

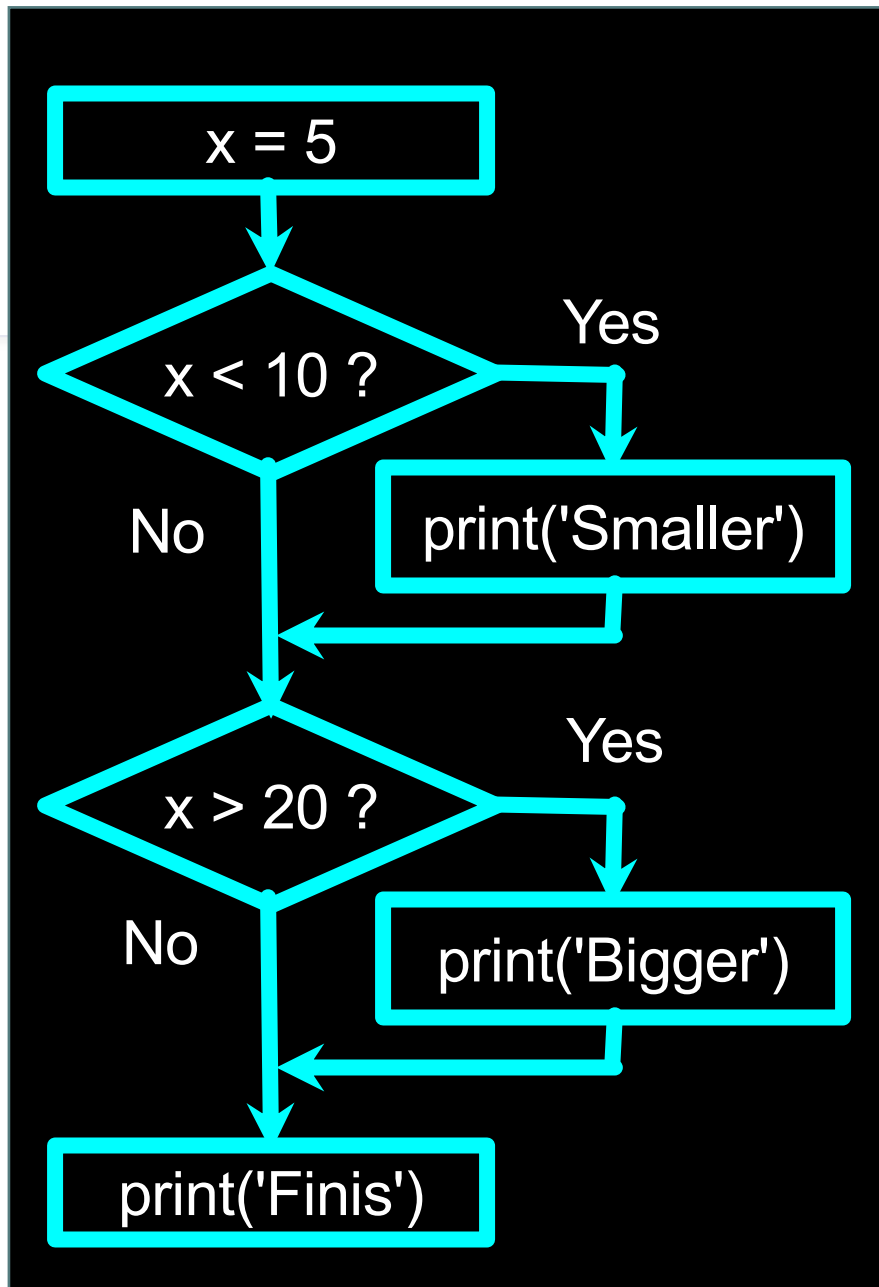
Conditional Execution

Introduction to Programming and Problem Solving

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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

