

# Conditional Execution

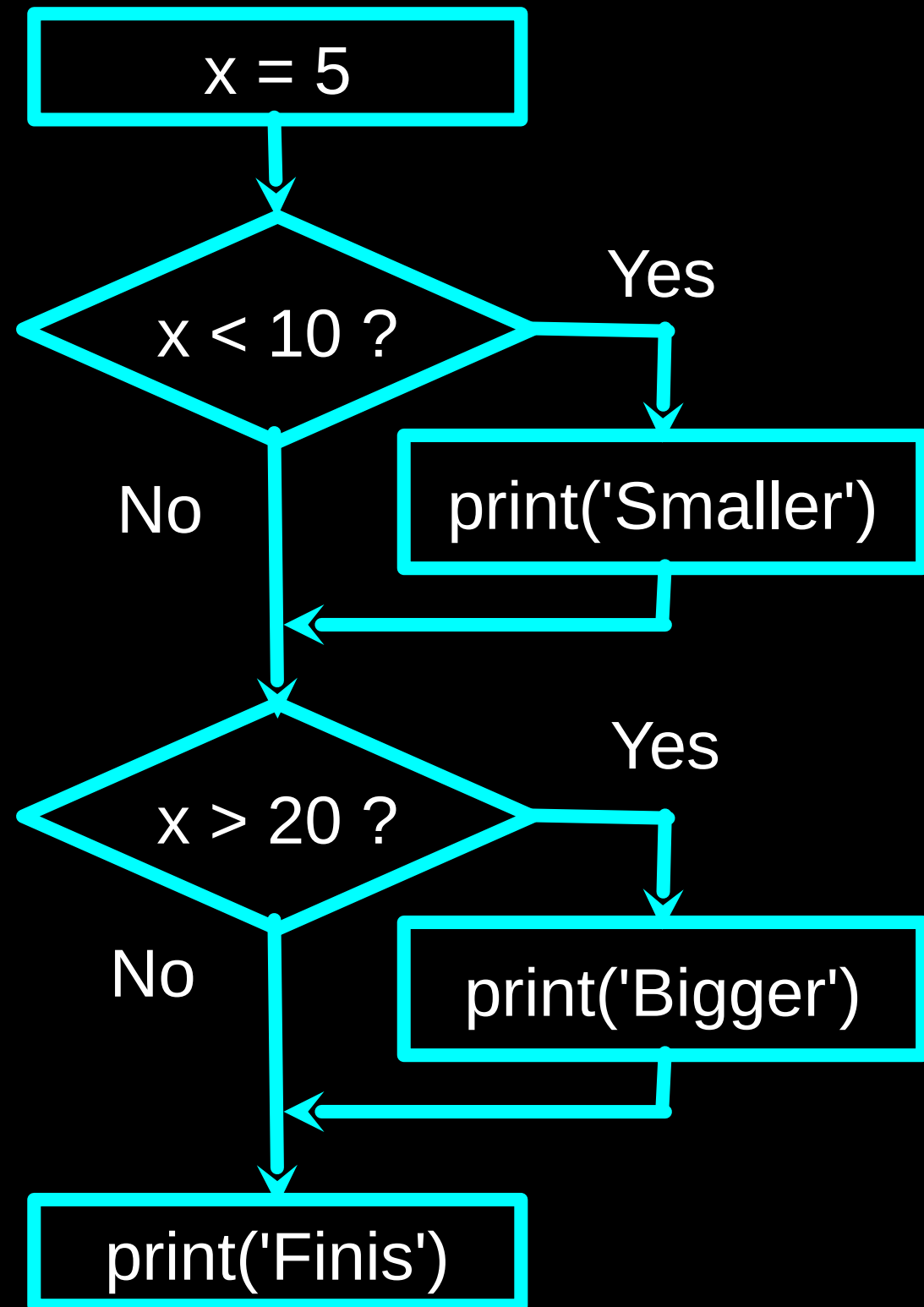
## Chapter 3



Python for Everybody  
[www.py4e.com](http://www.py4e.com)



# Conditional Steps



Program:

