

Objectives

- Announcement: Midterm prep document
- Constants review
- String method review
- Creating your own functions

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Constants Review

- Constants: don't change for "life" of program
 - During one program execution
 - If it's a constant always (like PI), that's true
- Could play Rainbow Dice to 10, 100, or 1000000
 - Makes easy to change program once at top

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String Methods

- **Methods**: available operations to perform on strings
 - Slightly different than functions
- Example method: find(substring)
 - Finds the index where substring is in string
 - Returns -1 if substring isn't found
- To call a method:
 - <string>.methodname([arguments])
 - Example: filename.find(".py")

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Executed on this string

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Common String Methods

Method	Operation
center(width)	Returns a copy of string centered within the given number of columns
count(sub[, start [, end]])	Return # of non-overlapping occurrences of substring <code>sub</code> in the string.
endswith(sub), startswith(sub)	Return <code>True</code> iff string ends with/begins with <code>sub</code>
find(sub[, start [, end]])	Return first index where substring <code>sub</code> is found
isalpha(), isdigit(), isspace()	Returns <code>True</code> iff string contains letters/digits/whitespace only
lower(), upper()	Return a copy of string converted to lowercase/uppercase

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string_methods.py

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String Methods vs. Functions

- Functions: all "input" as arguments/parameters
 - Example: `len` is a built-in function
 - Called as `len(str)`
- Methods: "input" are argument/parameters **and** the string the method was called on
 - Example call: `str.upper()`

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Practice Using String Methods

- Modify `binaryToDecimal.py` to verify that the entered string contains only numbers
 - Use one of the string methods
 - How could we make sure that it contains only 0s and 1s?

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Functions

- We've used several built-in functions
 - len, input, raw_input
 - Functions from modules, e.g., math and random
- **Functions** are small pieces of code that can be used in other pieces of code
 - Subprograms that have been given a name
 - Have 0 or more inputs
 - Produce 0 or 1 outputs
- Define our own functions!

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Functions

- Function is a **black box**
 - Implementation doesn't matter
 - Only care that function generates appropriate output, given appropriate input
- Example:
 - Didn't care how **raw_input** function was implemented



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Why write functions?

- Allows you to break up a hard problem into smaller, more manageable parts
- Makes your code easier to understand
- Hides implementation details (*abstraction*)
 - Provides interface (input, output)
- Makes part of the code reusable so that you:
 - Only have to type code once
 - Can debug it all at once
 - Isolates errors
 - Can make changes in one function (maintainability)

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Comparison of Code Using Functions

- Without functions:
 - menu_withoutfunc.py
- With functions
 - menu_withfunctions.py

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Example Program

- Lab 2, Problem 1
 - Any place to make a function?
 - Any place that has some useful code that we may want to reuse?

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Convert ft/s to mph



- Input: ft/s
- Output: mph

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Syntax of Function Definition

```

Keyword      Function Name      Input Name/
↓            ↓                  ↓
def ftpsToMPH(ftp) :           Function header
Body (or     SECOND_TO_HOUR = 3600
function    FEET_TO_MILE = (1.0/5280)
definition) result = ftps * SECOND_TO_HOUR * FEET_TO_MILE
return result
Keyword:
How to give output
    
```

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Where are functions in the code?

- Can be defined in script before use (calling it)
- Could be in separate **module**
 - Import to use in script
 - Example: menu.py
 - Define in modules when functions are reusable for many different programs
 - Benefits: shorter code (no function defs), isolate testing of function, write "test driver" scripts to test functions separately from use in script

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Parameters

- The inputs to a function are called **parameters** or **arguments**
- When **calling**/using functions, parameters must appear in same order as in the function header
 - Example: round(x, n)
 - x is float to round
 - n is integer of decimal places to round to

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Parameters

- **Formal Parameters** are the variables named in the the function definition.
 - **Actual Parameters** are the variables or literals that really get used when the function is called.
- ```

def round(x, n) : Formal
roundCelc = round(celc,2) Actual

```

Formal & actual parameters must match in order, number, and type!

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## Function Output

- When the code reaches a statement like **return x**
  - x is the output returned to the place where function called and the function stops
  - For functions that don't have explicit output, return does not have a value with it
    - return
    - Optional: don't need to have return (see menu.py)

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## Calling your own functions

```

jennifer_mph = ftpsToMPH(jen_ft_sec)
laura_mph = ftpsToMPH(laura_ft_sec)
venus_mph = ftpsToMPH(venus_ft_sec)

```

Output is assigned to venus\_mph

Function Name

Input

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## Flow of Control

- When you call the function, the computer jumps to the function and executes it
- When it is done, it returns to the same place in the first code where it left off

```

COURT_LEN = 78
#Make calculations to ft/s
j_ft_s = COURT_LEN / j_Speed
j_mi_hr = ftpersToMPH(j_ft_s)

def ftpsToMPH(ftps) :
 S2HR = 3600
 FT2MI = (1.0/5280)
 result = ftps * S2HR * FT2MI
 return result

```

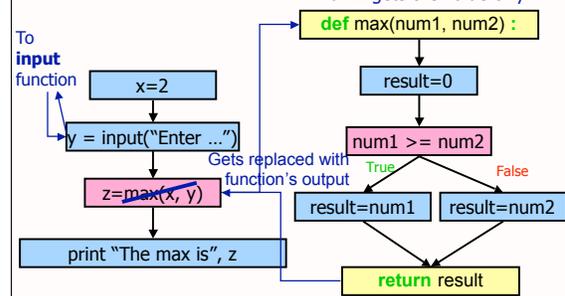
Note: not great variable names

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## Flow of Control



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## Flow of Control: Using return

```

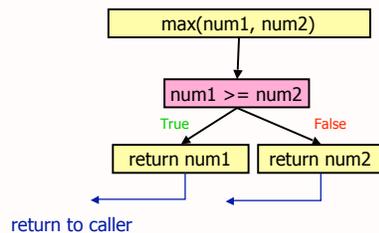
def max(num1, num2) :
 if num1 >= num2 :
 return num1
 else:
 return num2

```

```

x=2
y=6
z = max(x, y)

```



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## Flow of Control: Using return

```

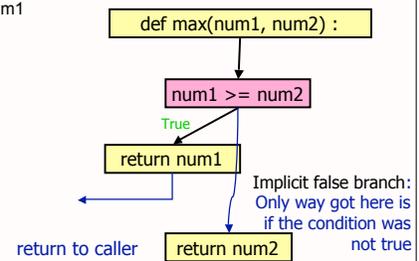
def max(num1, num2) :
 if num1 >= num2 :
 return num1
 return num2

```

```

x=2
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```



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## Passing Parameters

- Only **copies** of the actual parameters are given to the function
- The actual parameters in the calling code do not change.
- Swap example:
  - Swap two values in script
  - Then, put into a function

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