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

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

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

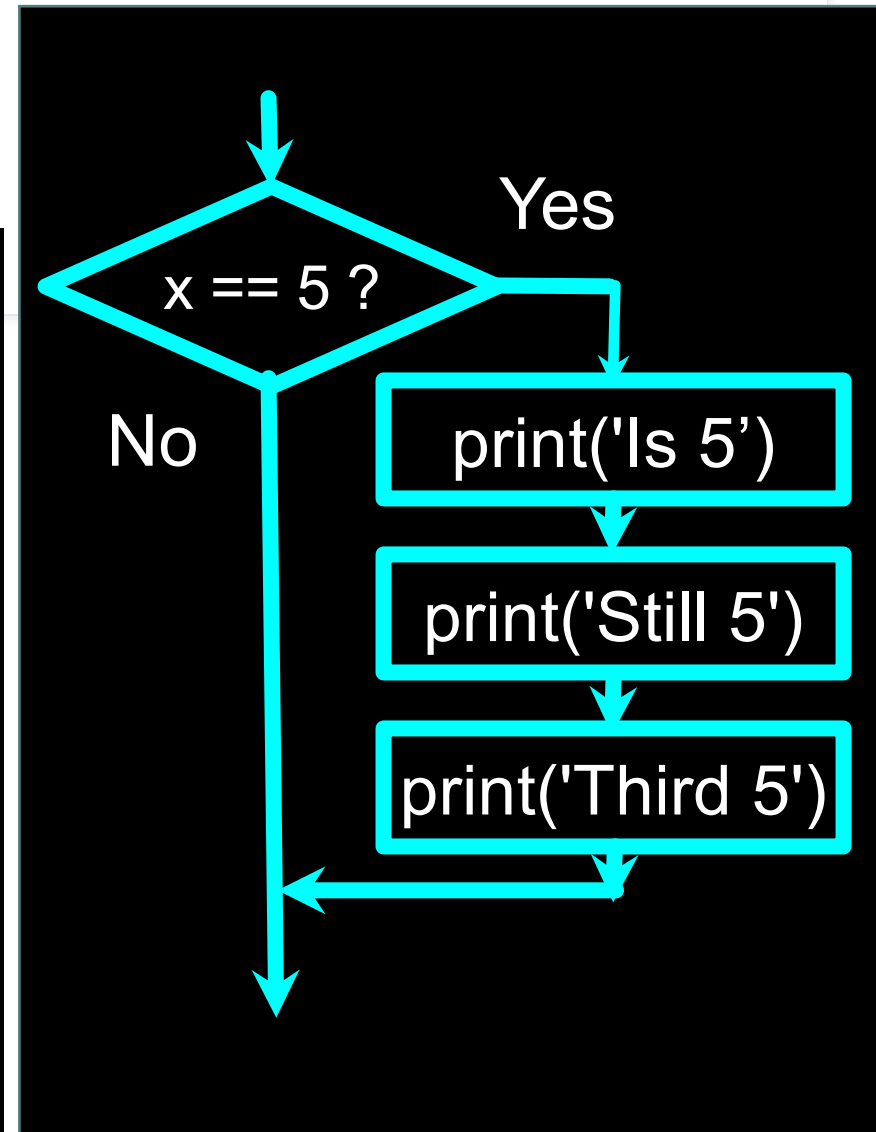
Less than or Equals 5

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

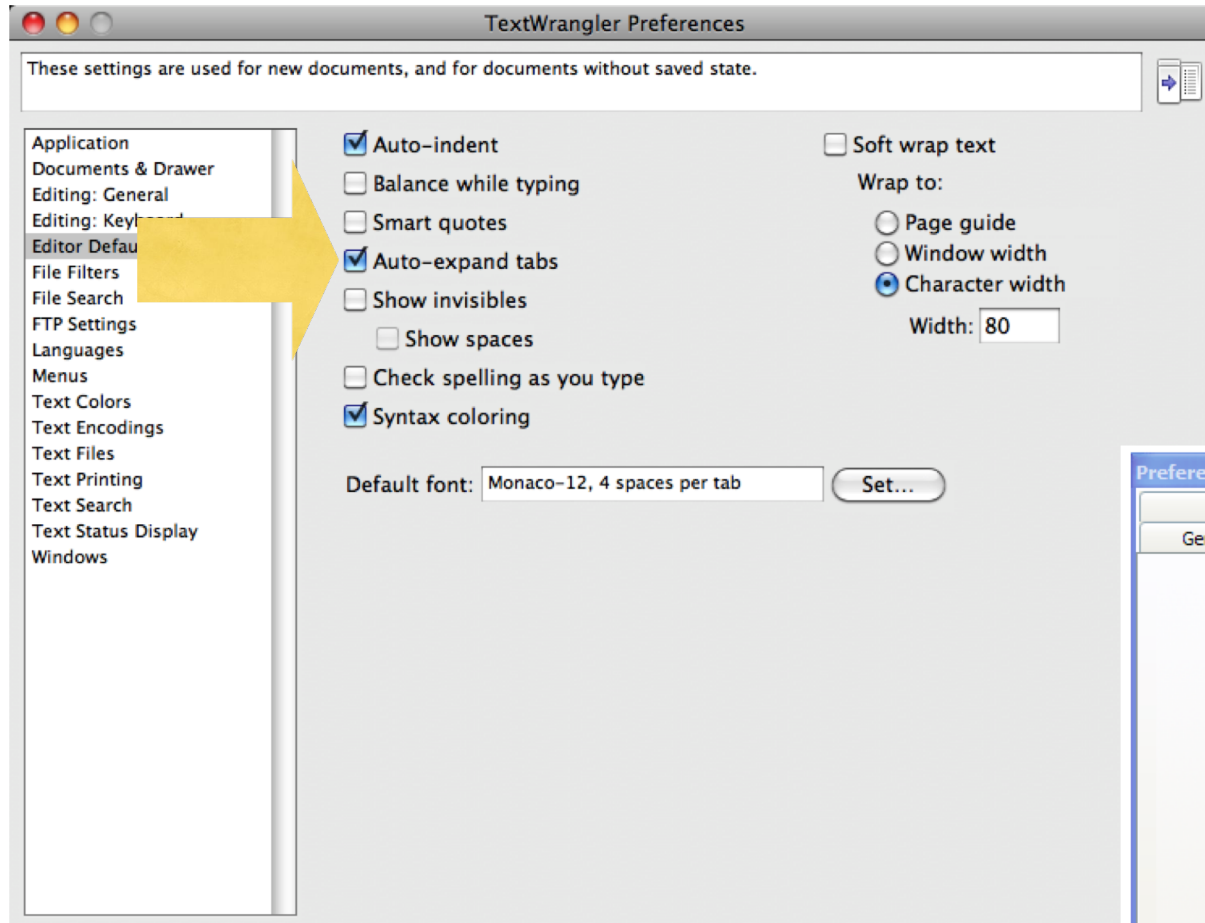


Indentation

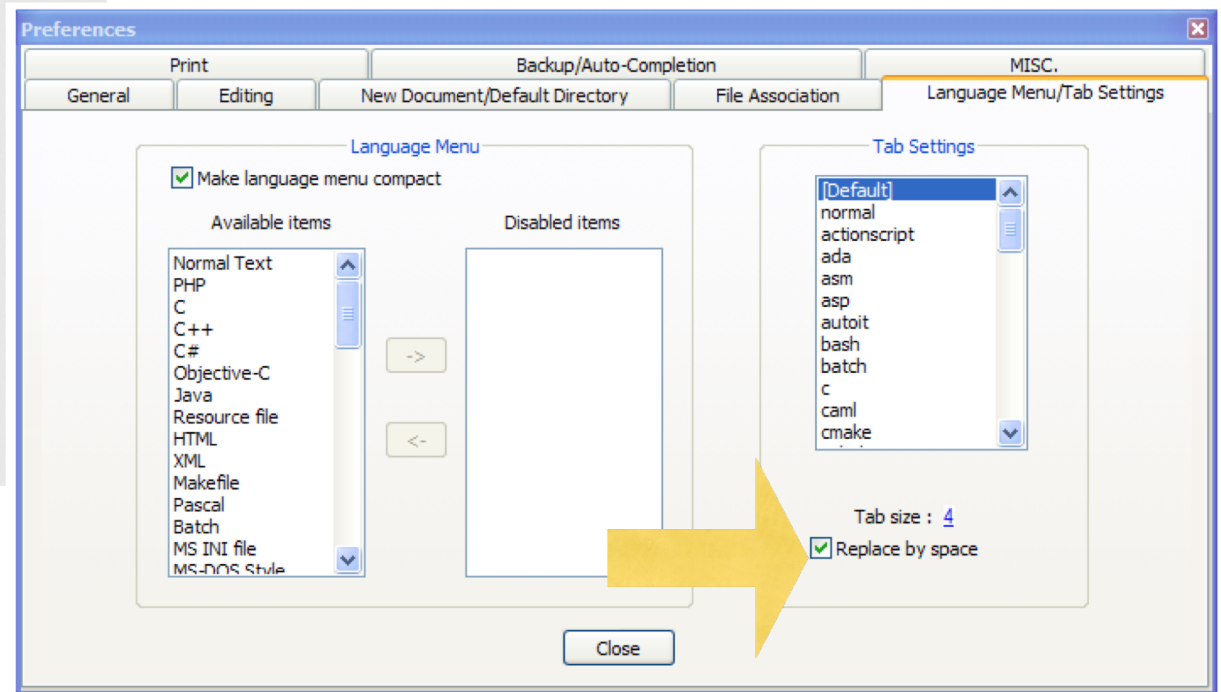
- **Increase indent** indent after an **if** statement or **for** statement (after :)
- **Maintain indent** to indicate the **scope** of the block (which lines are affected by the **if/for**)
- **Reduce indent** back to the level of the **if** statement or **for** statement to indicate the end of the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

