables
- We (the programmer) only need to know the name of the variable to use it
 - Use the name in an Input statement
 - Use the name in an Output statement
 - Use the name in a Processing (computation) statement

Terminology about variables

- Identifier – the name of the variable
 - Programming languages have rules for making names (rules for valid identifiers)
 - Usually the rules say start with a letter or underscore and then use any letter, digit, or underscore

Terminology about variables

- Data type – kind of data the variable can store
 - Integer
 - Floating point (real) number
 - Character
 - Boolean (true or false)

Terminology about variables

- Initialize – assign a value when the variable is created (declared)
- Assign – store a value in the variable
- Uninitialized – we (the programmer) did not assign a value to the variable. Unlike in math, all computer variables have some value (no unknowns).

Steps to use a variable

- Create (declare) the variable
- Assign a value to the variable
 - Initialize the variable
 - Assign a value
- Use the variable in input, output, or computation