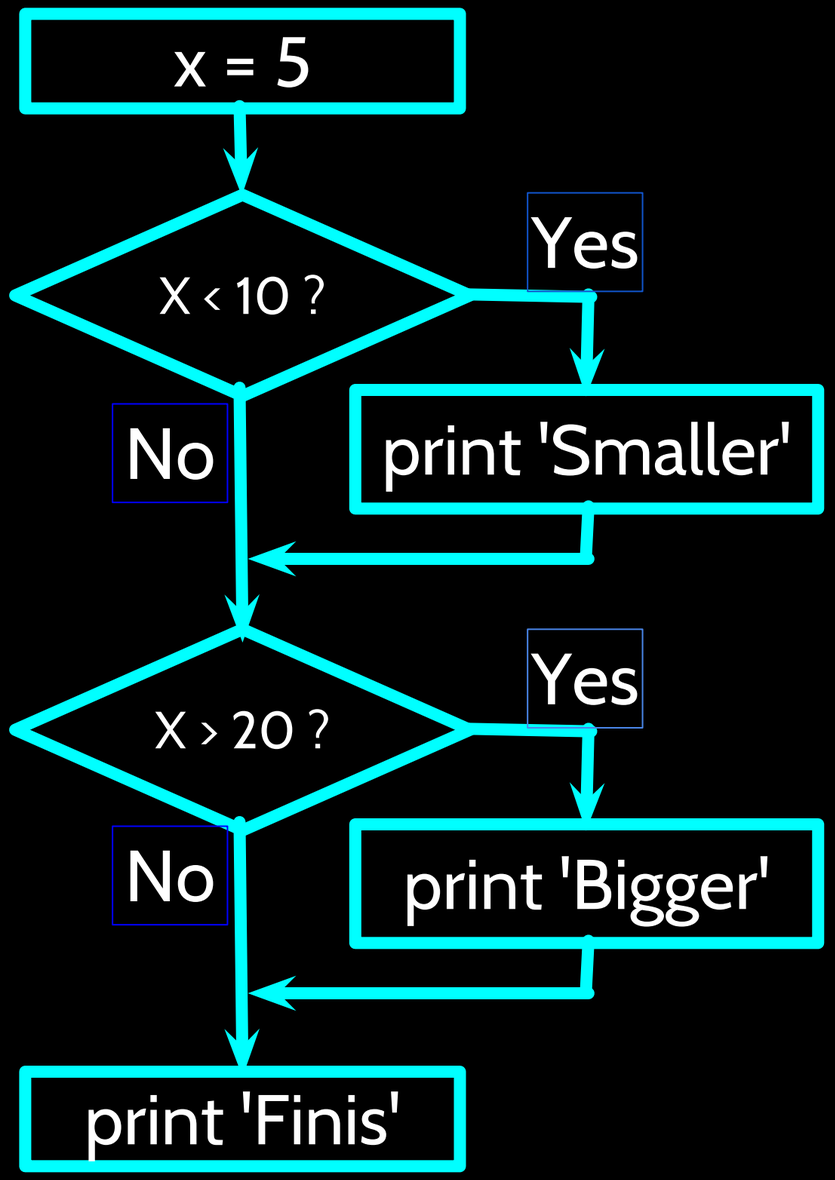
Conditional Execution

Chapter 3

Python for Informatics: Exploring Information
www.pythonlearn.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 - 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.