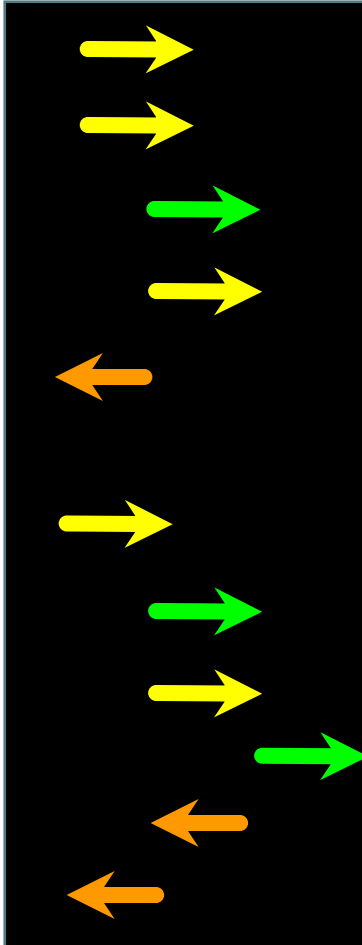
- Atom automatically uses spaces for files with ".py" extension (nice!)
- Most text editors can turn tabs into spaces - make sure to enable this feature
 - - Notepad++: Settings -> Preferences -> Language Menu/Tab Settings
 - - TextWrangler: TextWrangler -> Preferences -> Editor Defaults
- Python cares 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')
```

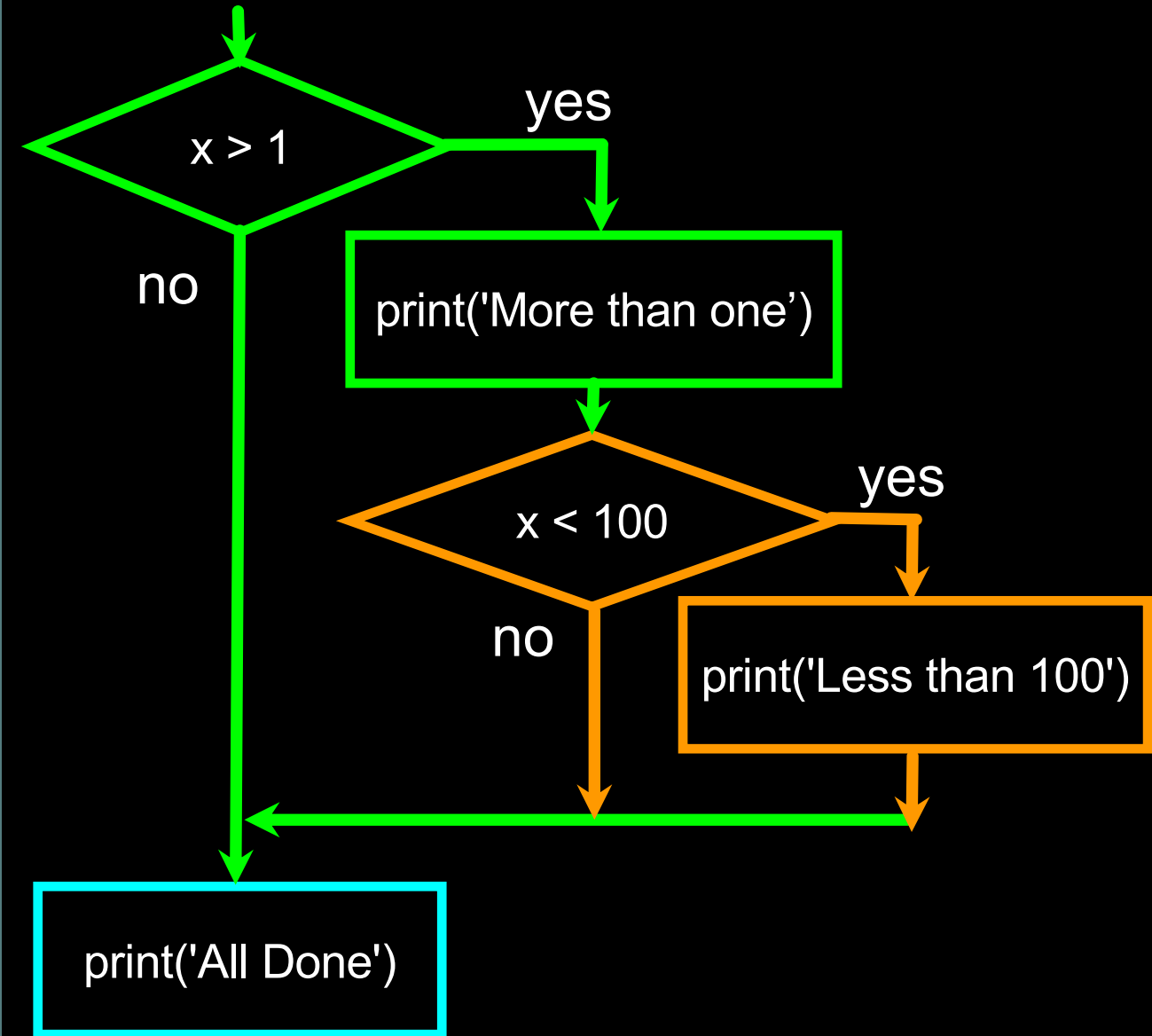
Think about begin/end blocks

