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PYTHON - CONDITIONAL

Last Updated: Thursday, January 24, 2019

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Objective, Overview & Introduction

- Now that we have learned about the the Python IDLE editor, and created some simple programs, you will now add conditional structures in a Python Editor, which you can then execute later.
- Using a Python Editor, you will implement a number of conditional statements, including:
  - if, else, and elif (else if) conditional structures
- You will have an opportunity to show you coding skill by turning in a number of Python labs. You will be measured on how well you implement these labs

WHAT YOU WILL KNOW…

- Prior Knowledge & Certifications
  - You should have an understanding of variable assignment, math, and string concatenation, and other basic Python language structures

- What You Will Know & Be Able To Do
  - You will be able to create, edit and save a Python program
  - You will be able to describe and implement basic conditional Python structures like if, else, elif, and determining if a statement is evaluated as True or False and getting input data from the user using input

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These slides are an adaption, to better target my SVCTE High School Mechatronics Engineering class, primarily from Dr. Charles R. Severance's Python for Everybody class https://www.py4e.com/ … but from other sources as well. See Appendix A

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New Words or Concepts...

- Conditional
- if, else, elif
- True/False

Where can I run my Python code?

- The main way we will implement Python code will be by running it on a Raspberry Pi, using the Linux command terminal shell, or the Idle3 Python interpreter
- If you don't have a Raspberry Pi, or if you don't have Python installed, you can execute your code on-line using a Python interpreter
  - Python 3 On-Line Interpreter - Tutorials Point
  - Python Shell – Python.org

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I GOT THIS... CAN I JUMP AHEAD?

- Jump Ahead and do the labs, save them. (show me and turn in later)
- Still need something to do? Try this Extra Credit <linktolab> (show me and turn in later)

RESOURCES & MATERIALS NEEDED

- PY4E Chapter 3 - Conditional execution

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MOSTLY DR. CHARLES R. SEVERANCE'S SLIDES

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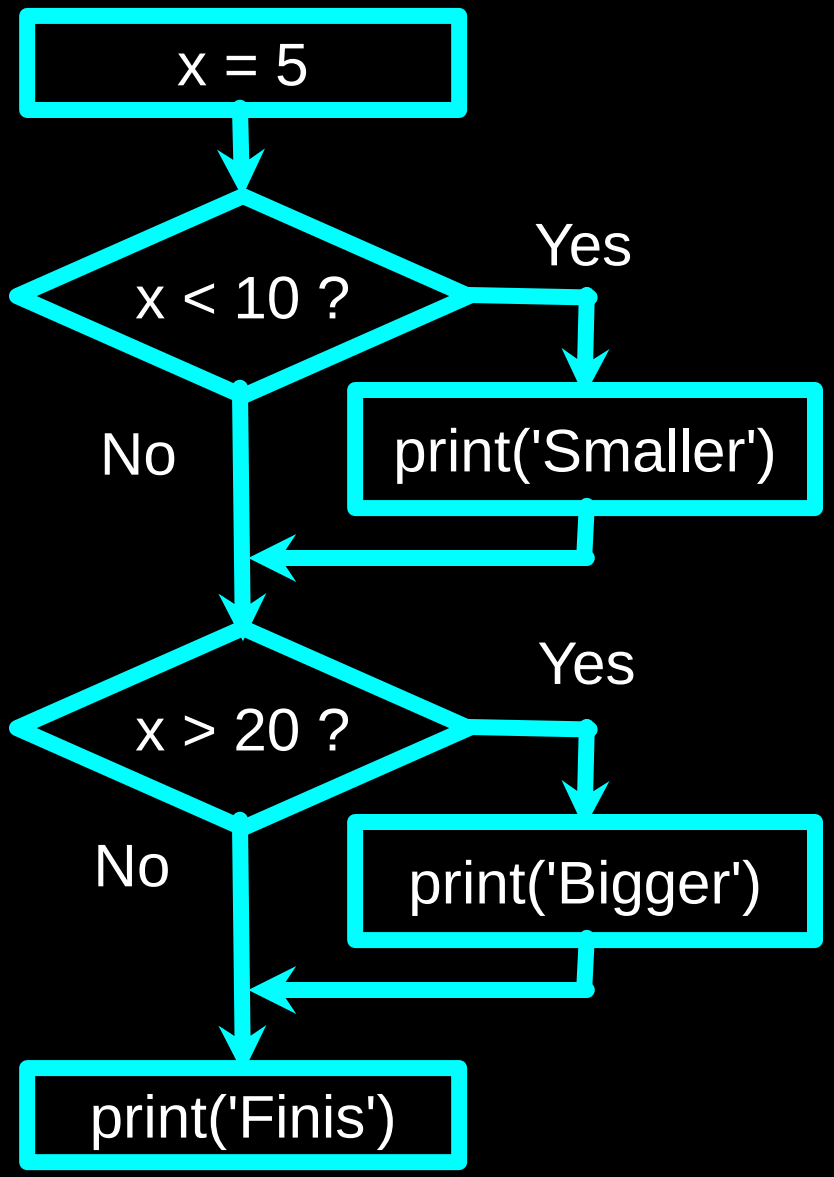
Conditional Execution

Chapter 3

Python for Everybody

www.py4e.com

Conditional Steps



Program:

```
x = 5
if x < 10:
    print('Smaller')
if x > 20:
    print('Bigger')

print('Finis')
```

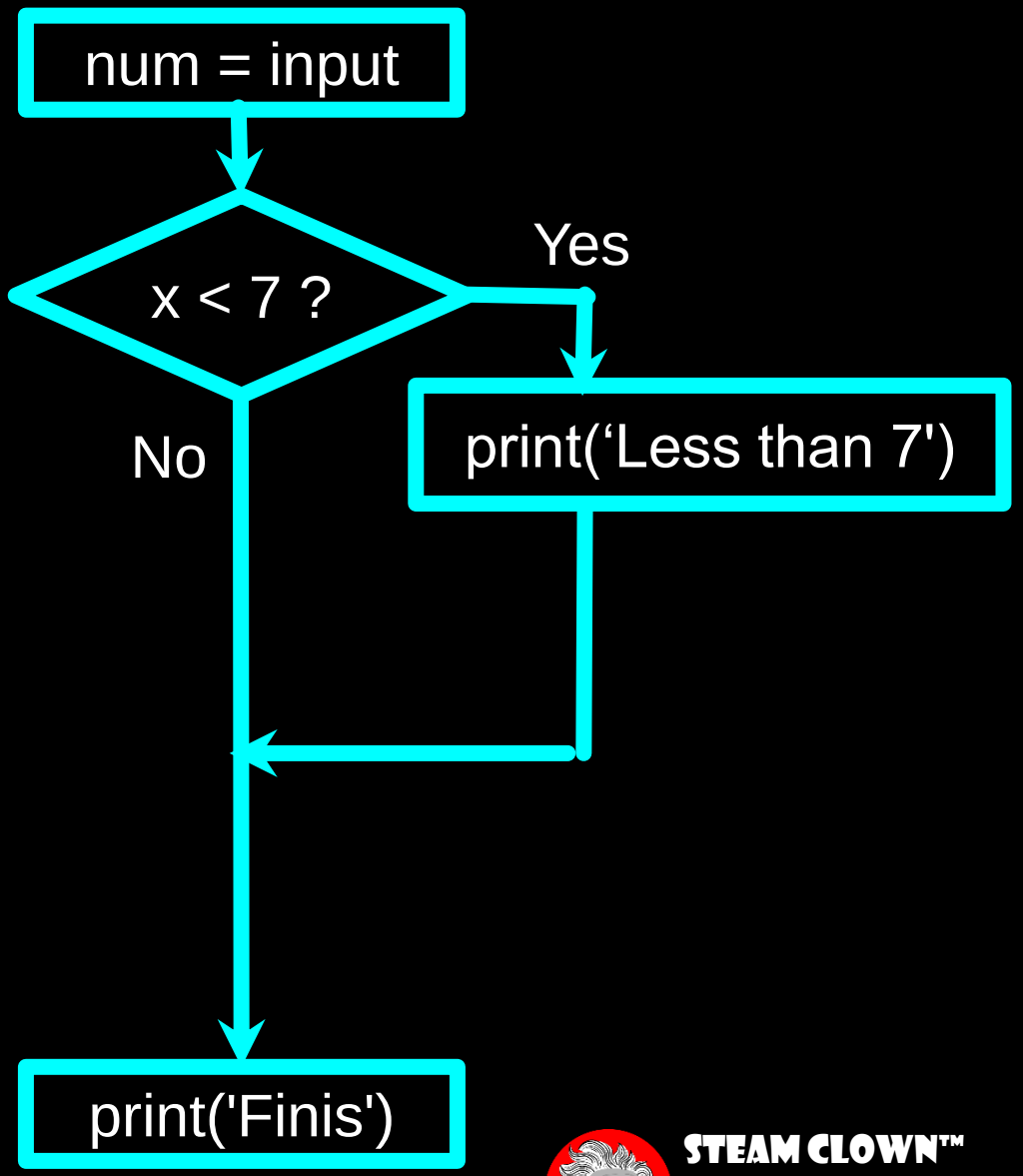
Output:

```
Smaller
Finis
```

LAB #1

Write a program that:

- Asks the use for a number
- Checks to see if the number is < 7
- If the number is less than 7 print “the number <num> is less than 7



