



Hack110!!!

*Interest Form opens
Feb 16th*

When: Saturday, April 18th from 10 am - 12 am (MIDNIGHT)

Where: Sitterson and Fred Brooks 1st floor (Floor 0)

Who can join? Anyone in COMP 110! No prior experience required.

Perks :

- Snacks and drinks All Day
- Free Shirt and CLE Credit
- Lunch and Dinner provided
- Fun workshops
- Demos for Prizes



Announcements

Re: Assignments:

- **LS07: Variables** due tonight at 11:59pm
- **EX02: Chardle** – due Sunday, Feb 8 at 11:59pm

Reminders:

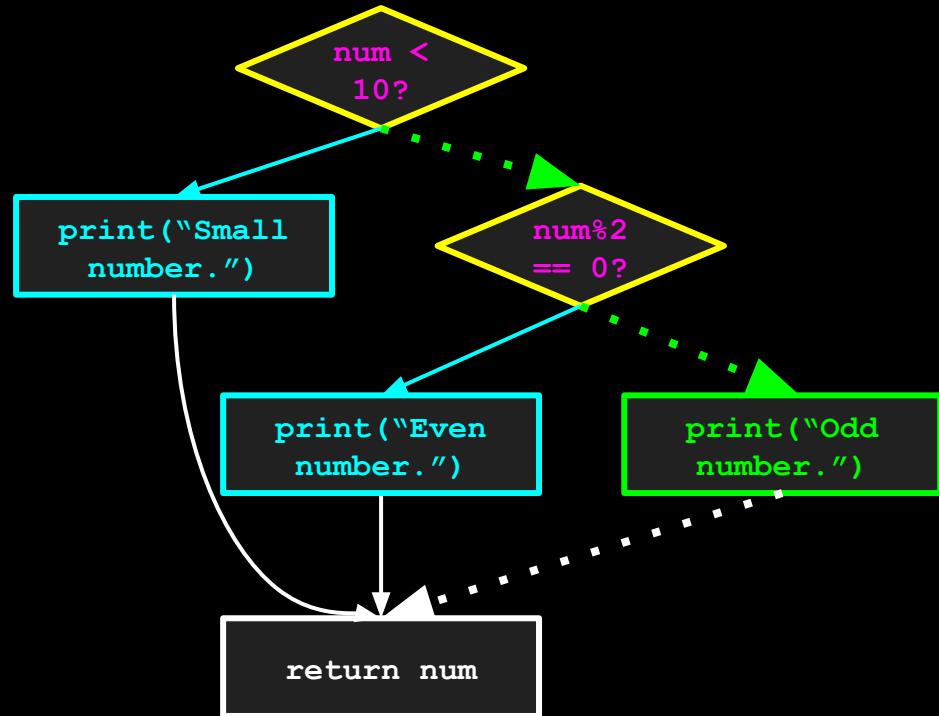
- **Quiz 01 on Thurs, Feb 12**
 - If you take your quizzes with the EOC/ARS, please ensure you've scheduled it!

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Conditionals (continued)

