

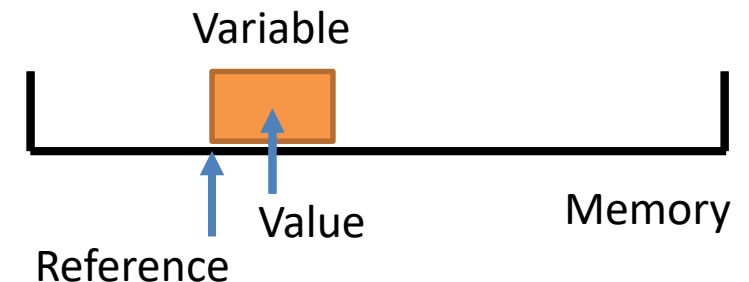
Mutability and Functions

Computing & Information Sciences

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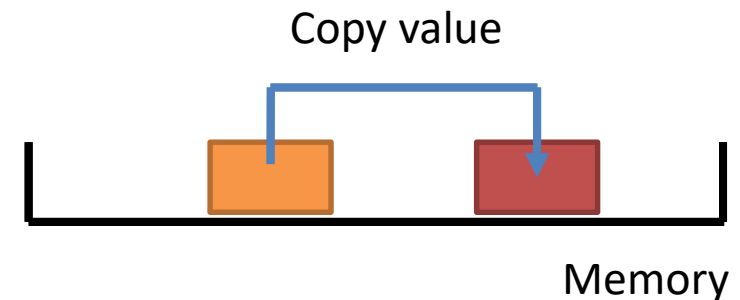
Variables

- A variable corresponds to a space in memory.
 - Refer to value in the allocated memory.
 - Refer to position to memory space – reference or pointer.
- Assignment operator (=):
 - **Immutable**: assign value to another variable.
 - **Mutable**: assign reference to another variable.



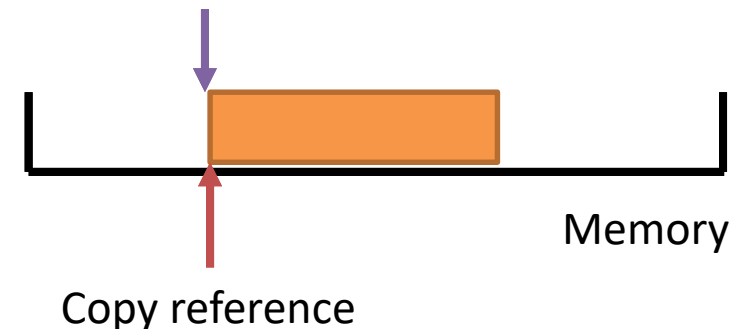
Immutable variables

- Values are copied from one variable to another.
 - A second variable occupies a different memory space.
 - Copied value can be updated without effecting the original.
- Immutable variable types:
 - Integer, float, string, Boolean, tuple.



Mutable variables

- References to original are assigned to a variable.
 - A variable refers to the original instance.
 - Modifying the value(s) in the variable modifies the original.
 - Need to explicitly copy values to avoid this.
- Mutable variable types:
 - Lists, dictionaries, objects (not all of them).



Functions

- Factorise program into smaller pieces.
 - One or more lines of program.
 - Easier to understand and test.
- Code reuse.
 - Call a function more than once.
 - Call a function from different parts of a program.

Functions

- Call function with zero or more input parameters.
 - Input parameters can contain complex data structures.
- A function can return a value or None.
 - Can return simple or complex data structures.

Functions: immutable variables

- Immutable variables as function parameters.
 - Input value copied into variable in function.
 - Changes made inside function do not affect outside function.
- Immutable variables as return value.
 - Output value copied into variable outside function.
 - Changes made outside function do not affect inside function.

Functions: mutable variables

- Mutable variables as function parameters.
 - Reference to input variable assigned to variable in function.
 - Changes made inside function affect outside function.
- Mutable variables as return value.
 - Reference to output variable assigned to variable outside function.
 - Changes made outside function affect inside function.



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