Comparison Operators

- Boolean expressions ask a question and produce a Yes or No result which we use to control program flow
- Boolean expressions using comparison operators evaluate to True / False or Yes / No
- Comparison operators look at variables but do not change the variables

Python	Meaning
<	Less than
<=	Less than or Equal to
==	Equal to
>=	Greater than or Equal to
>	Greater than
!=	Not equal

Remember: "=" is used for assignment.

http://en.wikipedia.org/wiki/George_Boole

Comparison Operators

```
x = 5
if x == 5 :
    print('Equals 5')
if x > 4 :
   print('Greater than 4')
if  x >= 5 :
    print('Greater than or Equals 5')
if x < 6 : print('Less than 6')
if x <= 5 :
    print('Less than or Equals 5')
if x != 6 :
    print('Not equal 6')
```

Equals 5

Greater than 4

Greater than or Equals 5

Less than 6

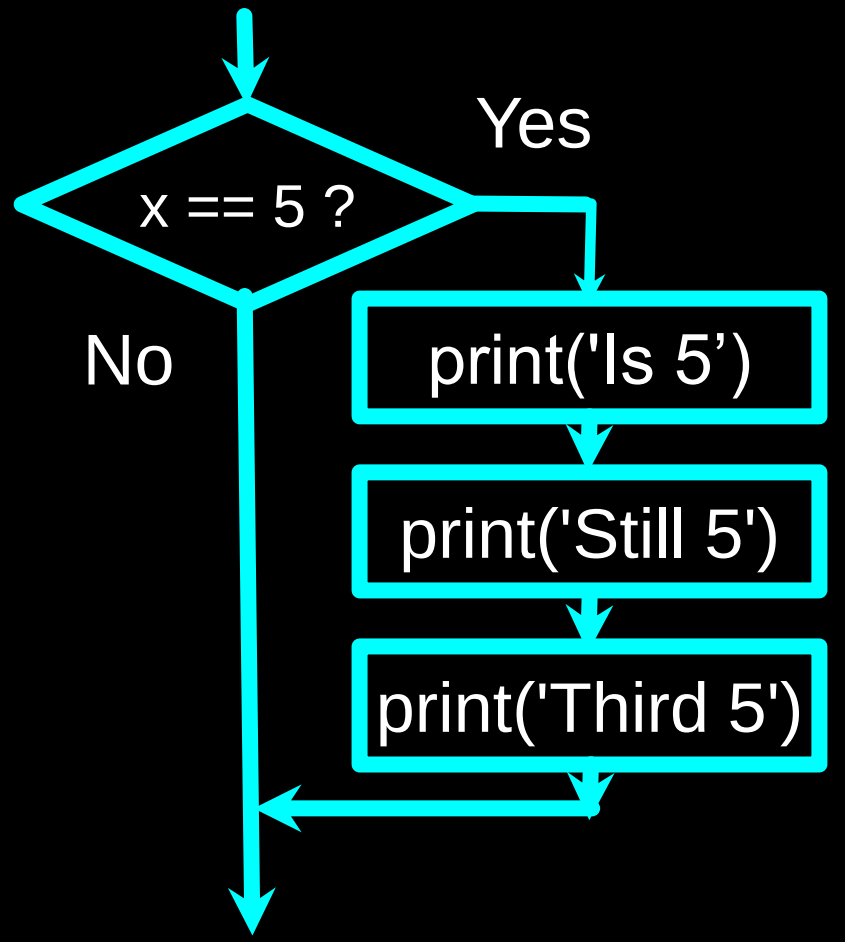
Less than or Equals 5

Not equal 6

One-Way Decisions

```
x = 5
print('Before 5')
if  x == 5 :
    print('Is 5')
    print('Is Still 5')
    print('Third 5')
print('Afterwards 5')
print('Before 6')
if x == 6 :
    print('Is 6')
    print('Is Still 6')
    print('Third 6')
print('Afterwards 6')
```

```
Before 5
Is 5
Is Still 5
Third 5
Afterwards 5
Before 6
Afterwards 6
```

