

CS 110

String Concatenation and Multiplication, and Mathematical Expressions

Adriana Picoral (she, her, hers)

adrianaps@arizona.edu

Gould-Simpson 829

house.py

```
size = int(input('What size house should be printed? '))
print(' ' + '_' * size + '^' + '_' * size + ' ')
print('/' + ' ' * size + ' ' + ' ' * size + '\\')
print('|' + ' ' * size + 'H' + ' ' * size + '|')
print('|' + '_' * size + 'H' + '_' * size + '|')
```

Vertical Difference

- In the house example, we had a program that could make houses of varying widths
- What about a program that can produce output of varying heights?

Smiles

- In this case, your program should take a number as input
- Make the face taller or shorter, based on the input value

The Goal: Face printing

What size face should be printed? 0

```
  ///|\\
 / 0  0 \
 |  I  |
 | \  / |
 |  _  |
 |  _  |
```

The Goal: Face printing

What size face should be printed? 1

```
  ///|\\
 / 0  0 \
 |      |
 |      |
 |      |
 |      |
 |  \    /
 |  _  _/
 |  _  _/
```

The Goal: Face printing

What size face should be printed? 3

```
  ///|\\
 /  0  0  \
 |          |
 |          |
 |          |
 |    I    |
 |          |
 |          |
 |          |
 |  \____/  |
 | \____/   |
```

Implement the face program!

- The space between the eyes and nose and nose and mouth changes with varying sized faces
- You can use other characters for the eyes, nose, hair

Face Printing Step 1

- Just get a face printing out
- Don't yet worry about adjusting the height

A face:

```
  ///|\\
 / 0  0 \
 |  I  |
 | \  / |
 |  _  |
 | \  / |
 |  _  |
```

Face Printing Step 2

- Accept the input value and convert it to an int

What size face should be printed? 3

```
  ///|\\
 / 0  0 \
|   I   |
|  \___/  |
|  \___/  |
```

Face Printing Step 3

- Make the size adjustable!

What size face should be printed? 3

What size face should be printed? 1

What size face should be printed? 0

```
height = int(input('input: '))
```

```
print(' ///|\\\\\\\\\\\\\\\\')
```

```
print('/ 0    0 \\\')
```

```
print('|          |\n' * height, end="")
```

```
print('|    I    |')
```

```
print('|          |\n' * height, end="")
```

```
print('|  \_\_\_ /  |')
```

```
print('|  \_\_\_\_\_ /')
```

Two numeric types: float and integer

- An **integer** is a type of value that can represent numbers without decimals or fractions
- A **float** can represent numbers with decimals

```
age = 35                # integer
score = 81.23           # float
height_meters = 1.8288  # float (6 feet)
print(type(age))
print(type(score))
print(type(height_meters))
```


The Mathematical Operators

+	Addition
-	Subtraction
*	Multiplication
/	Division
//	Integer Division
**	Exponent
%	Modulus

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Note: using these on 2 integers functions differently than it does when strings are involved!



Strings vs Ints (Addition)

What will the value of each of these variables be? No Computers!

a = '4' + 5

b = 20 + 15

c = 2 + 'Hi there'

d = 'Hi there' + 'Hi there'

Strings vs Ints (Multiplication)

What will the value of each of these variables be? No Computers!

a = '4' * 5

b = 20 * 15

c = 2 * 'Hi there'

d = 'Hi there' * 'Hi there'

What will the value of the variables be?

No Computers!

```
a = 3 + 3 - 2 * 4
```

```
b = 5 * 5 / 10
```

```
d = a - b * 2
```

```
print(d)
```

What will the value of the variables be?

No Computers!

$$a = 3 + 3 - 2 * 4 \quad -2$$

$$b = 5 * 5 / 10$$

$$d = a - b * 2$$

What will the value of the variables be?

No Computers!

$$a = 3 + 3 - 2 * 4 \quad -2$$

$$b = 5 * 5 / 10 \quad 2.5$$

$$d = a - b * 2$$

What will the value of the variables be?

No Computers!

a	=	3	+	3	-	2	*	4	-2
b	=	5	*	5	/	10			2.5
d	=	a	-	b	*	2			-7.0

Mathematical Expressions

- The math on the left-hand side of the equals-sign in the previous example are referred to as **mathematical expressions**
- A **mathematical expression** is a combination of one or more **operands** and zero or more **operators** that produce a **value**

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- A **mathematical expression** is a combination of one or more **operands** and zero or more **operators** that produce a **value**
 - **Operand:** A value or variable in a math expression
 - **Operator:** A symbol that represents a mathematical operation (such as `+` `-` `*` `/` `//` `**` `%`)

PEMDAS

- What does PEMDAS stand for?

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 1. First **P**arentheses,
 2. Then **E**xponentiation
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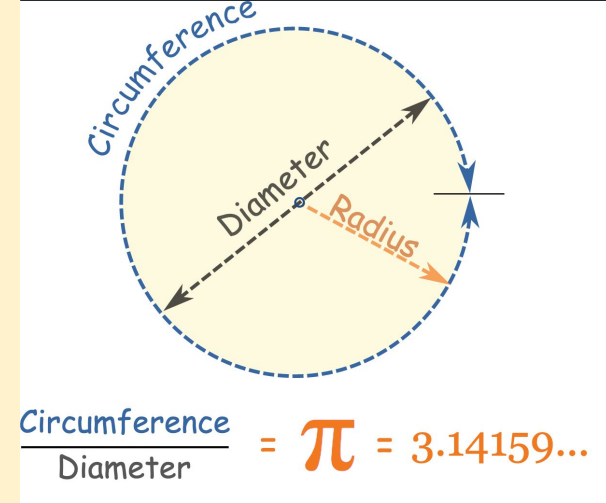


If there is a tie, then python will evaluate the math left-to-right

Area of Circle

- Write a program that takes a diameter, and calculates the area of the corresponding circle

$$\text{Area} = 3.14 \times r^2$$



Enter circle diameter: 5

Area of circle with diameter 5.0 is 19.625

Area of Circle

```
### Author: Benjamin Dicken
```

```
### Course: CSc 110
```

```
### Description: This program accepts a circle diameter as input.
```

```
###           it then calculates and prints the area for that circle.
```

```
diameter = float(input('Enter circle diameter: '))
```

```
area = 3.14 * (diameter / 2)**2
```

```
print('Area of circle with diameter', diameter, 'is', area)
```

Parentheses

- Parentheses can be used in mathematical expressions
- Specifically, they can be used to force a particular order of operations
- Similar to regular math!

PEMDAS

- What value will each of these variables take on? No computers!

$$a1 = 5 / 5 * 10 * 5$$

$$a2 = 5 / (5 * 10) * 5$$

$$b1 = 5 * 10 - 2$$

$$b2 = 5 * (10 - 2)$$

PEMDAS

- What value will each of these variables take on? No computers!

$$a1 = 5 / 5 * 10 * 5 \quad 50.0$$

$$a2 = 5 / (5 * 10) * 5 \quad 0.5$$

$$b1 = 5 * 10 - 2 \quad 48$$

$$b2 = 5 * (10 - 2) \quad 40$$

Integer Division

- What value will this variable take on? No computers!

```
b = (3 // (4 // 5)) + 1
```