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

print('Finis')
```

Output:

**Smaller**  
**Finis**

# 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](http://en.wikipedia.org/wiki/George_Boole)

# Comparison Operators

<pre>x = 5</pre>	
<pre>if x == 5 :</pre>	
<pre>    print('Equals 5')</pre>	Equals 5
<pre>if x &gt; 4 :</pre>	
<pre>    print('Greater than 4')</pre>	Greater than 4
<pre>if x &gt;= 5 :</pre>	
<pre>    print('Greater than or Equals 5')</pre>	Greater than or Equals 5
<pre>if x &lt; 6 : print('Less than 6')</pre>	Less than 6
<pre>if x &lt;= 5 :</pre>	
<pre>    print('Less than or Equals 5')</pre>	Less than or Equals 5
<pre>if x != 6 :</pre>	
<pre>    print('Not equal 6')</pre>	Not equal 6

# One-Way Decisions

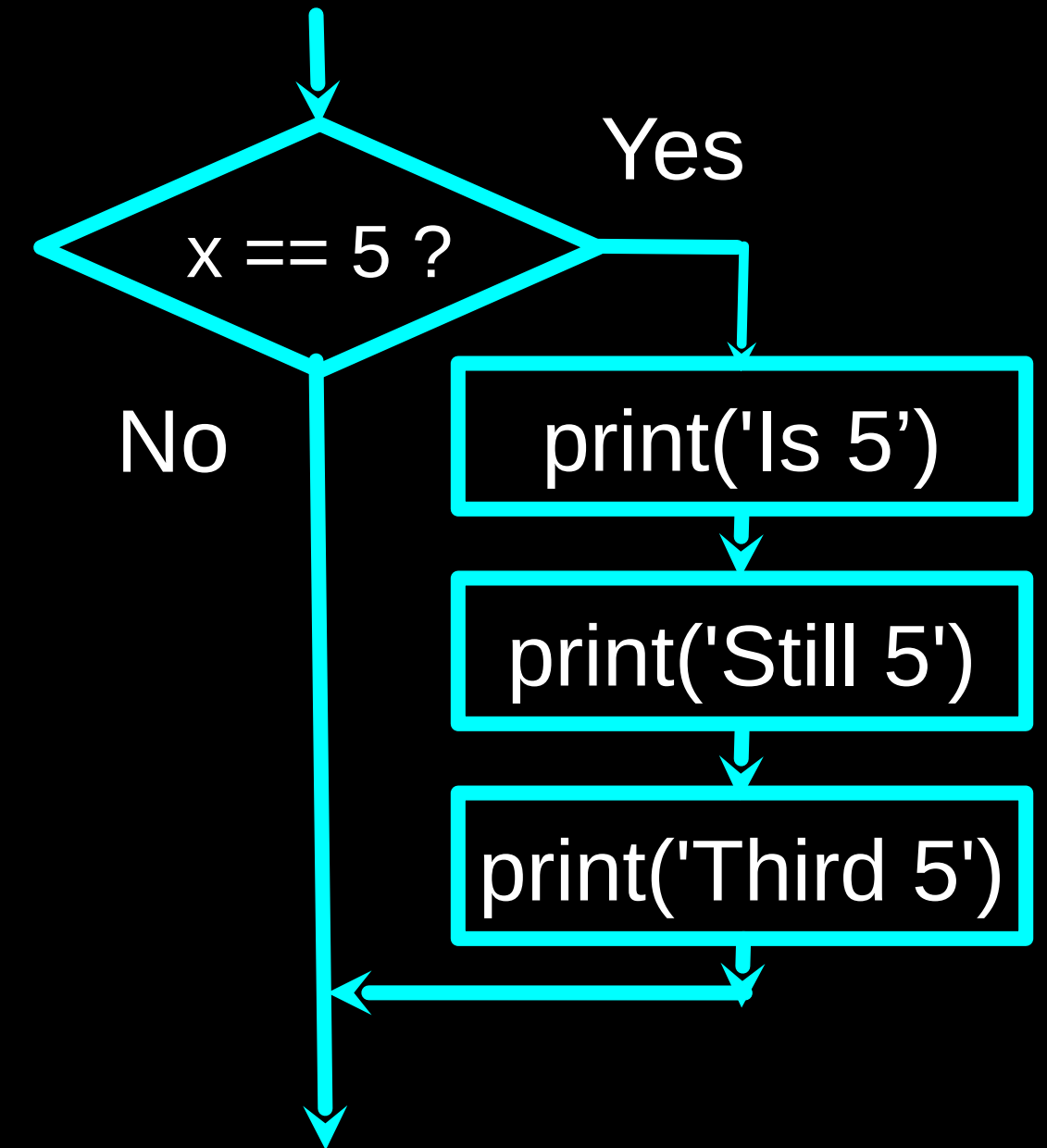
```
x = 5
print('Before 5')
if x == 5 :
    print('Is 5')
    print('Is Still 5')
    print('Third 5')
print('Afterwards 5')
print('Before 6')
if x == 6 :
    print('Is 6')
    print('Is Still 6')
    print('Third 6')
print('Afterwards 6')
```

Before 5

Is 5  
Is Still 5  
Third 5

Afterwards 5  
Before 6

Afterwards 6

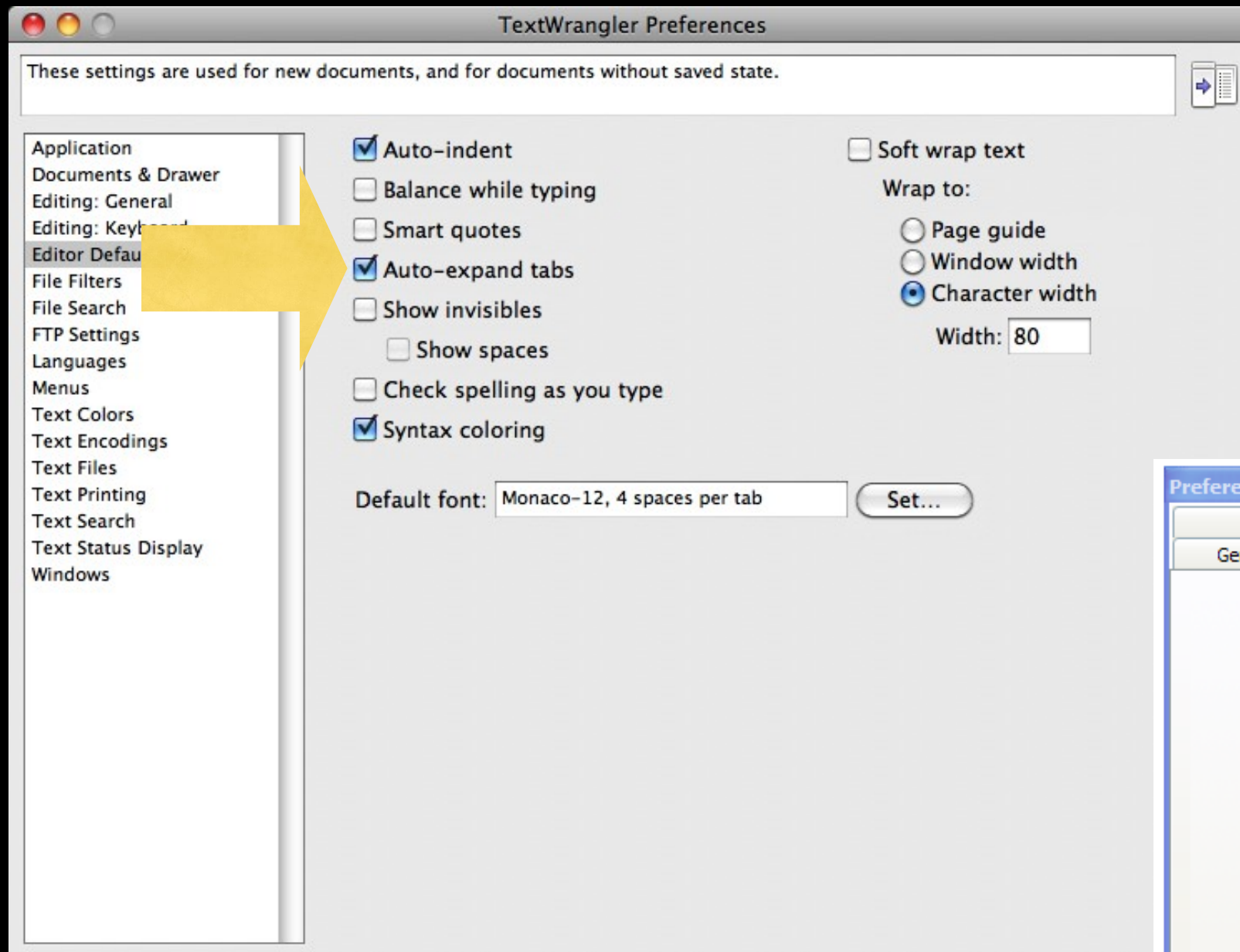


# Indentation

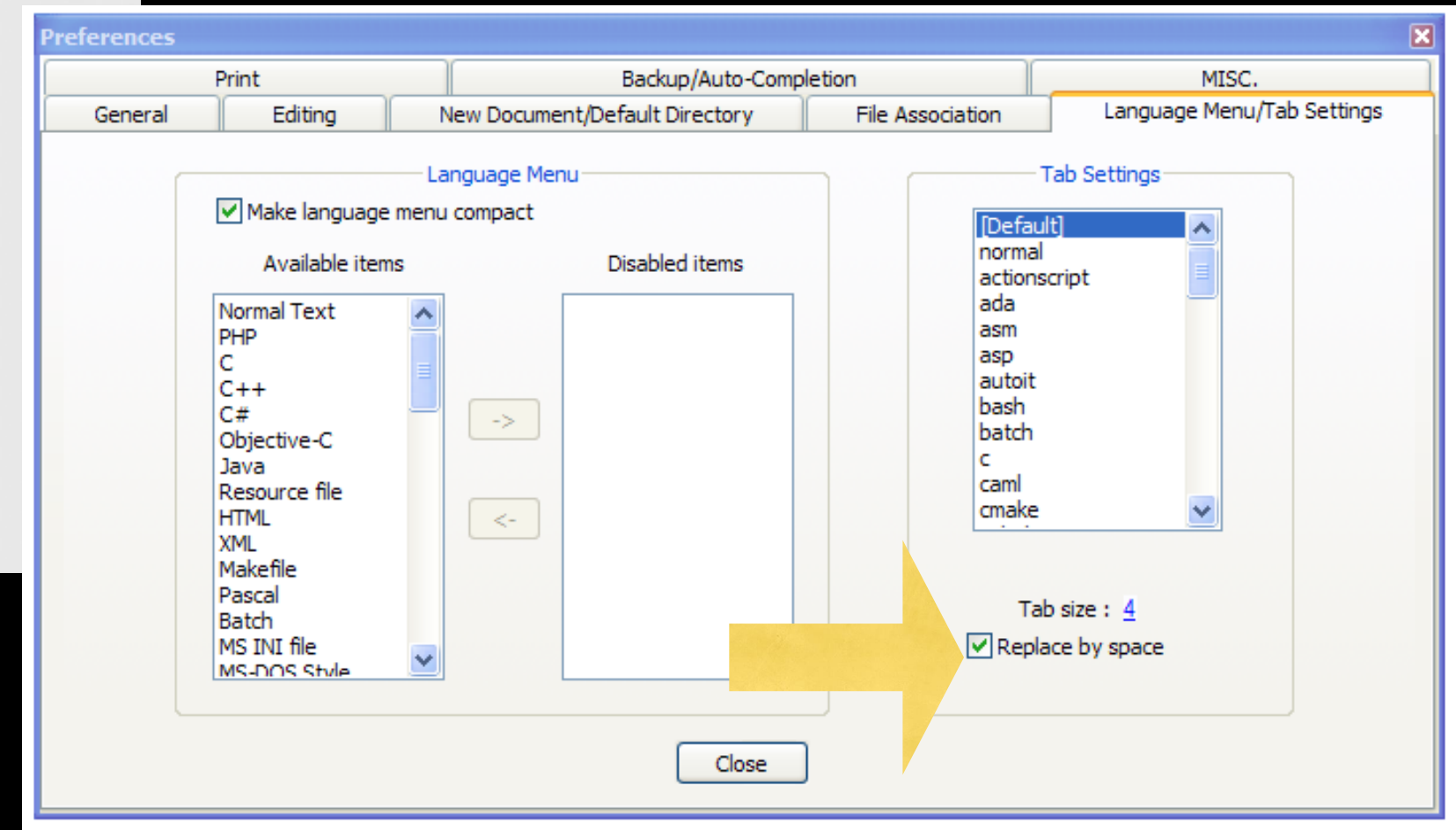
- **Increase indent** indent after an **if** statement or **for** statement (after : )
- **Maintain indent** to indicate the **scope** of the block (which lines are affected by the **if/for**)
- **Reduce indent** back to the level of the **if** statement or **for** statement to indicate the end of the 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

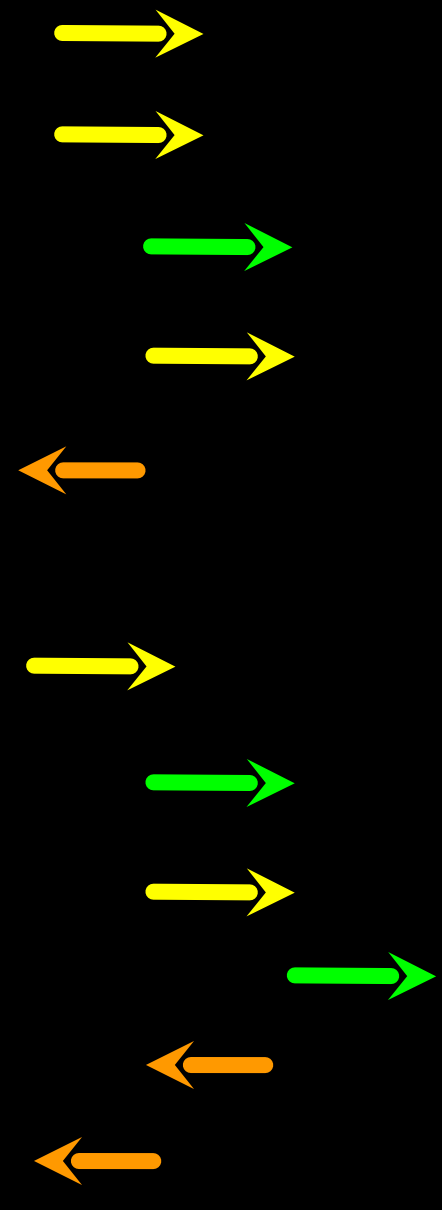


This will save you  
much unnecessary  
pain.





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')
```