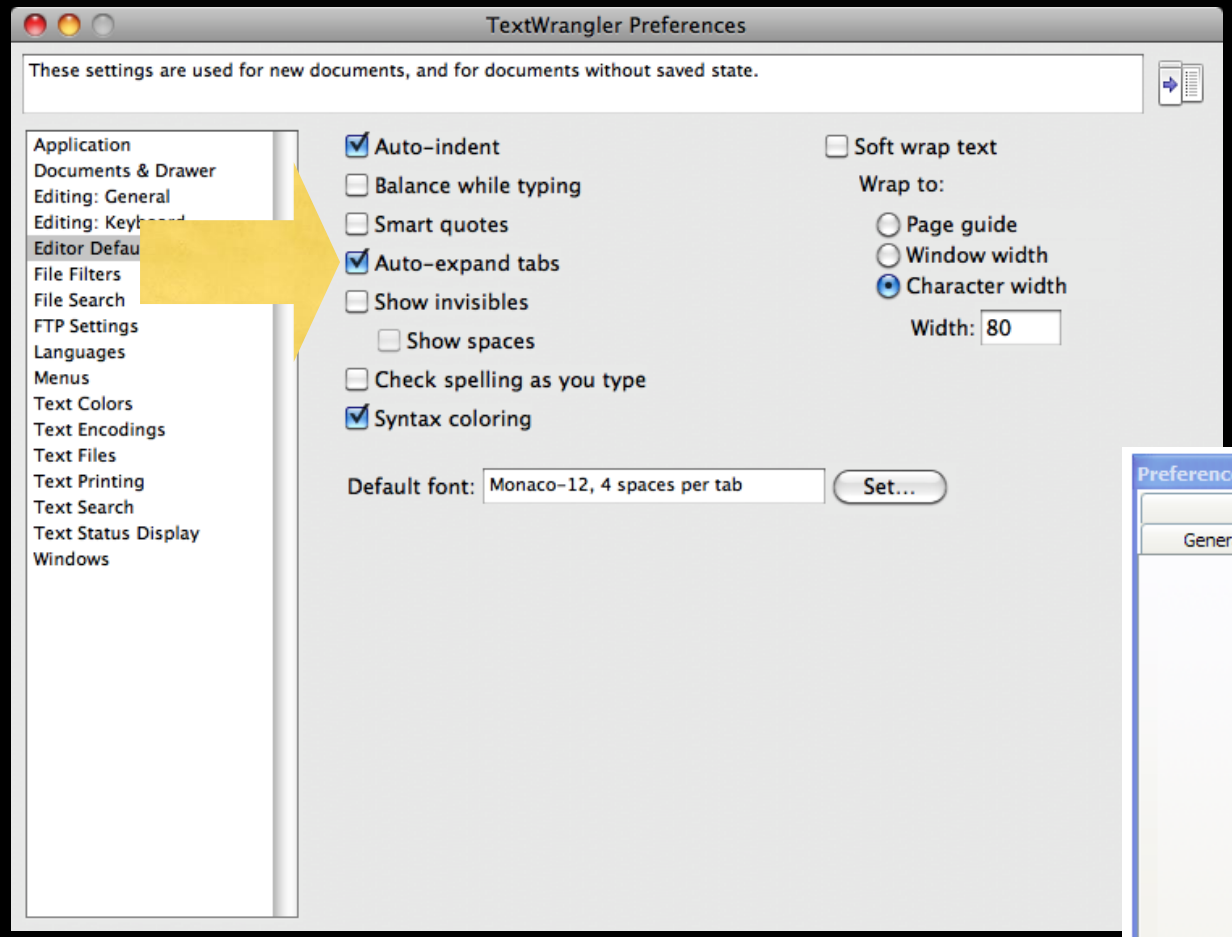


Indentation

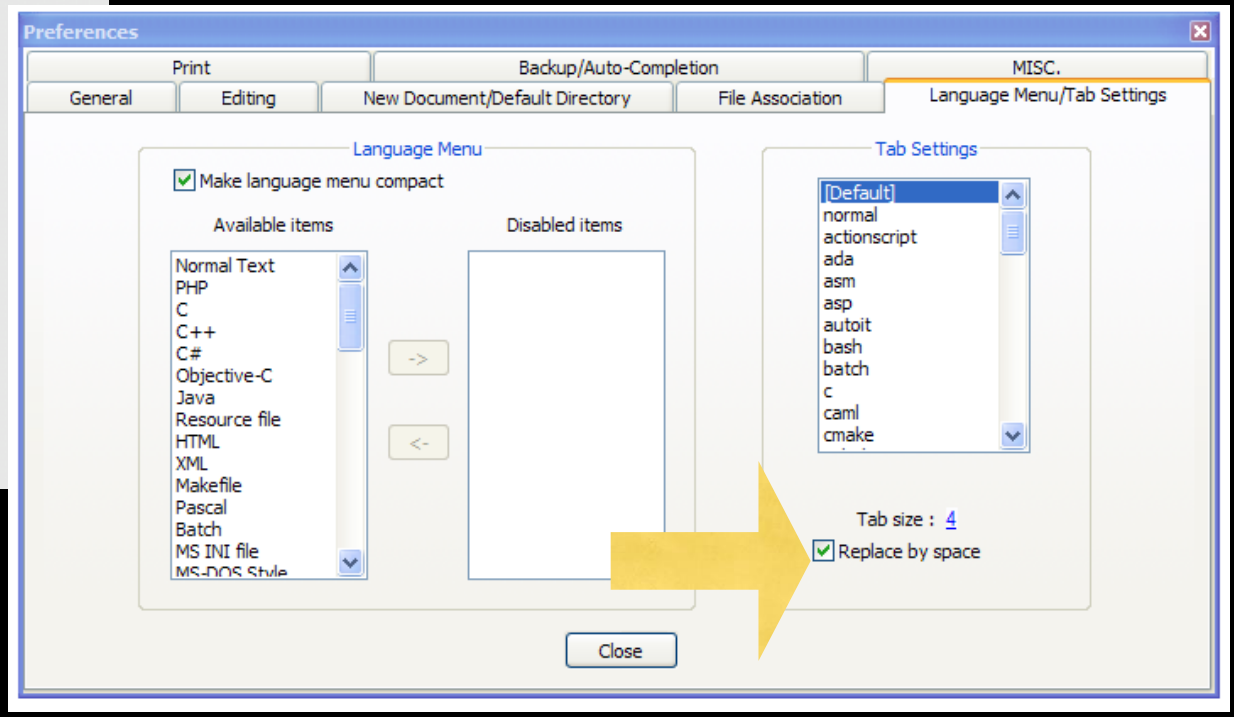
- Increase indent indent after an if statement or for statement (after :)
- Maintain indent to indicate the scope of the block (which lines are affected by the if/for)
- Reduce indent back to the level of the if statement or for statement to indicate the end of the block
- Blank lines are ignored - they do not affect indentation
- Comments on a line by themselves are ignored with regard to indentation

Warning: Turn Off Tabs!!

- Atom automatically uses spaces for files with ".py" extension (nice!)
- Most text editors can turn tabs into spaces - make sure to enable this feature
  - NotePad++: Settings -> Preferences -> Language Menu/Tab Settings
  - TextWrangler: TextWrangler -> Preferences -> Editor Defaults
- Python cares a *lot* about how far a line is indented. If you mix tabs and spaces, you may get “indentation errors” even if everything looks fine

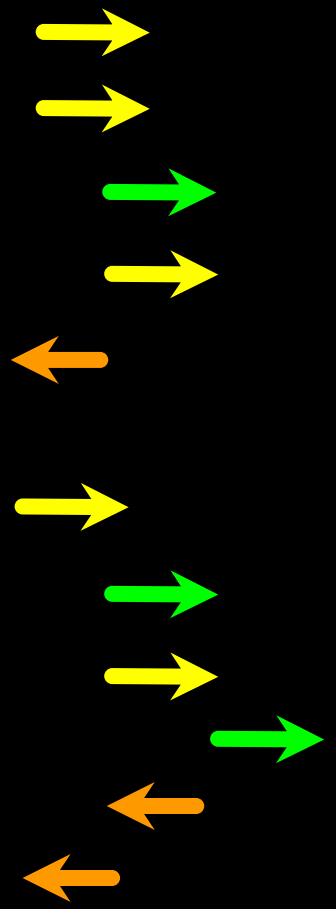


This will save you much unnecessary pain.



increase / maintain after if or for

decrease to indicate end of block



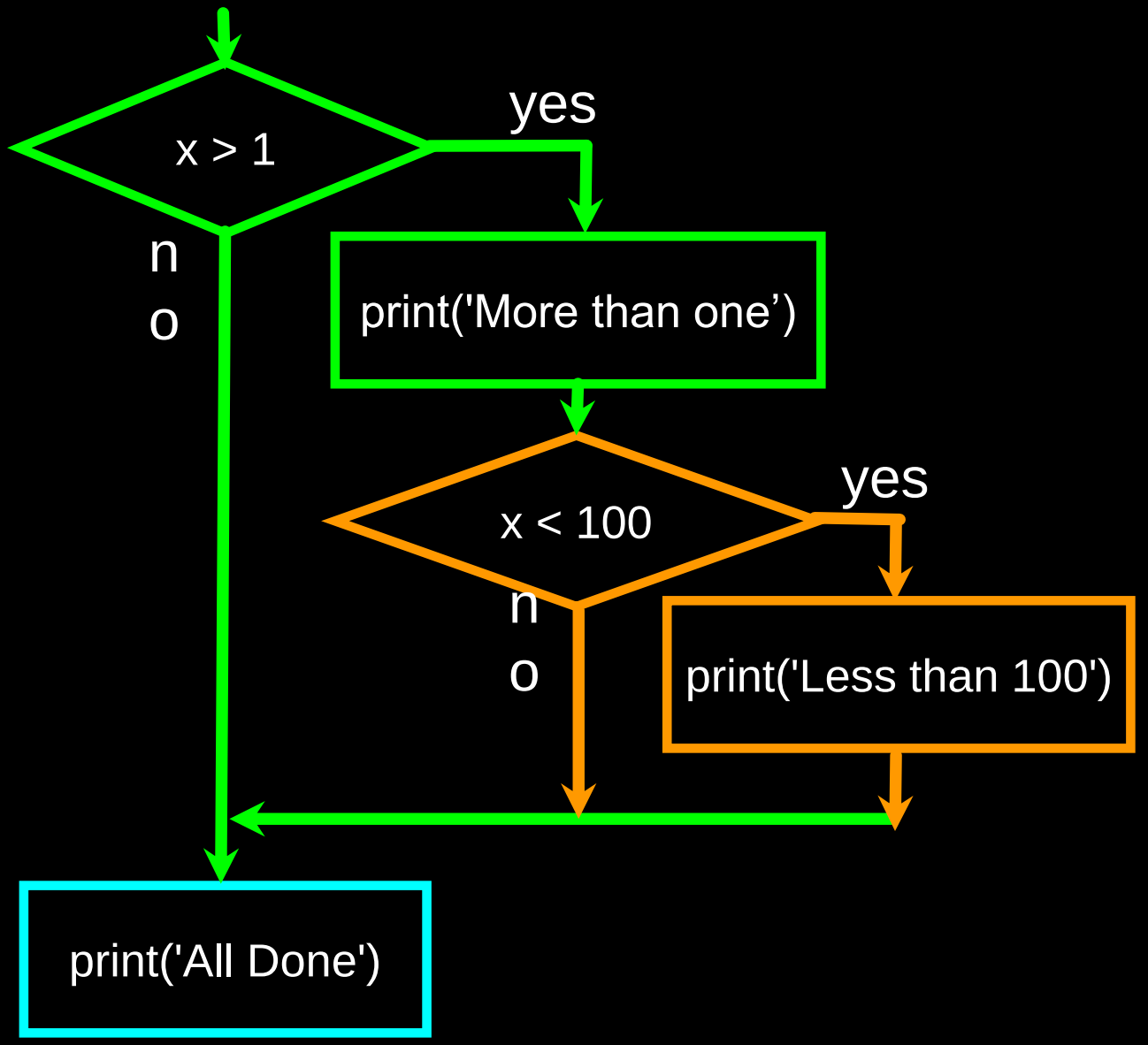
```
x = 5
if x > 2 :
    print('Bigger than 2')
    print('Still bigger')
print('Done with 2')

for i in range(5) :
    print(i)
    if i > 2 :
        print('Bigger than 2')
    print('Done with i', i)
print('All Done')
```

Think About begin/end Blocks

```
x = 5
if x > 2 :
    print('Bigger than 2')
    print('Still bigger')
print('Done with 2')

for i in range(5) :
    print(i)
    if i > 2 :
        print('Bigger than 2')
    print('Done with i', i)
print('All Done')
```

