Conditional Execution

Lecture 3

Primitive Conditions

- *Conditions* are expressions which evaluate to *true* or *false*.

- One kind of condition is the comparison of two numerical values of the same type.

Examples:
Payrate > 10
(x+10) == (y*z -8)

Conditional Operation: If-Statement

- Syntax

if <condition> :
**   <list of statements>**

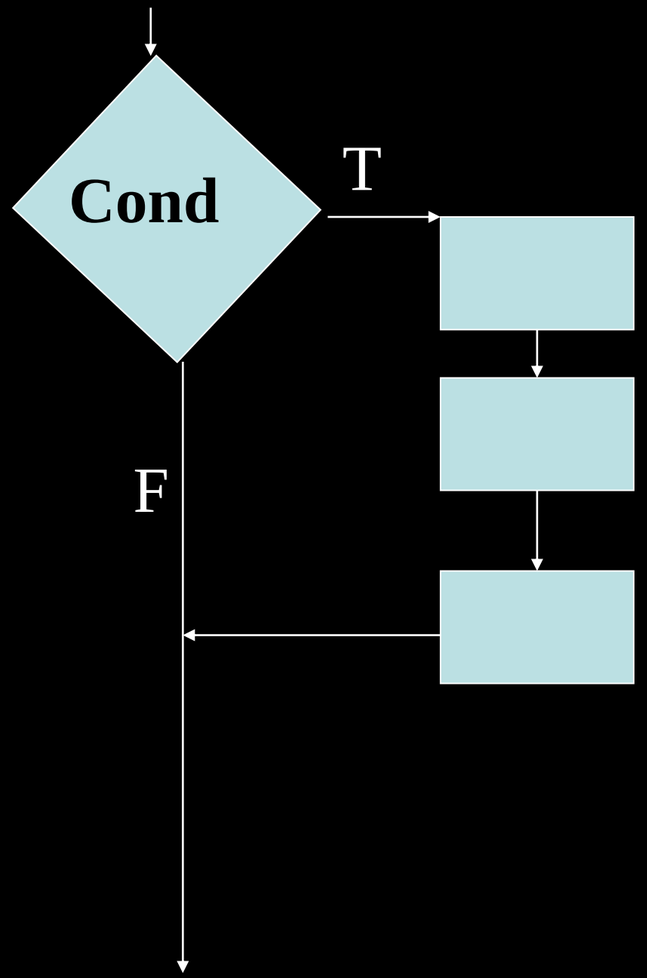
<condition> would be replaced by actual condition, etc.

The colon is required

The list of statements, must be indented – part of the syntax for Python

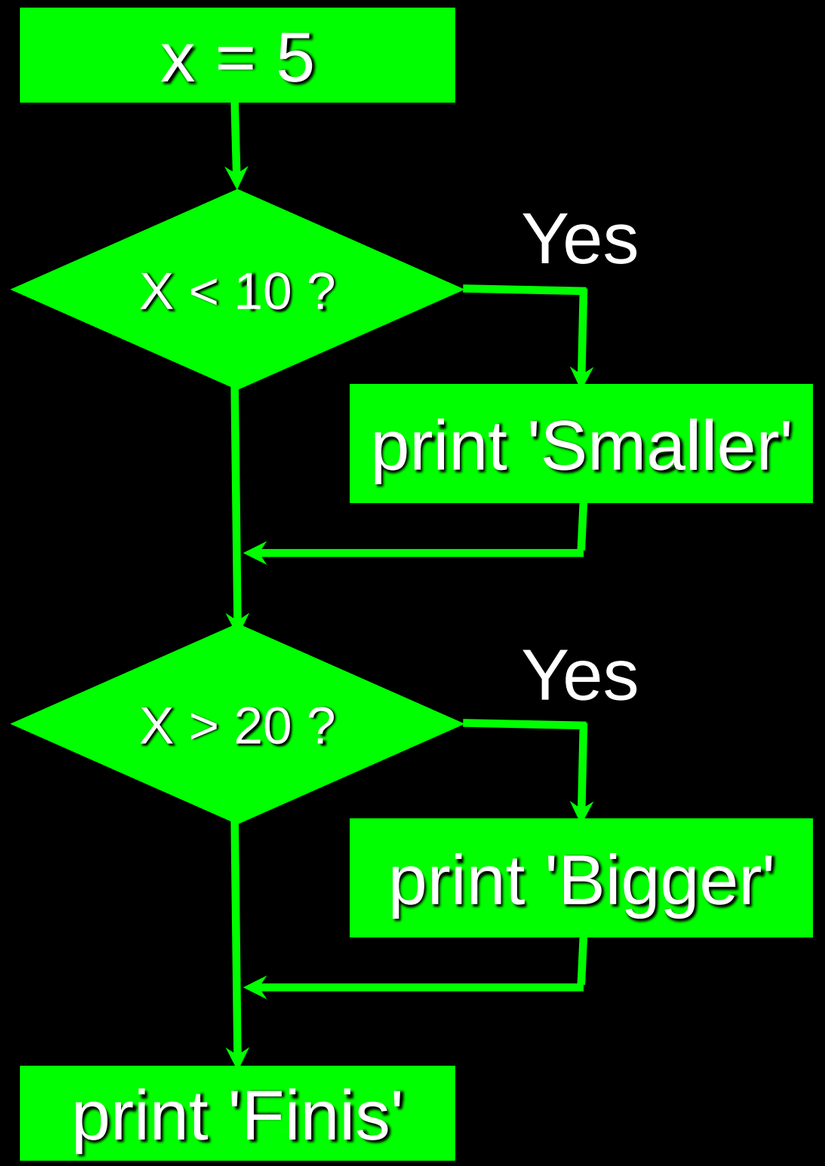
The If-Statement

- Semantics:
  - the condition is evaluated
  - if the condition is true, the list of statements is executed



If-Statement examples

```
if yearsWorked > 10 :
        bonus = 1000

if age >= 65 :
    total = 0.85 * total
numSeniors = numSeniors + 1
```



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 - Yes / No
- Comparison operators look at variables but do not change the variables

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

Remember: “=” is used for assignment

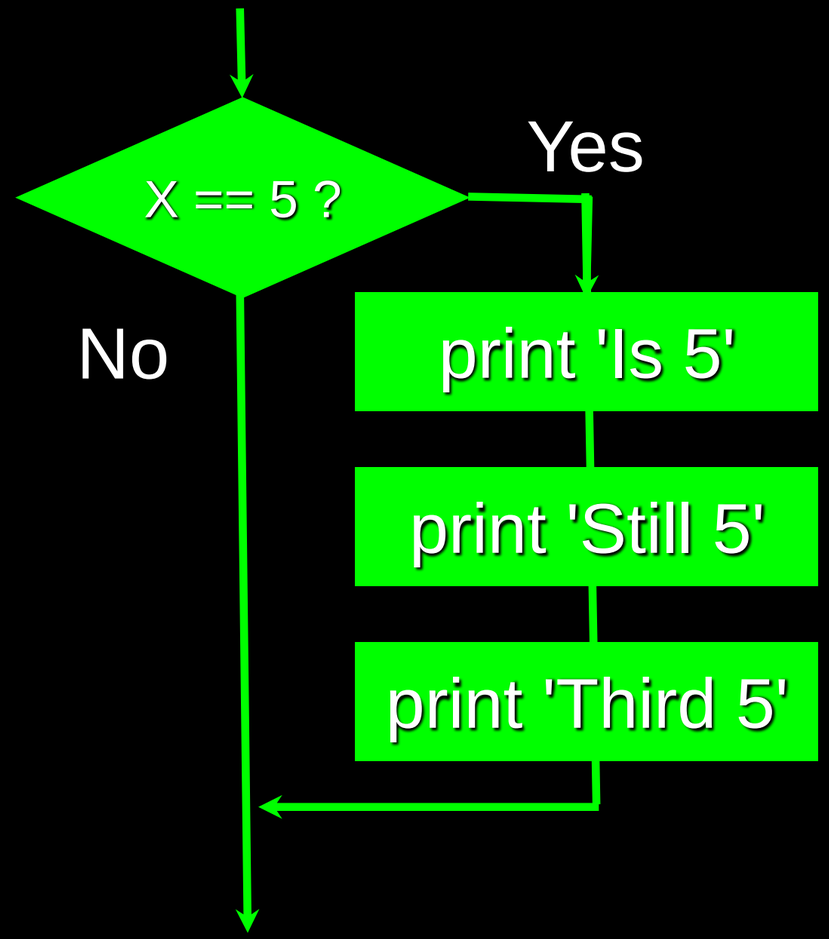
Comparison Operators

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

```
Equals 5
Greater than 4
Greater than or Equal 5
Less than 6
Less than or Equal 5
Not equal 6
```

```
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
```