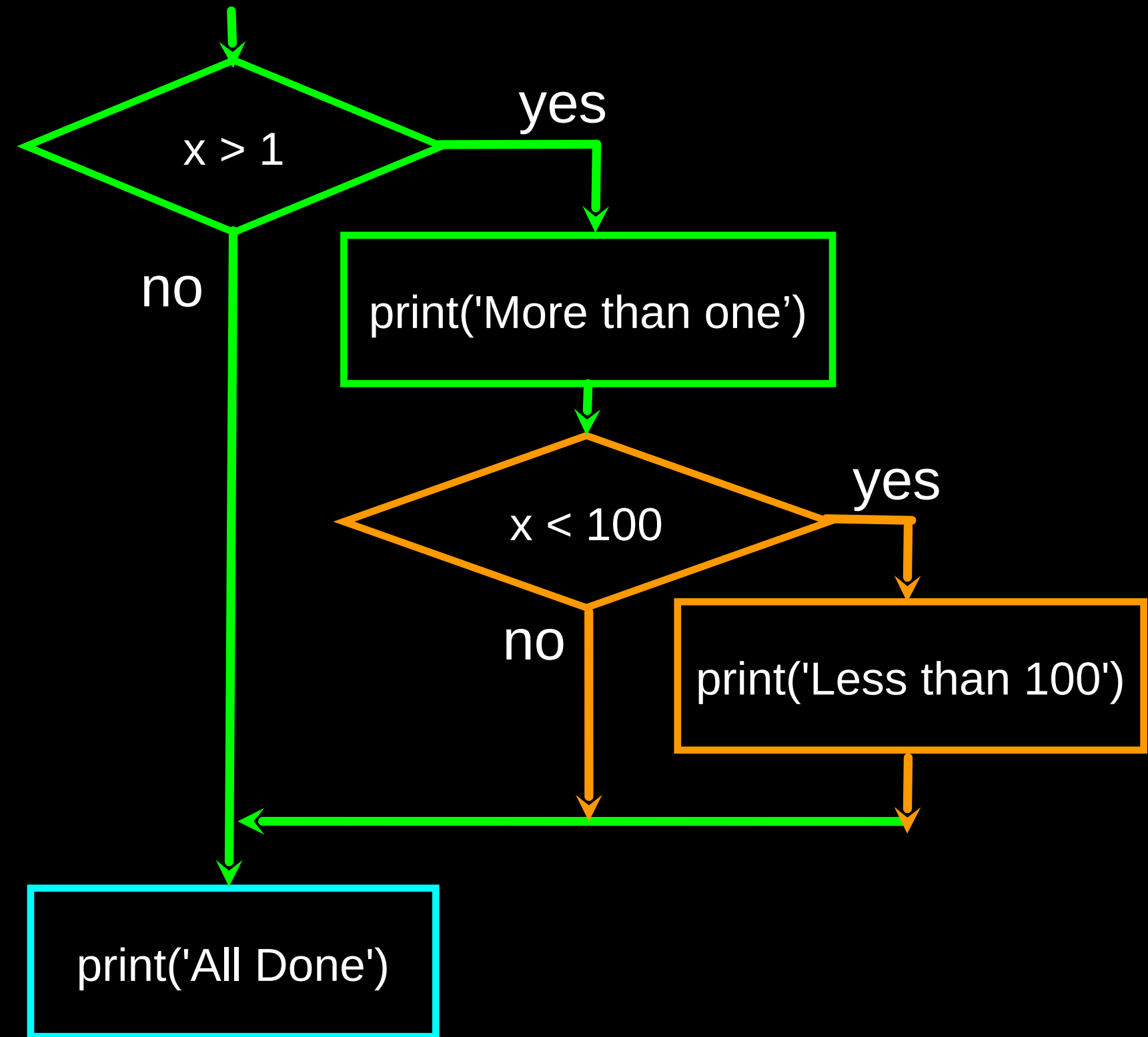
# Think About begin/end Blocks

```
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')
```