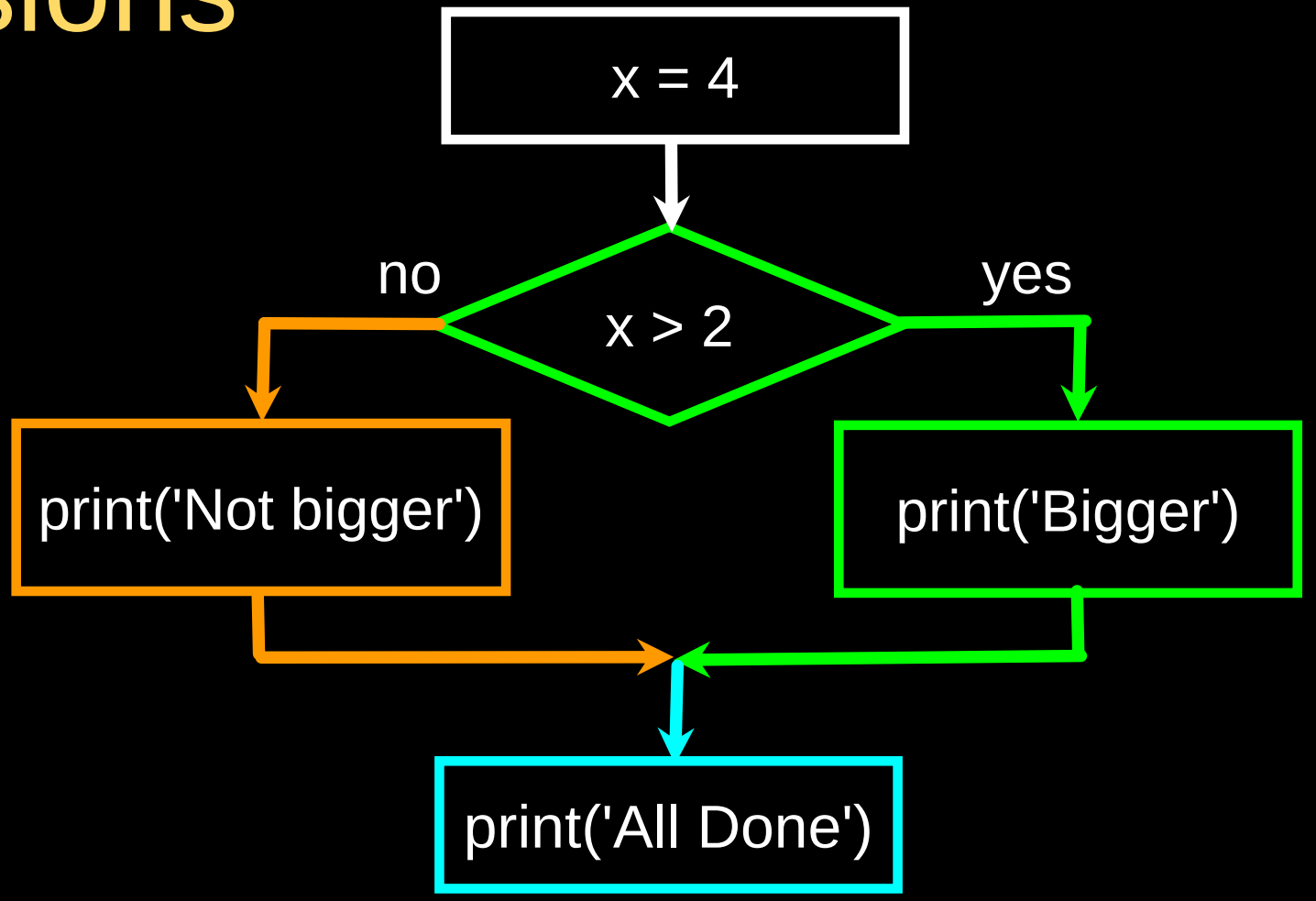
Nested Decisions

```
x = 42
if x > 1 :
    print('More than one')
    if x < 100 :
        print('Less than 100')
print('All done')
```



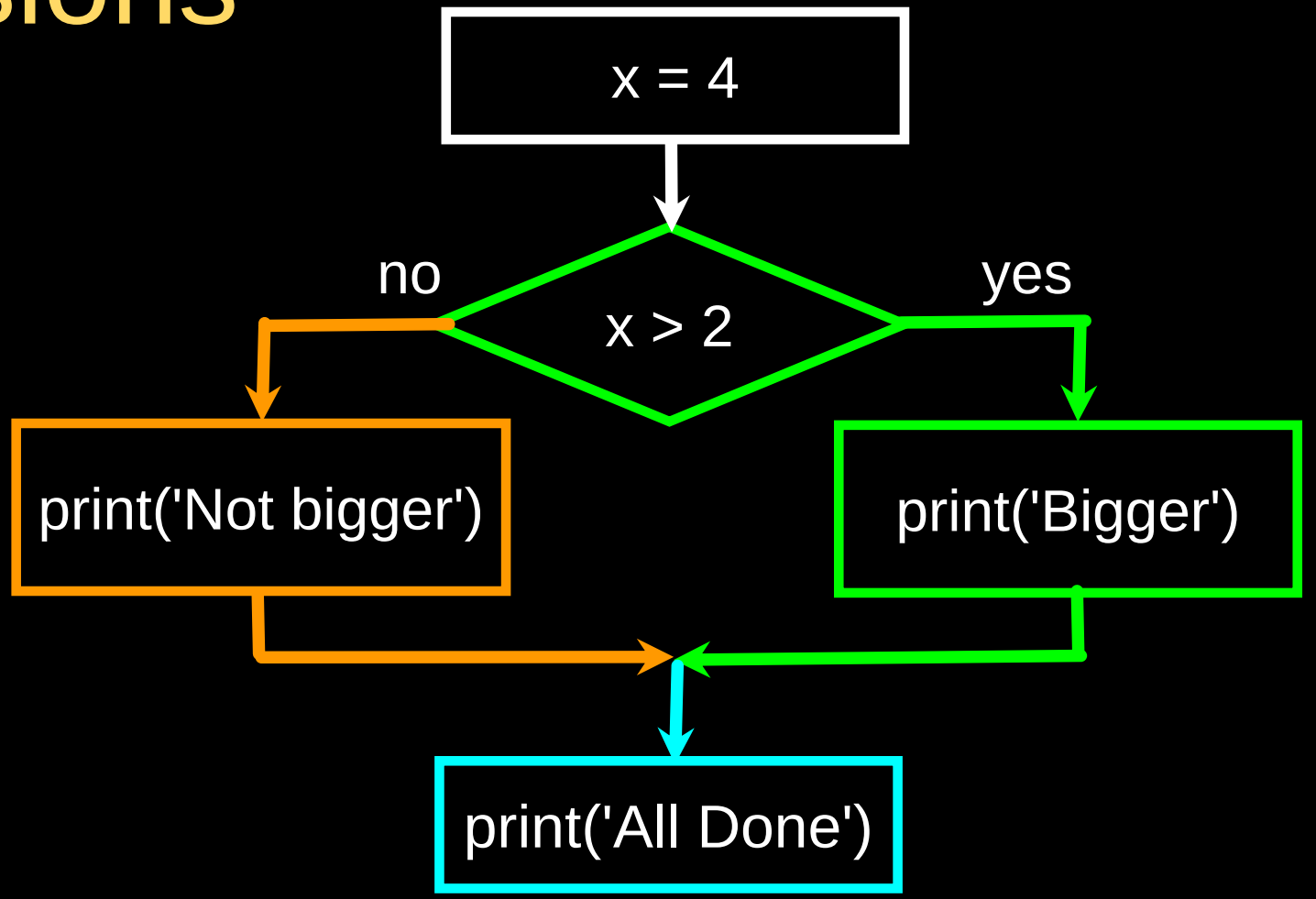
Two-way Decisions

- Sometimes we want to do one thing if a logical expression is true and something else if the expression is false
- It is like a fork in the road - we must choose one or the other path but not both



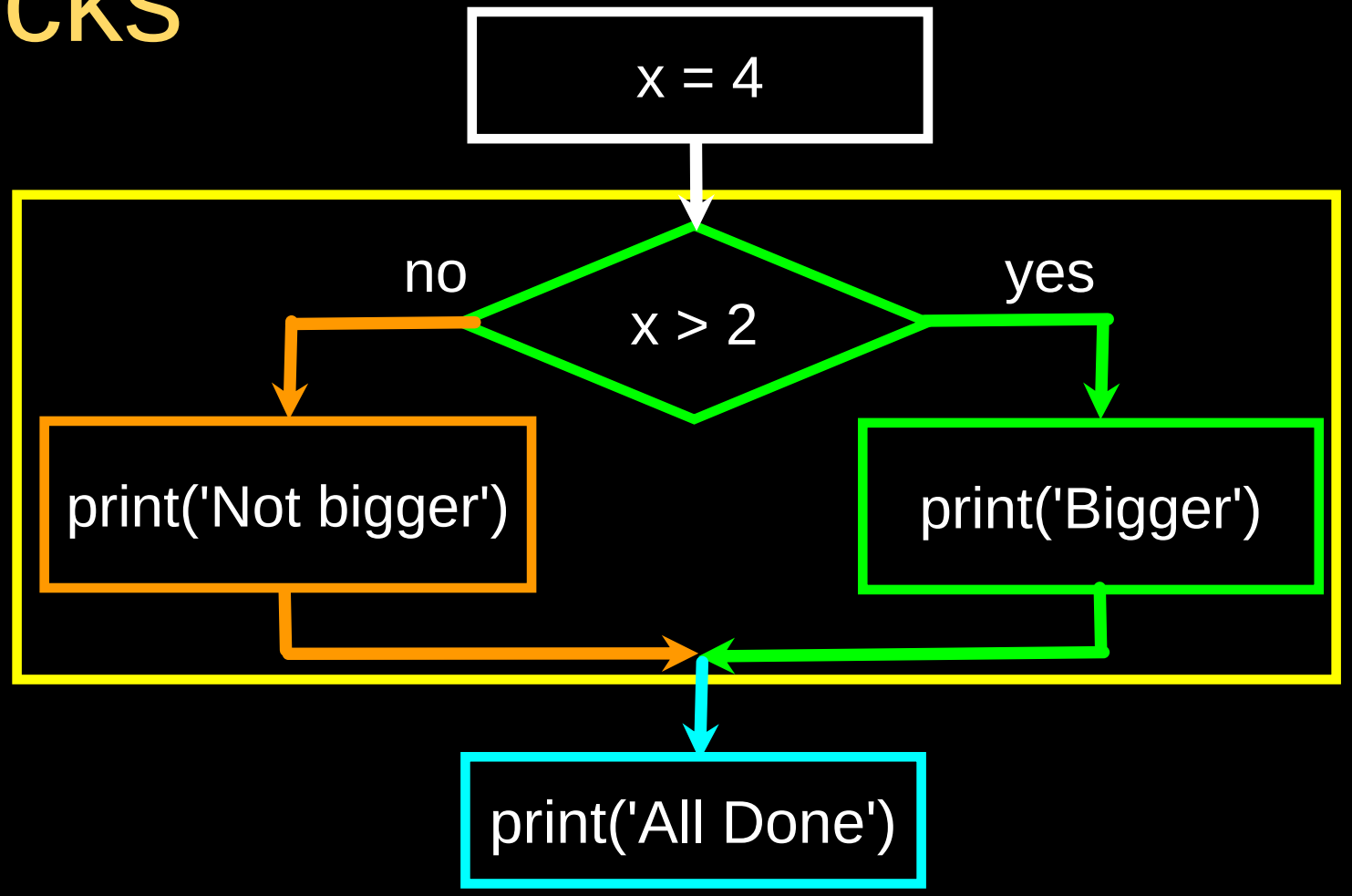
Two-way Decisions with else:

```
x = 4

if x > 2 :
    print('Bigger')
else :
    print('Smaller')

print('All done')
```