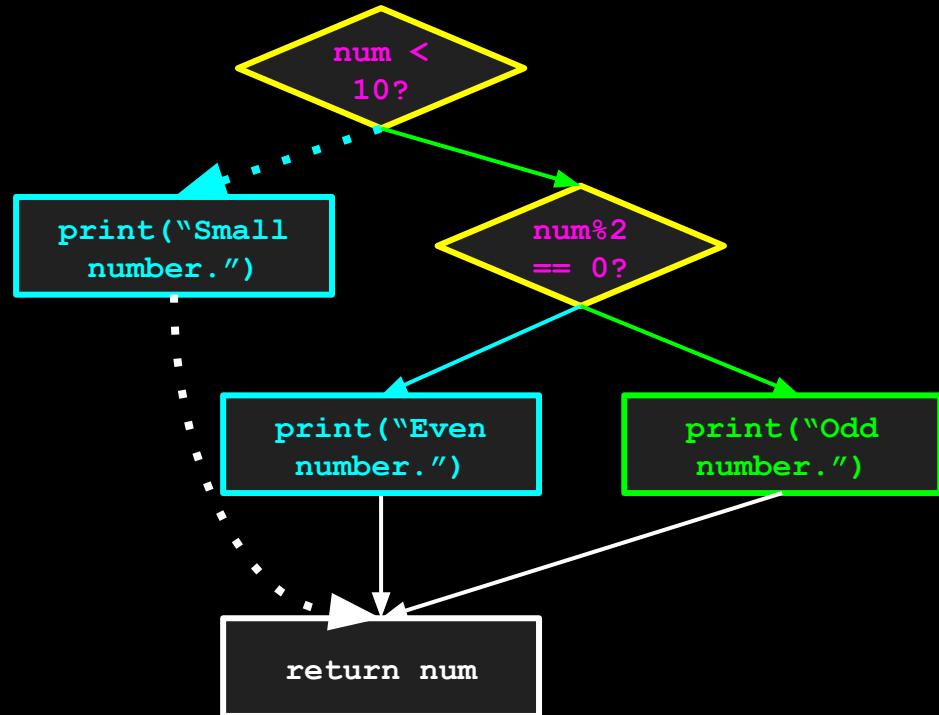
Drawing the control flow...

```
1 def number_info(num: int) -> None:  
2     if num < 10:  
3         print("Small number.")  
4     else:  
5         if num % 2 == 0:  
6             print("Even number.")  
7         else:  
8             print("Odd number.")  
9     return num  
10  
11 number_info(num=11)  
12 print(number_info(num=4))
```



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What if...

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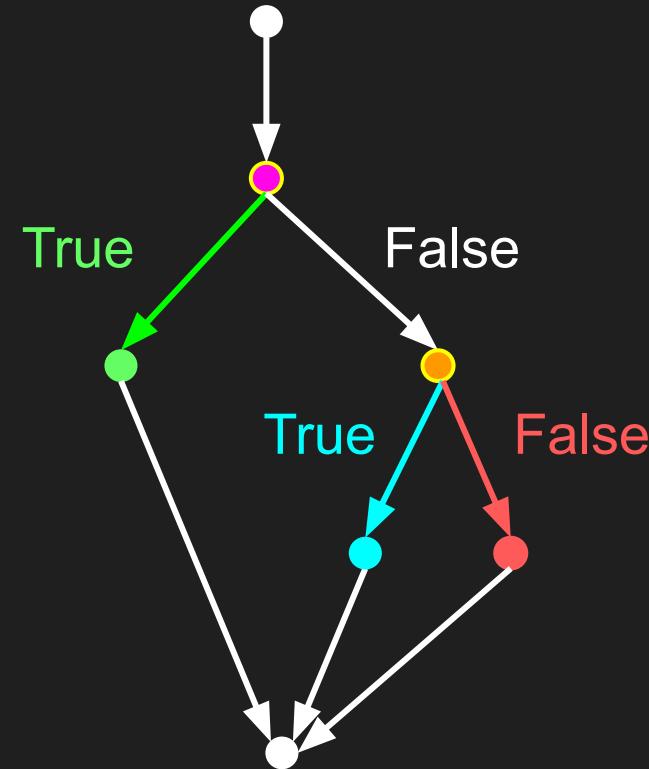
What if...