One-Way Decisions

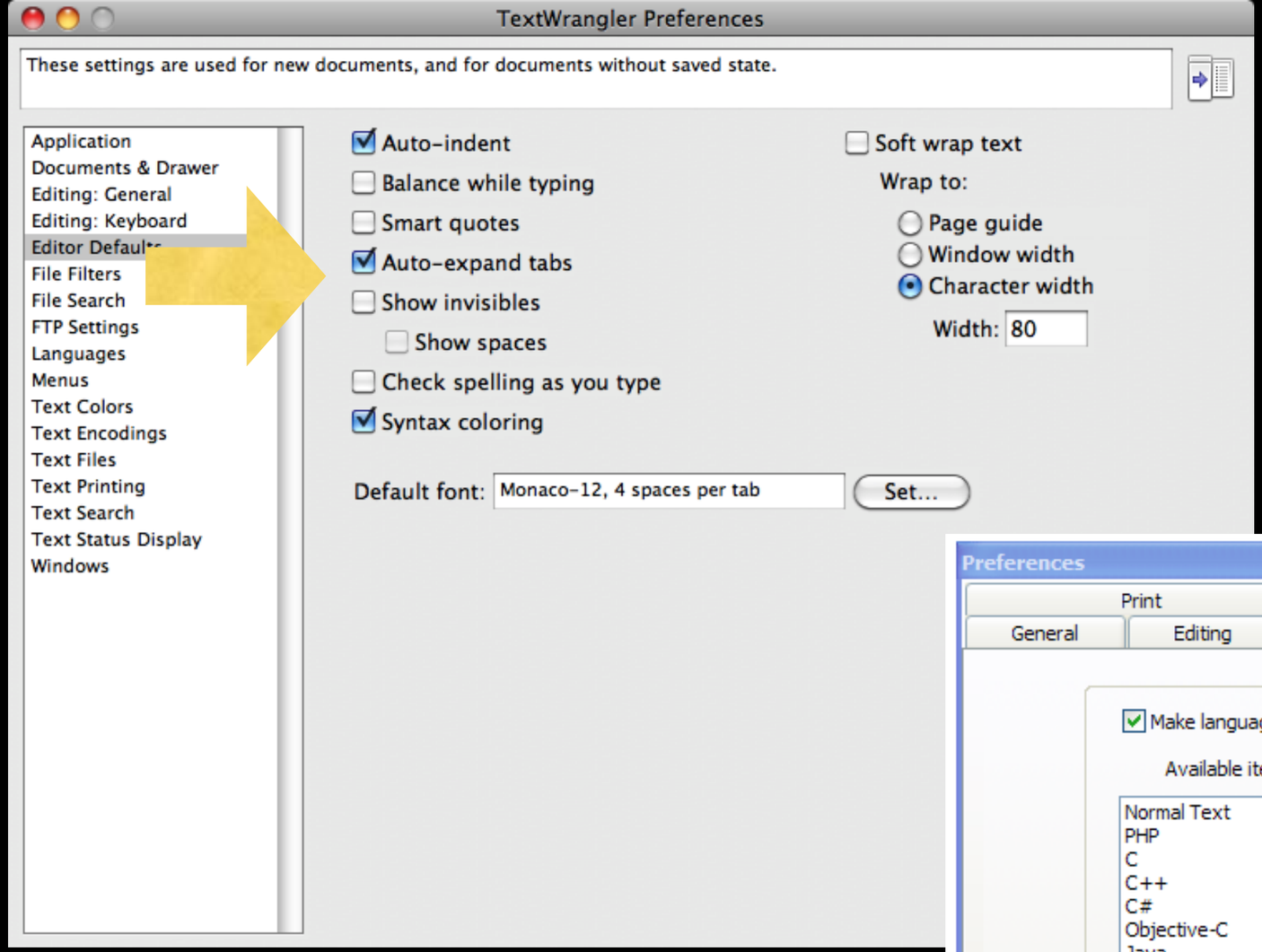
Indentation

- Increase indent to 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 to *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 w.r.t. indentation

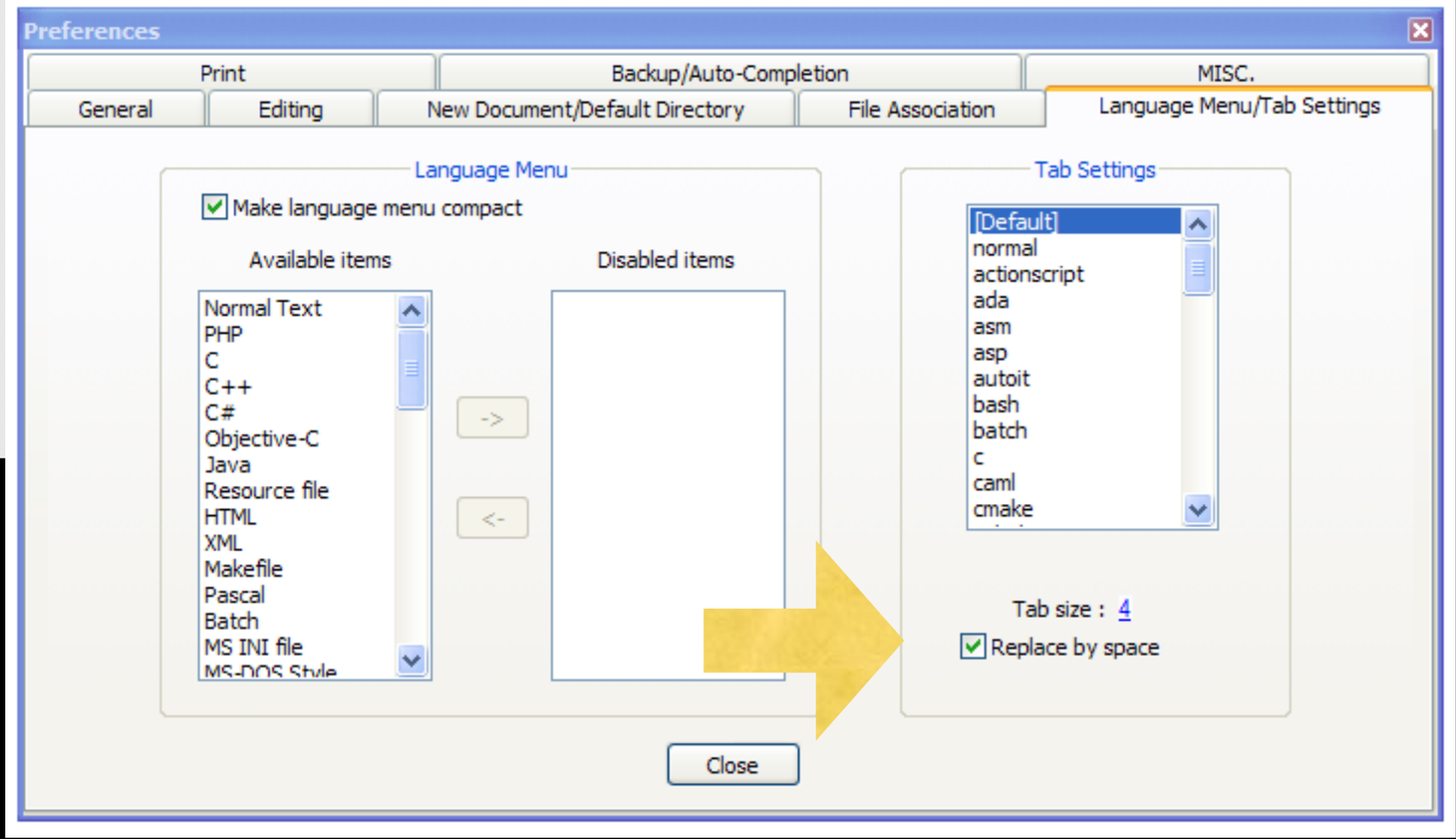
Warning: Turn Off Tabs

- 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 line is indented. If you mix tabs and spaces, you may get “indentation errors” even if everything looks fine

Please do this now while you are thinking about it so we can all stay sane...