Visualize Blocks

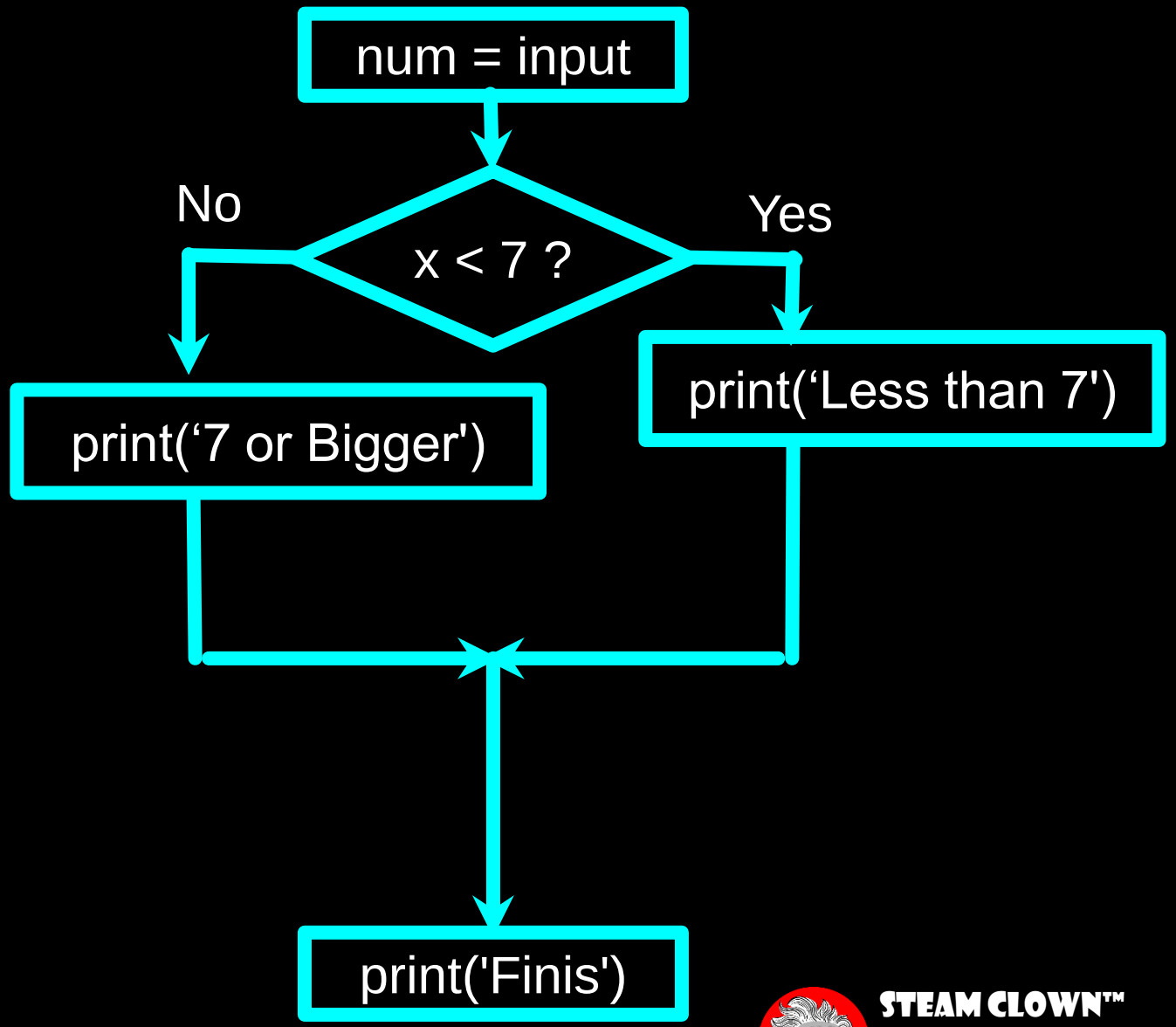
```
x = 4

if x > 2 :
    print('Bigger')
else :
    print('Smaller')

print('All done')
```



Lab #2 – If/Else

Write a program that:

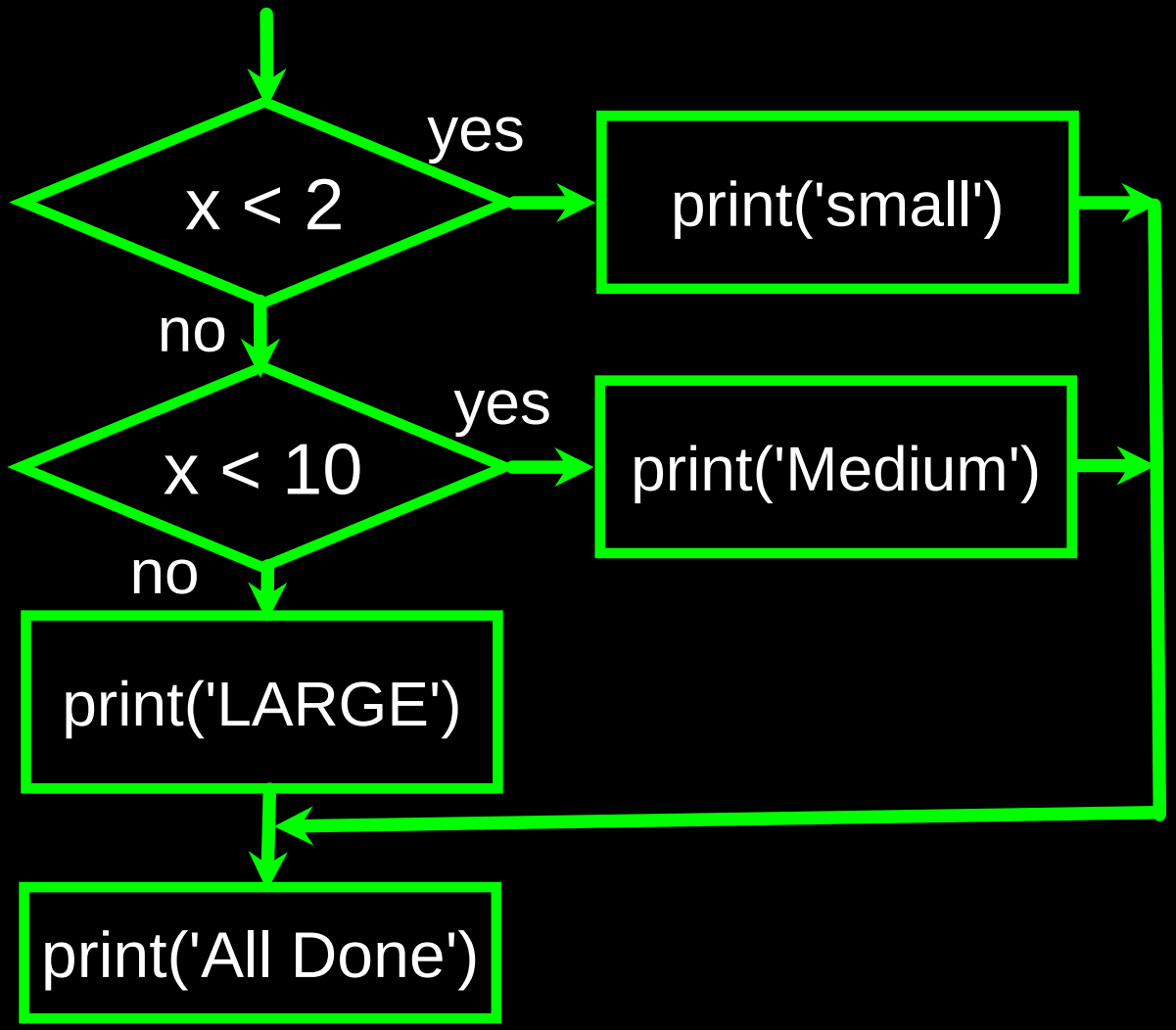
- Asks the use for a number
- Checks to see if the number is < 7
- If the number is less than 7 print “the number <num> is less than 7
- If the number is 7 or greater, then print “the number <num> is 7 or greater



More conditional structures...

