

## *First Programs*

zyBooks  
"Programming in Python 3"  
chapter 1 - chapter 2

### *A Pattern for a Program*

- Basic structural pattern: "IPO"
  - **I**ntput - get some data (from the user)
  - **P**rocess - manipulate the data
  - **O**utput - display the results of the manipulations
- Great for simple programs
- Variations on this pattern support more complex and powerful programs, too

## *step 1: Input*

- Fundamental user-input function: `"input()"`
  - Accepts typed input from the keyboard/user
  - *returns* a string of text
    - » Usually, save the string in a *variable*
  - The return value can also be used immediately
  
  - Takes an optional *argument* that is shown to the user first
    - » *prompt* gives user a hint of what they should type

## *Input examples*

- `username = input('What is your name? ')`
  
- `nstr = input('Enter a number? ')`  
`nval = int( nstr )`
  - or
- `nval = \`  
`int(input('Enter a number? '))`
  - single program statement, but it spans two lines of the file
  - `"\"` means "*continued on next line*"

## *Use the input examples*

- `username = input('What is your name? ')`  
`print('Hello, ', username)`
- `nval = \`  
`int(input('Enter a number? '))`  
`double = nval * 2`  
`print('Twice', nval, 'is', double)`

## *step 2: Process*

- Do something with the user's input, to determine the desired "answer"
  - or, "information"
  - or, "result"
  - or, "output"
- Generally involves expressions, functions, constructs such as "loops" and "if-else" blocks
  - Can be simple, or very complex and detailed
- Uses additional *variables*

### *Processing examples*

- `nval = int( nstr )`
- `double = nval * 2`
- `import math`  
`volume = 4/3 * math.pi * radius**3`  
`# volume of a sphere, using a defined constant "math.pi"`
  - This is an *expression*

### *step 3: Output*

- Show the results of the processing to the user
- Fundamental output function: `"print()"`
  - Takes arguments that are displayed on computer's screen
  - No return value (none needed)
- Displayed output can be *formatted* to control the style of display

### *Output examples*

- `print('Hello, ', username)`
- `print('Twice', nval, 'is', double)`
- `print('answer: {:6.2f}' \`  
`.format(volume))`  
*# "volume" printed in 6 spaces, using 2 decimal places*

### *Put it together: a geometry exercise*

- Simple program to calculate the diameter, circumference, and area of a circle:
  - **Input:** get the circle's radius
  - **Process:** calculate diameter, calculate circumference, calculate are
    - » Use an "import math" statement to get `math.pi`
  - **Output:** print the results

## *Put it together: a money exercise*

- Calculate annual income
  - Input: get hourly salary, hours-per-week, weeks-per-year
  - Process: multiply values to calculate salary-per-year
  - Output: print the yearly salary
    - » Format with a dollar sign?

## *More exercises*

- Calculate your hours of class per week
- Calculate interest on a \$1000 loan
- Calculate your age, in months
- Convert temperatures in degrees Fahrenheit to degrees Celsius
- Calculate hypotenuse of a right triangle
  - Hint: import "math", then use "math.sin()", "math.cos()", "math.tan()" as needed