Types; Variables; Operators

COSC 101, 2018-01-26

Announcements
- For Monday
  - Read sections 2.8, 2.10-2.11
  - Complete reading questions

Outline
- Warm-up
- Types
- Variables
- Operators

Warm-up
- What is the output of this program?
  ```python
  print("Go 'Gate!")
  print(10 + 3)
  print(3.14159)
  ```
  - Output:
    - Go 'Gate!
    - 13
    - 3.14159

- What values (or objects) does this code contain?
  - String "Go 'Gate!"
  - Integer 10
  - Integer 3
  - Float 3.14159

Types
- Programs work with values (or objects)
- Different types (or classes) of objects
  - String --- consist of letters, numbers, punctuation, or symbols
  - Integer --- whole number
  - Float --- decimal number
- How do you convert between types? --- use str(), int(), or float()
- Why convert between types? --- some operations can only be applied to specific types
  - E.g., mathematical operators (+, -, *, /) can only be used with integers and floats
- What is the output of each statement? If an error occurs, specify what type of error.
  a. print(type('The year is...'))
     Output:
     <class 'str'>
  b. print(type("2018"))
     Output:
     <class 'str'>
c. print(int("2018"))
Output:
2018
d. print(str(2018))
Output:
2018
e. print(type("The month is..."))
Syntax error
f. print(int("January"))
Runtime error
g. print(int(1.83))
Output:
1

Variables
- Variable --- a name that refers to a value
- How do we create a new variable? --- with an assignment statement
  - E.g., myVar = 10
- Which of the following are valid assignment statements? If a statement is invalid, state why.
  a. weekday = "Friday"
     Valid
  b. "Neil deGrasse Tyson" = scientist
     Invalid --- variable name must be on the left-hand side and value on the right-hand side
  c. value1 = 50
     Valid
  d. class_number = 101
     Valid
  e. class name = "Intro to Computing I"
     Invalid --- variable names may not contain spaces
  f. 1st = "Gold"
     Invalid --- variable names may not start with a number

Operators
- Operator --- represents a mathematical (or logical) operation
  - E.g., addition (+), subtraction (-), etc.
- Which mathematical operation does each operator represent?
  a. *
     Multiplication
  b. **
     Exponentiation
  c. /
     Division
  d. //
     Integer division
  e. %
     Modulo (integer remainder)
Operators follow standard order-of-operations rules from mathematics

1. Parenthesis
2. Exponentiation
3. Multiplication, division
4. Addition, subtraction

Operands may be values or variables

What is the output of each program? If an error occurs, specify what type of error.

a. print(3 * 2 + 1)
   Output:
   7

b. print(6/4)
   print(6//4)
   print(6%4)
   Output:
   1.5
   1
   2

c. print(2 ** 2 ** 2)
   Output:
   8

d. print (+ 1 2)
   Syntax error

e. x = 5
   print(x + 1)
   y = 10
   print (x + y)
   Output:
   6
   15

f. z = 5 * 10
   print(z)
   Output:
   50

g. m = ‘50’
   n = 100
   print(m + n)
   Runtime error

h. r = 1
   s = 2 + r
   print(r)
   print(s)
   Output:
   1
   3

Practice

a. Write a program that calculates the area of a rectangle with length 20 and width 10.

b. Write a program that calculates sales tax and the total cost for a $9.99 purchase with a tax rate of 8%.