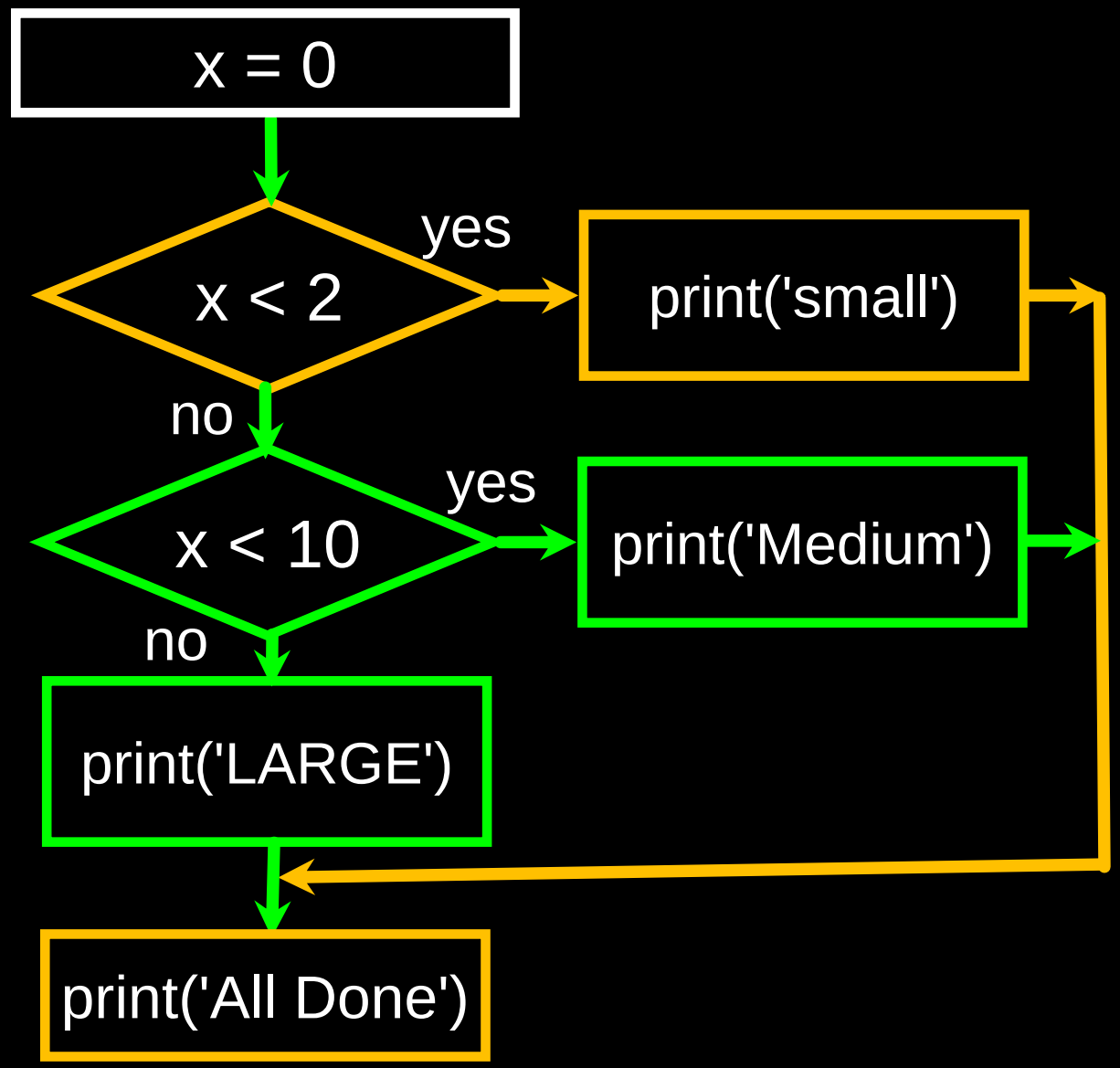
Multi-way

```
if x < 2 :
    print('small')
elif x < 10 :
    print('Medium')
else :
    print('LARGE')
print('All done')
```



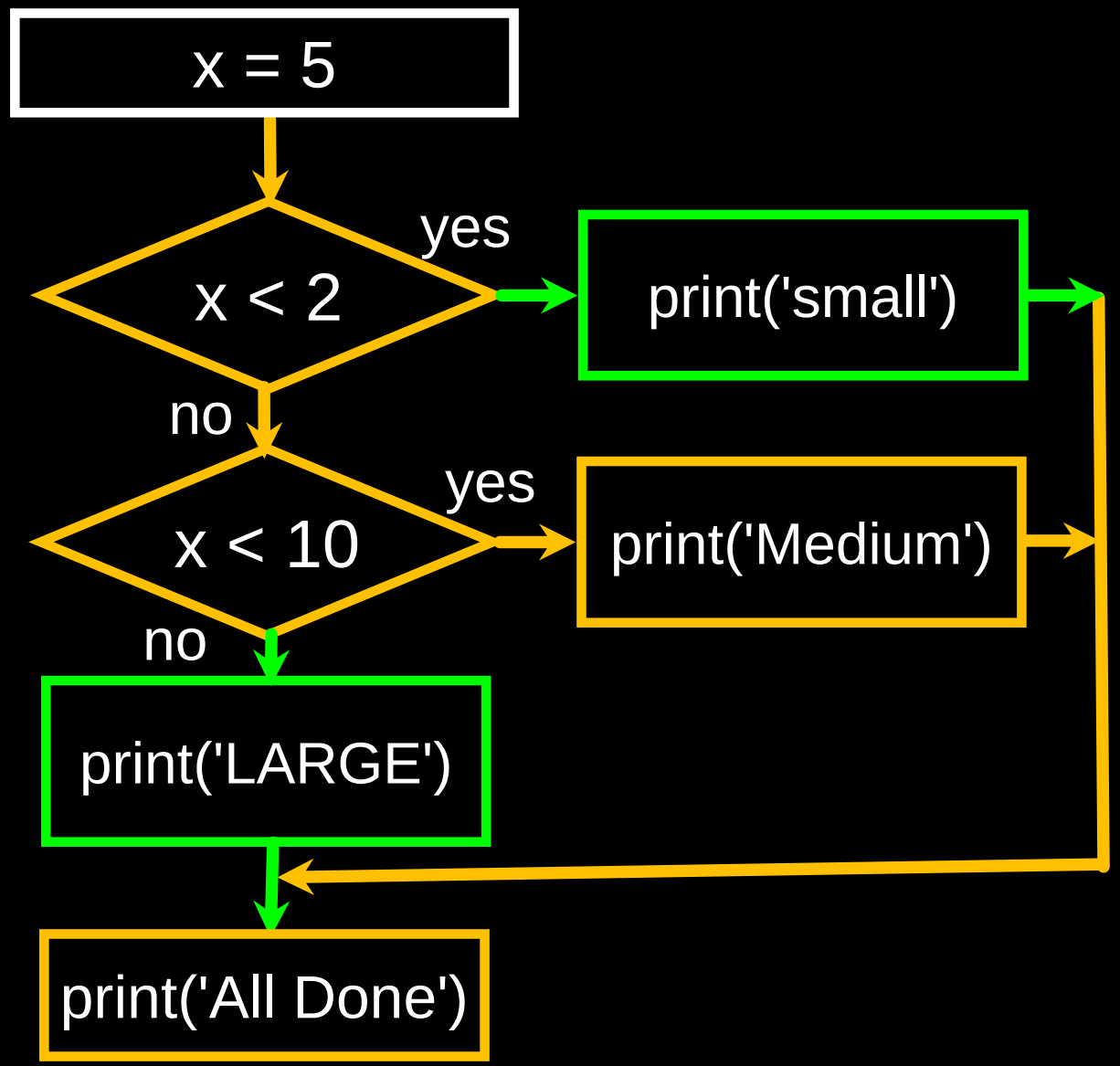
Multi-way

```
x = 0
if x < 2 :
    print('small')
elif x < 10 :
    print('Medium')
else :
    print('LARGE')
print('All done')
```



