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>
```

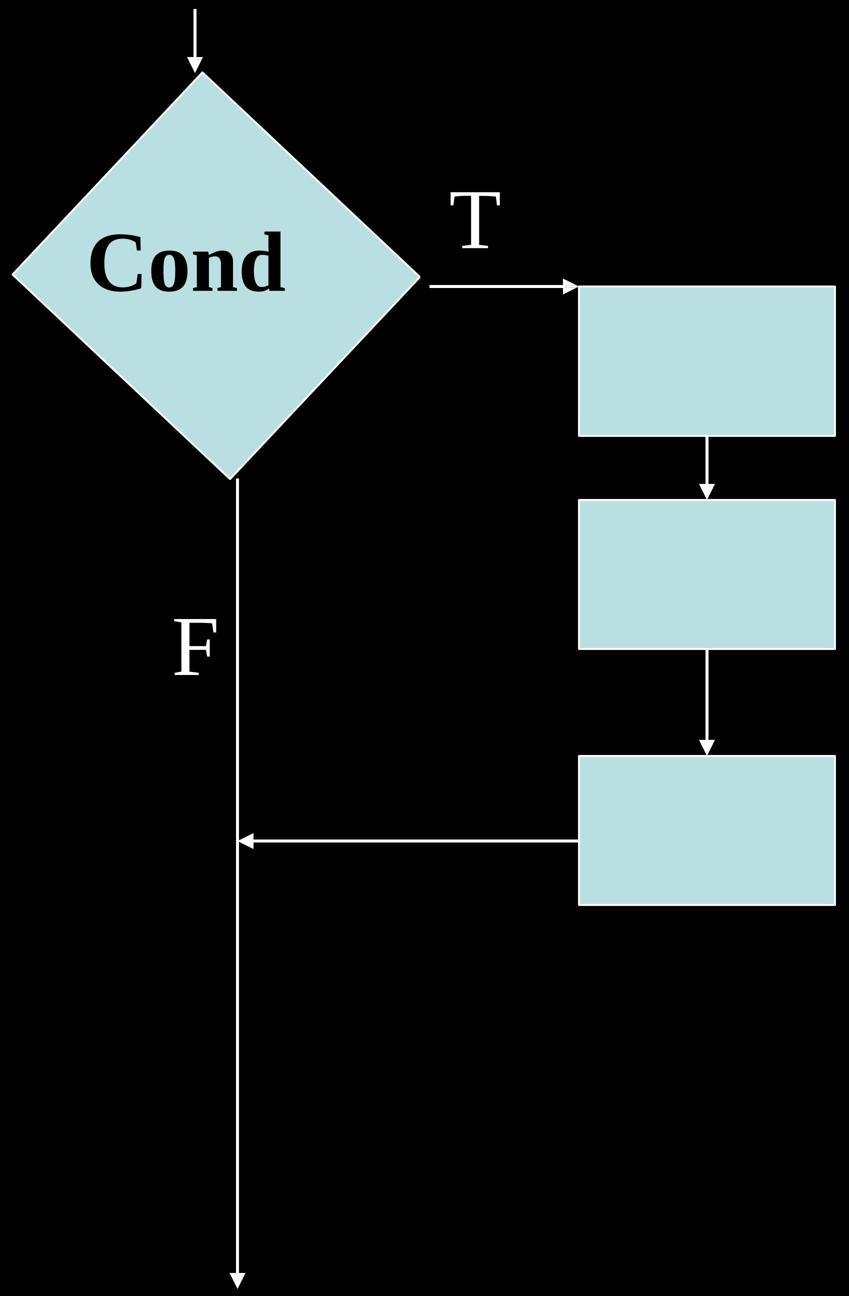
<condition> would be replaced by actual condition, etc.

The colon is required

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

The If-Statement

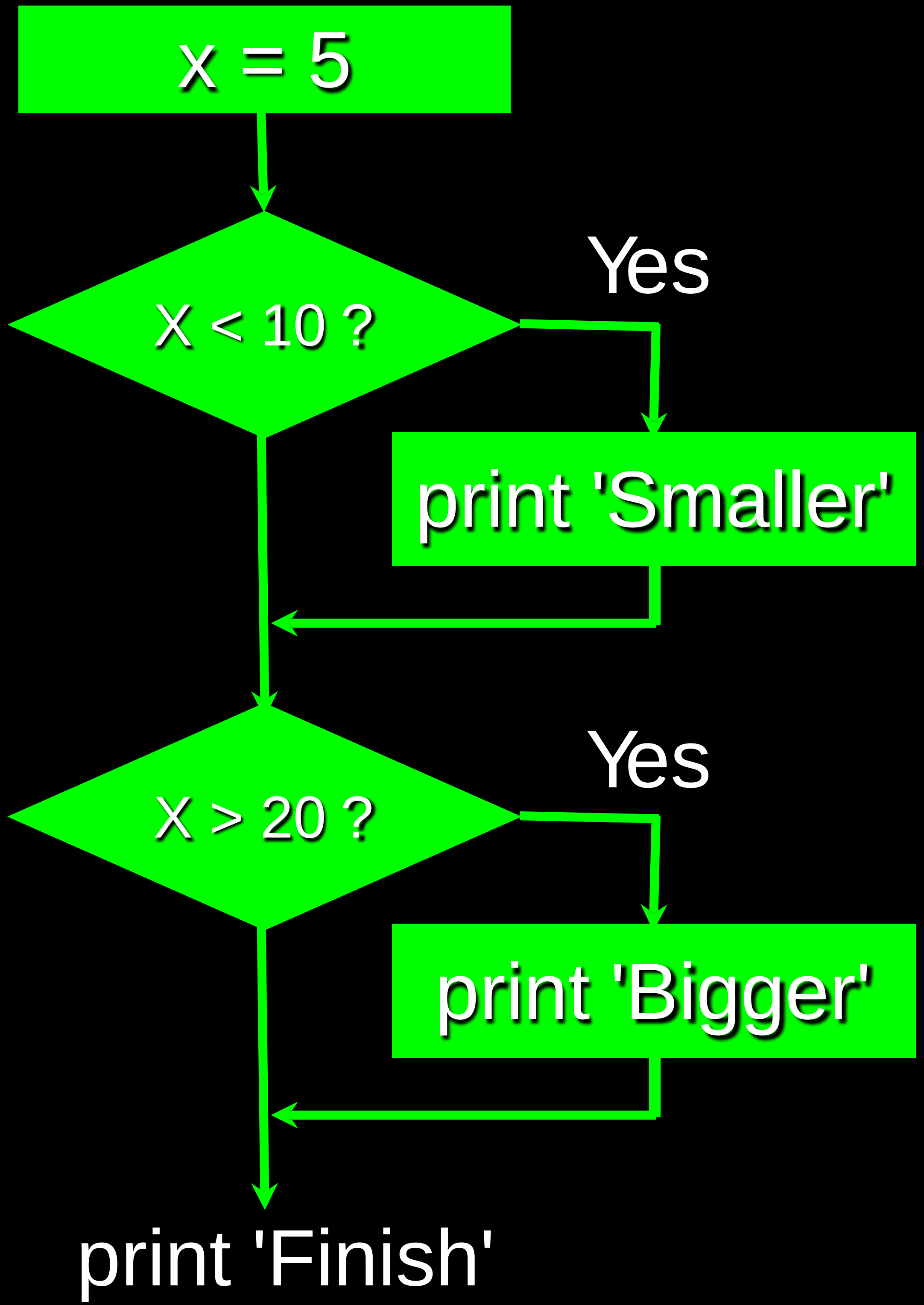
- Semantics:
  - the condition is evaluated
  - if the condition is true, the list of statements is executed



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 'Finish'
```