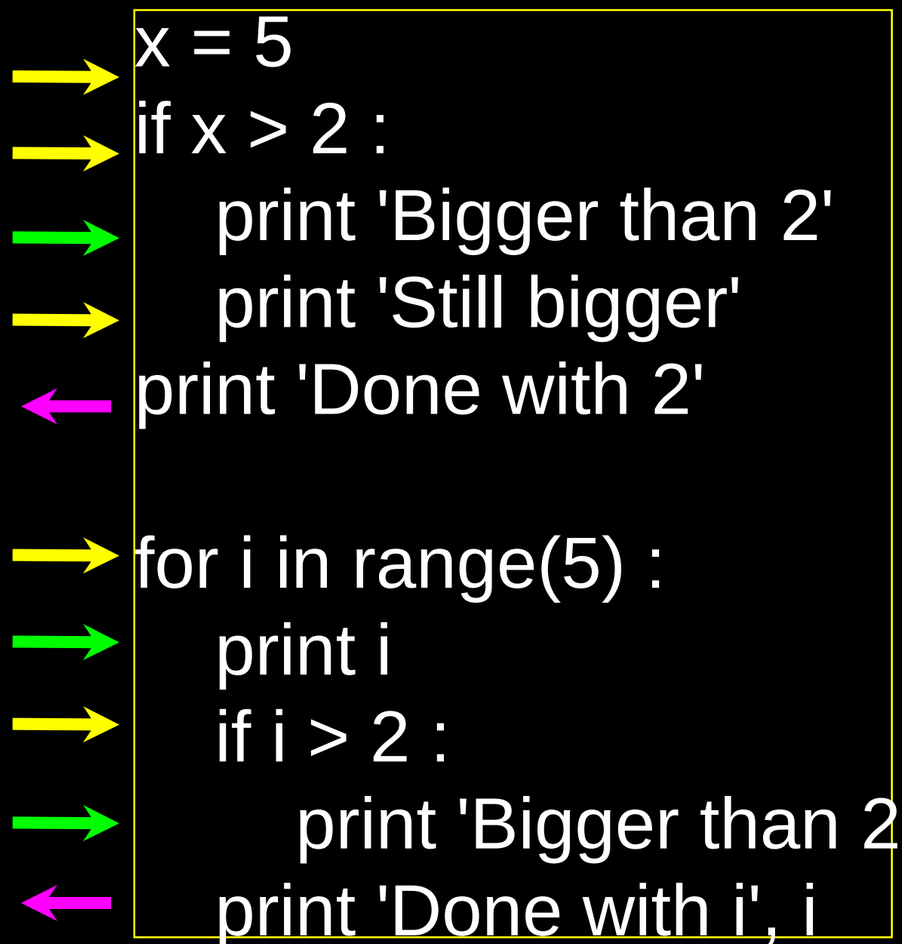
This will save you much unnecessary pain.



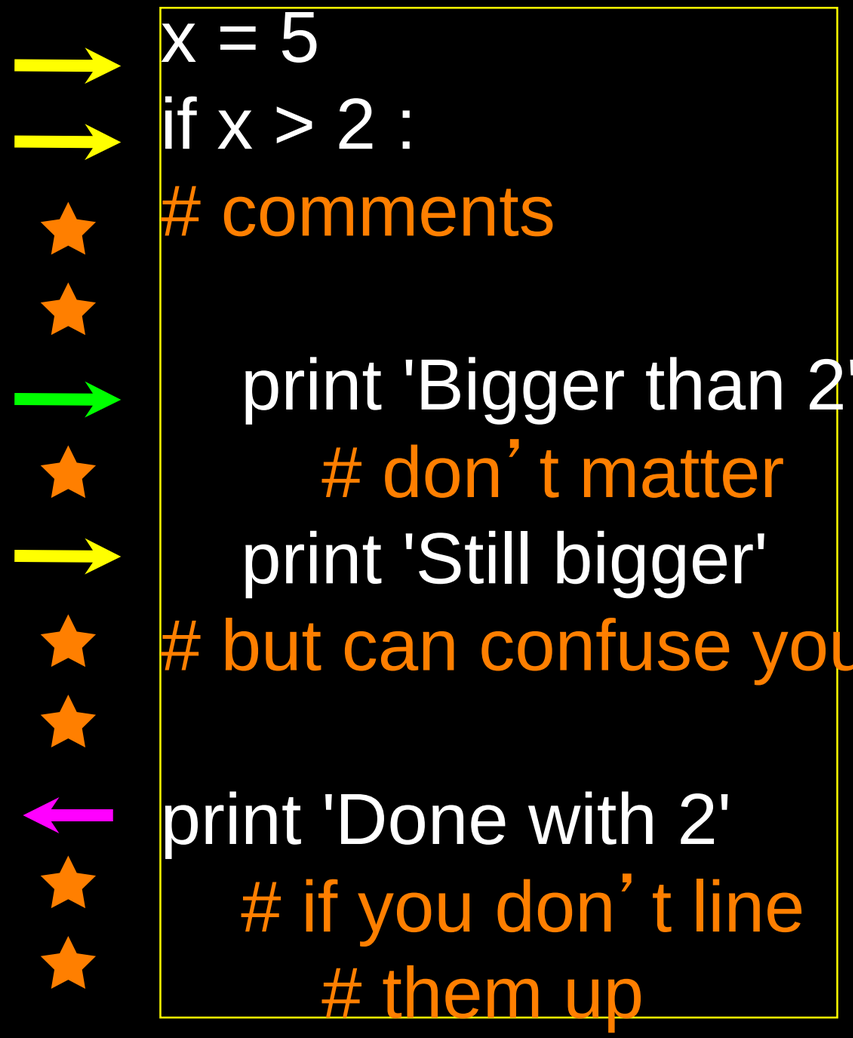
increase / maintain after if or for

decrease to indicate end of block

blank lines and comment lines ignored



```
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
```



```
x = 5
if x > 2 :
# comments

    print 'Bigger than 2'
        # don't matter
    print 'Still bigger'
# but can confuse you

print 'Done with 2'
    # if you don't line
        # them up
```

Mental begin/end squares

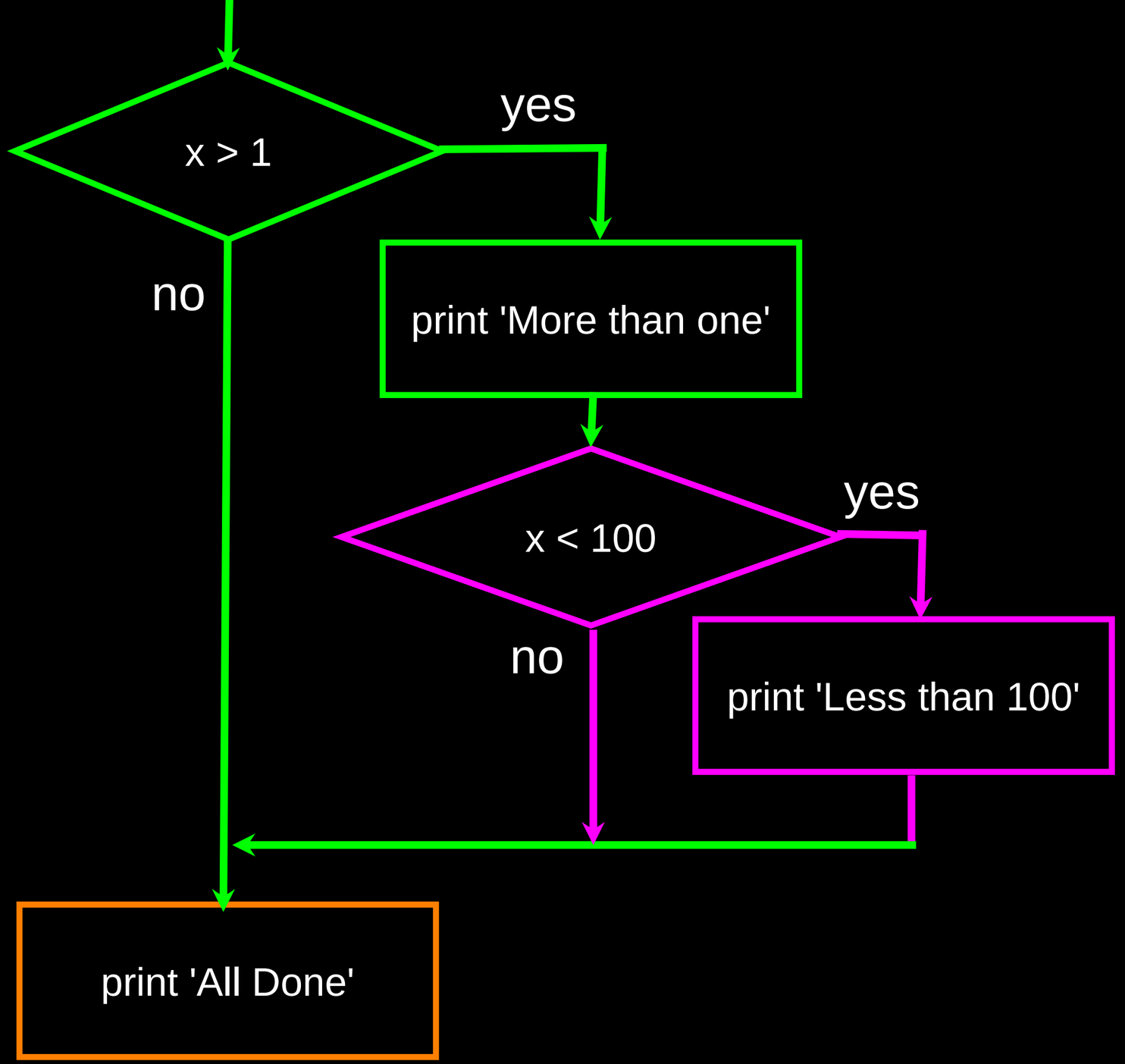
```
x = 5
if x > 2 :
    print 'Bigger than 2'
    print 'Still bigger'
print 'Done with 2'
```