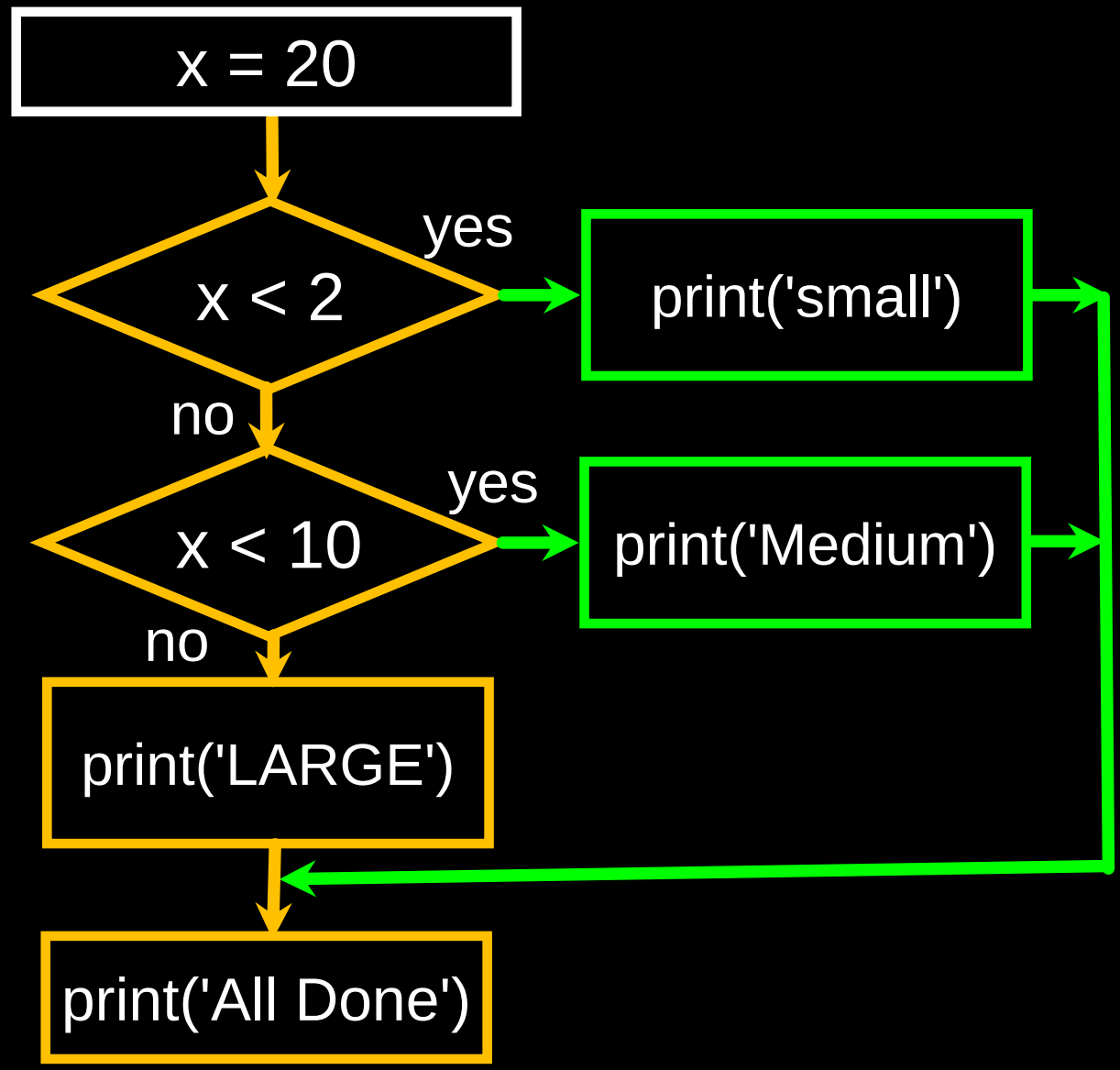
Multi-way

```
x = 5
if x < 2 :
    print('small')
elif x < 10 :
    print('Medium')
else :
    print('LARGE')
print('All done')
```



Multi-way

```
x = 20
if x < 2 :
    print('small')
elif x < 10 :
    print('Medium')
else :
    print('LARGE')
print('All done')
```



Multi-way

```
# No Else
x = 5
if x < 2 :
    print('Small')
elif x < 10 :
    print('Medium')

print('All done')
```

```
if x < 2 :
    print('Small')
elif x < 10 :
    print('Medium')
elif x < 20 :
    print('Big')
elif x < 40 :
    print('Large')
elif x < 100:
    print('Huge')
else :
    print('Ginormous')
```

Multi-way Puzzles

Which will never print regardless of the value for x?

```
if x < 2 :
    print('Below 2')
elif x >= 2 :
    print('Two or more')
else :
    print('Something else')
```

```
if x < 2 :
    print('Below 2')
elif x < 20 :
    print('Below 20')
elif x < 10 :
    print('Below 10')
else :
    print('Something else')
```

LAB #3 - MULTI-WAY PUZZLES

Write these programs and run them…

What code does not run?

Fix it…

```
if x < 2 :
    print('Below 2')
elif x >= 2 :
    print('Two or more')
else :
    print('Something else’)
```

```
if x < 2 :
    print('Below 2')
elif x < 20 :
    print('Below 20')
elif x < 10 :
    print('Below 10')
else :
    print('Something else')
```

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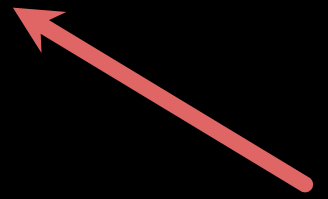
The try / except Structure

- You surround a dangerous section of code with try and except
- If the code in the try works - the except is skipped
- If the code in the try fails - it jumps to the except section

```
$ cat notry.py
astr = 'Hello Bob'
istr = int(astr)
print('First', istr)
astr = '123'
istr = int(astr)
print('Second', istr)
```

```
$ python3 notry.py
Traceback (most recent call last):
File "notry.py", line 2, in <module>
istr = int(astr)ValueError: invalid literal
for int() with base 10: 'Hello Bob'
```



All
Done

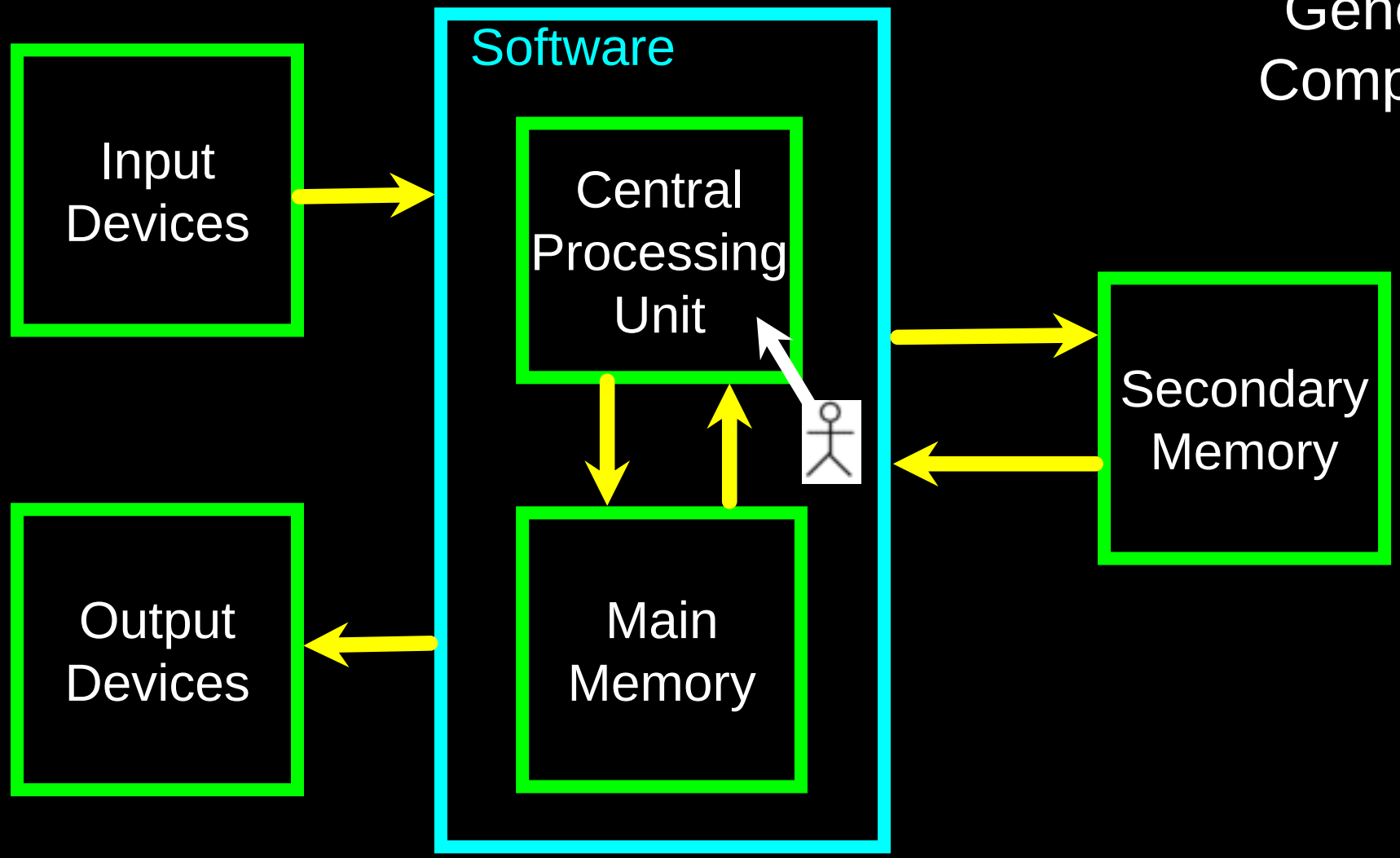
The program stops here

```
$ cat notry.py
astr = 'Hello Bob'
istr = int(astr)
```