Output:

```
Smaller
Finish
```

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 assignmen

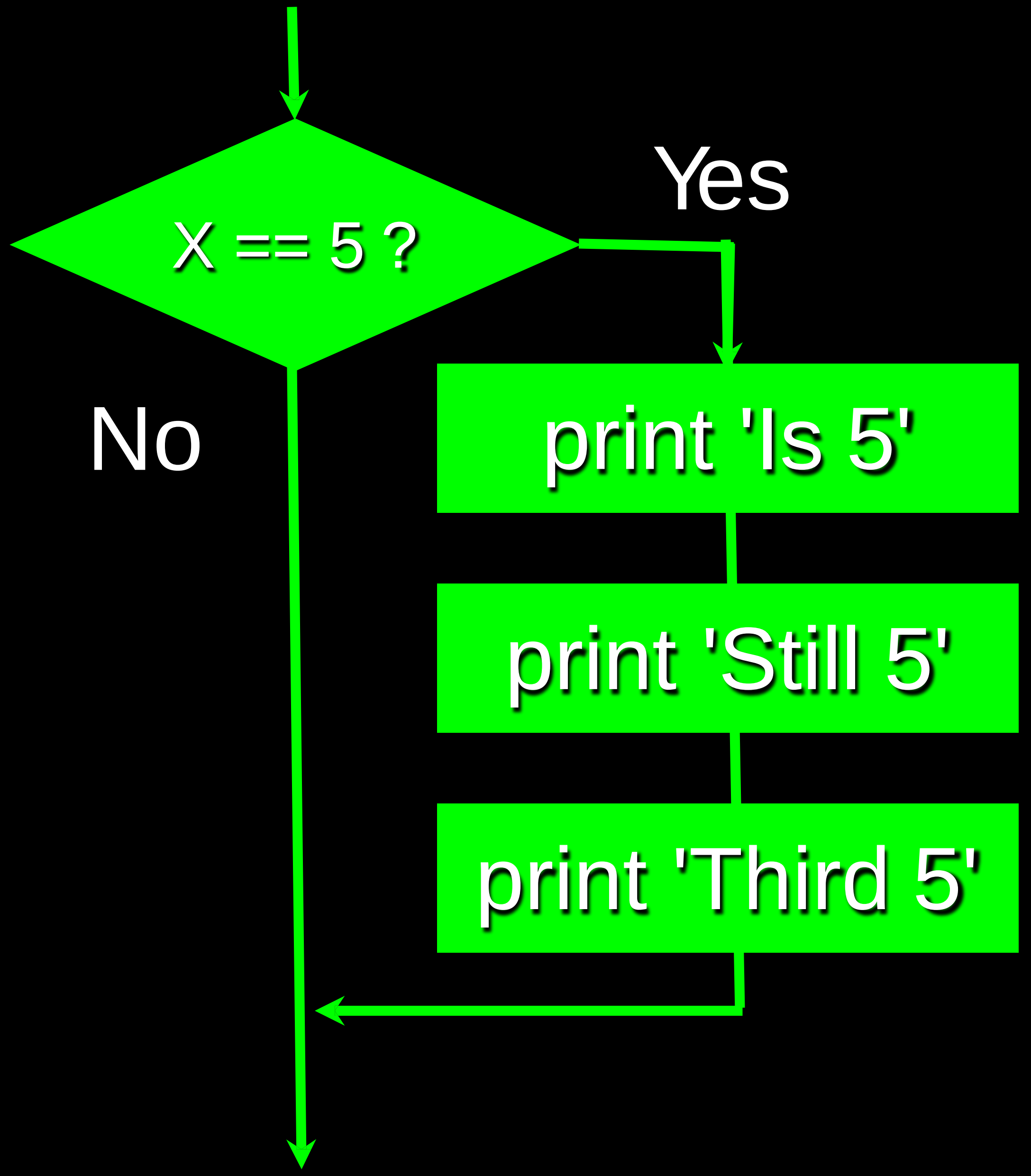
Comparison Operators

```
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

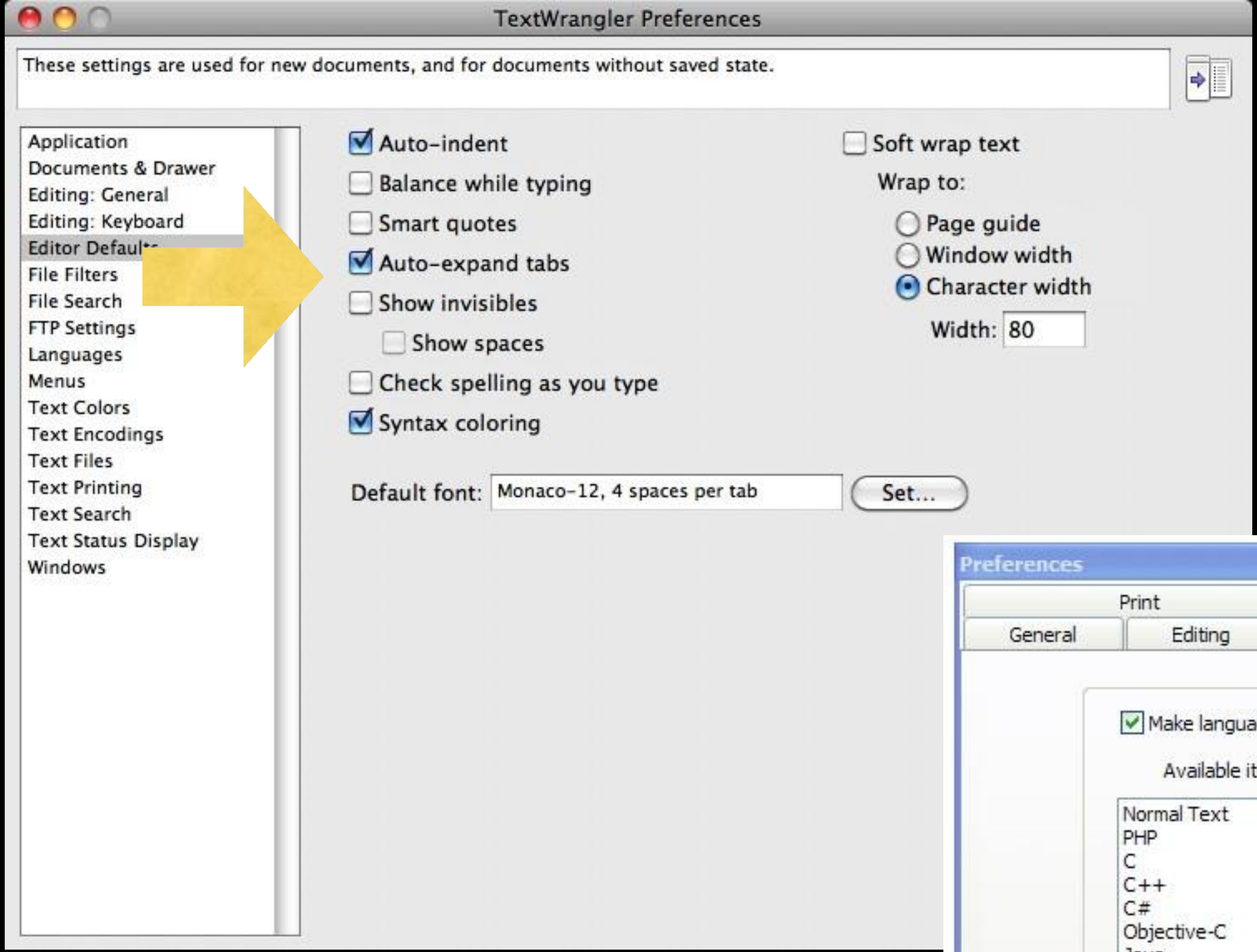
Indentation

- 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...


TextWrangler Preferences

These settings are used for new documents, and for documents without saved state.

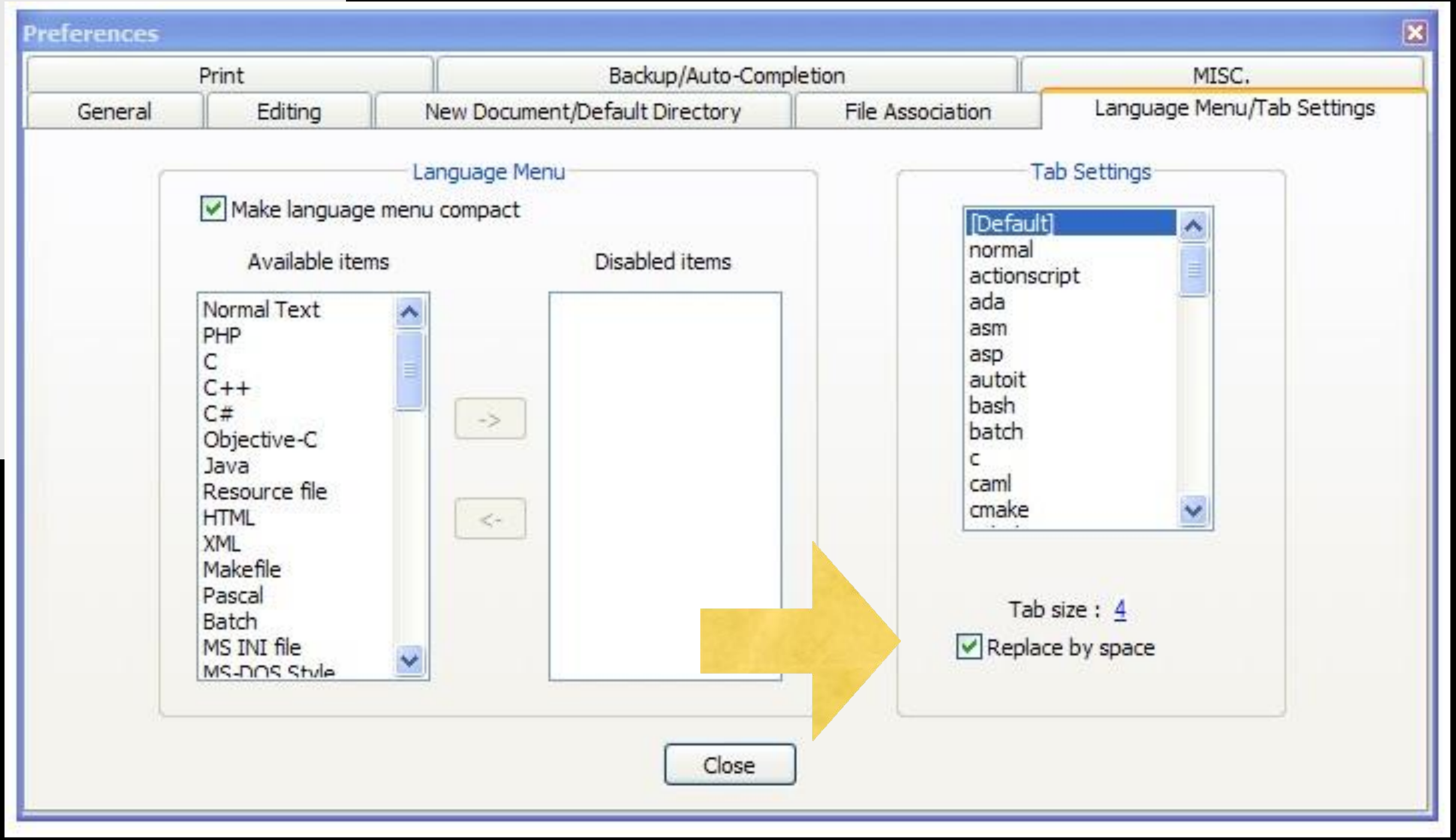
Application
Documents & Drawer
Editing: General
Editing: Keyboard
Editor Defaults
File Filters
File Search
FTP Settings
Languages
Menus
Text Colors
Text Encodings
Text Files
Text Printing
Text Search
Text Status Display
Windows

[✓] Auto-indent
[ ] Balance while typing
[ ] Smart quotes
[✓] Auto-expand tabs
[ ] Show invisibles
[ ] Show spaces
[ ] Check spelling as you type
[✓] Syntax coloring

[ ] Soft wrap text
Wrap to:
( ) Page guide
( ) Window width
(●) Character width
Width: 80

Default font: Monaco-12, 4 spaces per tab

This will save you much unnecessary pain.


Preferences

Language Menu

[✓] Make language menu compact

Available items: Normal Text, PHP, C, C++, C#, Objective-C, Java, Resource file, HTML, XML, Makefile, Pascal, Batch, MS INI file, MS-DOS Style

Disabled items

Tab Settings

[Default]
normal
actionscript
ada
asm
asp
autoit
bash
batch
c
caml
cmake

Tab size : 4

[✓] Replace by space

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

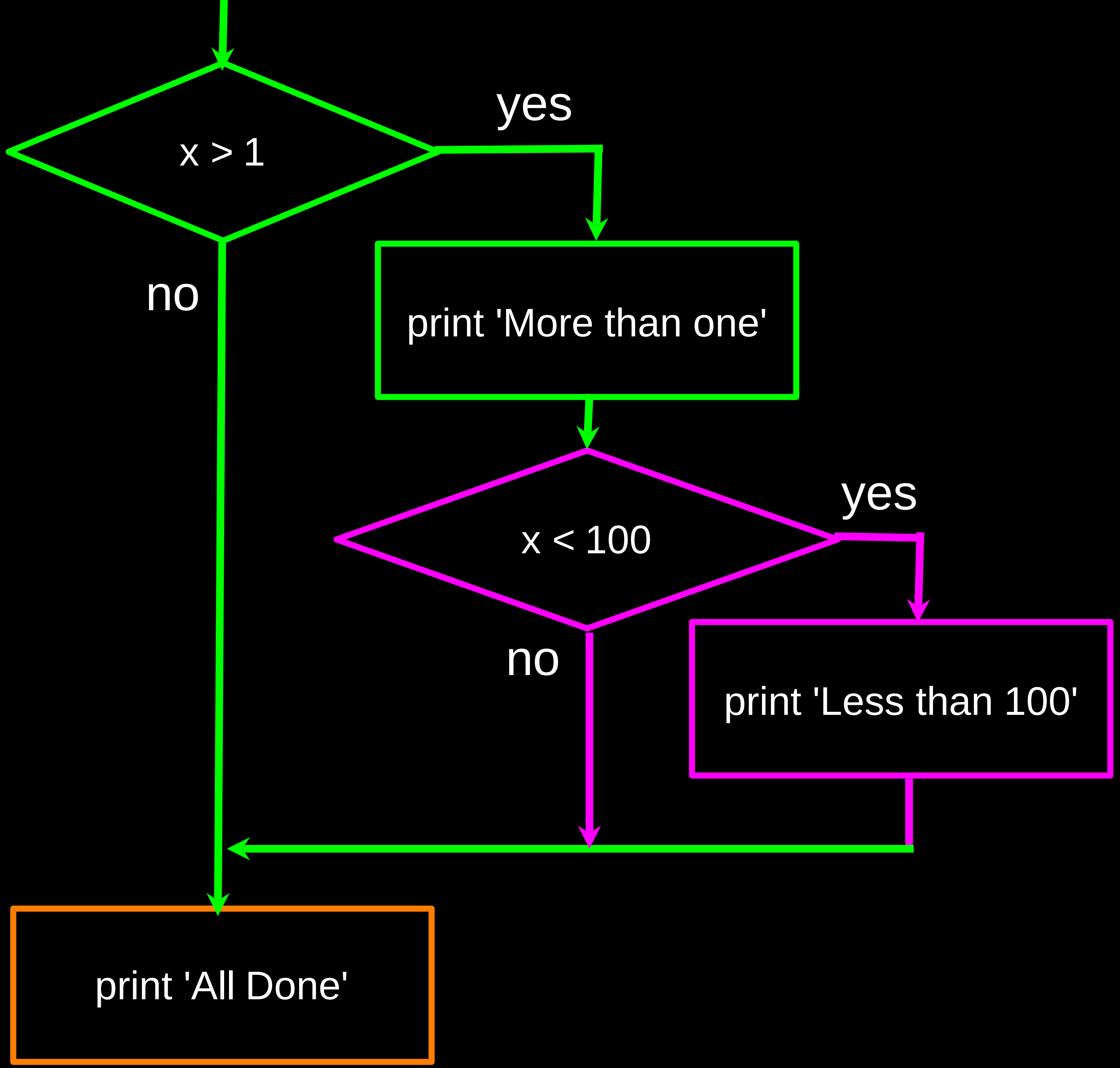
```
x = 5
if x > 2 :
    print 'Bigger than 2'
    print 'Still bigger'
print 'Done with 2'
```