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

```
x = 5
if x > 2 :
# comments

    print 'Bigger than 2'
        # doesn't matter
    print 'Still bigger'
# but can confuse you

print 'Done with 2'
```

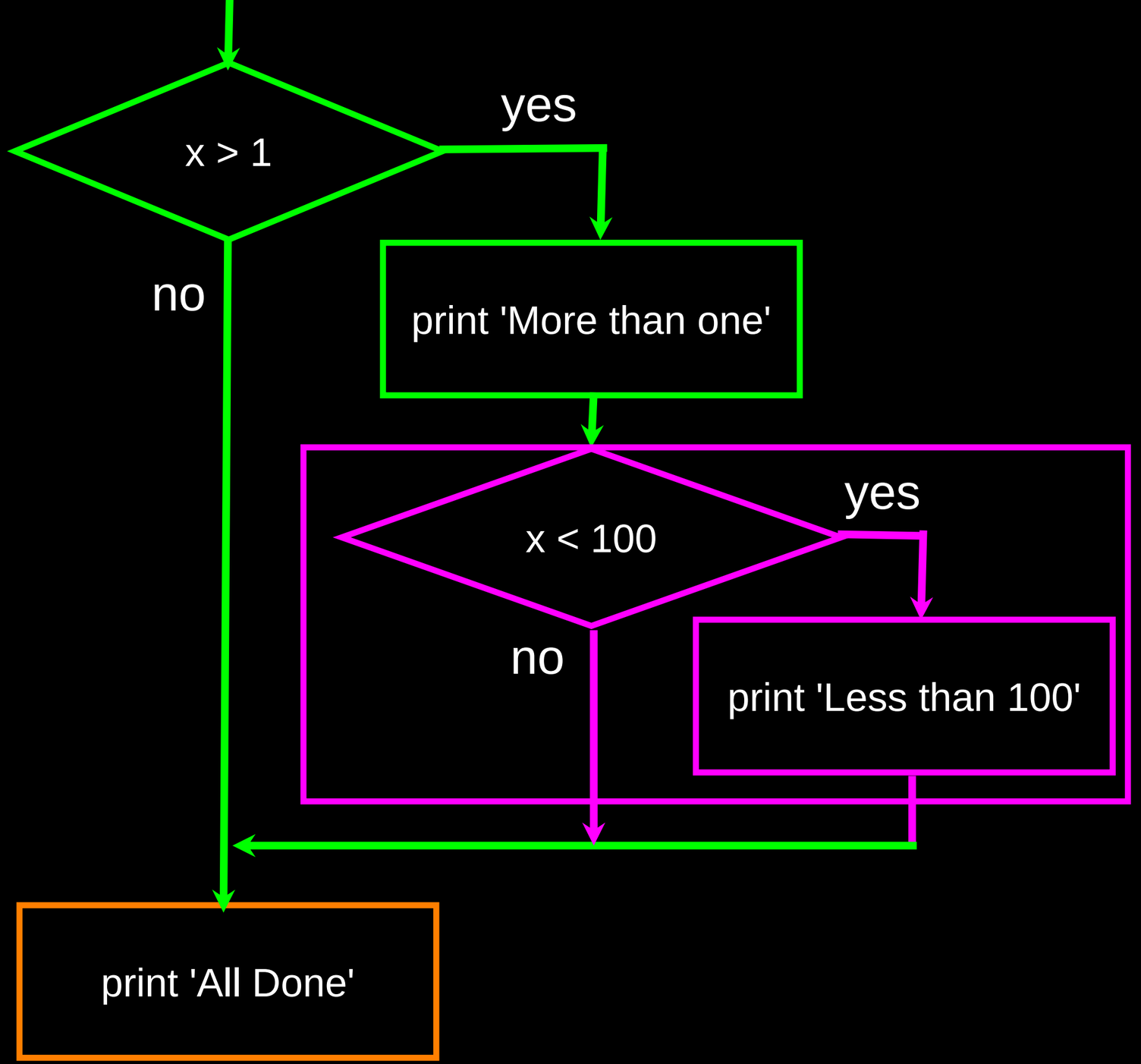
Nested Decisions

```
x = 42

if x > 1 :
    print 'More than one'
    if x < 100 :
        print 'Less than 100'

print 'All done'
```



Nested Decisions

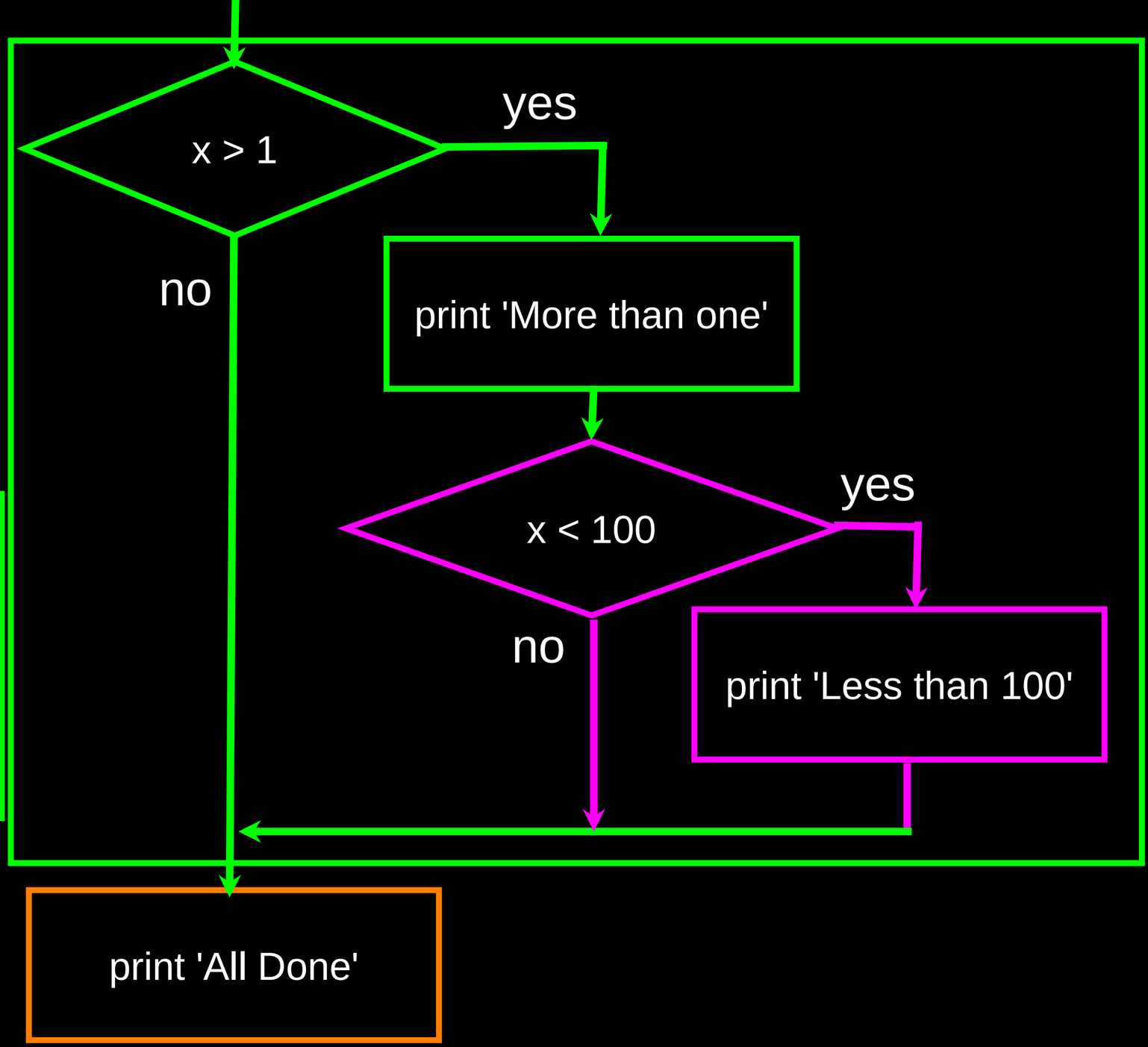
```
x = 42

if x > 1 :
    print 'More than one'
    if x < 100 :
        print 'Less than 100'

print 'All done'
```