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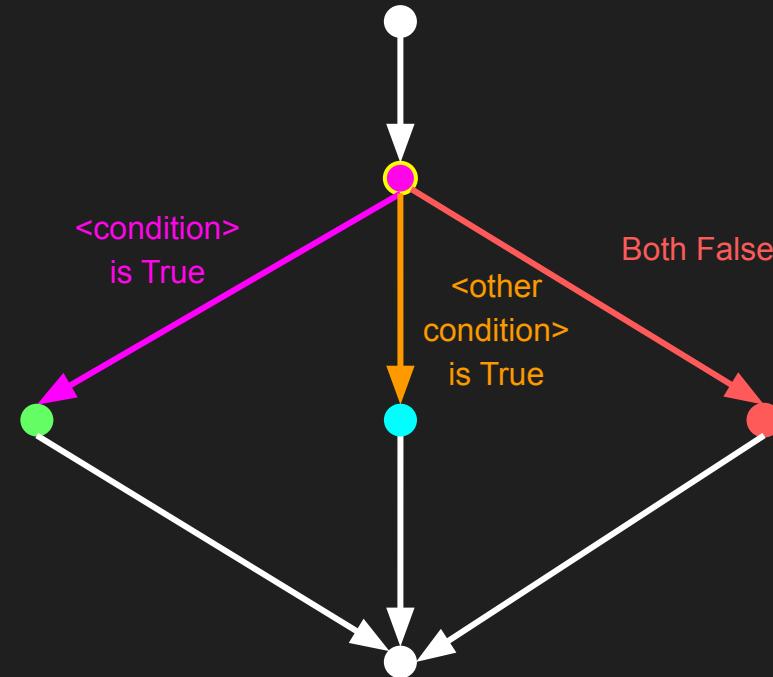
Previous Control Flow

```
if <condition>:  
    <do something>  
  
else:  
    if <other condition>:  
        <do something else>  
  
    else:  
        <do third thing>  
  
<rest of program>
```



New Control Flow

```
if <condition>:  
    <do something>  
  
elif <other condition>:  
    <do something else>  
  
else:  
    <do third thing>  
  
<rest of program>
```



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Variables &
Positional Arguments

Warm-Up: Discuss these questions with a neighbor, then 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))
```

Note: This warm-up gives a preview of the new concepts we'll cover today. As you work through it, focus on using your intuition and what you already know to make sense of the code.

Questions to discuss with a neighbor:

What does line 2 remind you of?

What does line 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))
```

Output

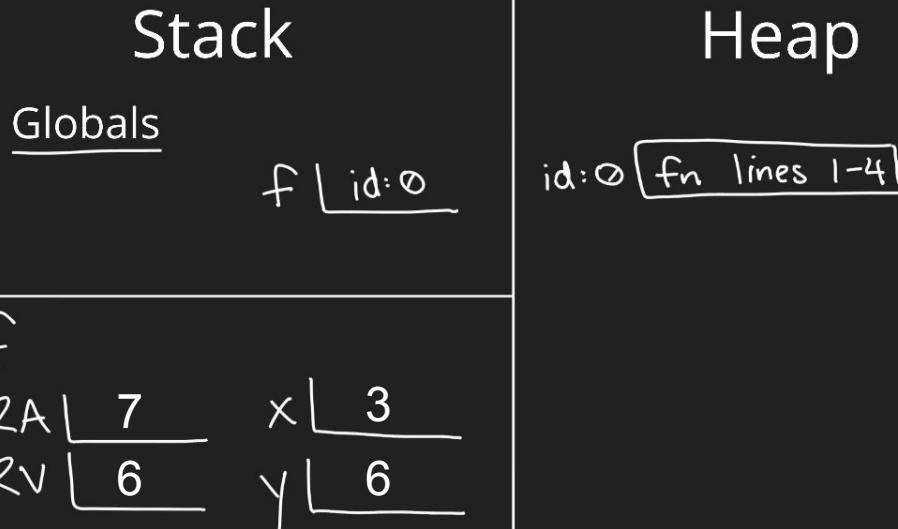
Stack
Globals

Heap

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

Output

6



Key Variable Terminology

Variable Declaration / Definition

`<name>: <type>`

Examples:

`students: int`

`message: str`

- Associates a name/identifier with a data type, and a space in the current frame

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`<name>: <type>`

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Variable Assignment

`<name> = <expression>`

- Binds a new value to a variable name in memory

Examples:

`students = 900`

`message = "comp" + str(110)`

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Variable Assignment

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Variable Initialization

- First time a variable is assigned

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Variable Initialization

- First time a variable is assigned

Note: You can declare and initialize a variable on two different lines (e.g., lines 2-3 in the warm-up), or on the same line, e.g:

`y: int = x * 2`

Key Variable Terminology

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1  def f(x: int) -> int:  
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Key Variable Terminology

Variable Declaration / Definition

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Variable Assignment

`<name> = <expression>`

- Binds a new value to a variable name in memory

Variable Initialization

- First time a variable is assigned

Variable Access

`print(students)`

- “Reading” or using a variable name in an expression

Left-hand vs. Right-hand Side of Assignment

Each side of the assignment operator (=) plays a distinct role in variable assignment!