```
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'
```

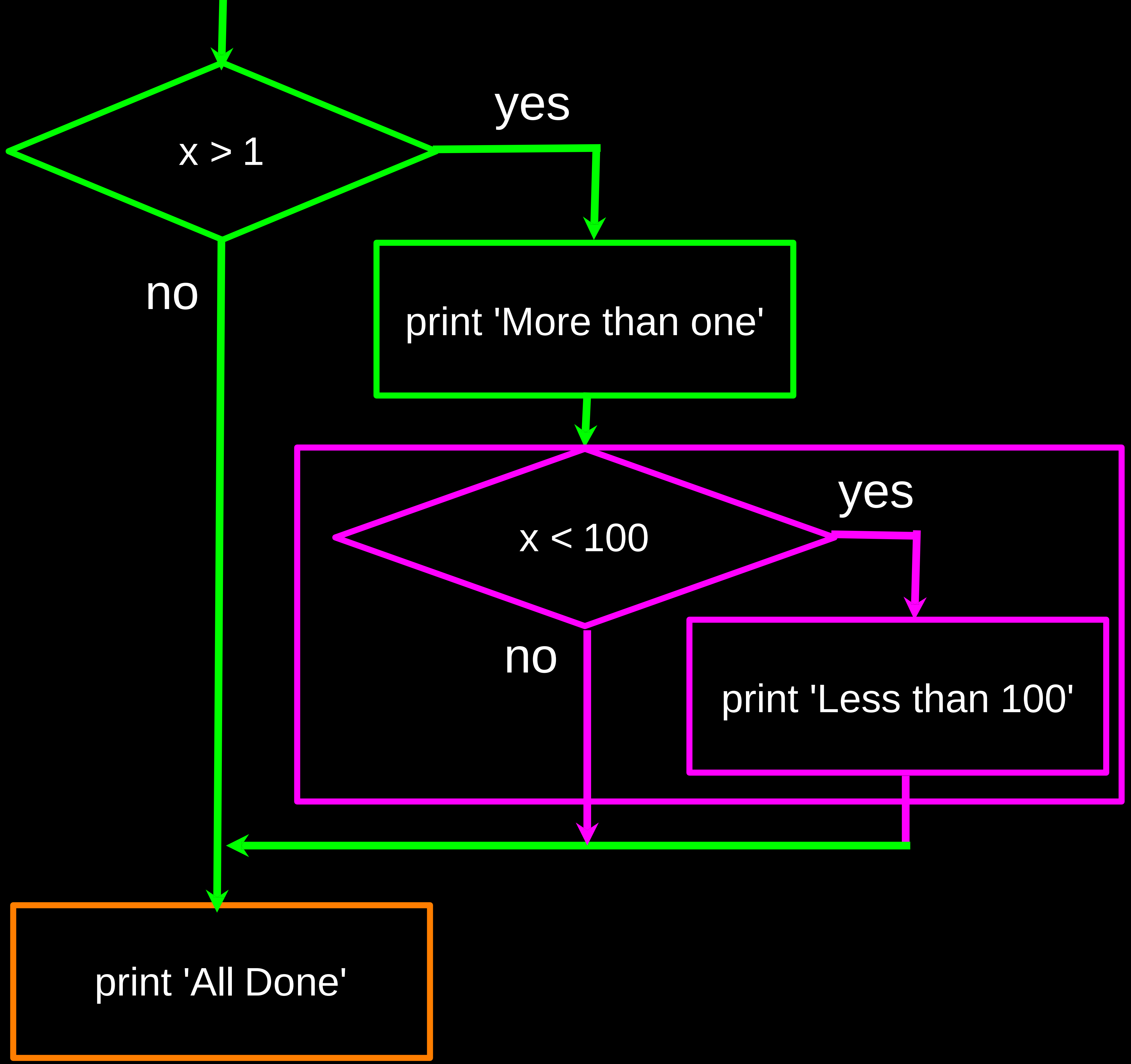
Nested Decisions

