

Objectives

- Wrap up arithmetic
- A few programming tricks
- String operations
- Escape Sequences

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Modulo Operator: %

- Modular Arithmetic: Remainder from division
 - $x \% y$ means 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

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Modulo Practice

- $7 \% 2$
- $3 \% 6$
- $6 \% 2$
- $7 \% 14$
- $14 \% 7$
- $6 \% 0$

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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?

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Trick #1: Type Conversion

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

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

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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?

average3.py

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Programming, Testing Practice

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

average3.py

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STRING OPERATIONS

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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 """
```

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String Operations

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

- Examples:
 - "I feel " + "sleepy"
 - Evaluates to "I feel sleepy"
 - "Oops! " * 3
 - Evaluates to "Oops! Oops! Oops!"

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Recall lab 0

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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

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Motivating Constants

- I have a survey program that asks people to rate something on a scale of 1 to 10
- It asks 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

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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?

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`scale.py`

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Escape Sequences

- Escape sequences
 - newline character (carriage return) -> `\n`
 - tab -> `\t`
 - quote -> `\'`
 - backslash -> `\\`
- Example:
 - `print "To print a \\, you must use '\\\\\\""`
 - What does this display?

Shell demonstration

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`demo_str.py`

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Practice

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

`escape_sequence.py`

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For This Week

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

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