```
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')
```

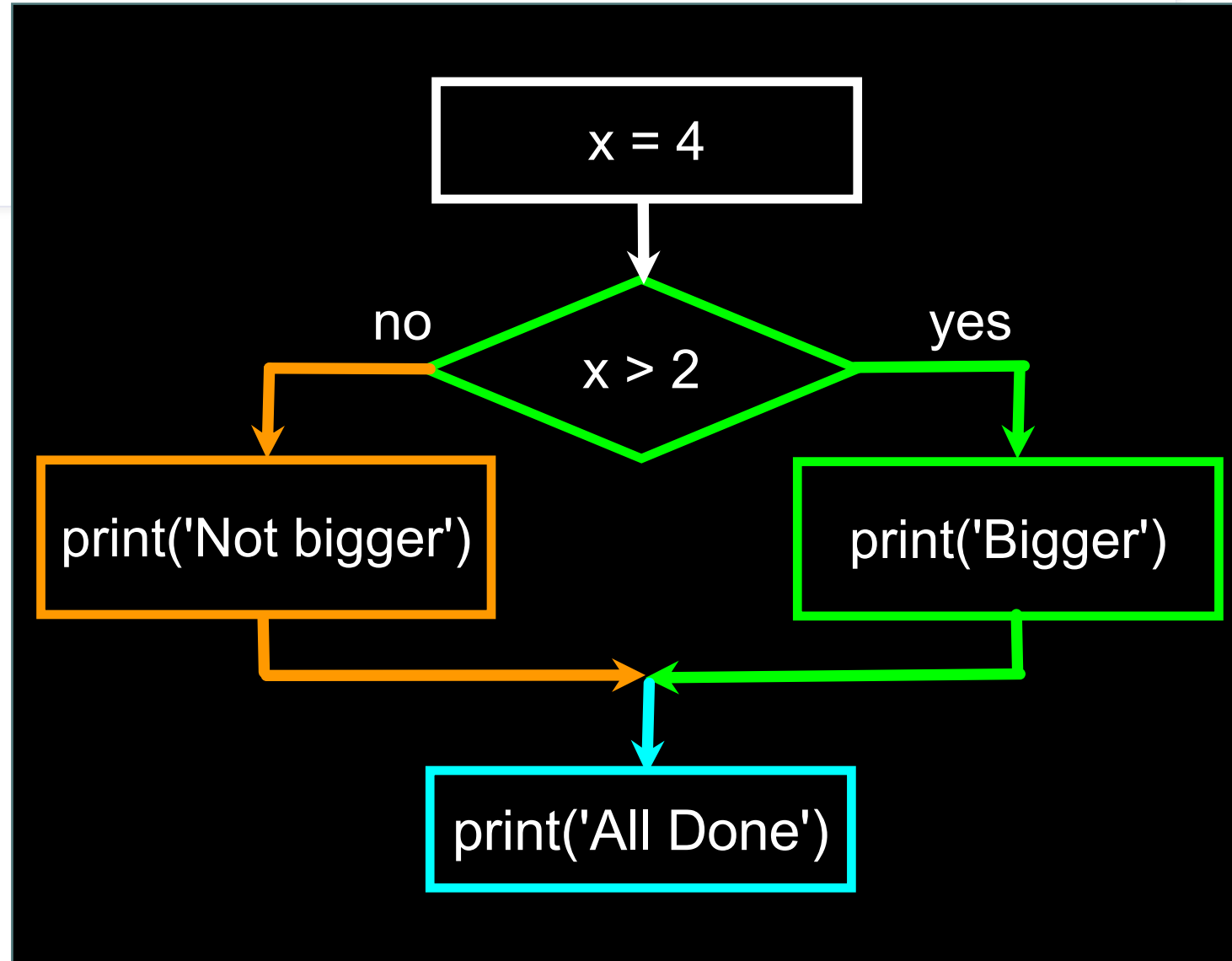
Nested decisions

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



Two-way Decisions

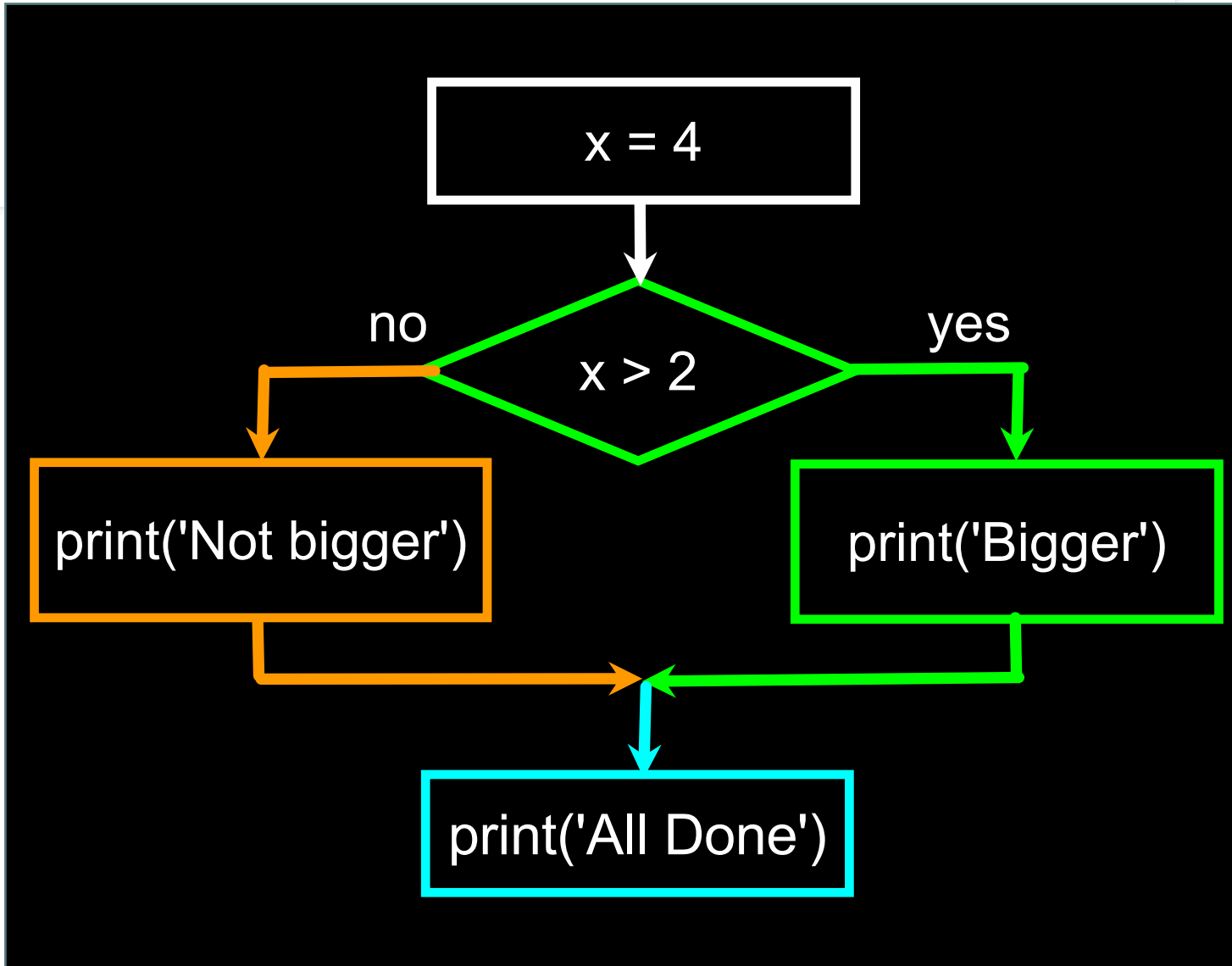
- Sometimes we want to do one thing if a logical expression is **true** and something else if the expression is **false**
- It is like a fork in the road - we must choose **one or the other** path but **not both**



Two-way decisions with else:

