COMP 141

CS1: Programming Fundamentals

math operations,
input from keyboard

Rhodes College

Warm-up

You are caught going 74 miles/hour in a 60mph zone. The fine is $15 for every mile per hour over the limit. Which of the programs correctly prints your fine? (there may be more than one)

1
```
speed = 74
limit = 60
print(fine)
fine = (speed – limit) * 15
```

2
```
speed = 74
limit = 60
fine = over * 15
over = (speed – limit)
print(fine)
```

3
```
limit = 60
speed = 74
fine = (speed – limit) * 15
print(fine)
```

Performing Calculations

- **Math expression: performs calculation and gives a value**
  - Math operator: tool for performing calculation
  - Operands: values surrounding operator
    - Variables can be used as operands
  - Resulting value typically assigned to variable
- **Two types of division:**
  - `/` operator performs floating point division
  - `//` operator performs integer division
    - Positive results truncated, negative rounded away from zero

The Exponent Operator and the Remainder Operator

- **Exponent operator (`**`): Raises a number to a power**
  - `x ** y` = x^y
- **Remainder operator (`%`): Performs division and returns the remainder**
  - a.k.a. modulus operator
  - e.g., `4%2=0`, `5%2=1`
  - Typically used to convert times and distances, and to detect odd or even numbers

Operator Precedence and Grouping with Parentheses

- **Python operator precedence:**
  1. Operations enclosed in parentheses
     - Forces operations to be performed before others
  2. Exponentiation (**)
  3. Multiplication (*), division (/ and //), and remainder (%)
  4. Addition (+) and subtraction (-)
- **Higher precedence performed first**
  - Same precedence operators execute from left to right

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Converting Math Formulas to Programming Statements

- **Operator required for any mathematical operation**
- **When converting mathematical expression to programming statement:**
  - May need to add multiplication operators
  - May need to insert parentheses

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Performing Calculation Practice

You're working at a fast food restaurant where a burger costs $3.99 and French fries cost $1.99.

- Write a program (save this as a script) that uses 2 variables to store these two prices.
- Your program should then print out the cost of buying 2 burgers and 3 fries.
- If you finish early, make your program add in 9.25% sales tax.

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Reading Input from the Keyboard

- **Most programs need to read input from the user**
- **Built-in `input` function reads input from keyboard**
  - **Returns** the data as a string
  - Format: *`variable`* `= input(`*`prompt`*`)`
    - `prompt` is typically a string instructing user to enter a value
  - Does not automatically display a space after the prompt

Example:

```
>>> name = input("Please enter your name: ")
```

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Reading Numbers with the `input` Function

- **`input` function always returns a string**
- **Built-in functions convert between data types**
  - `int(item)` converts *item* to an `int`
  - `float(item)` converts *item* to a `float`
  - Nested function call: general format:
    `function1(function2(argument))`
    - value returned by function2 is passed to function1
  - Type conversion only works if item is valid numeric value, otherwise, throws exception

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Input from Keyboard

- For integers:

```
variable = int(input("Prompt"))
```

- For floats:

```
variable = float(input("Prompt"))
```

- For strings:

```
variable = input("Prompt")
```

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Practice

1. Modify your food program (burger and fries) to prompt the user for how many burgers and orders of fries they want, and print the total cost.
2. Write a short program (new file) that will calculate the proper tip on a bill.
   - Prompt the user for the total cost of the bill.
   - Assume you are leaving an 18% tip.
   - Calculate the total tip for the bill.
   - Output the tip amount
   - If you're done early, prompt the user for the tax rate, then use it to calculate the total cost of the bill with tax and tip.

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