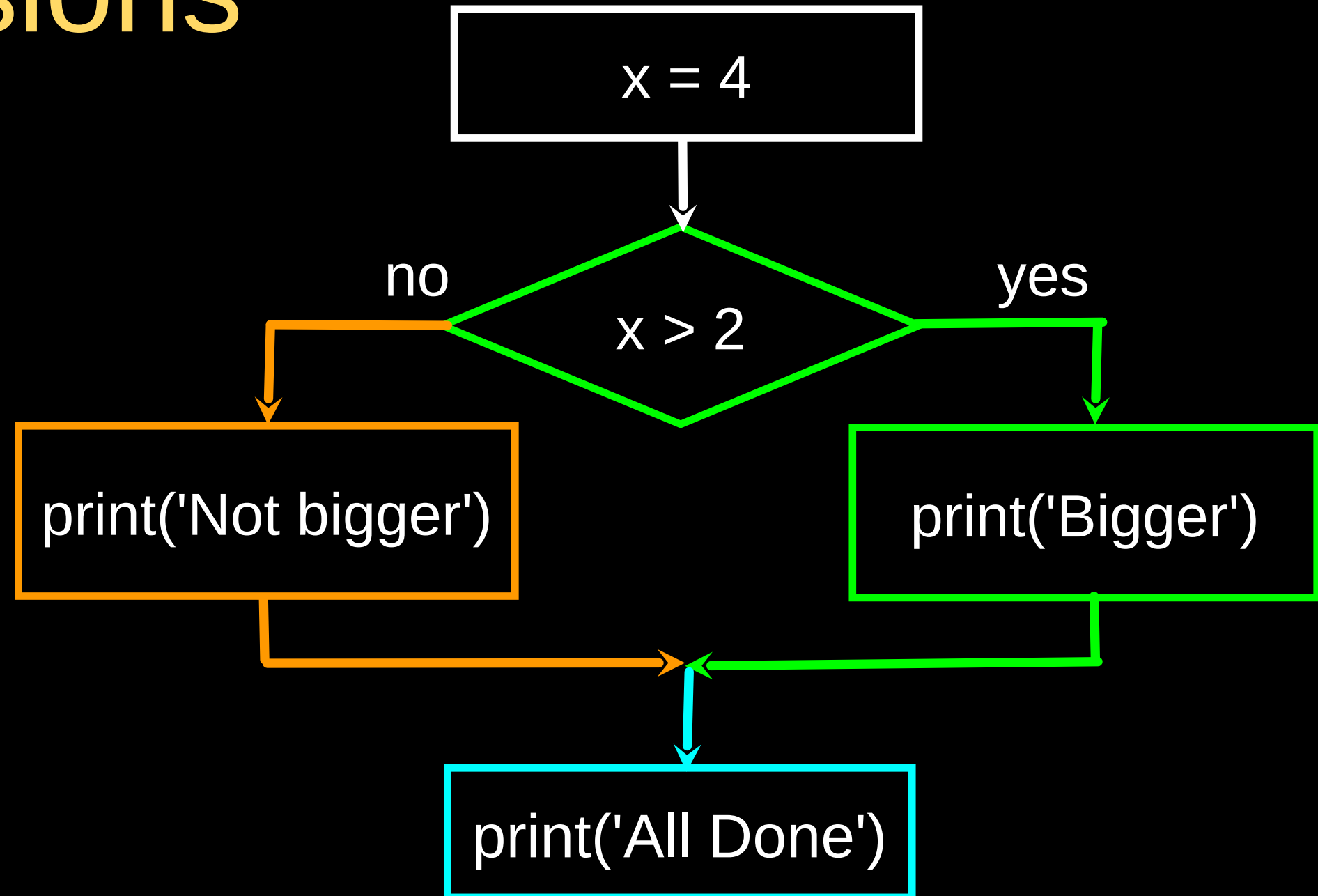
# Nested Decisions

```
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

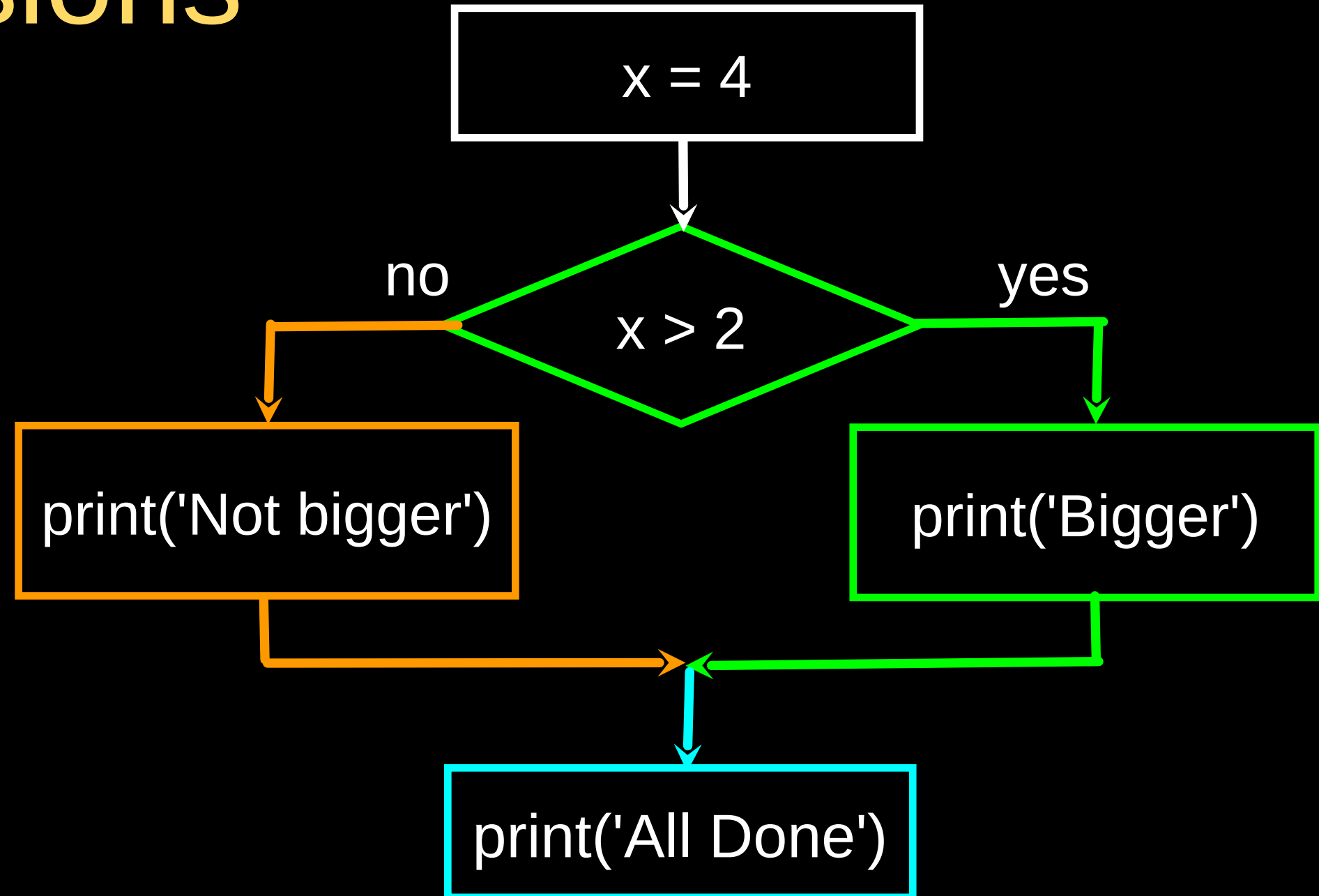


# Two-way Decisions with else:

