

Functions Overview

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These slides functions in general

Functions Overview

- Function - Mathematics
 - 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
 - A definition
 - One or more inputs (parameters)
 - Must be part of the functions **Domain**
 - A result
 - All results together form the functions **Range**

Functions Overview

- Definition
 - The definition describes the mapping of the input(s) to an output
 - It uses **Formal Parameters** to describe the mapping

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

Functions Overview

- Call
 - To use the function, you call it while providing the desired inputs
 - Uses **Actual Parameters** to pass **values** to the function
 - The function **returns** the result

inputs
function parameters
(actual parameters)

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

formal parameters *a,b,c* are replaced with the actual parameter **values**

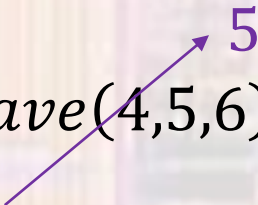
result (return value)

Calls (evaluations) use
'Actual Parameters'

Functions Overview

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

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

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


$$x = 3 * 5 + 2$$

$$x = 17$$

Functions Overview

- Variables passed to a function
 - Variable **VALUES** are passed into the function, not the variables themselves
 - The **actual parameters** are not affected by anything that happens inside the function

Definition

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

variables:

$$x = 3$$

$$y = 4$$

$$z = 5$$

actual parameters x,y,z

$\text{ave}(x, y, z)$



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

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

Call

Functions Overview

- Variables passed to a function
 - Don't be confused by common variable names

Definition

formal parameters a, b

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

variables:

$$a = 5$$

$$b = 9$$

actual parameters b, a

Call

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

formal parameters a, b

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

Functions Overview

- Formal parameter scope
 - The **formal parameters** in a function definition are local to the function – **they are only visible inside 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

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

$$div(1, 2) = \frac{1}{2} \Rightarrow 0.5$$