Nested Decisions

x = 42

```
if x > 1 :
    print 'More than one'
    if x < 100 :
        print 'Less than 100'

print 'All done'
```



The If-else-Statement

- Syntax

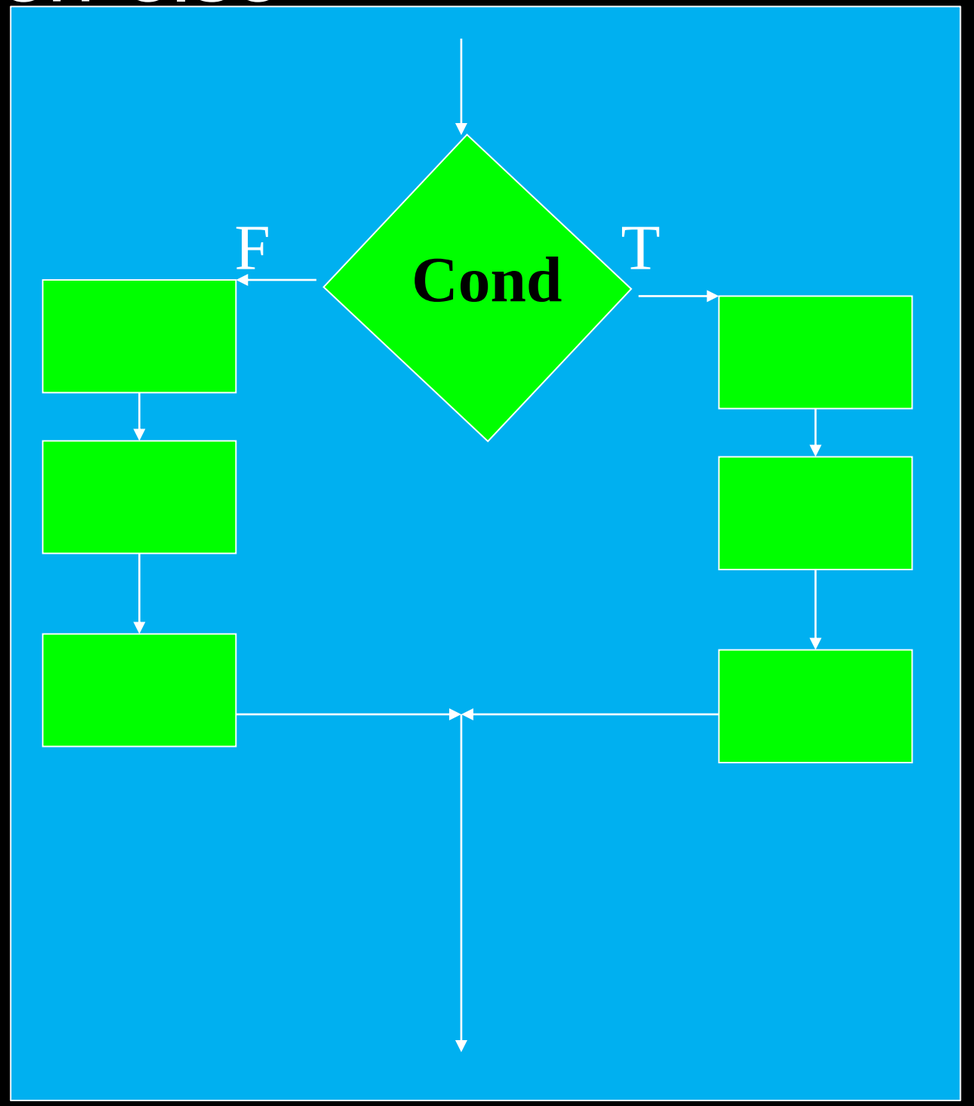
```
if <condition> :
<list of statements>
else :
    <list of statements>
```

- Note colon after else

- Both lists must be indented.

Conditional Operation: if-then-else

- Semantics:
  - the condition is evaluated
  - if the condition is true, the list of statements is executed



If-Else-Statement examples

- if yearsWorked > 10 :

```
        bonus = 1000
else :
        bonus = 500
```

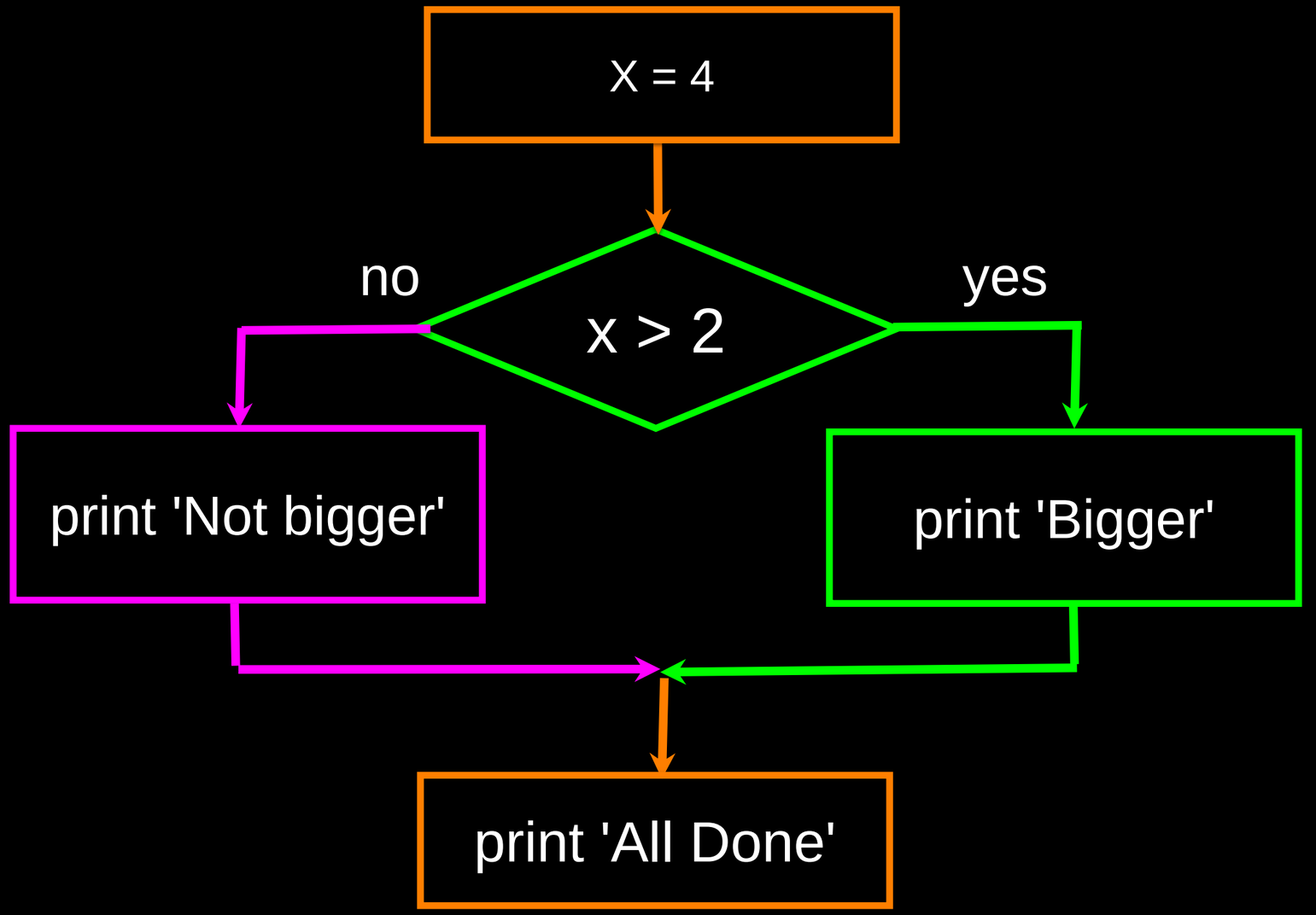
- if age >= 65 :

```
        price = 0.85 * price
        numSeniors = numSeniors + 1
else :
        nonSeniors = nonSeniors + 1
```