```
x = 4

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

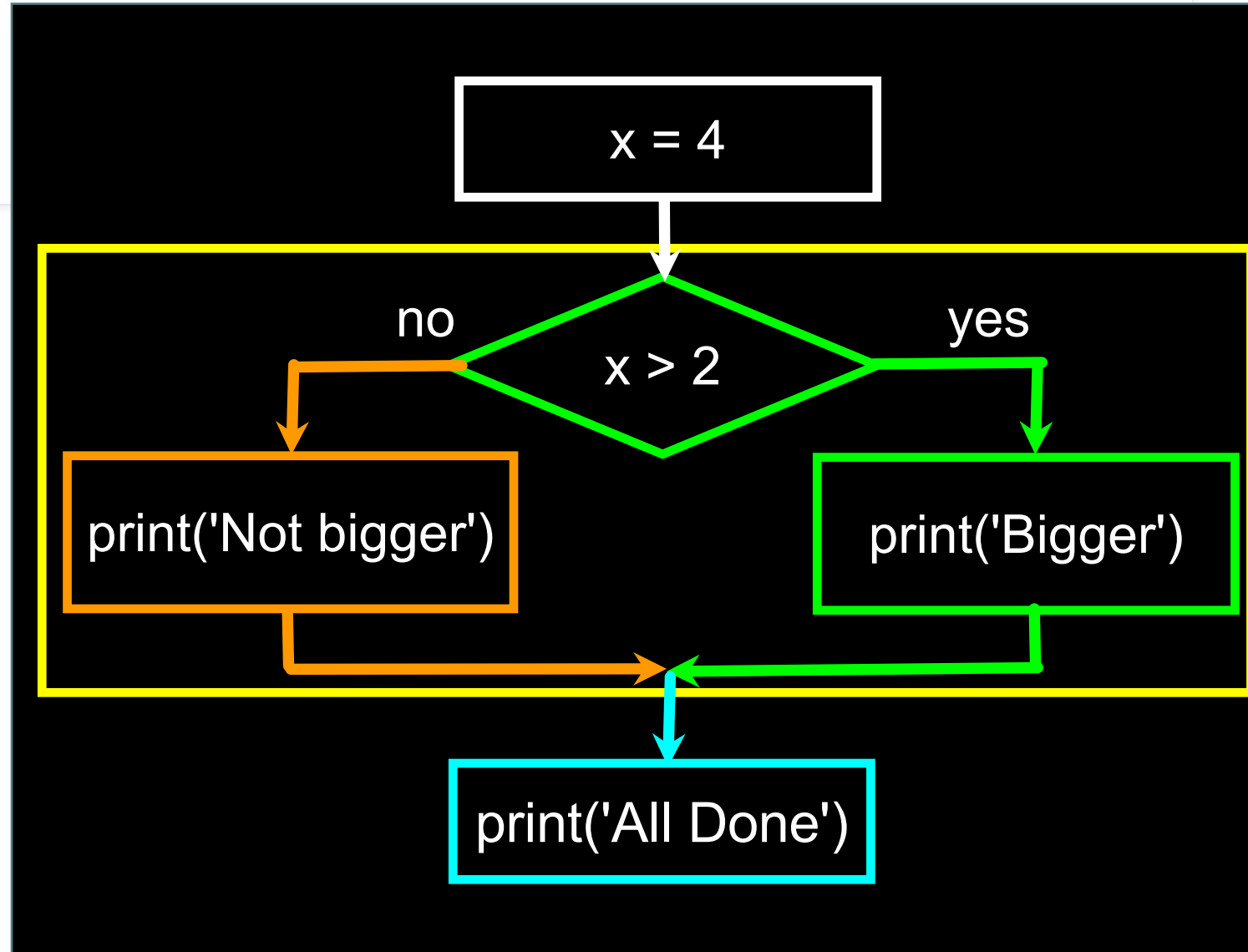


Visualize blocks

```
x = 4
```

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

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

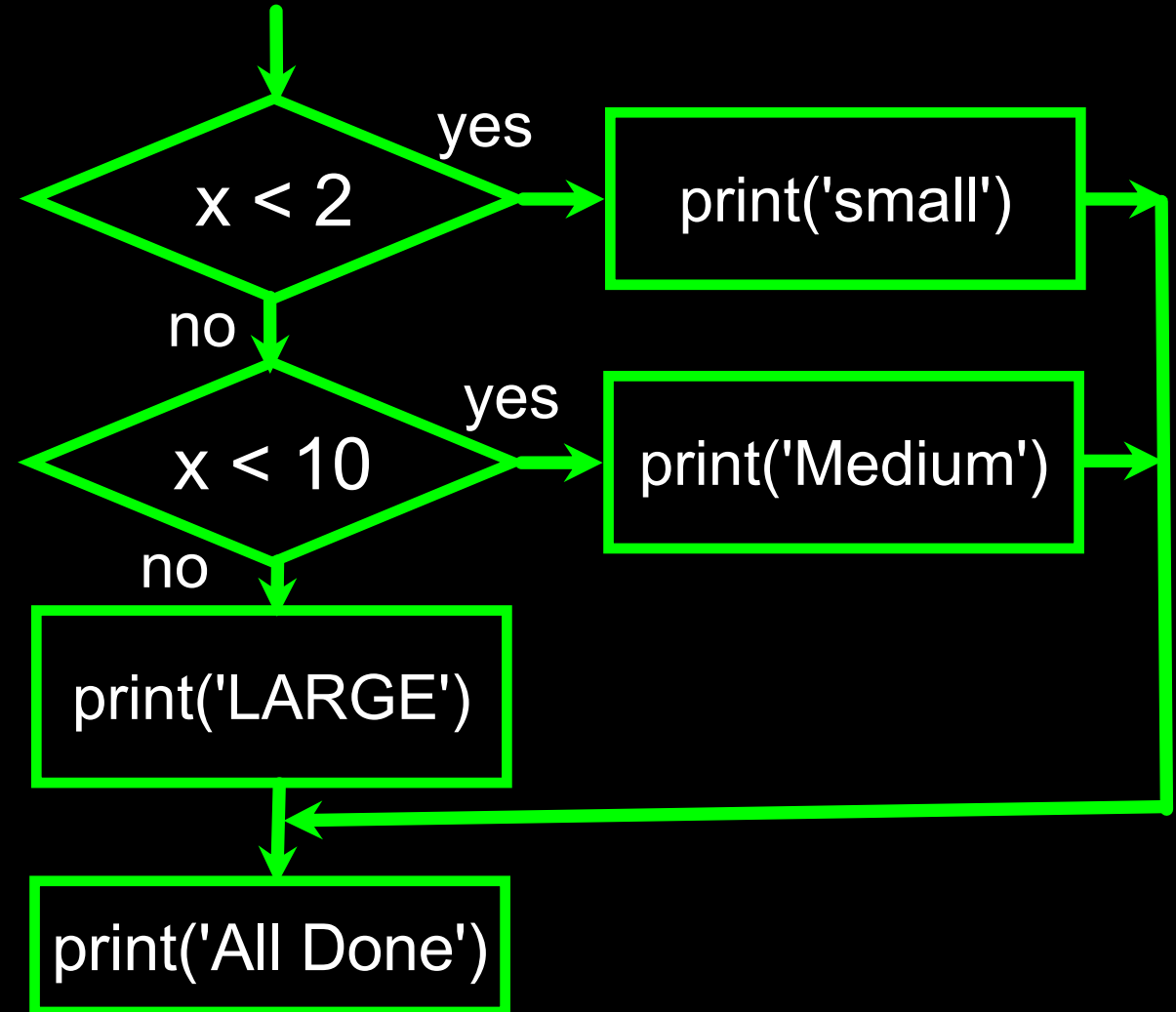




More conditional structures...