Variable Assignment

`<name> = <expression>`

Execute an assignment statement in 2 steps:

1. Evaluate the **expression** on the right-hand side of the **assignment operator**, down to a literal value.
2. Assign (or “bind”) that literal value to the **variable** on the left-hand side.

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 has not been declared. Commonly from typos or renaming a variable and not updating all accesses

Why variables? One reason: to store the results of function calls for later use!

```
1  def pizza_price(size: int, toppings: int) -> float:
2      """Calculate price of 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 total_price: float = pizza_price(size=14, toppings=2)
14 print(total_price)
```

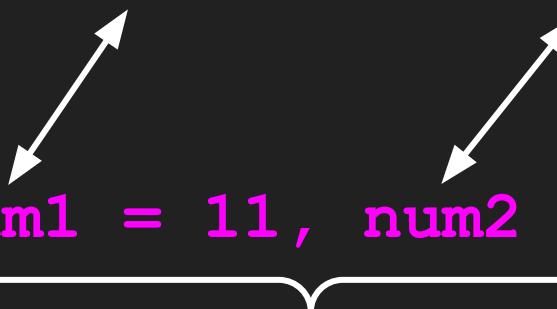
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8     price = price + toppings * 0.75  
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10    return price  
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13 total_price: float = pizza_price(size=14, toppings=2)  
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```

Keyword vs. Positional Arguments

Recall: Signature vs Call

```
def divide(num1: int, num2: int) -> float:
```

```
divide(num1 = 11, num2 = 3)
```



The diagram consists of two white arrows. One arrow points from the word 'num1' in the function signature to the value '11' in the call expression. Another arrow points from the word 'num2' in the function signature to the value '3' in the call expression.

These are called **keyword arguments**, since you are assigning values based on the parameter names.

Keyword arguments

```
def divide(num1: int, num2: int) -> float:
```

```
divide(num1 = 11, num2 = 3)
```

Benefit of keyword arguments:
order of arguments doesn't
matter.

Keyword arguments

```
def divide(num1: int, num2: int) -> float:
```

```
divide(num1 = 11, num2 = 3)
```

```
divide(num2 = 3, num1 = 11)
```

Benefit of keyword arguments:
order of arguments doesn't
matter.

Positional Arguments

```
def divide(num1: int, num2: int) -> float:
```

```
divide(11, 3)
```

For **positional arguments**, values are assigned based on the order (*position*) of the arguments.

```
1 def pizza_price(size: int, toppings: int) -> float:  
2     """Calculate price of 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 total_price: float = pizza_price(size=14, toppings=2)  
14 print(total_price)
```

How could we rewrite these as **positional arguments**?

```
1     """Calling to and fro..."""
2
3
4 def ping(i: int) -> int:
5     print("ping: " + str(i))
6     if i <= 0:
7         return i
8     else:
9         return pong(i=i - 1)
10
11
12 def pong(i: int) -> int:
13     print("pong: " + str(i))
14     return ping(i=i - 1)
15
16
17 print(ping(i=2))
```

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1     """Calling to and fro..."""
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12 def pong(i: int) -> int:
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15
16
17 print(ping(i=2))
```

How could we rewrite this as a **positional argument**?



Weekly Tutoring + Office Hours

Office Hours (Sitterson Hall (SN) 008):

- Mondays–Fridays: 11am-5pm
- Sundays: 1-5pm

Tutoring (see CSXL site for location):

- Mondays, Wednesdays, Thursdays: 5-7pm