```
x = 4
```

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

```
print('All done')
```

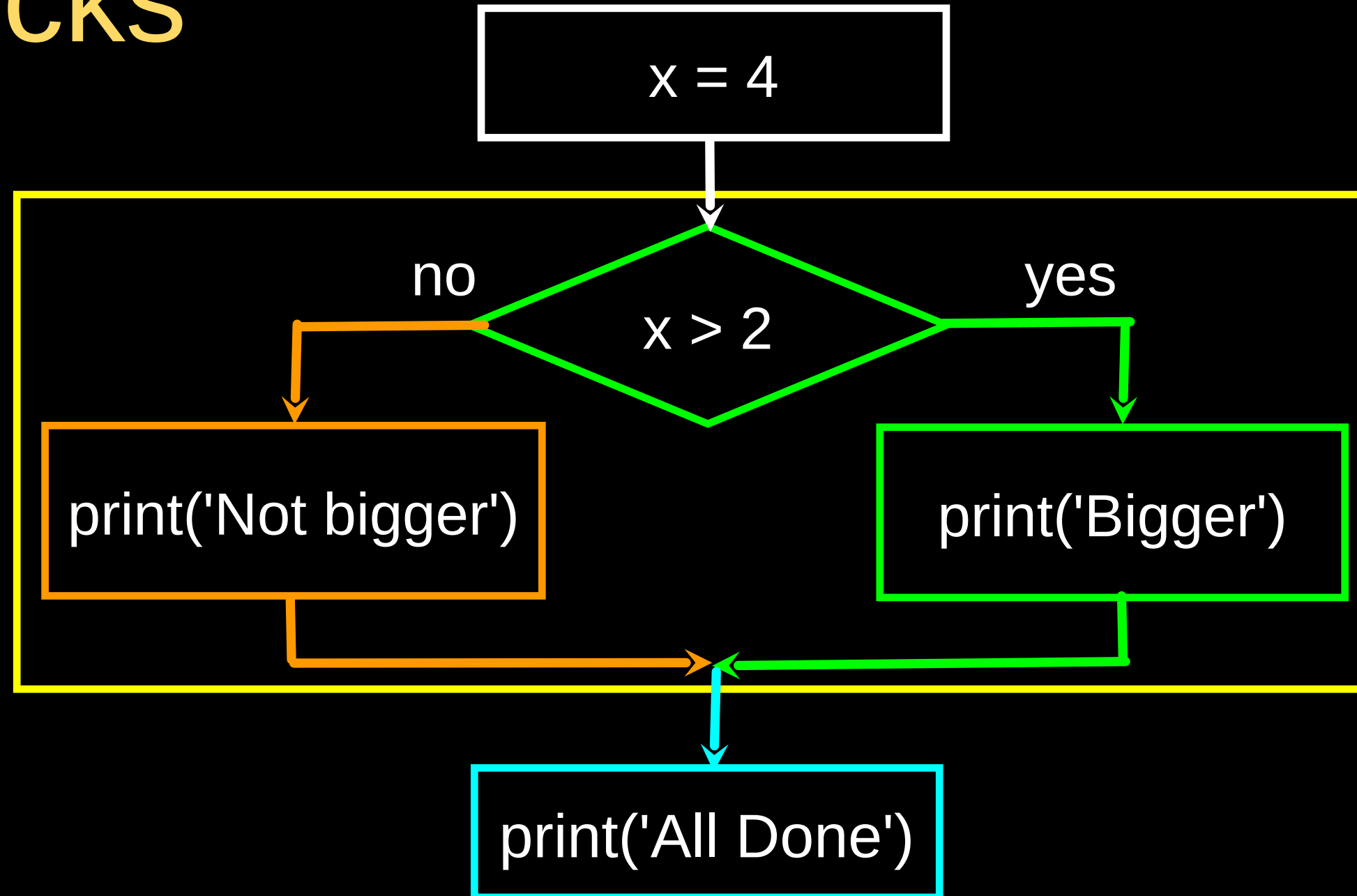


# Visualize Blocks

x = 4

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

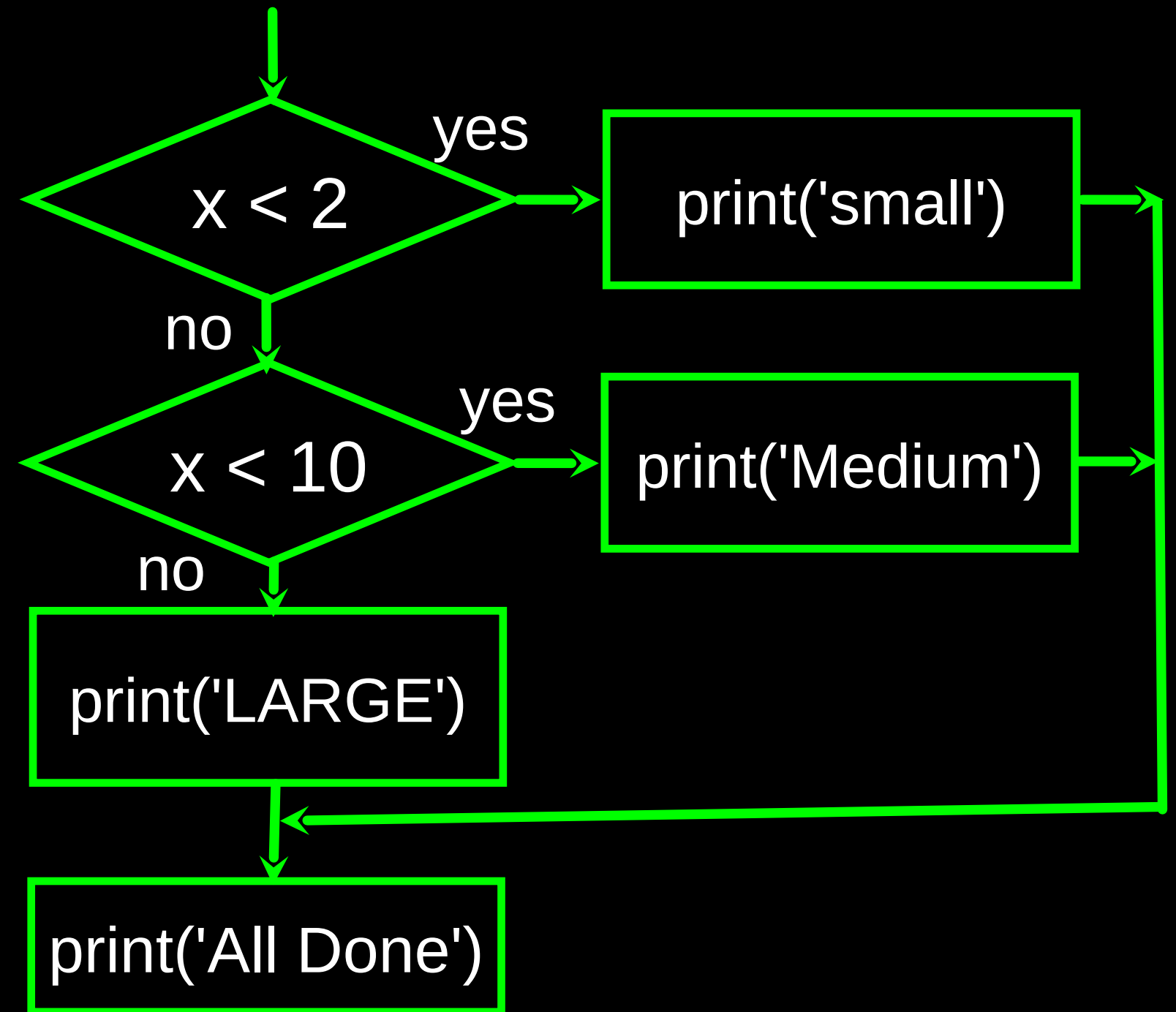
```
print('All done')
```



More Conditional Structures...