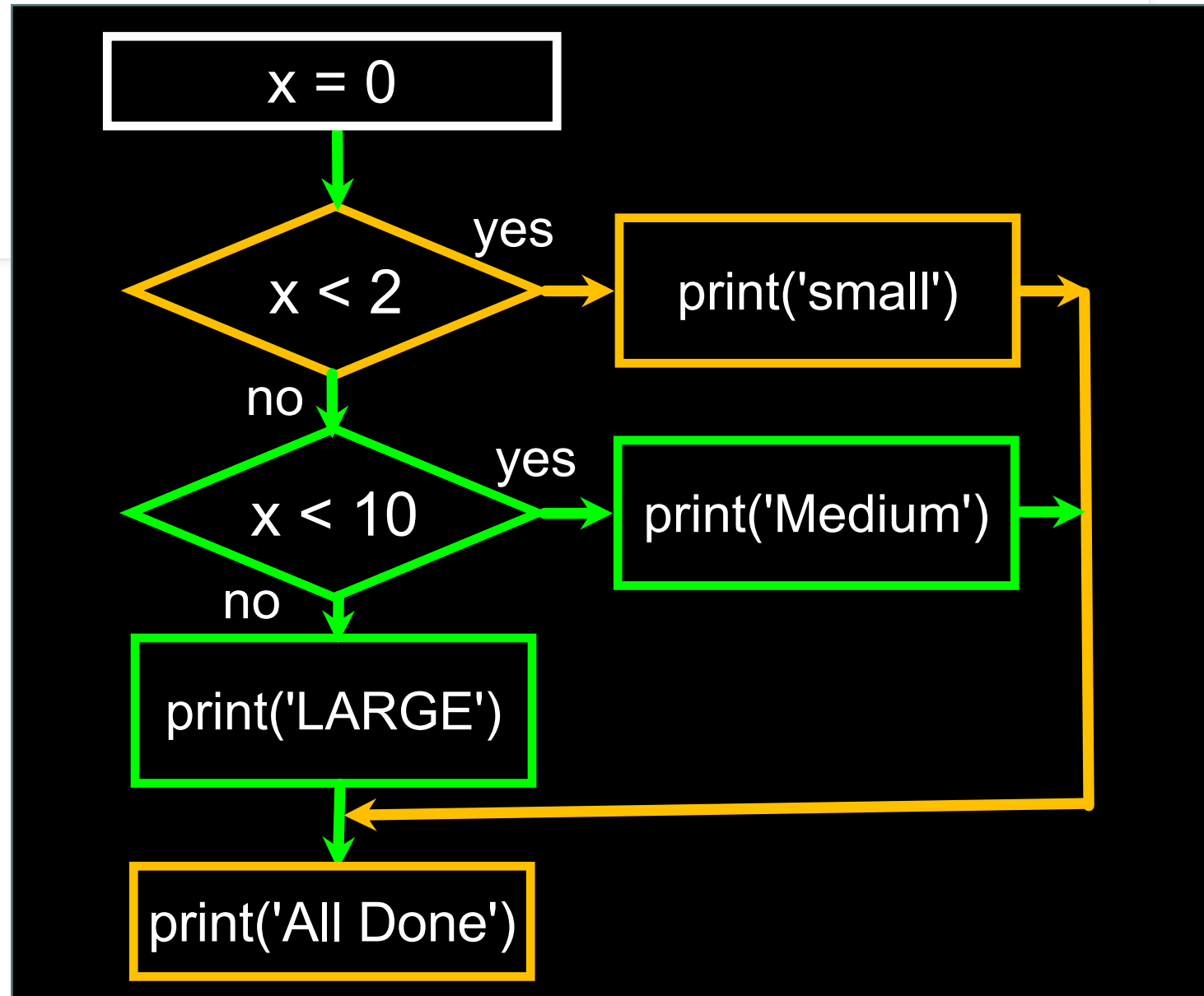
Multi-way

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



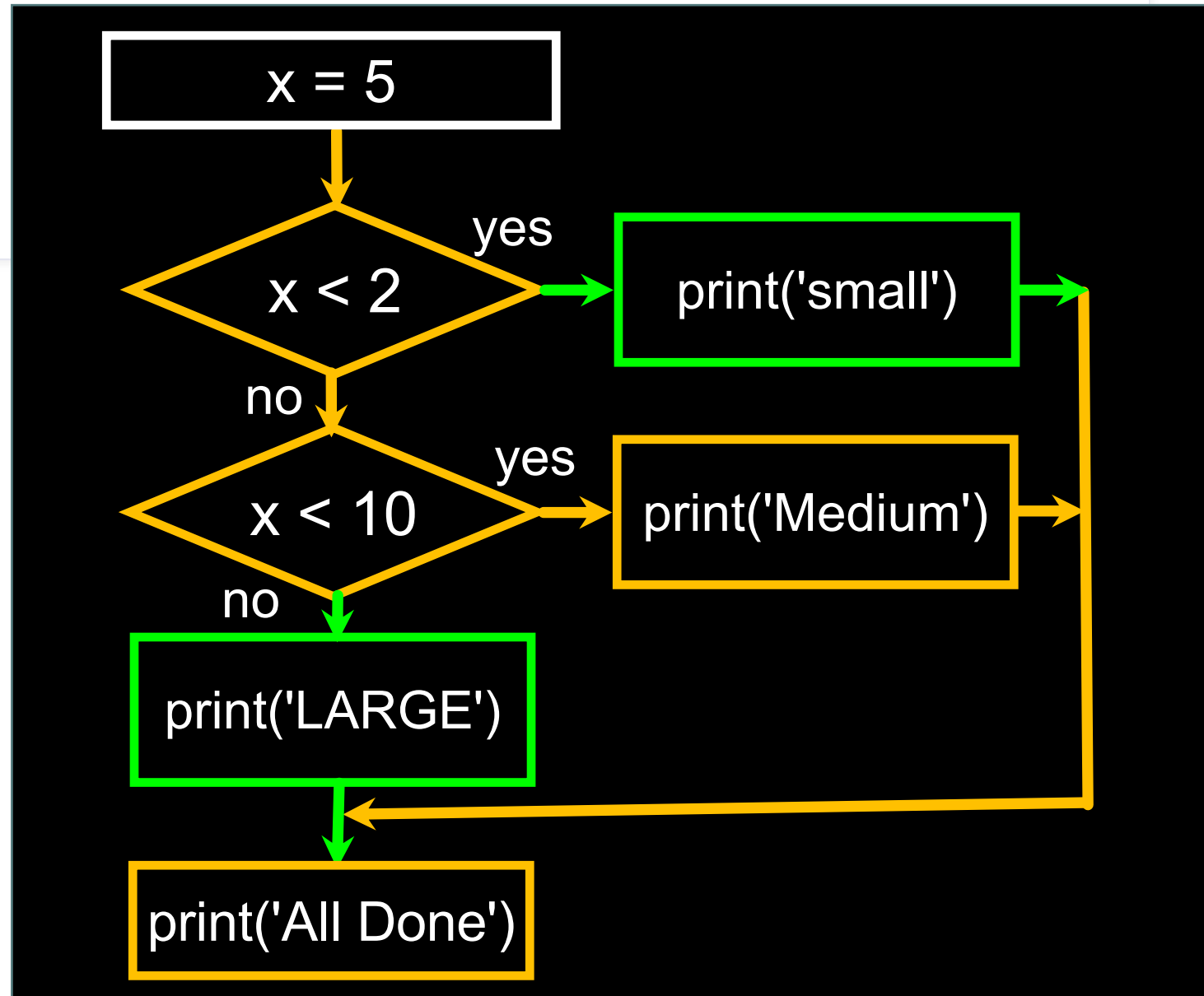
Multi-way