Two Way Decisions

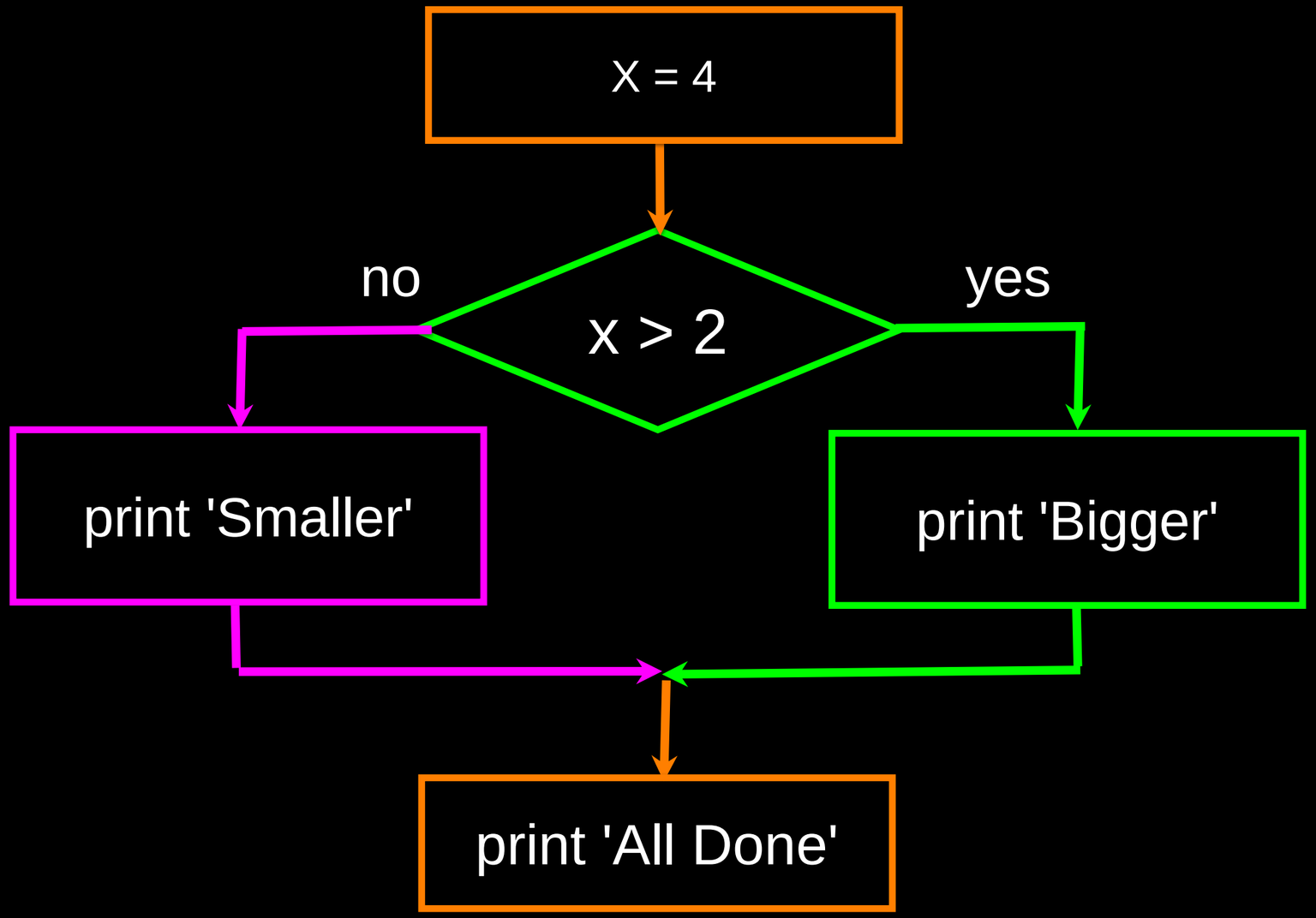
- Sometimes we want to do one thing if a logical expression is true and something else if the expression is false

- It is like a fork in the road - we must choose one or the other path but not both



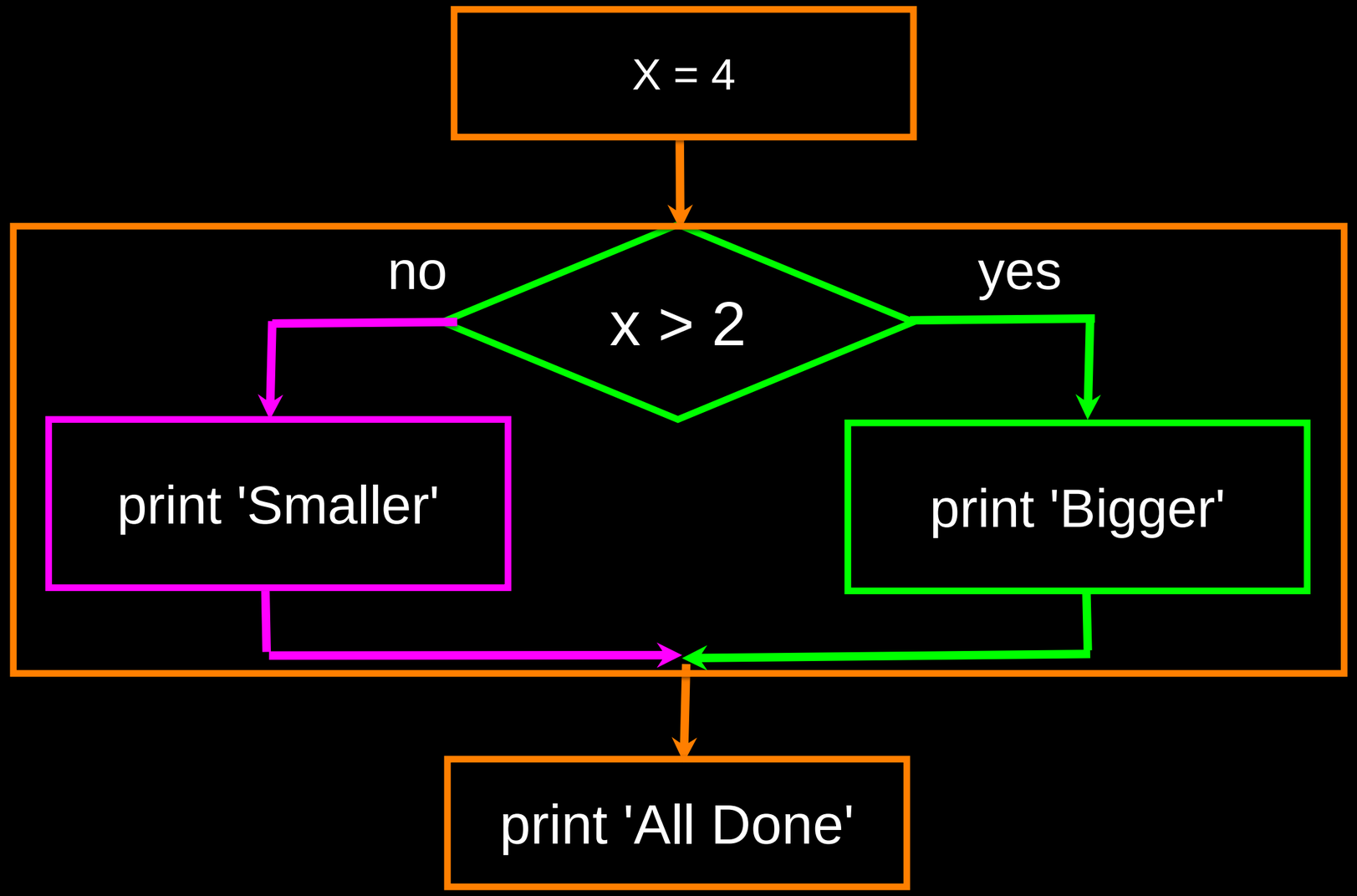
Two-way using else :

```
x = 4

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

print 'All done'
```