# Multi-way

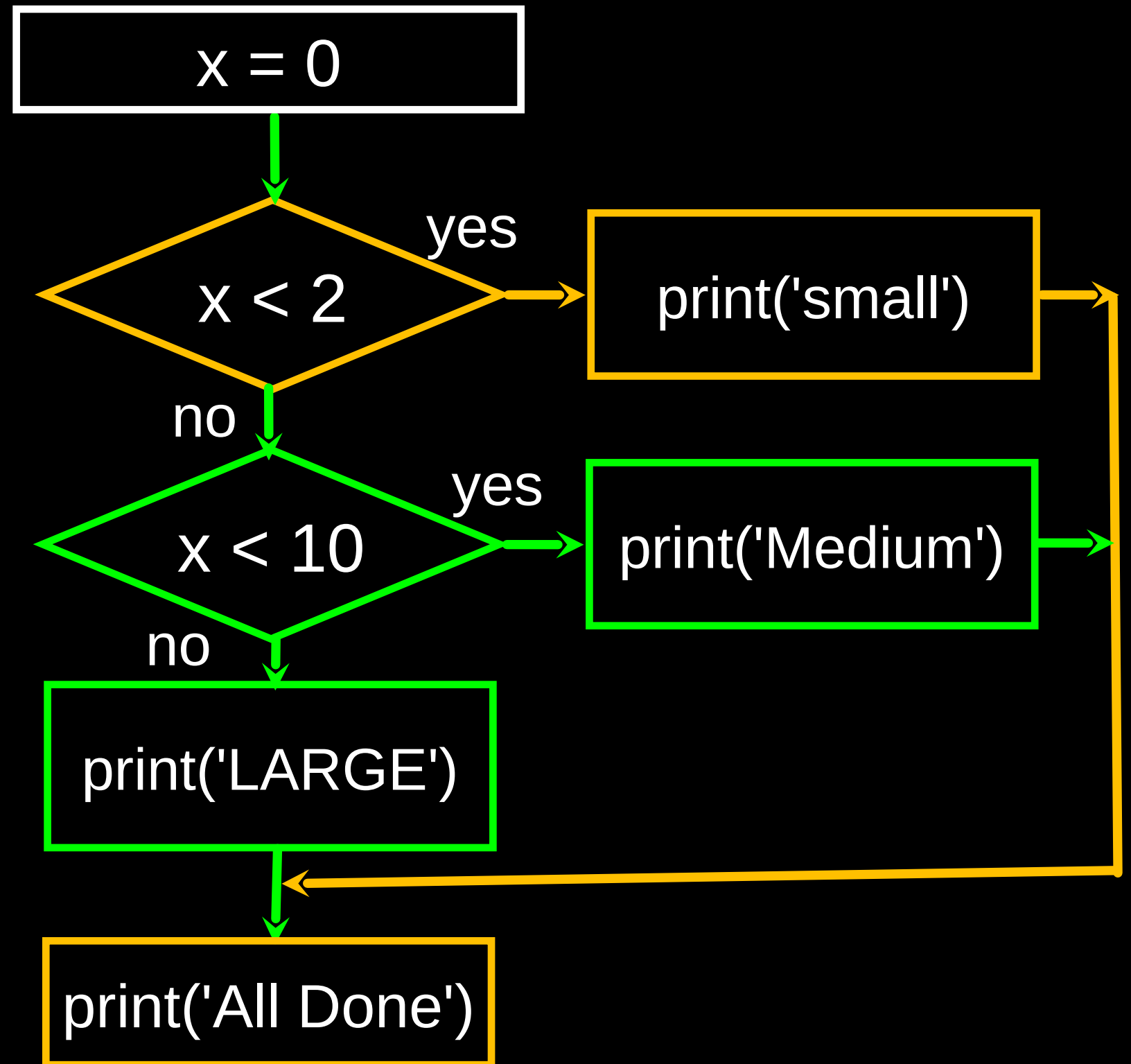
```
if x < 2 :  
    print('small')  
elif x < 10 :  
    print('Medium')  
else :  
    print('LARGE')  
print('All done')
```





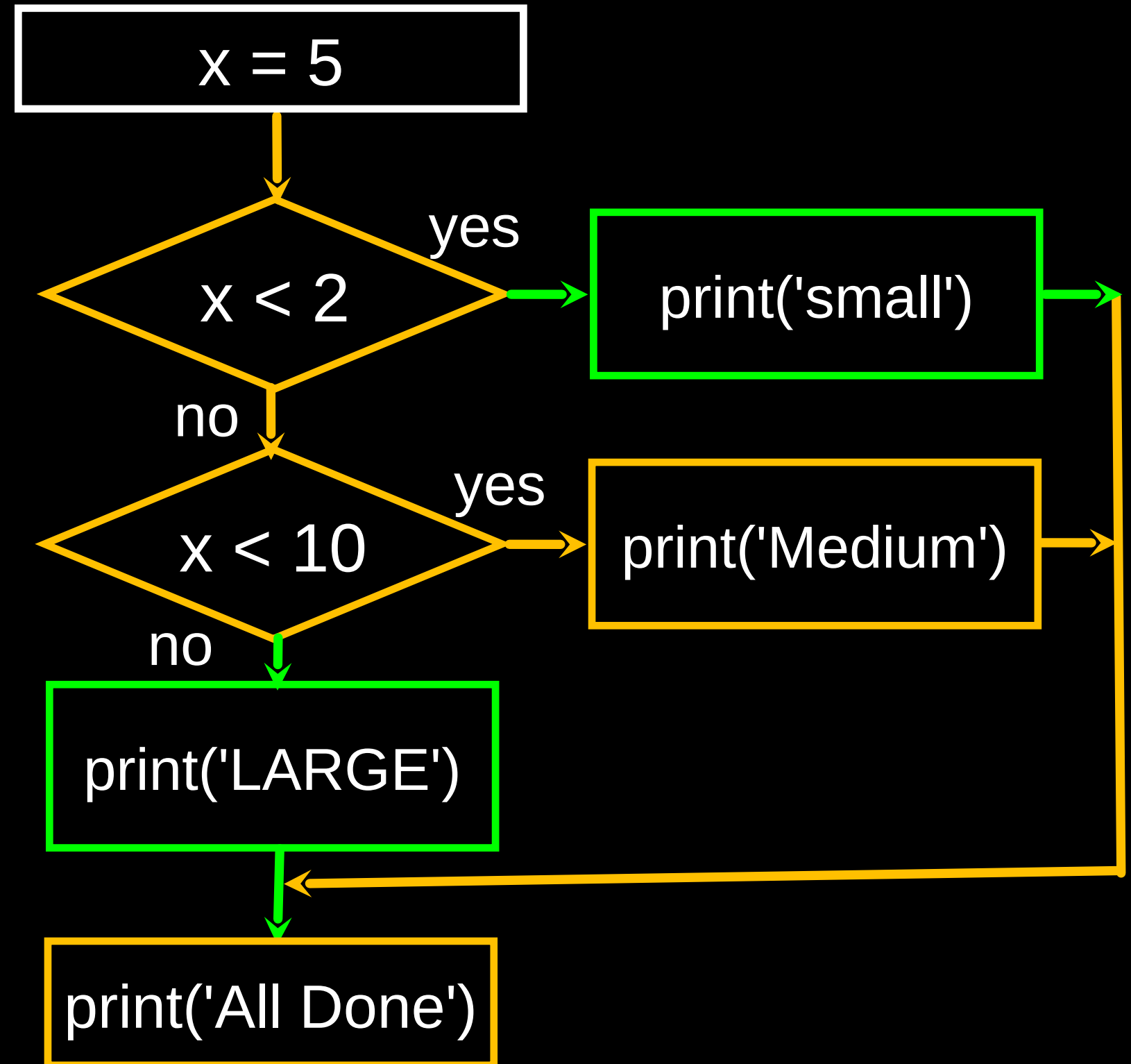
# Multi-way

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



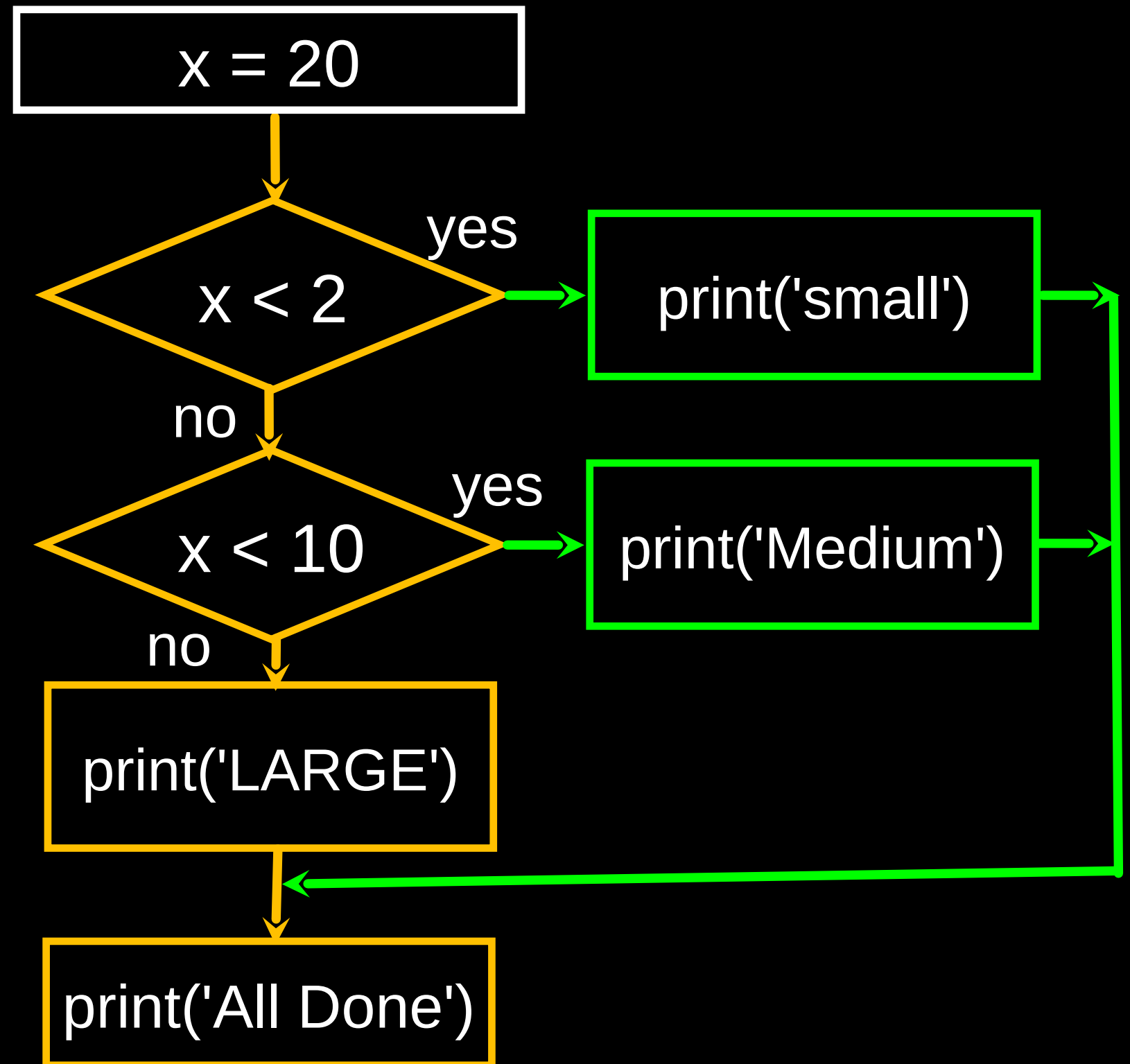
# Multi-way