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



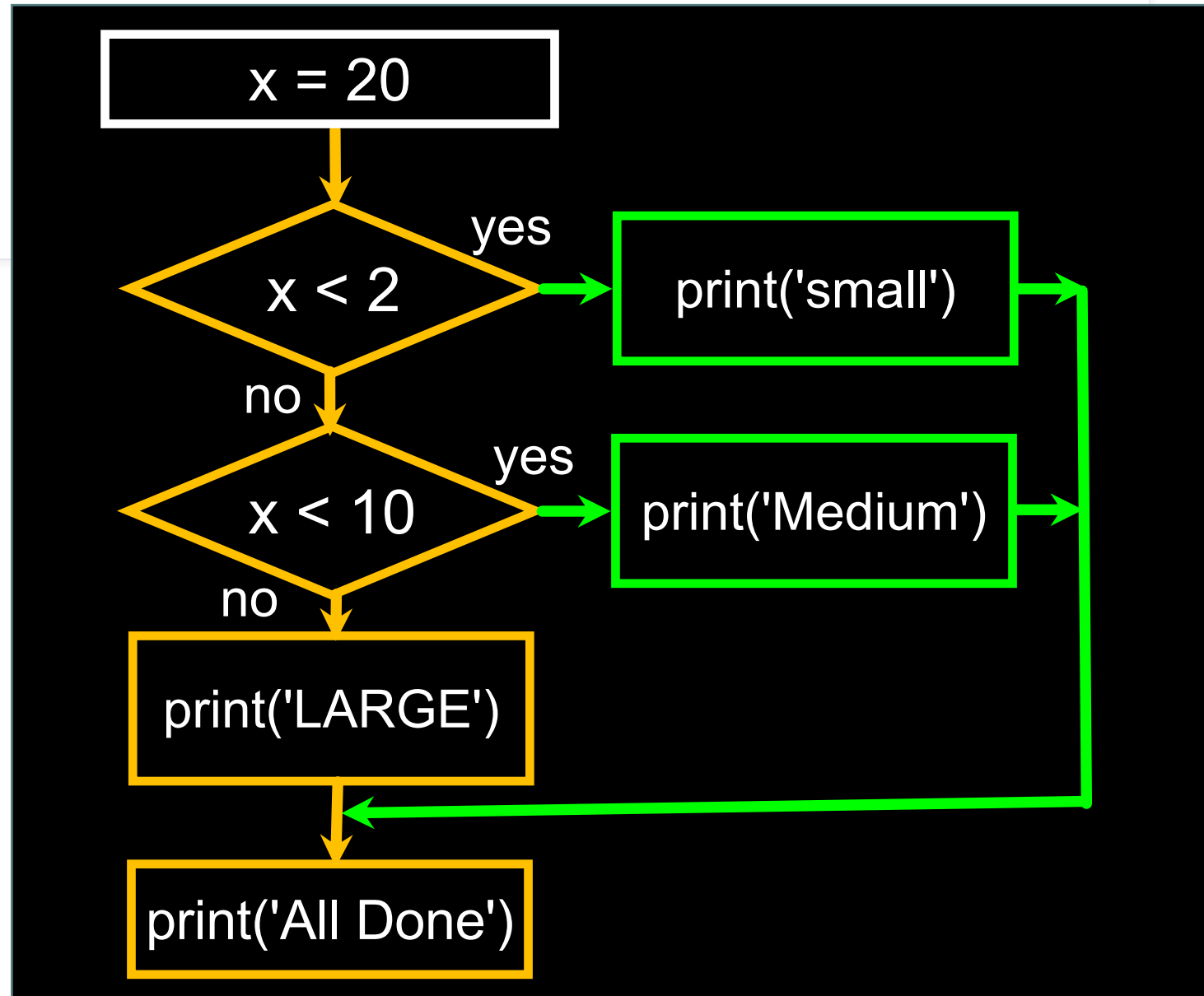
Multi-way

```
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')
```

