

Variables and While Loops

Today starts as a Paper + Pencil or Tablet + Pencil day... please keep laptops stowed away!

COMP110 - CL08
2024/02/20

Announcements

- LSo7 - Variables and While Loops due Tomorrow Night (February 21st)
 - Quick, supplemental reading on today's lecture subject
 - Reading Posted, Gradescope Questions by 5pm Today
- EXo3 - Wordle
 - Uses concepts of today and LSo7
 - Implement the popular online game Wordle!
 - Posts by February 22nd

Warm-up: Discuss the following questions with a neighbor, then, on paper, diagram how you believe this works.

```
1  def f(x: int) -> int:  
2      y: int  
3      y = x * 2  
4      return y  
5  
6  
7  print(f(3))
```

Questions to discuss with a neighbor:

What does line #2 remind you of?

What does line number #3 remind you of?

```
1  def f(x: int) -> int:
2      y: int
3      y = x * 2
4      return y
5
6
7  print(f(3))
```

Introducing Variables

Trace the Following Program in a Diagram

```
1  def pizza_price(size: int) -> float:
2      """Calculate the price of a pizza."""
3      price: float = 10.0
4
5      if size >= 16:
6          price = 20.0
7
8      return price
9
10
11 print(pizza_price(size=16))
```

```
1 def pizza_price(size: int) -> float:  
2     """Calculate the price of a pizza."""  
3     price: float = 10.0  
4  
5     if size >= 16:  
6         price = 20.0  
7  
8     return price  
9  
10  
11 print(pizza_price(size=16))
```

Key Variable Terminology

- Variable Declaration / Definition
- Variable Assignment
- Variable Initialization
- Variable Access

Identify Key Concepts

Then Trace the Following Program in a Diagram

Identify: Declaration, Initialization vs. Assignment, Access

```
1  def pizza_price(size: int, toppings: int) -> float:
2      """Calculate the price of a pizza with toppings."""
3      price: float = 10.0
4
5      if size >= 16:
6          price = 20.0
7
8      price = price + toppings * 0.75
9
10     return price
11
12
13 print(pizza_price(size=14, toppings=2))
```

```
1 def pizza_price(size: int, toppings: int) -> float:  
2     """Calculate the price of a pizza with toppings."""  
3     price: float = 10.0  
4  
5     if size >= 16:  
6         price = 20.0  
7  
8     price = price + toppings * 0.75  
9  
10    return price  
11  
12  
13 print(pizza_price(size=14, toppings=2))
```

Left-hand vs. Right-hand Side of Assignment

The = Symbol is the *Assignment Operator*

- Each side of the assignment operator plays a distinct role in variable assignment!

Be Careful!

This program is *very slightly modified* from the previous. Can you spot the error? Try tracing again.

```
1  def pizza_price(size: int, toppings: int) -> float:
2      """Calculate the price of a pizza with toppings."""
3      price: float
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5      if size >= 16:
6          price = 20.0
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8      price = price + toppings * 0.75
9
10     return price
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12
13 print(pizza_price(size=14, toppings=2))
```

Common Variable Errors

- `UnboundLocalError` - Occurs when attempting to access a variable that is declared in a function but not yet initialized
- `NameError` - Occurs when attempting to access a variable that is not declared. Commonly from typos or renaming a variable and not updating all accesses.

Why variables?

One reason: Store the results of function calls (computation or data input) for later use!

```
1 ✓ def madlibs() -> str:  
2     name: str = input("Give me a name: ")  
3     adjective: str = input("Give me a positive adjective: ")  
4     verb: str = input("Give me a verb ending in ing:")  
5     return f"{name} is {adjective} at {verb}"
```

Speed Writing Exercise

Introducing: While Loops

- Follow-along in Trailhead / VSCode

```
1  def love(n: int) -> None:
2      i: int = 0
3      while i < n:
4          print(f'i <3 u ({i})')
5          i = i + 1
```

Trace the Following Example

```
1  def sum(xs: tuple[int, ...]) -> int:
2      """Sum the values of a tuple."""
3      total: int = 0
4      i: int = 0
5      while i < len(xs):
6          total = total + xs[i]
7          i = i + 1
8
9      return total
10
11
12  print(sum(xs=(1, 2, 3)))
```

The Structure & Semantics of a While Loop