Python
Lesson 2: Variables, Operations, and Types

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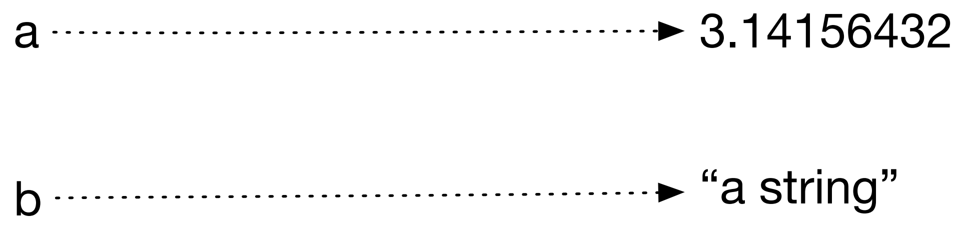
Variables and Types

- All program languages specify how data in memory locations is modified
- Python: A *variable* is a handle to a storage location
  - The storage location can store data of many types
    - Integers
    - Floating point numbers
    - Booleans
    - Strings

Variables and Types

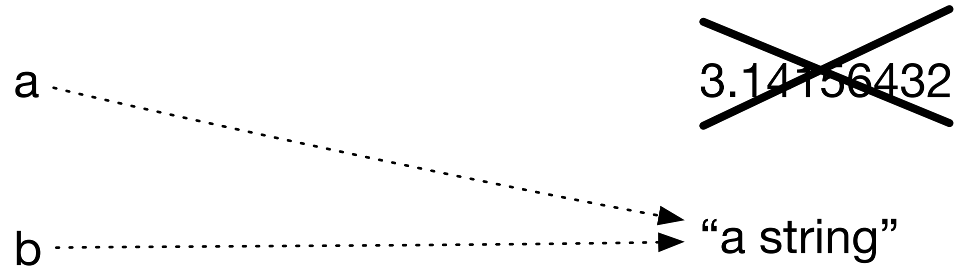
- Assignment operator `=` makes a variable name refer to a memory location
- Variable names are not declared and can refer to any legitimate type

```
a = 3.14156432
b = "a string"
```



- Create two variables and assign values to them
- Variable *a* is of type floating point and variable *b* is of type string

```
a = b
```



- After reassigning, both variable names refer to the same value
- The floating point number is garbage collected

Expressions

- Python builds expression from smaller components just as any other programming language
  - The type of operation expressed by the same symbol depends on the type of operands
- Python follows the usual rules of precedence
  - and uses parentheses in order to express or clarify orders of precedence.

Expressions

- Arithmetic Operations between integers / floating point numbers:
  - Negation (-), Addition (+), Subtraction (-), Multiplication (*), Division (/), Exponentiation (**)
  - Integer Division //
  - Remainder (modulo operator) (%)

Expressions

- IF we use / between two integers, then we always get a floating point number
- If we use // between two integers, then we always get an integer
    - a//b is the integer equal or just below a/b

Expressions

- Strings are marked by using the single or double quotation marks
- You can use the other quotation mark within the string
- Some symbols are given as a combination of a forward slash with another symbol
    - Examples: \t for tab, \n for new line, \’ for apostrophe, \“ for double quotation mark, \\ for backward slash
    - We’ll get to know many more, but this is not the topic of today

Expressions

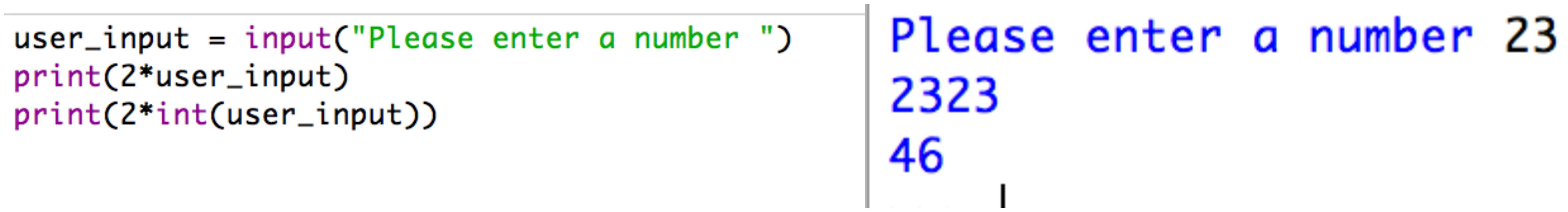
- Strings can be concatenated with the +
- They can be replicated by using an integer and the * sign
- Examples:
  - `“abc"+"def"  —> 'abcdef'`
  - `‘abc\"'+'fg'  —> 'abc"fg'`
  - `3*”Hi'"  —>  “Hi'Hi'Hi'"`