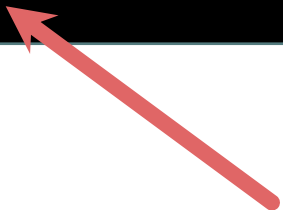
```
if x < 2 :  
    print('Below 2')  
elif x < 20 :  
    print('Below 20')  
elif x < 10 :  
    print('Below 10')  
else :  
    print('Something else')
```

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** - the **except** section is executed


```
$ type 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

```
$ type 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.

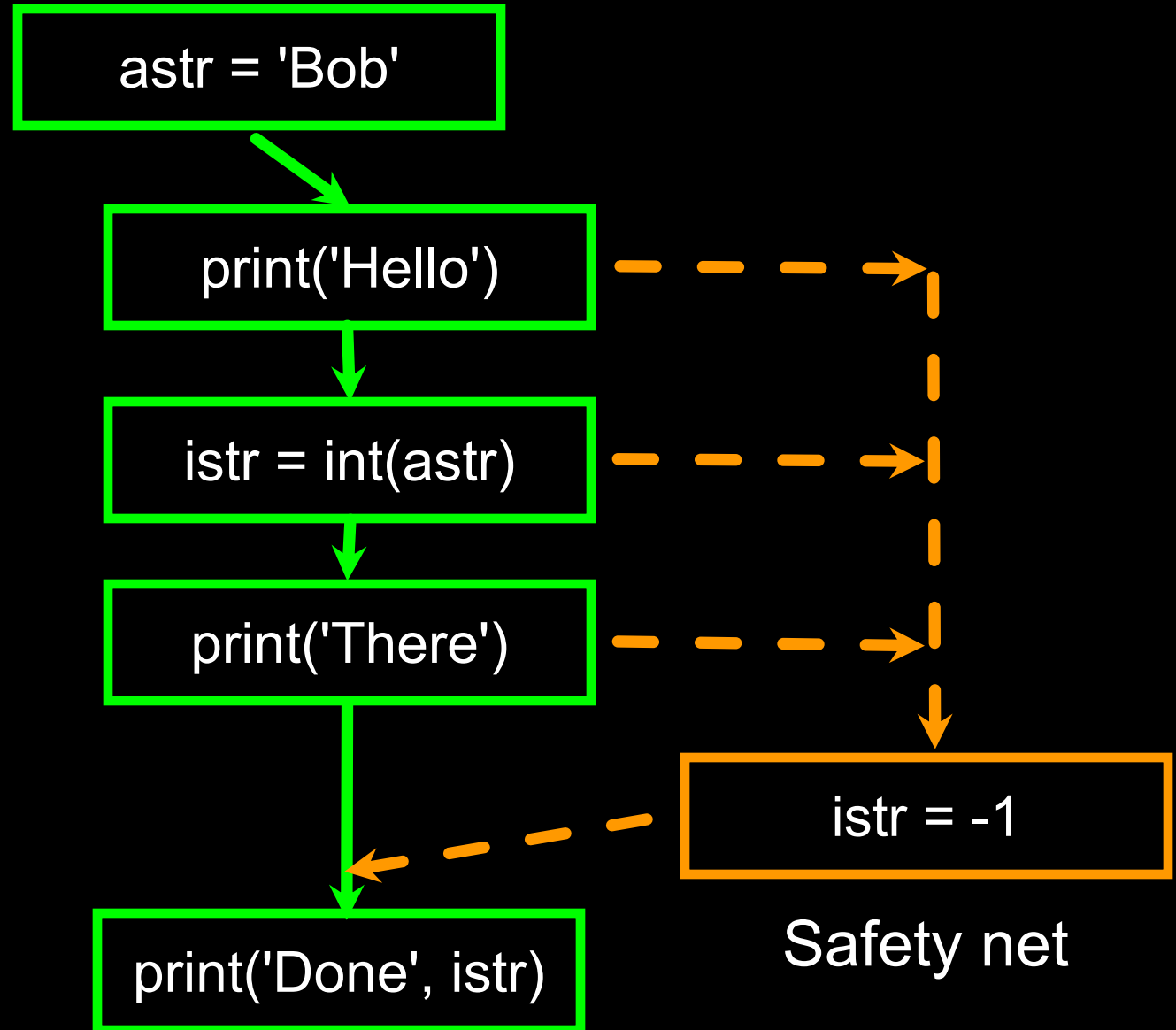
```
$ python tryexcept.py
First -1
Second 123
```

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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- Modified and enhanced by Erdogan Dogdu, Angelo State University, 2020