

# Function Review

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These slides review function concepts

# Function Review

- Function
  - Defines the relationship between a set of inputs and an output
  - Mathematically this is defined as a **mapping**
    - Every set of inputs provides only one output
  - Functions have:
    - A name
    - One or more inputs (parameters)
    - A definition
    - A result

# Function Review

- Definition
  - The definition describes the mapping of the input(s) to an output

## Definition

The diagram shows the function definition  $ave(a, b, c) = \frac{a + b + c}{3}$ . Annotations include: 'function name' pointing to 'ave', 'inputs function parameters (formal parameters)' pointing to '(a, b, c)', and 'mapping' pointing to the equals sign and the fraction.

$$ave(a, b, c) = \frac{a + b + c}{3}$$

Definitions use  
'Formal Parameters'

# Function Review

- Call
  - To use the function, you **call** it while providing the desired inputs

**Call**

result (return value)

$$ave(4,5,6) = \frac{4 + 5 + 6}{3} \Rightarrow 5$$

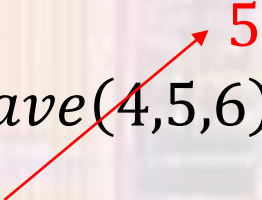
inputs  
function parameters  
(actual parameters)

Calls (evaluations) use  
'Actual Parameters'

# Function Review

- Call
  - The function call is replaced with the result (returns the value) when used in an equation

$$x = 3 * ave(4,5,6) + 2$$

$$x = 3 * ave(4,5,6) + 2$$


$$x = 3 * 5 + 2$$

$$x = 17$$

# Function Review

- Formal Parameters
  - The formal parameters in a function definition are local to the function – they have no meaning outside of the function

**Definition**  $ave(a, b, c) = \frac{a + b + c}{3}$        $div(a, b) = \frac{a}{b}$

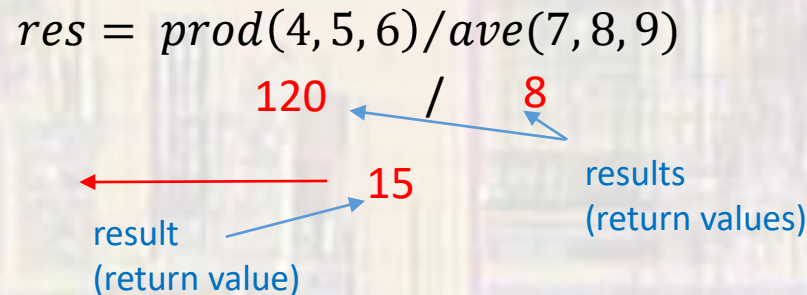
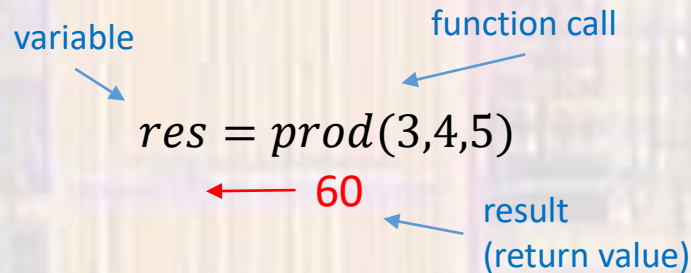
Even though both functions use *a* and *b* internally, there is no relationship between the values passed to them

# Function Review

- Values passed to a function

$$ave(a, b, c) = \frac{a + b + c}{3}$$

$$prod(a, b, c) = a * b * c$$



# Function Review

- Variables passed to a function

Definition

$x = 3$   
 $y = 4$   
 $z = 5$

$$ave(a, b, c) = \frac{a + b + c}{3}$$

Call

$res = ave(x, y, z)$



$res = ave(3, 4, 5)$

← 4

The variables  $x$ ,  $y$ ,  $z$  are **not** passed to the function  
the **value of  $x$** , the **value of  $y$** , and the **value of  $z$**   
are passed to the function



# Function Review

- Formal Parameters
  - The formal parameters in a function definition are local to the function – they have no meaning outside of the function

## Definition

$$\text{div}(a, b) = \frac{a}{b}$$

## Call

*variables:*  $a = 5$

$b = 9$

$$\text{div}(b, a) = \frac{9}{5}$$

The variables  $a$  and  $b$  are not related to the formal parameters  $a, b, c$

# Function Review

- Non-mathematical Functions
  - In programming not all functions are mathematical
  - Some functions:
    - Have parameters and return no value
    - Have no parameters and return a value
    - Have no parameters and return no value
  - Some functions:
    - Modify values outside the function

More on this to come!