```
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')
```

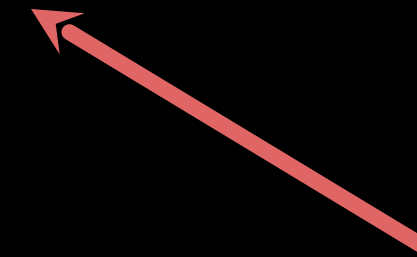
# The try / except Structure

- 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'
```

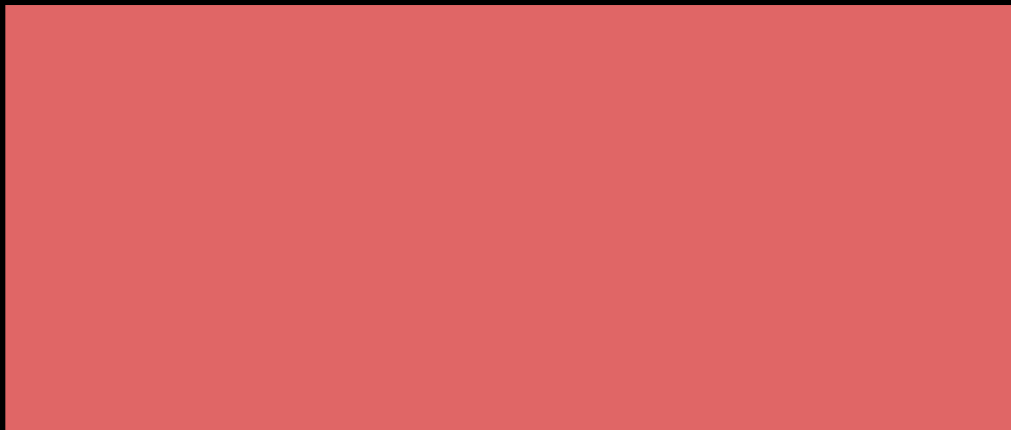


All  
Done

The  
program  
stops  
here

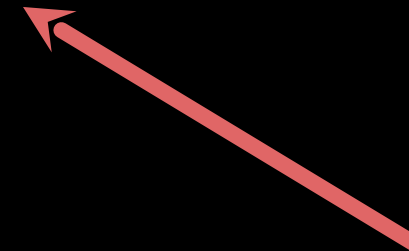


```
$ cat notry.py
astr = 'Hello Bob'
istr = int(astr)
```