Change of Type

- Python allows you to convert the contents of a variable or expression to an expression with a different type but equivalent value
  - Be careful, type conversation does not always work
- To change to an integer, use `int( )`
- To change to a floating point, use `float()`
- To change to a string, use `str( )`

Example

- Input is done in Python by using the function `input`
  - Input has one variable, the prompt, which is a string
  - The result is a string, which might need to get processed by using a type conversion (aka **cast**)
  - The following prints out the double of the input (provided the user provided input is interpretable as an integer), first as a string and then as a number

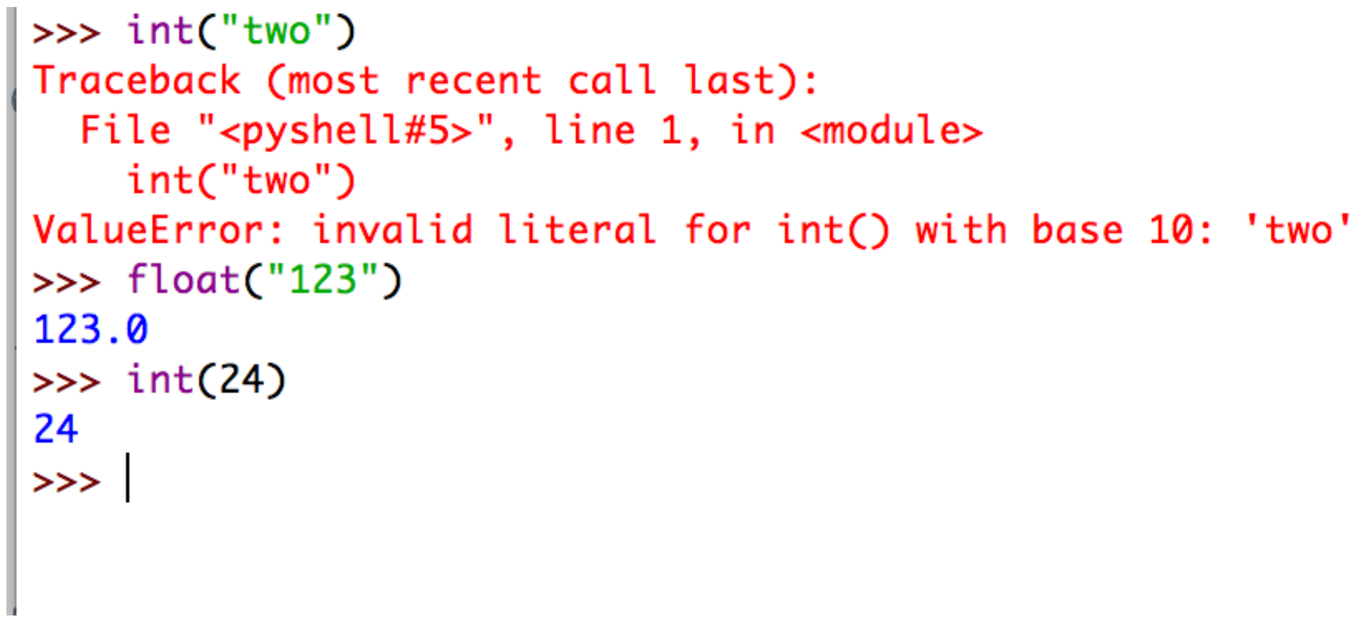


```
user_input = input("Please enter a number ")
print(2*user_input)
print(2*int(user_input))
```

```
Please enter a number 23
2323
46
```

Example

- Python does not understand English (or Hindi) so giving it a number in other than symbolic form does not help
- It can easily understand "123"
- It does not complain about the expression having the same type.



```
>>> int("two")
Traceback (most recent call last):
  File "<pyshell#5>", line 1, in <module>
    int("two")
ValueError: invalid literal for int() with base 10: 'two'
>>> float("123")
123.0
>>> int(24)
24
>>> |
```