```
x = 42

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

print 'All done'
```



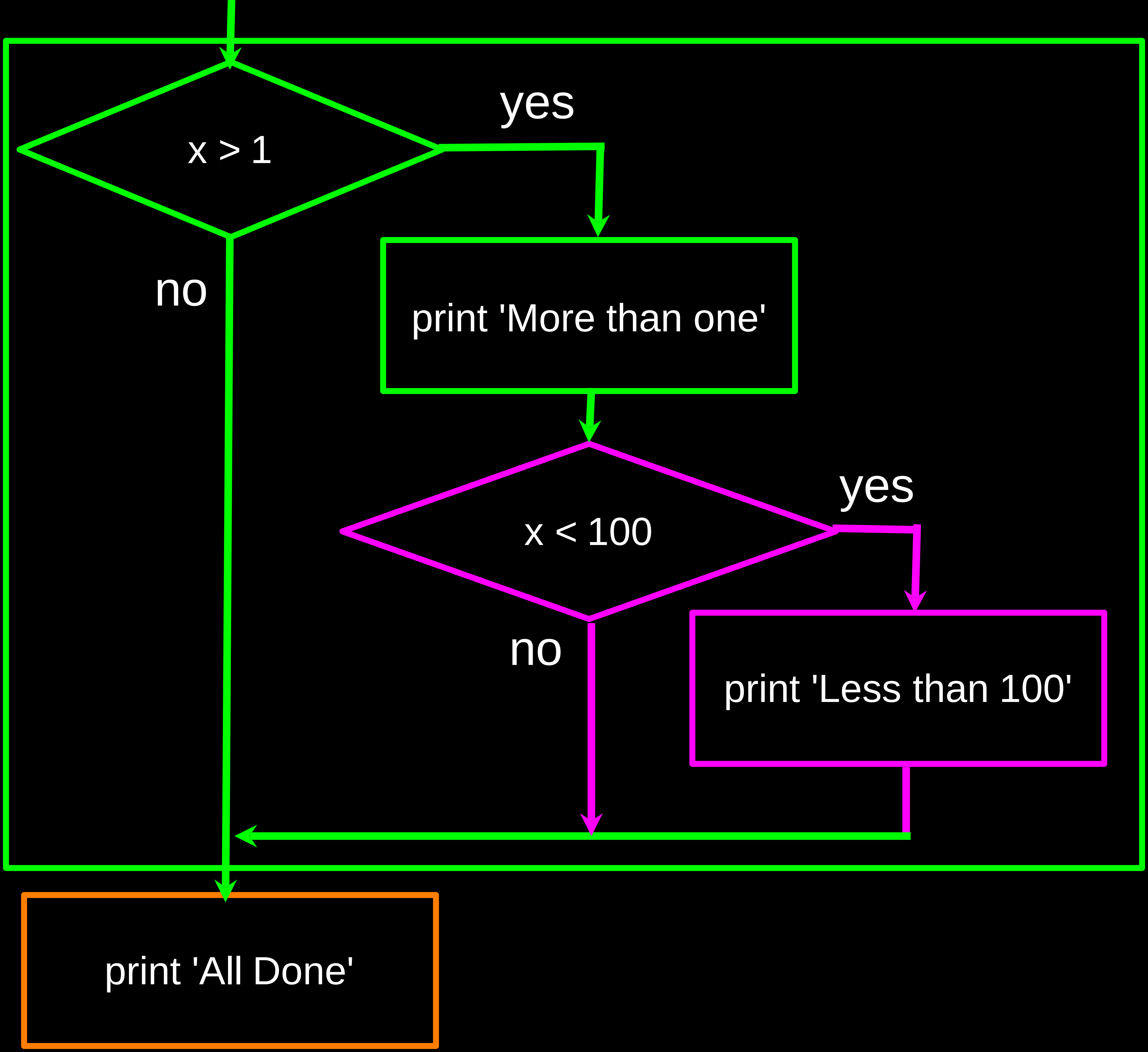
Nested Decisions