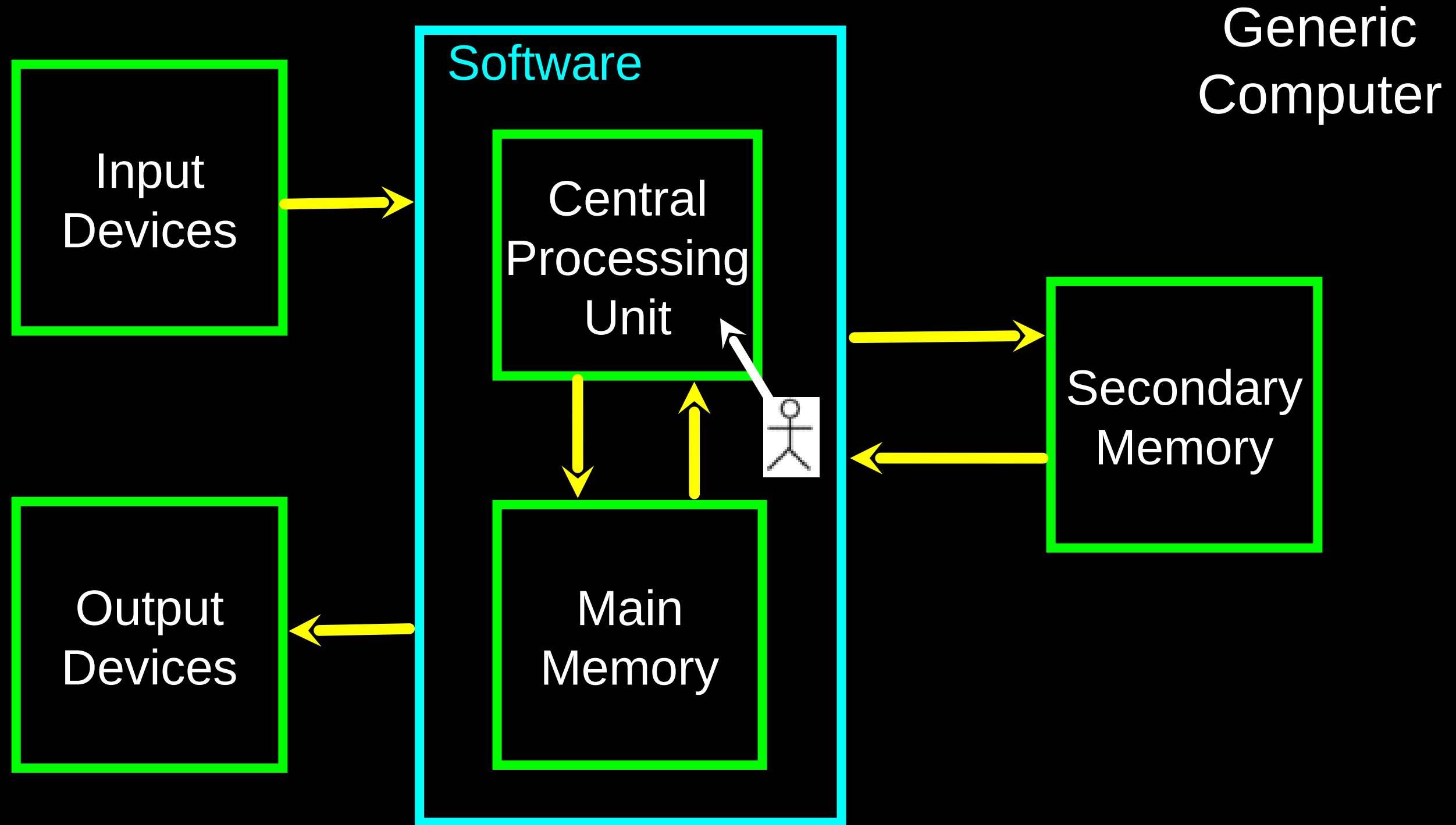
```
$ python3 notry.py
```

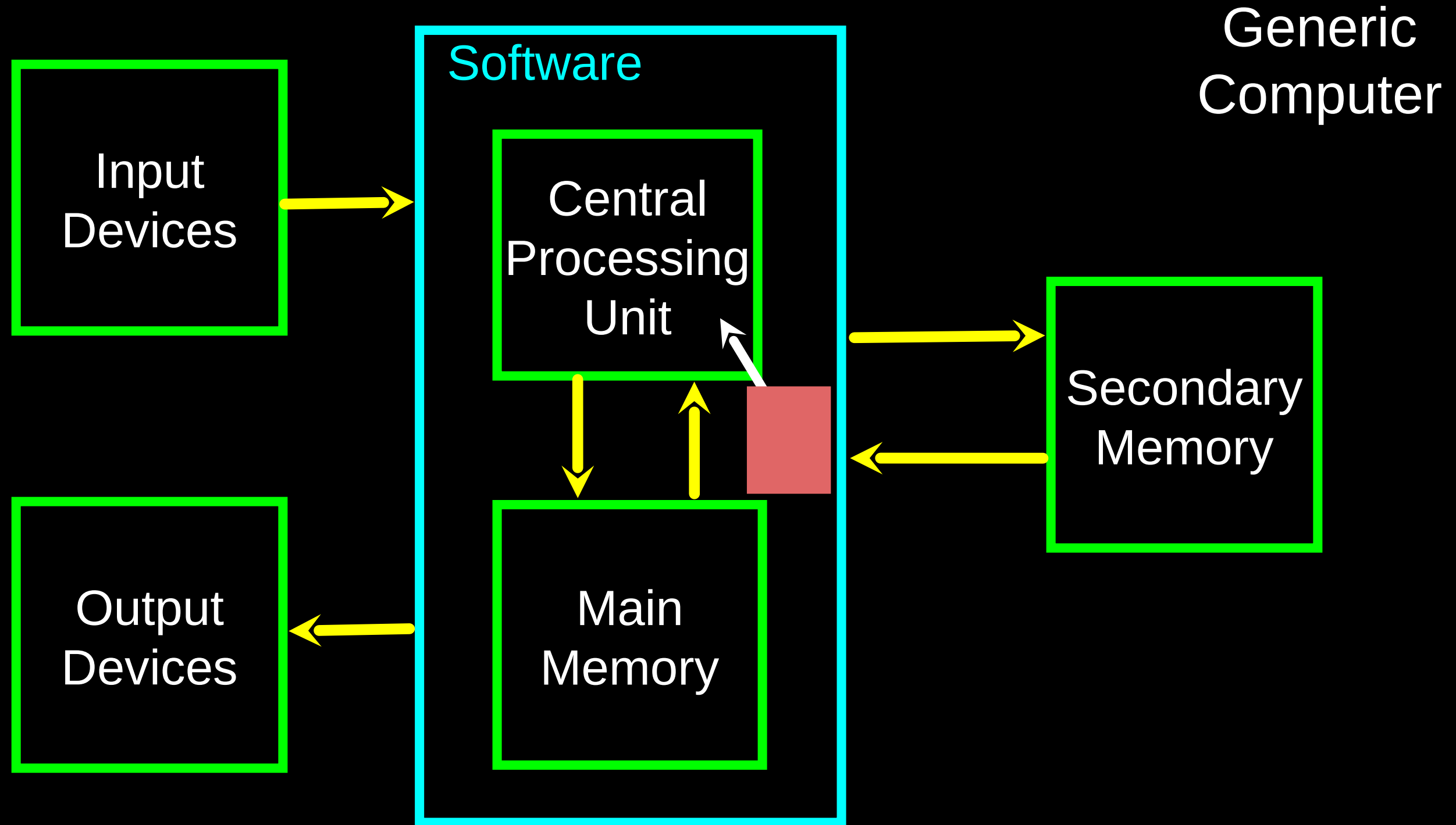
```
Traceback (most recent call last):
File "notry.py", line 2, in <module>
istr = int(astr)ValueError: invalid literal
for int() with base 10: 'Hello Bob'
```



All  
Done







```
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.

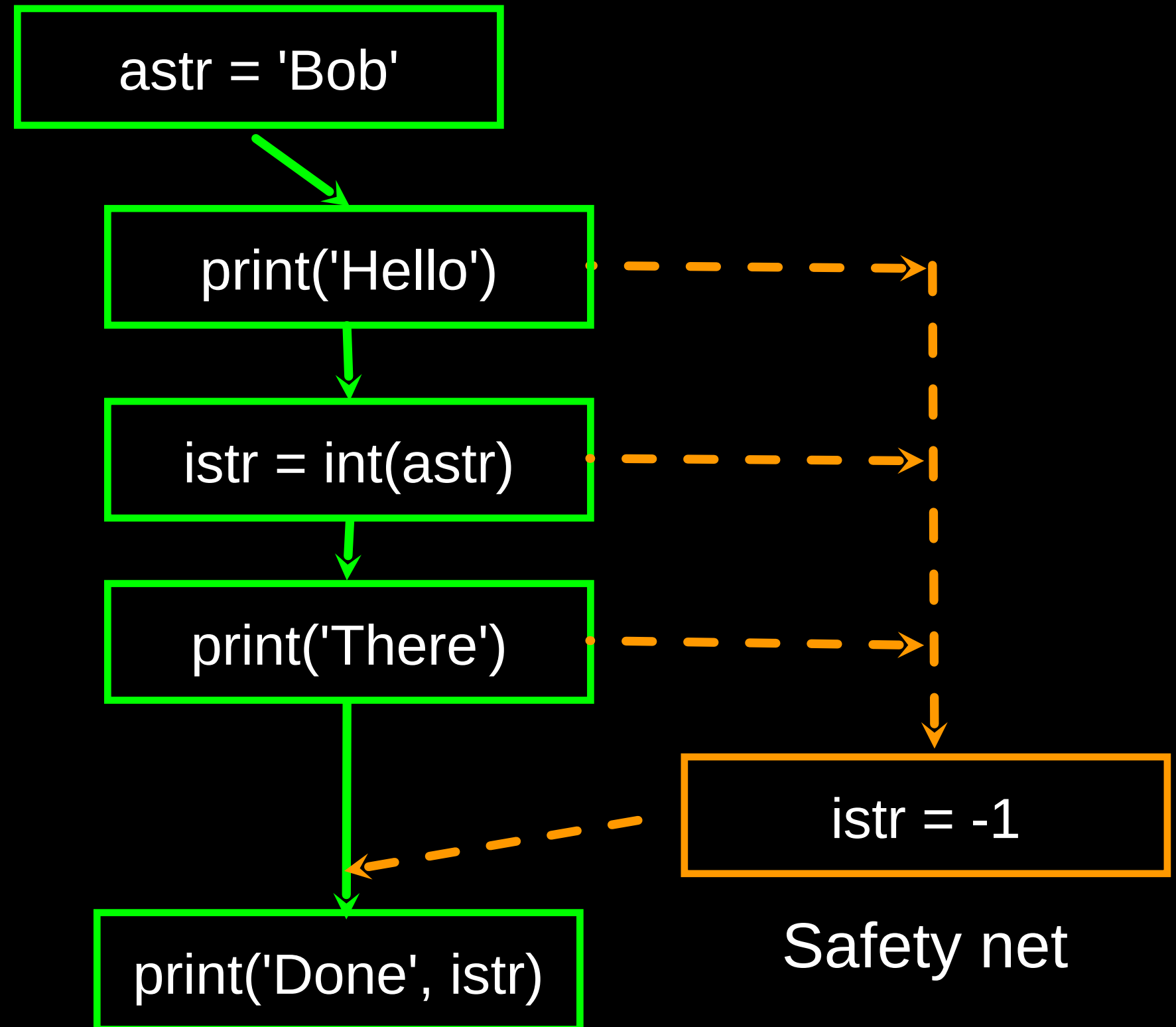
```
$ python tryexcept.py
First -1
Second 123
```

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
$
```

# 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

## Exercise

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

$$475 = 40 * 10 + 5 * 15$$

## Exercise

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



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