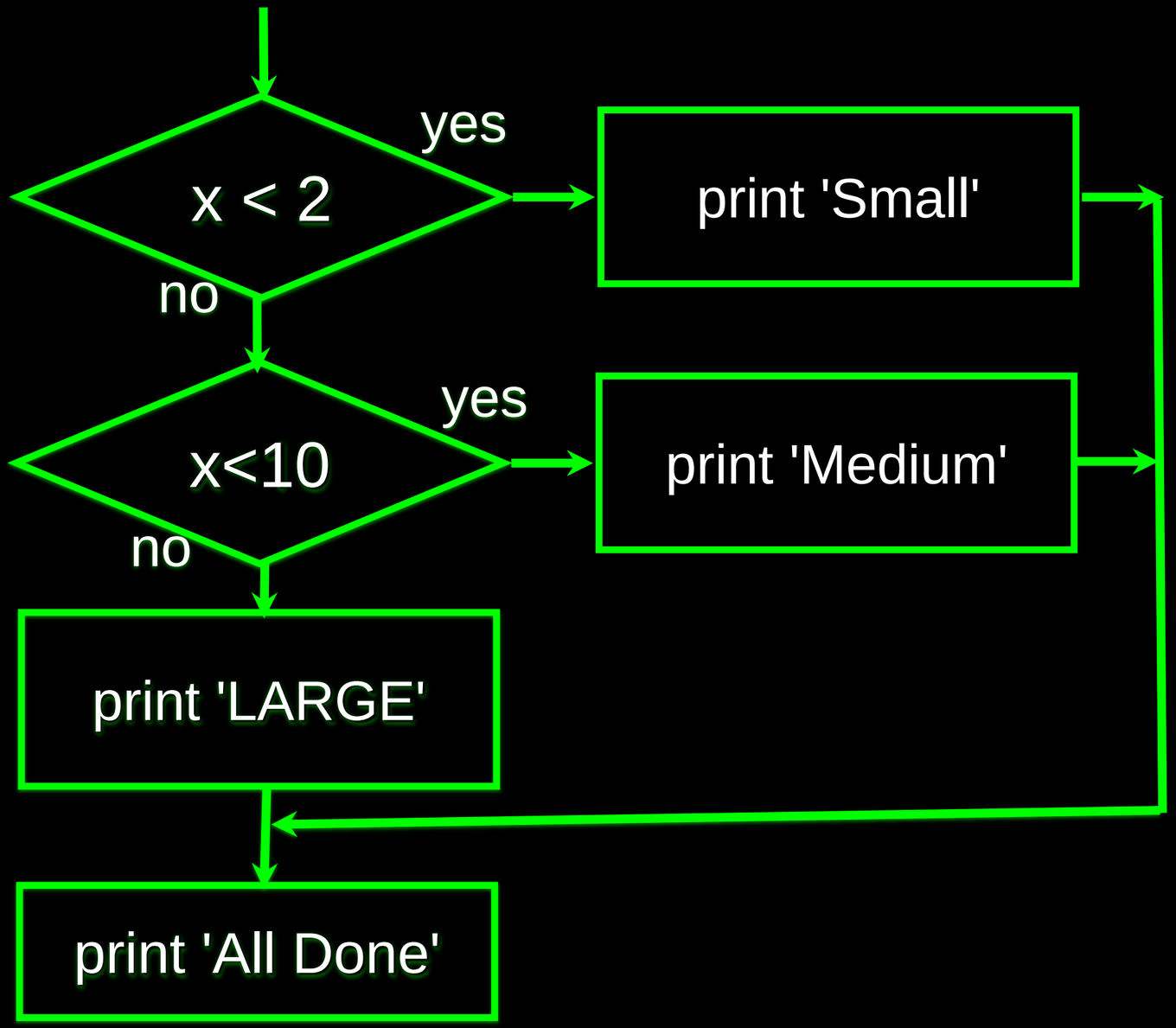
Two-way using else :

```
x = 4

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

print 'All done'
```



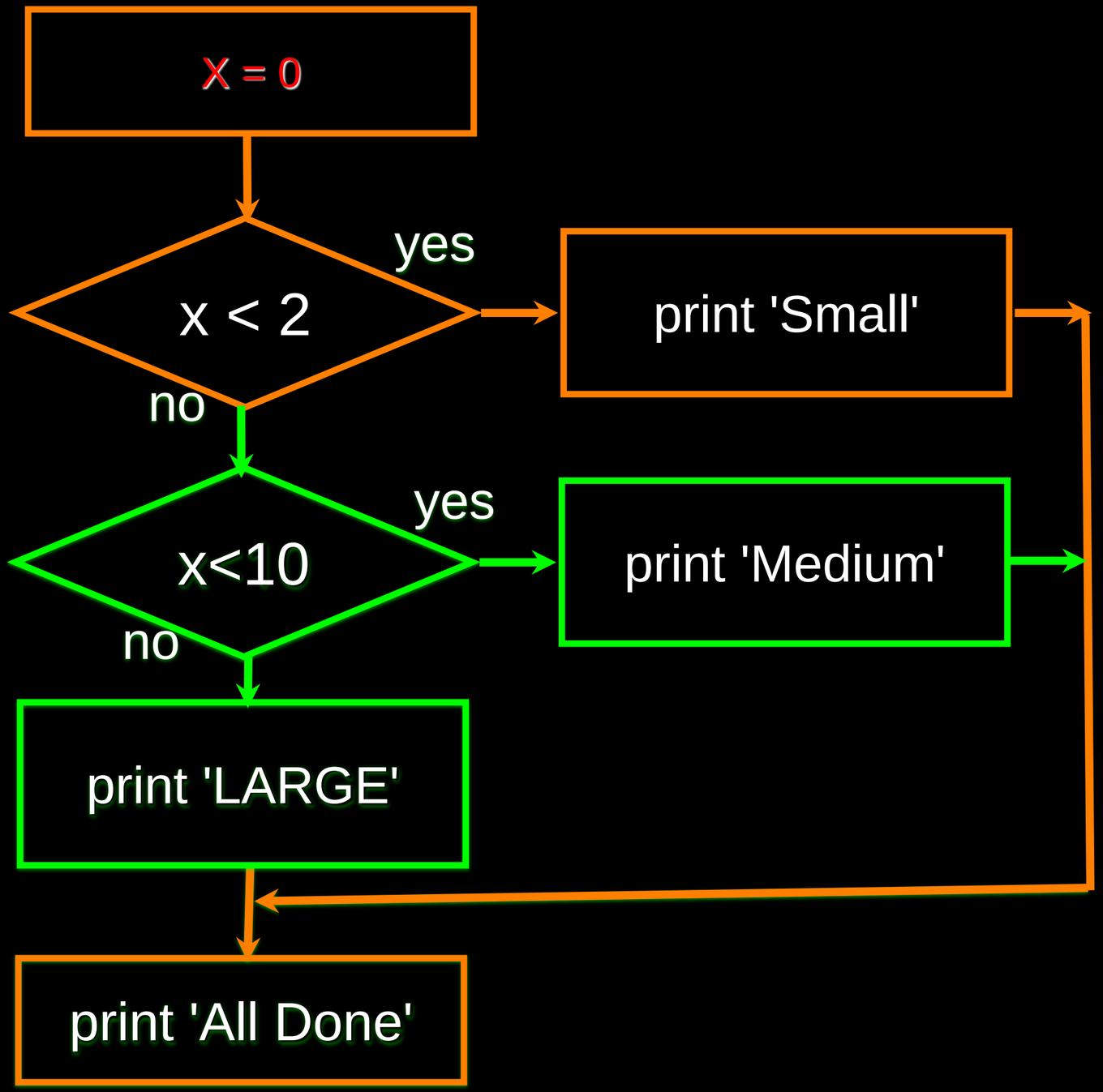
Multi-way

```
if x < 2 :
    print 'Small'
elif x < 10 :
    print 'Medium'
else :
    print 'LARGE'
print 'All done'
```