```
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

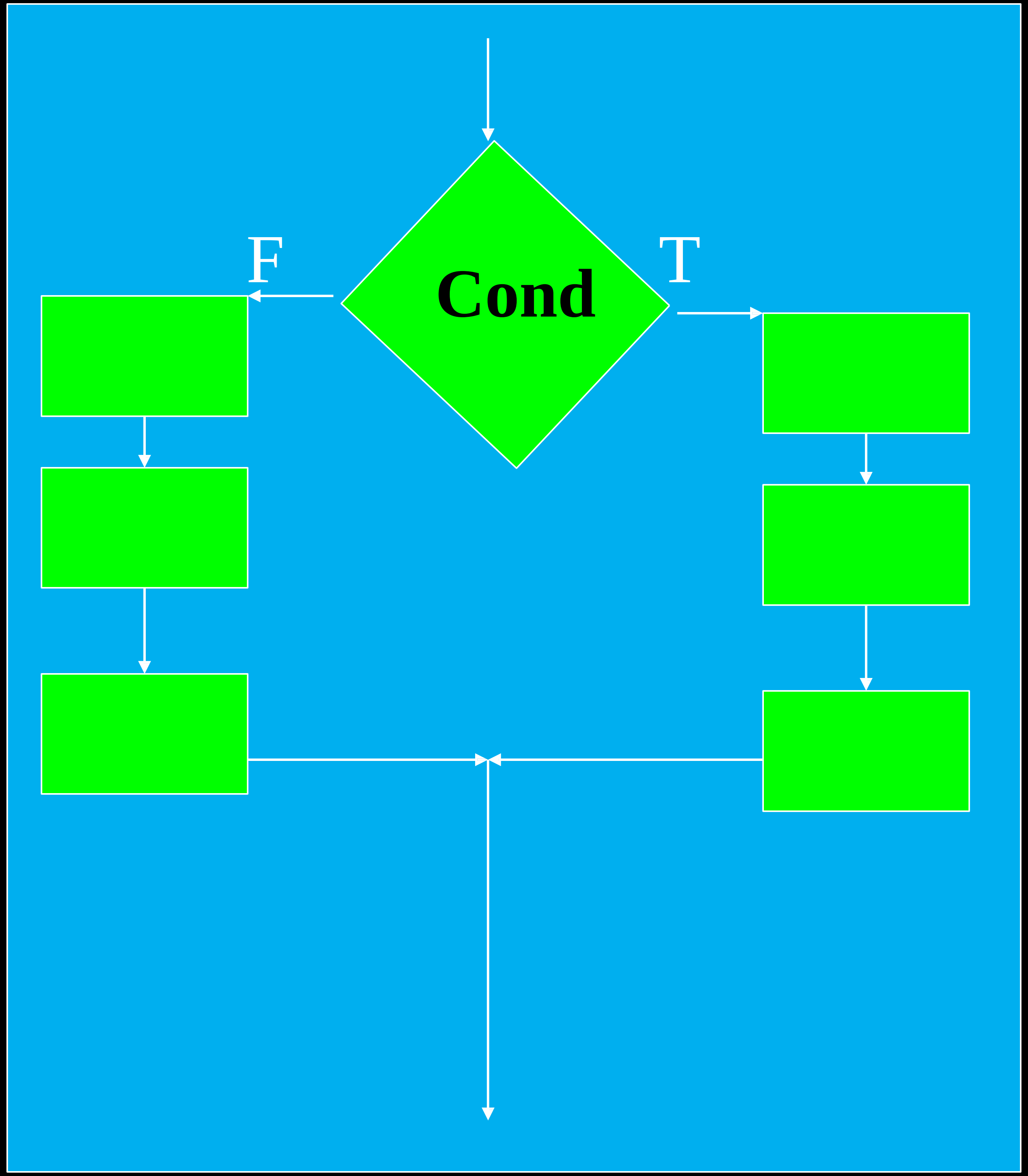
- Syntax

```
 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

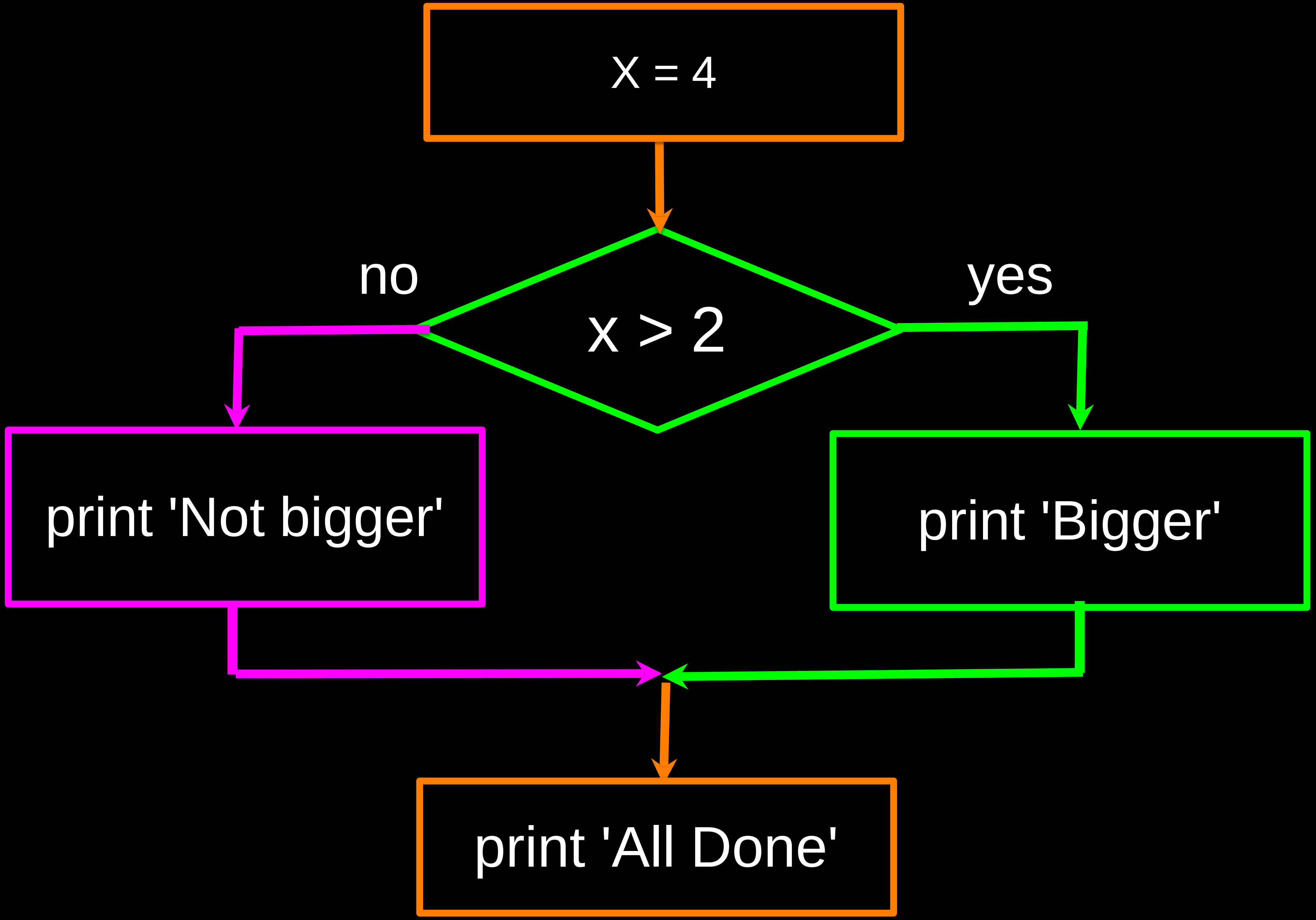
-
  ```
  if yearsWorked > 10 :

      bonus = 1000
  else :
      bonus = 500
  ```

-
  ```
  if age >= 65 :
      price = 0.85 * price
      numSeniors = numSeniors + 1
  else :
      nonSeniors = nonSeniors + 1
  ```

Two Way Decisions

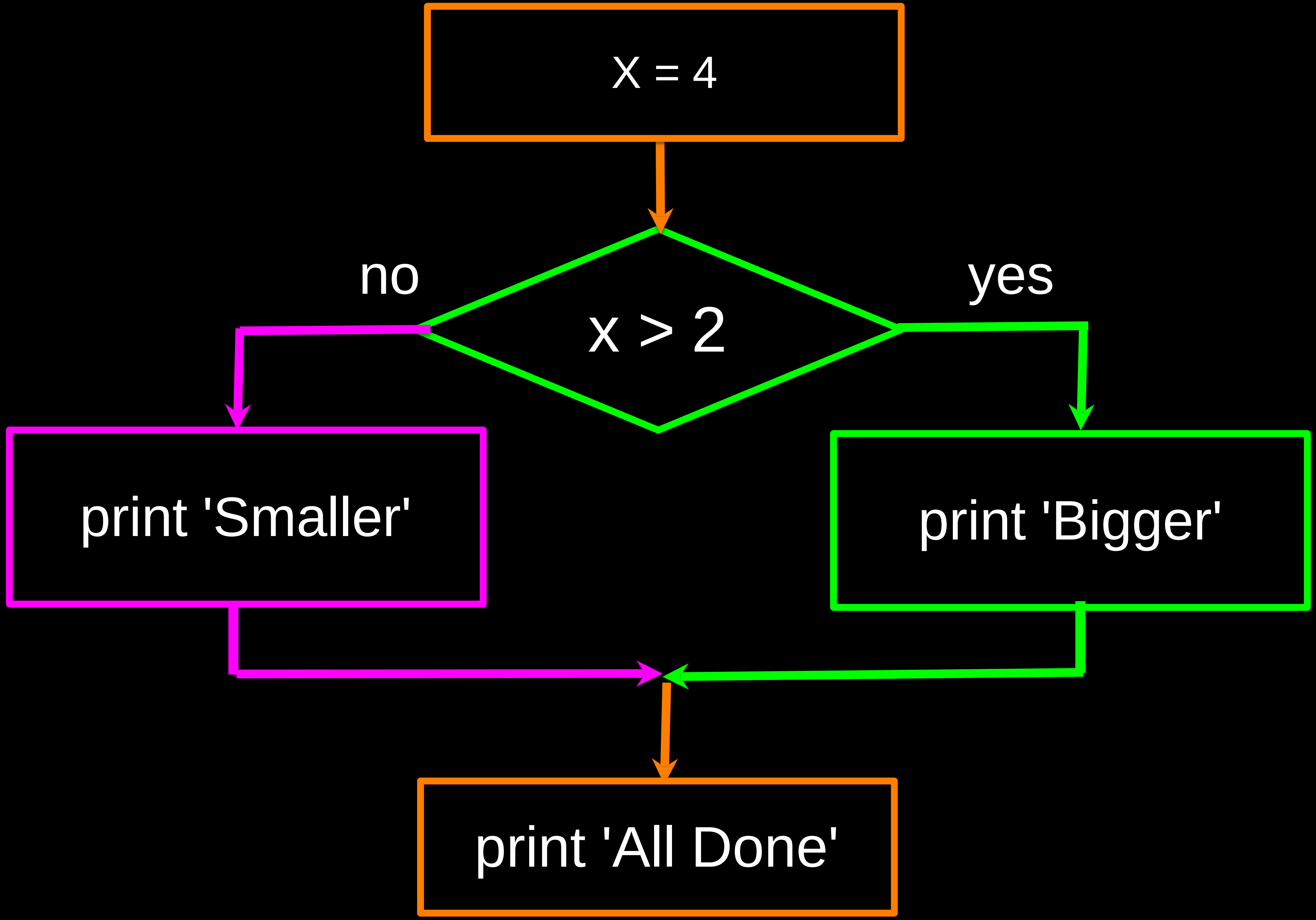
- Sometimes we want to do one thing if a logical expression is true and something else if the expression is false

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



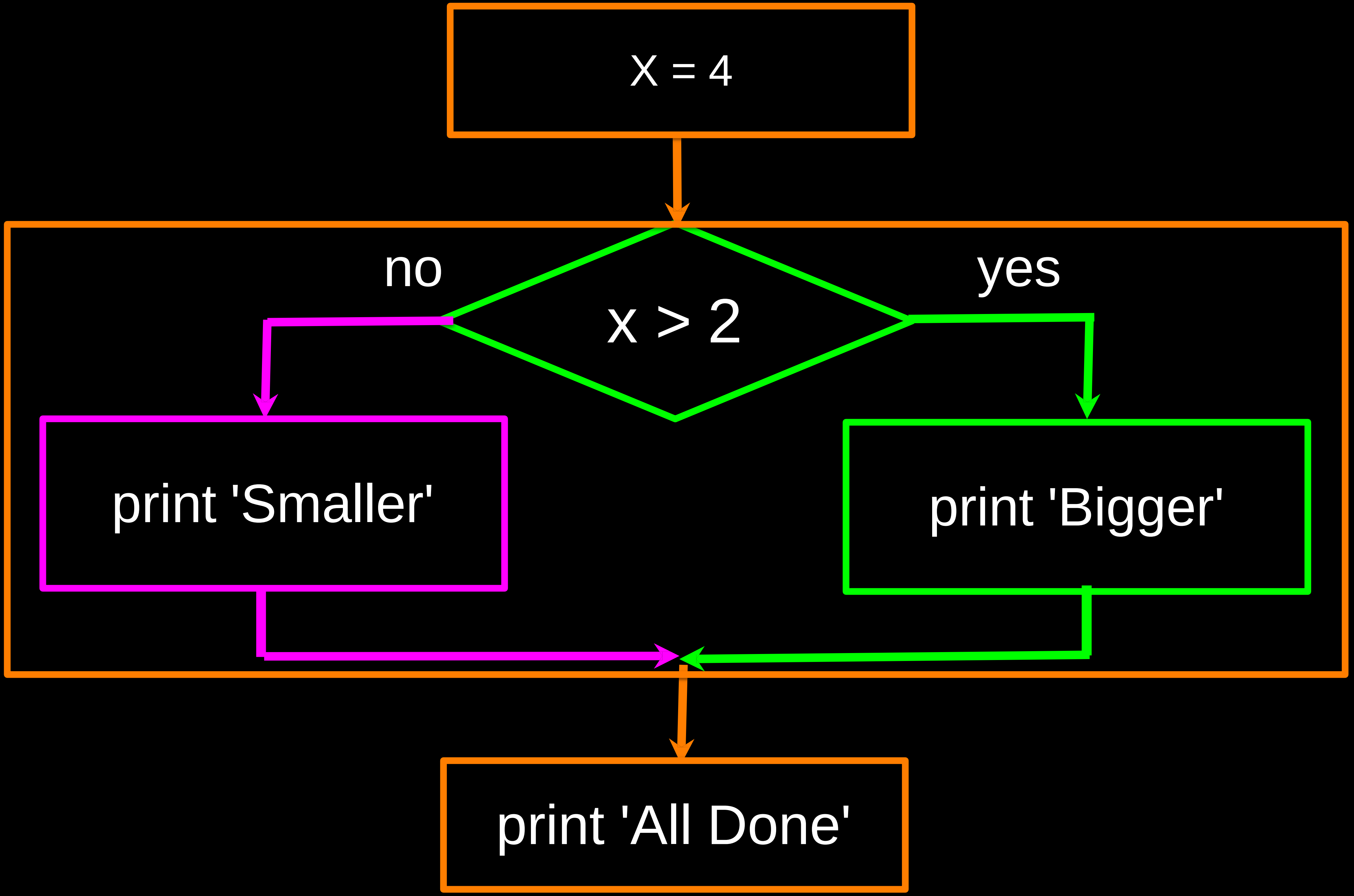
Two-way using else :

