

Function Review

Last updated 6/13/23

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

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

function name

inputs
function parameters
(formal parameters)

mapping

The diagram illustrates the components of a function definition. It features a central mathematical equation: $ave(a, b, c) = \frac{a + b + c}{3}$. Four blue arrows point from text labels to specific parts of the equation: one arrow points from 'function name' to the identifier 'ave'; another arrow points from 'inputs' to the three variables 'a', 'b', and 'c'; a third arrow points from 'mapping' to the division operator '/'; and a fourth arrow points from 'function parameters (formal parameters)' to the same set of variables 'a', 'b', and 'c'.

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)

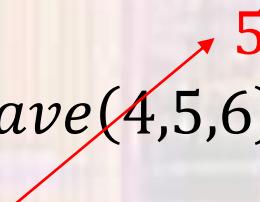
The diagram illustrates a function call. At the top, the word "Call" is written in red. Below it, the function "ave(4,5,6)" is shown. A blue arrow points from the parameter list "(4,5,6)" to the word "inputs" in blue text. To the right of the equals sign, the result "5" is shown, with a blue arrow pointing from it to the text "result (return value)" in blue.

Calls (evaluations) use
'Actual Parameters'

Function Review

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

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

$$x = 3 * \cancel{ave(4,5,6)} + 2$$


$$x = 3 * 5 + 2$$

$$x = 17$$

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

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

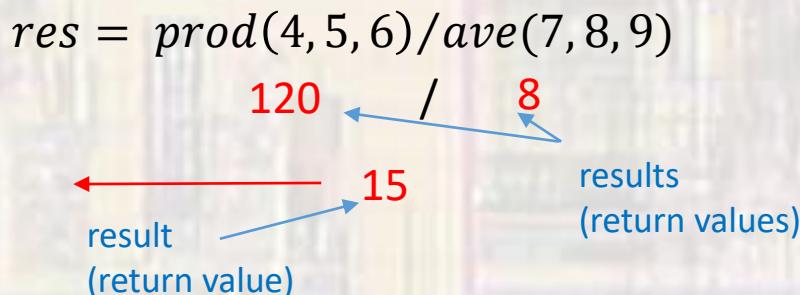
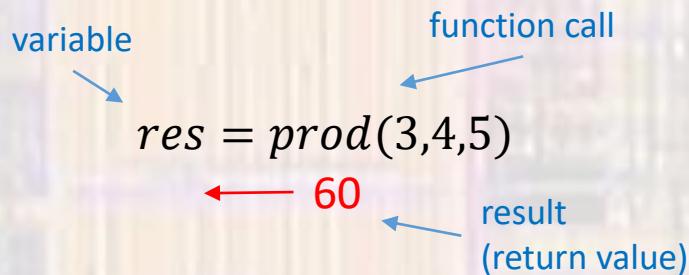
Even though both functions use a and b internally,
there is no relationship between the values passed to them

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

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

Call

variables: $a = 5$
 $b = 9$

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

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!