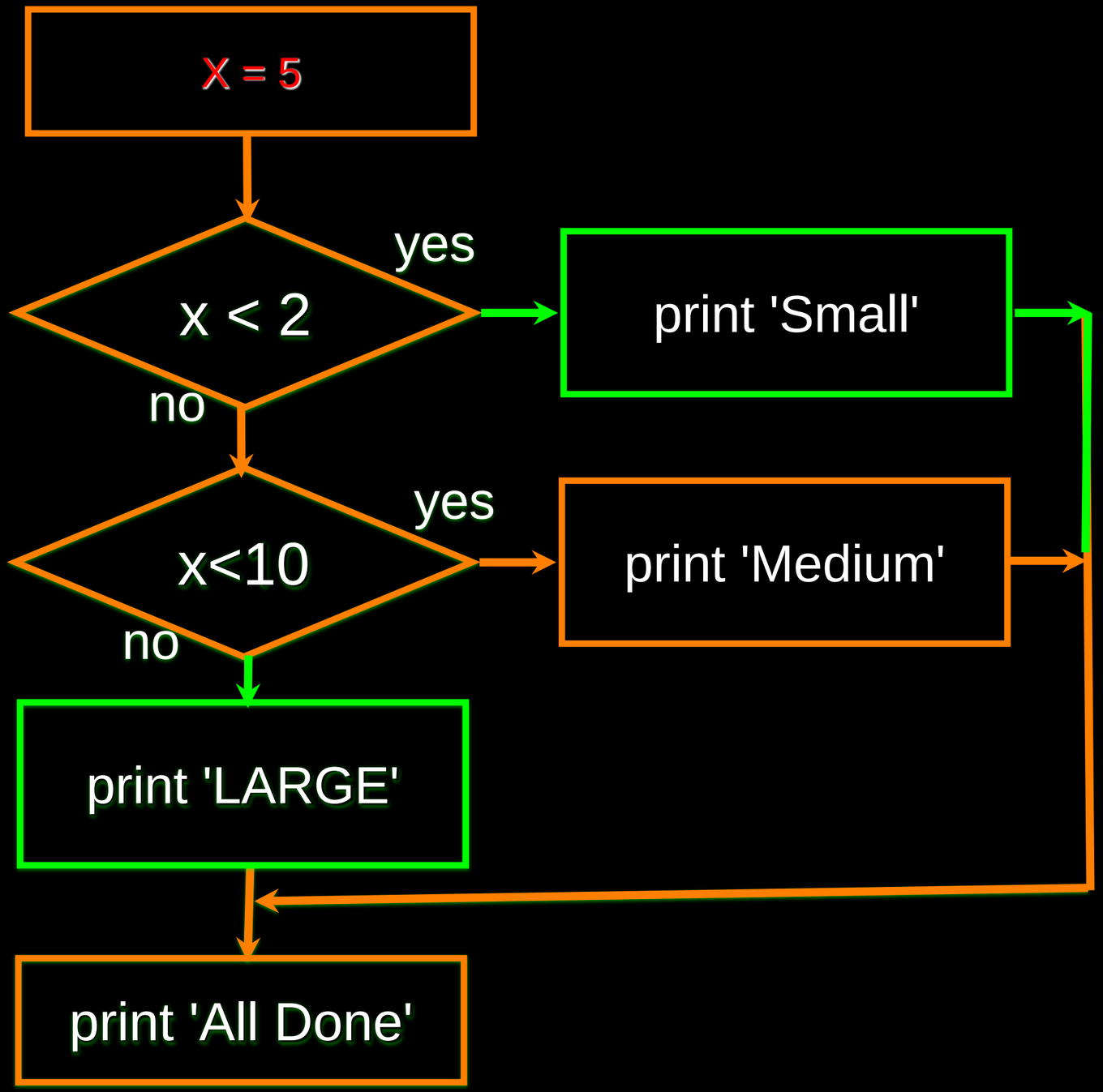
Multi-way

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



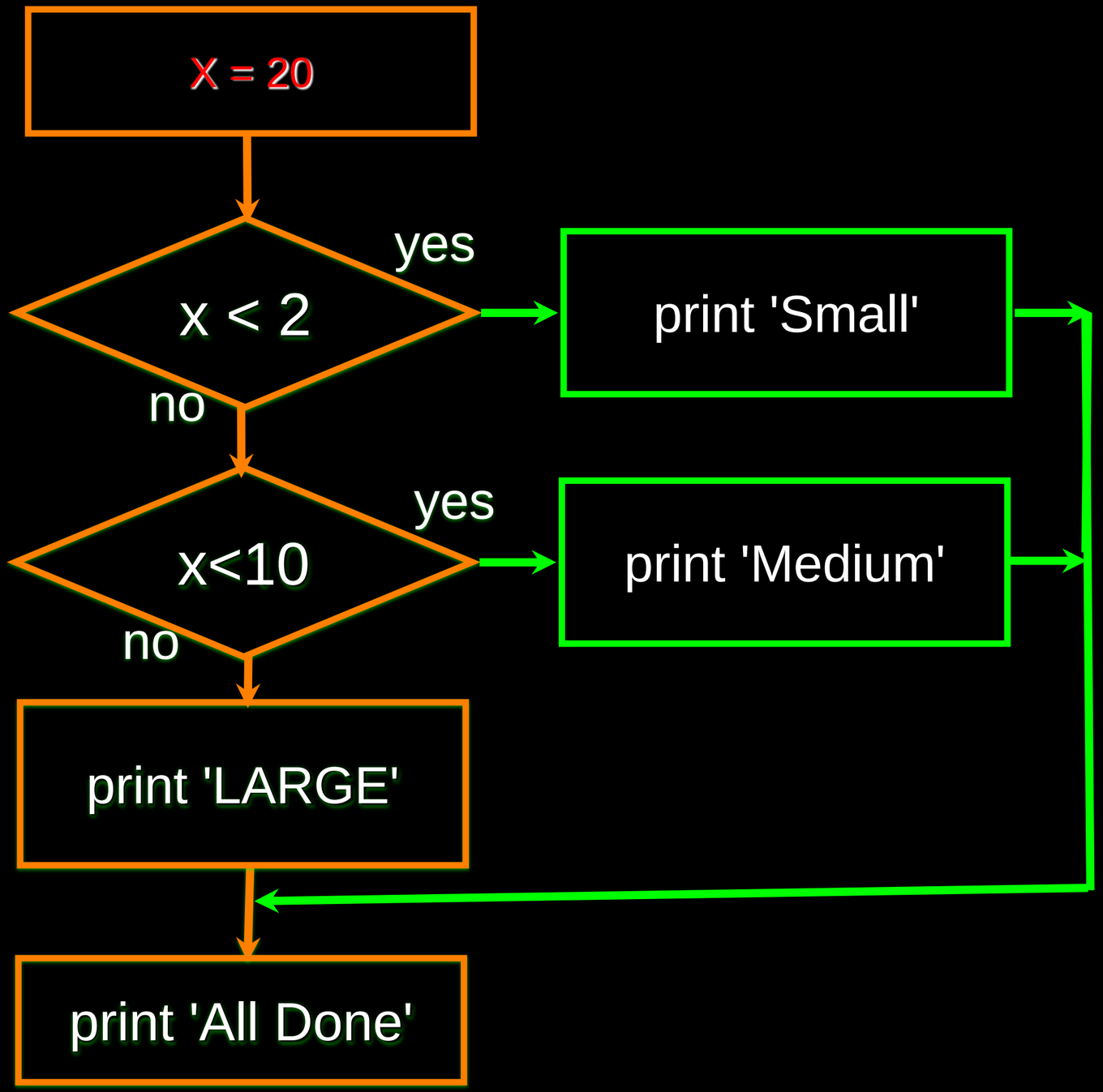
Multi-way

```
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?

```
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'
```

Sample try / except

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

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

```
$ python trynum.py
Enter a number:42
Nice work
$ python trynum.py
Enter a number:fourtytwo
Not a number
$
```

Python Session

```
IDLE 1.1.3
>>> numSeniors = 0
>>> numNonSeniors = 0
>>> price = input("Enter the price: ")
Enter the price: 15
>>> age = input("Enter the age: ")
Enter the age: 75
>>> if age >= 65
SyntaxError: invalid syntax
>>> if age >= 65 :
        price = .85 * price
        numSeniors = numSeniors + 1
else:
        numNonSeniors = numNonSeniors + 1


>>> print price, numSeniors, numNonSeniors
12.75 1 0
```

Python Session (cont)

```
>>> price = input("Enter the price: ")
Enter the price: 20
>>> age = input("Enter the age: ")
Enter the age: 22
>>> if age >= 65 :
        price = .85 * price
        numSeniors = numSeniors + 1
else:
        numNonSeniors = numNonSeniors + 1


>>> print price, numSeniors, numNonSeniors
20 1 1
```

Summary

- Comparison operators == <= >= > < !=
- Logical operators: and or not
- Indentation
- One Way Decisions
- Two way Decisions if : and else :
- Nested Decisions
- Multiway decisions using elif
- Try / Except to compensate for errors