```
x = 4

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

print 'All done'
```



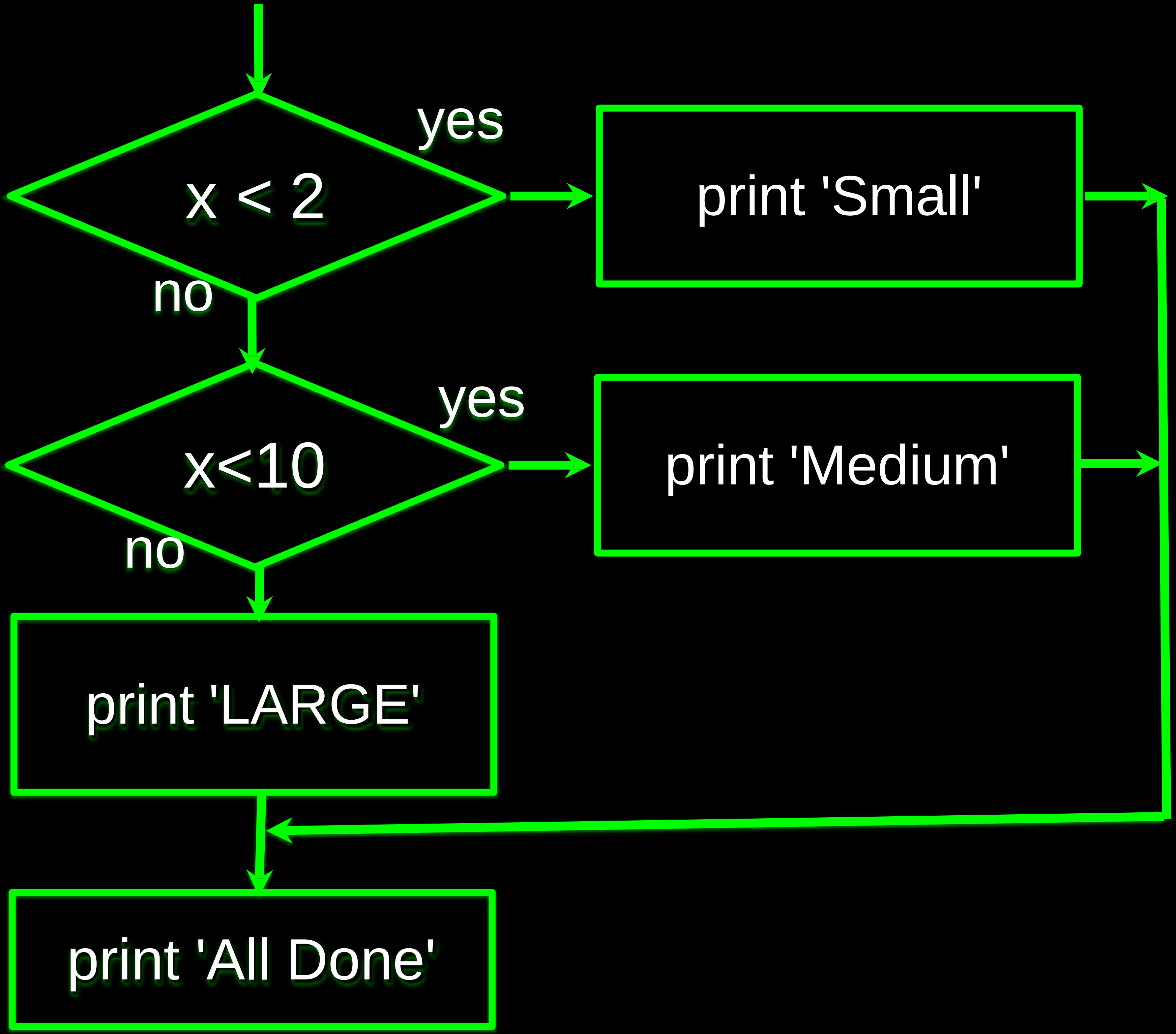
Two-way using else :