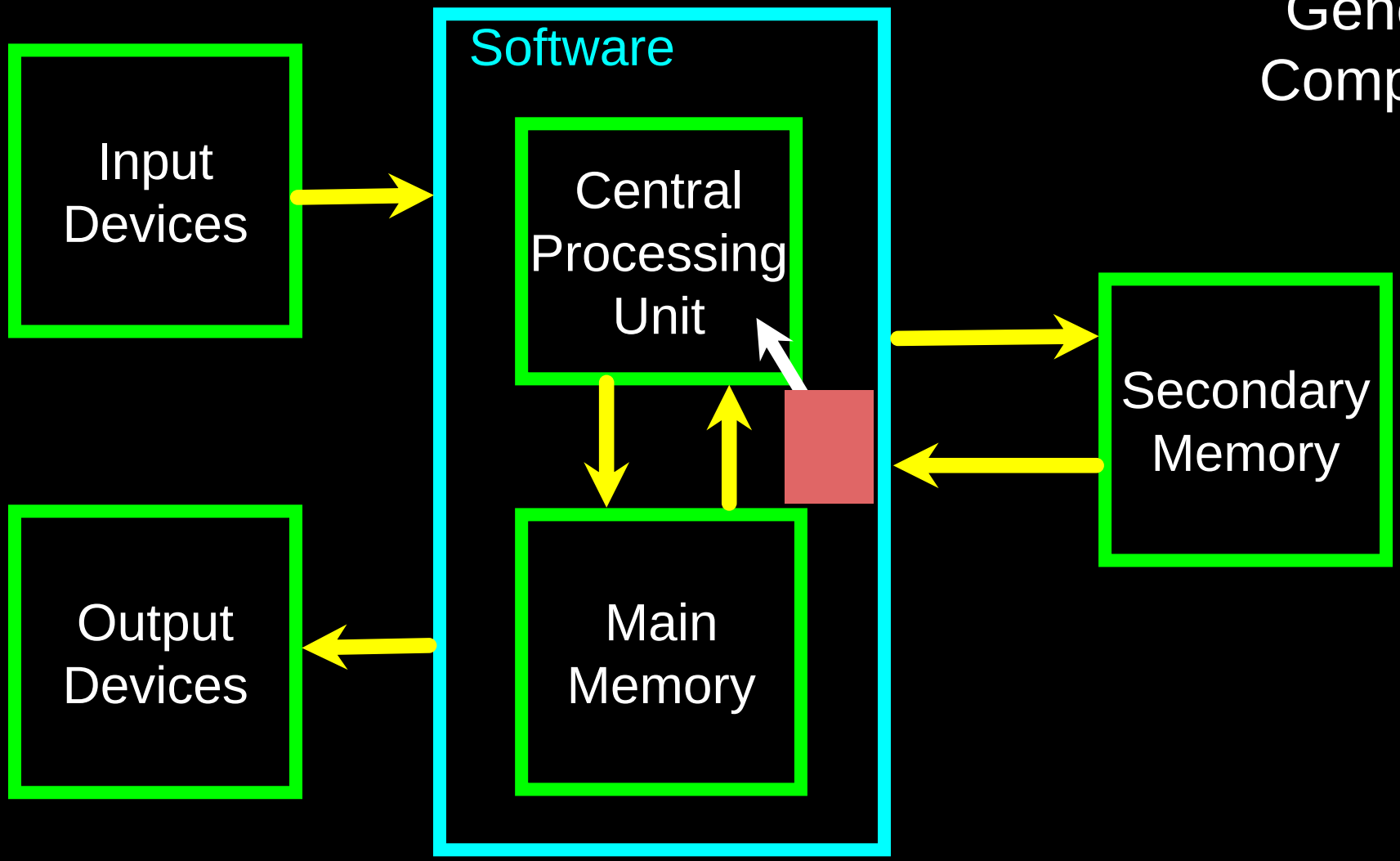
```
$ python3 notry.py
Traceback (most recent call last):
File "notry.py", line 2, in <module>
istr = int(astr)ValueError: invalid literal
for int() with base 10: 'Hello Bob'
```

All Done

Generic Computer



Generic Computer



```
astr = 'Hello Bob'
try:
    istr = int(astr)
except:
    istr = -1

print('First', istr)

astr = '123'
try:
    istr = int(astr)
except:
    istr = -1

print('Second', istr)
```

When the first conversion fails - it just drops into the except: clause and the program continues.

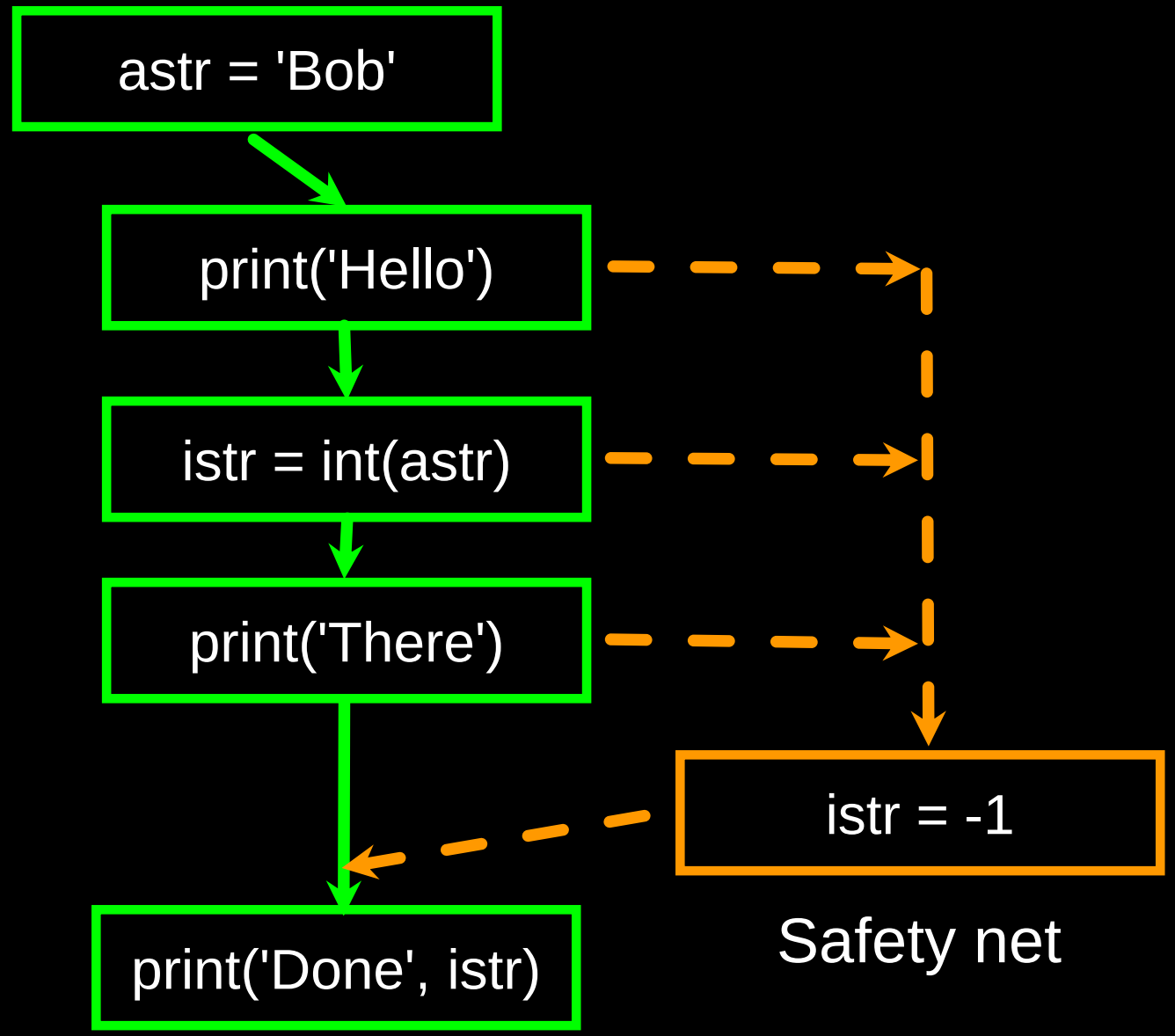
```
$ python tryexcept.py
First -1
Second 123
```

When the second conversion succeeds - it just skips the except: clause and the program continues.

try / except

```
astr = 'Bob'
try:
    print('Hello')
    istr = int(astr)
    print('There')
except:
    istr = -1

print('Done', istr)
```



Sample try / except

```
rawstr = input('Enter a number:')
try:
    ival = int(rawstr)
except:
    ival = -1

if ival > 0 :
    print('Nice work')
else:
    print('Not a number')
```

```
$ python3 trynum.py
Enter a number:42
Nice work
$ python3 trynum.py
Enter a number:forty-two
Not a number
$
```

LAB #4 - SAMPLE TRY / EXCEPT

Open a new python file and Type in this code

```
rawstr = input('Enter a number:')
try:
    ival = int(rawstr)
except:
    ival = -1

if ival > 0 :
    print('Nice work')
else:
    print('Not a number')
```

```
$ python3 trynum.py
Enter a number:42
Nice work
$ python3 trynum.py
Enter a number:forty-two
Not a number
$
```

Summary

- Comparison operators
  == <= >= > < !=
- Indentation
- One-way Decisions
- Two-way decisions:
  if: and else:
- Nested Decisions
- Multi-way decisions using elif
- try / except to compensate for errors

LAB #5

Rewrite your pay computation to give the employee 1.5 times the hourly rate for hours worked above 40 hours.

```
Enter Hours: 45
Enter Rate: 10

Pay: 475.0
```

475 = 40 * 10 + 5 * 15

LAB #6

Rewrite your pay program using try and except so that your program handles non-numeric input gracefully.

```
Enter Hours: 20
Enter Rate: nine
Error, please enter numeric input

Enter Hours: forty
Error, please enter numeric input
```

Acknowledgements / Contributions

Initial Development: Charles Severance, University of Michigan School of Information

… Insert new Contributors and Translators here

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