Objectives

- Wrap up arithmetic
- A few programming tricks
- String operations
- Formatting output

Modulo Operator: %

- Modular Arithmetic: Remainder from division
  - x % y = the remainder of x/y
  - Read as "x mod y"
- Example: 6 % 4
  - Read as "six mod four"
  - 6/4 is 1 with a remainder of 2, so 6%4 evaluates to 2
- Works only with integers
  - Typically just positive numbers
- Precedence rules: P E - DM**%** AS

Modulo Practice

- 7 % 2 =
- 3 % 6 =
- 6 % 2 =
- 7 % 14 =
- 14 % 7 =
- 6 % 0 =

Brainstorm

- What useful thing does % 10 do?
  - 3 % 10 =
  - 51 % 10 =
  - 40 % 10 =
  - 678 % 10 =
  - 12543 % 10 =
- What useful thing does /10 do (integer division)?
  - 3/10 =
  - 51/10 =
  - 40/10=
  - 678/10 =
  - 12543 / 10 =
- What useful thing does % 2 do?

Trick #1: Type Conversion

- You can convert a variable's type
  - Use the type's **constructor**

Conversion Function/ Constructor	Example	Value Returned
int(<number or string>)	int(3.77)	3
	int("33")	33
long(<number or string>)	long(12)	12L
	long("13")	13L
float(<number or string>)	float(22)	22.0
str(<any value>)	str(99)	"99"

Trick #2: Arithmetic Shorthands

- Called **extended assignment operators**
- Increment Operator
  - x = x + 1 can be written as **x += 1**
- Decrement Operator
  - x = x – 1 can be written as **x -= 1**
- Shorthands are similar for ***, /** :
  - x /= 2
  - amount *= 1.05

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Programming, Testing Practice

- Average three numbers
  - ➢ What are good test cases?

Programming, Testing Practice

- Average three numbers
  - ➢ What are good test cases?
  - ➢ How can we make sure we get a floating point number?
    - Two alternatives

STRING OPERATIONS

String Operations

Operand	Syntax	Meaning
+	`str1 + str2`	Concatenate two strings into one string
*	`str * num`	Concatenate string num times

- Examples:
  - ➢ `str = "I feel " + "sleepy"`
  - ➢ `str = "Oops! " * 3`

Motivating Constants

- Let's say I have a survey program that asks people to rate something on a scale of 1 to 10
- I ask people to rate 100 different things
- I could create the prompt
  - `"Rank " + thing + " on a scale of 1 to 10"`
- But what if my scale changes, and I want it to be on a scale of 1 to 100?
  - ➢ I want to make sure the ranking is within my range

Constants

- Special variables whose values are defined once and never changed
  - ➢ By convention, not enforced
- By convention
  - ➢ A constant's name is all caps
  - ➢ Typically defined at top of program → easy to find, change
- Examples:
  - `SCALE_MIN = 1`
  - `SCALE_MAX = 10`
  - Never assigned values in remainder of program

Practice

- Given the following code

```
SCALE_MIN = 1
SCALE_MAX = 10
prompt = …
rating = input( prompt )
```

- Create the string variable `prompt` for the `input` statement so that it prompts the user:

On a scale of 1 to 10, how much do you like Matt Damon?

Strings: `str`

- Used for text
- Indicated by double quotes "" or single quotes ''
  - In general, I'll use double quotes
  - Empty string: "" or ''
- Use triple quotes """ for strings that go across multiple lines

```
"""This string
is long.
Like, really, really long """
```

Escape Sequences

- Escape Sequences
  - newline character (carriage return) -> \n
  - tab -> \t
  - quote -> \"   Shell demonstration
  - backslash -> \\
- Example:
  - print "To print a \\, you must use \"\\\\\\"
    - What does this display?

Practice

- Display To print a tab, you must use '\t'.
- Display I said, "How are you?"

For This Week

- Lab 1: Due Friday by classtime
- Broader Issues: Four Puzzles from Cyberspace
  - Through "Jake's Communities"
  - Posted on Sakai by 10 a.m. on Friday