```
x = 4

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

print 'All done'
```



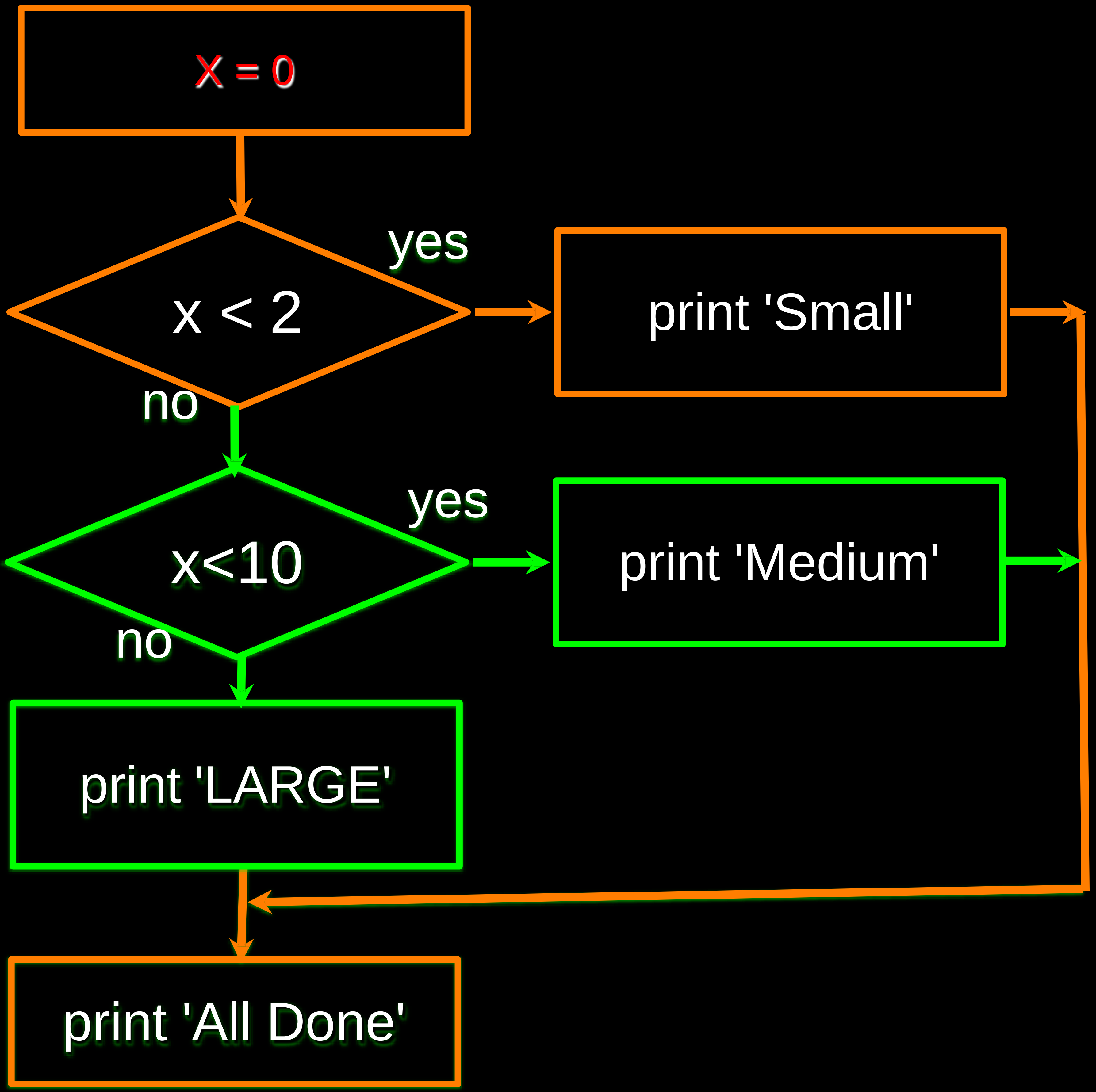
Multi-way

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



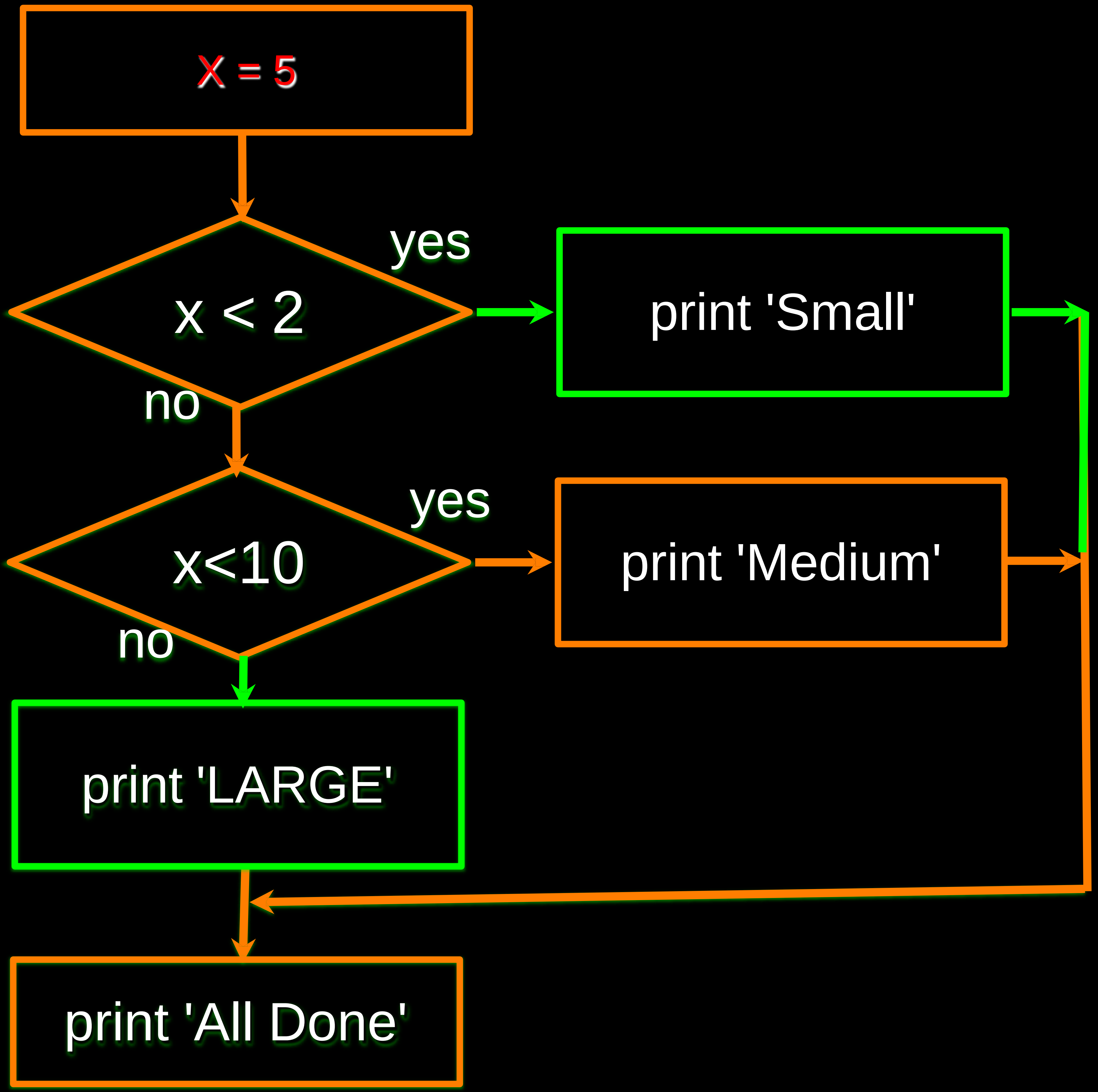
Multi-way

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



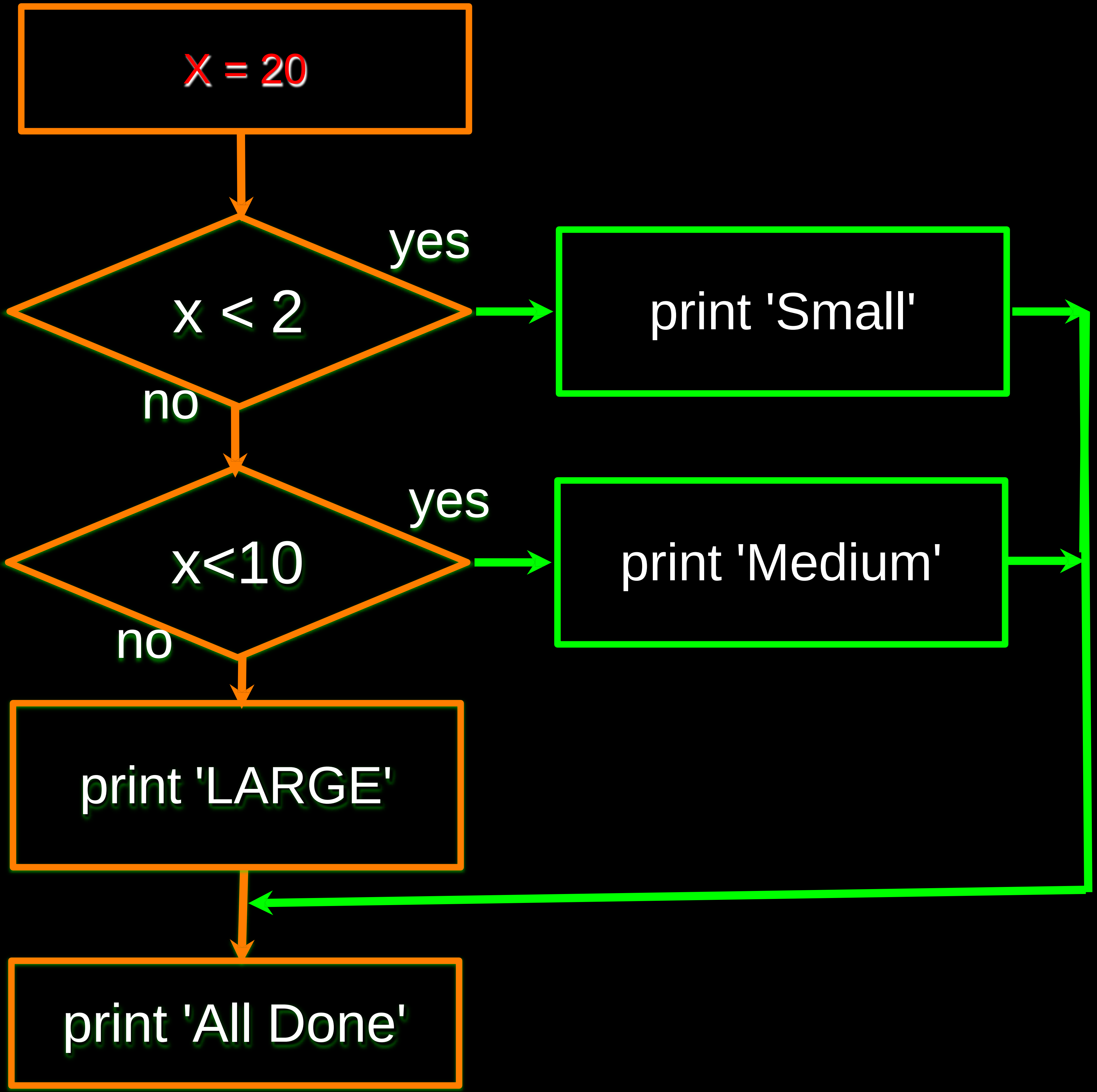
Multi-way

```
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'
```

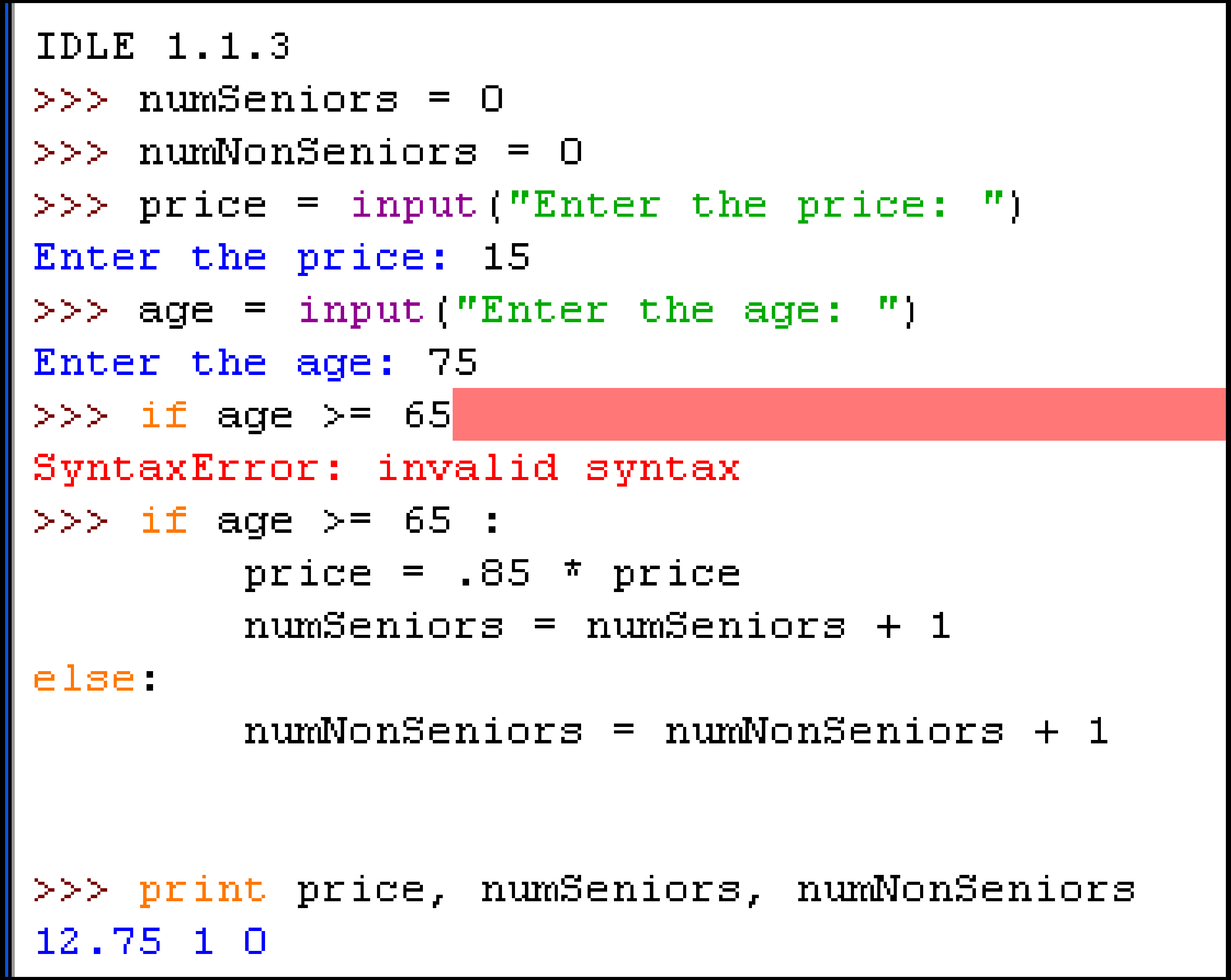
```
if x < 2 :
    print 'Below 2'
elif x < 20 :
    print 'Below 20'
elif x < 10 :
    print 'Below 10'
else :
    print 'Something else'
```

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'
```

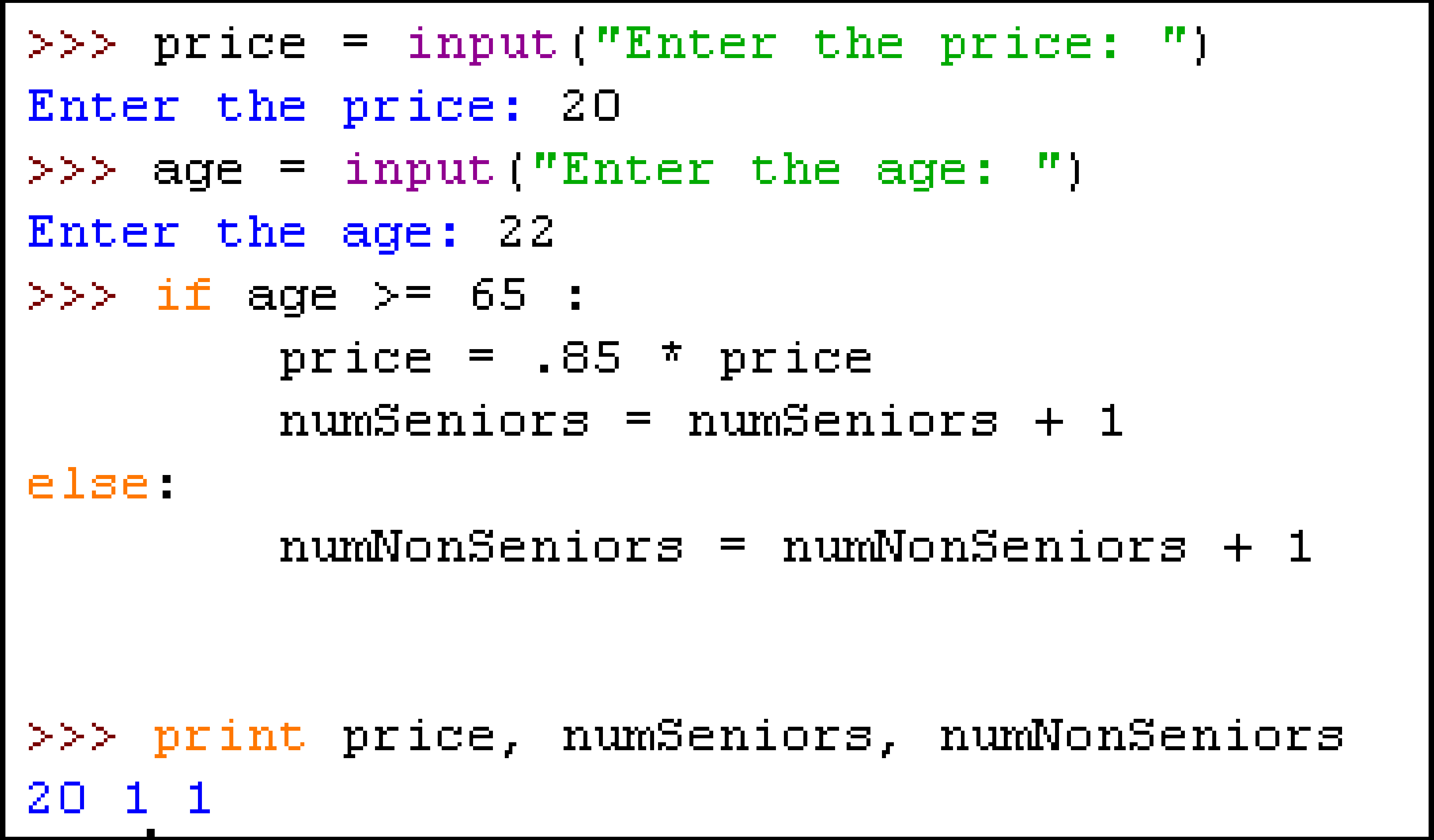
```
$ python trynum.py
Enter a number:42
Nice work
$ python trynum.py
Enter a number:fourtytwo
Not a number
$
```

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