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

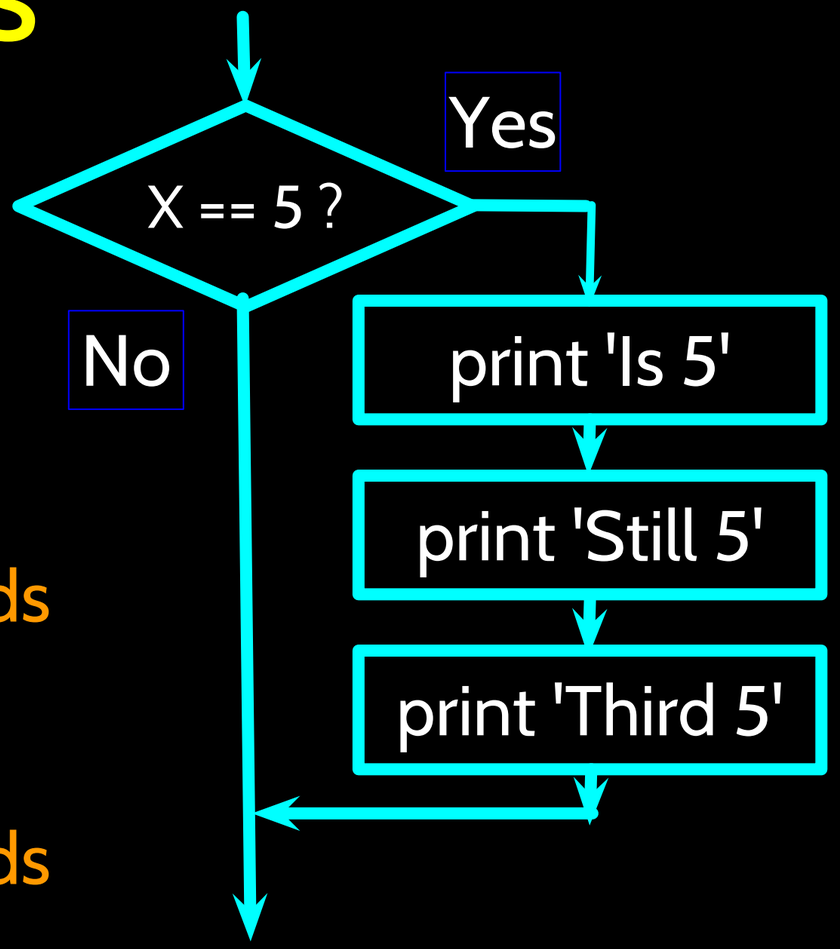
Less than or Equals 5

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
```

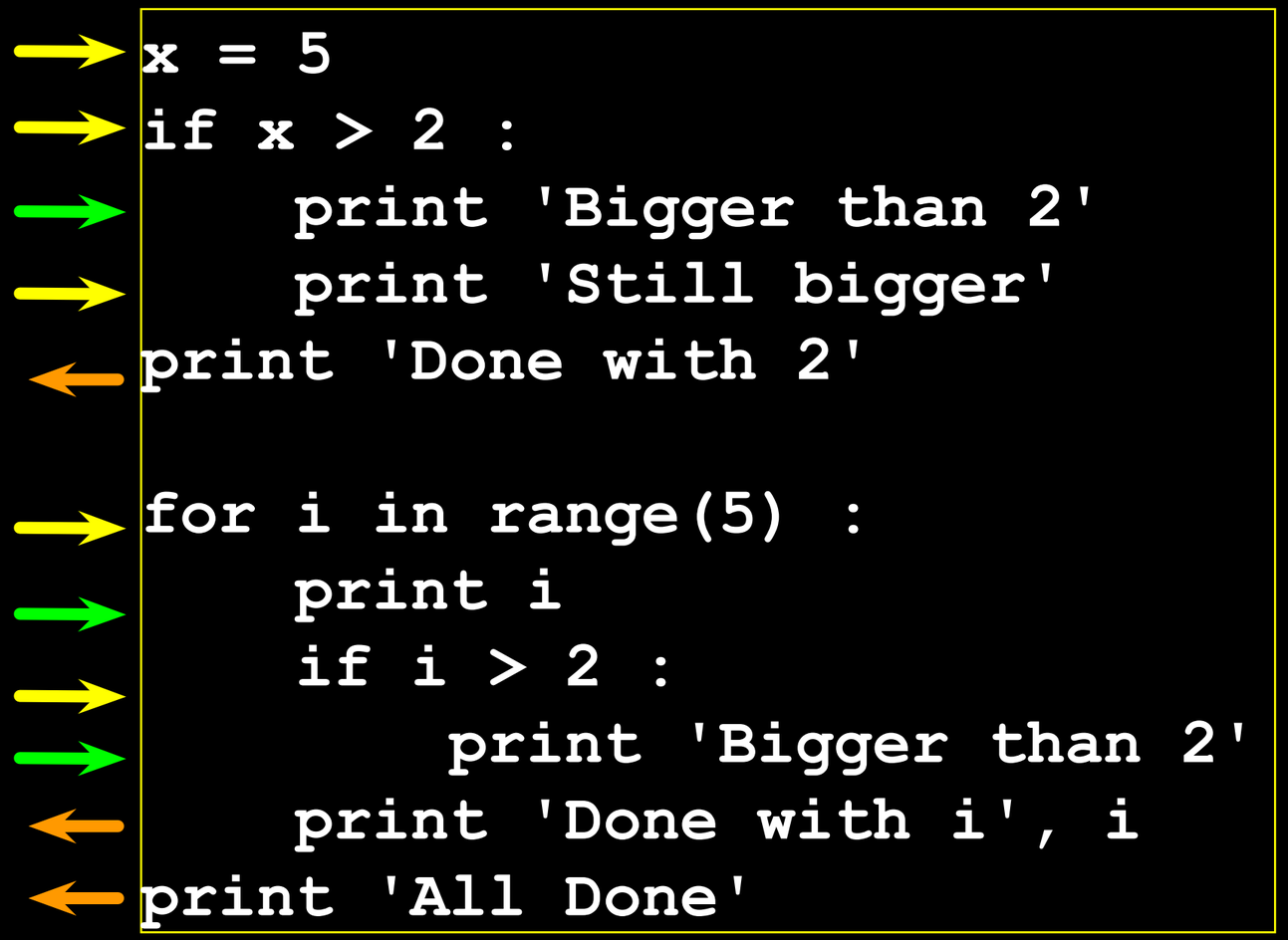


Indentation

- 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

increase / maintain after if or for

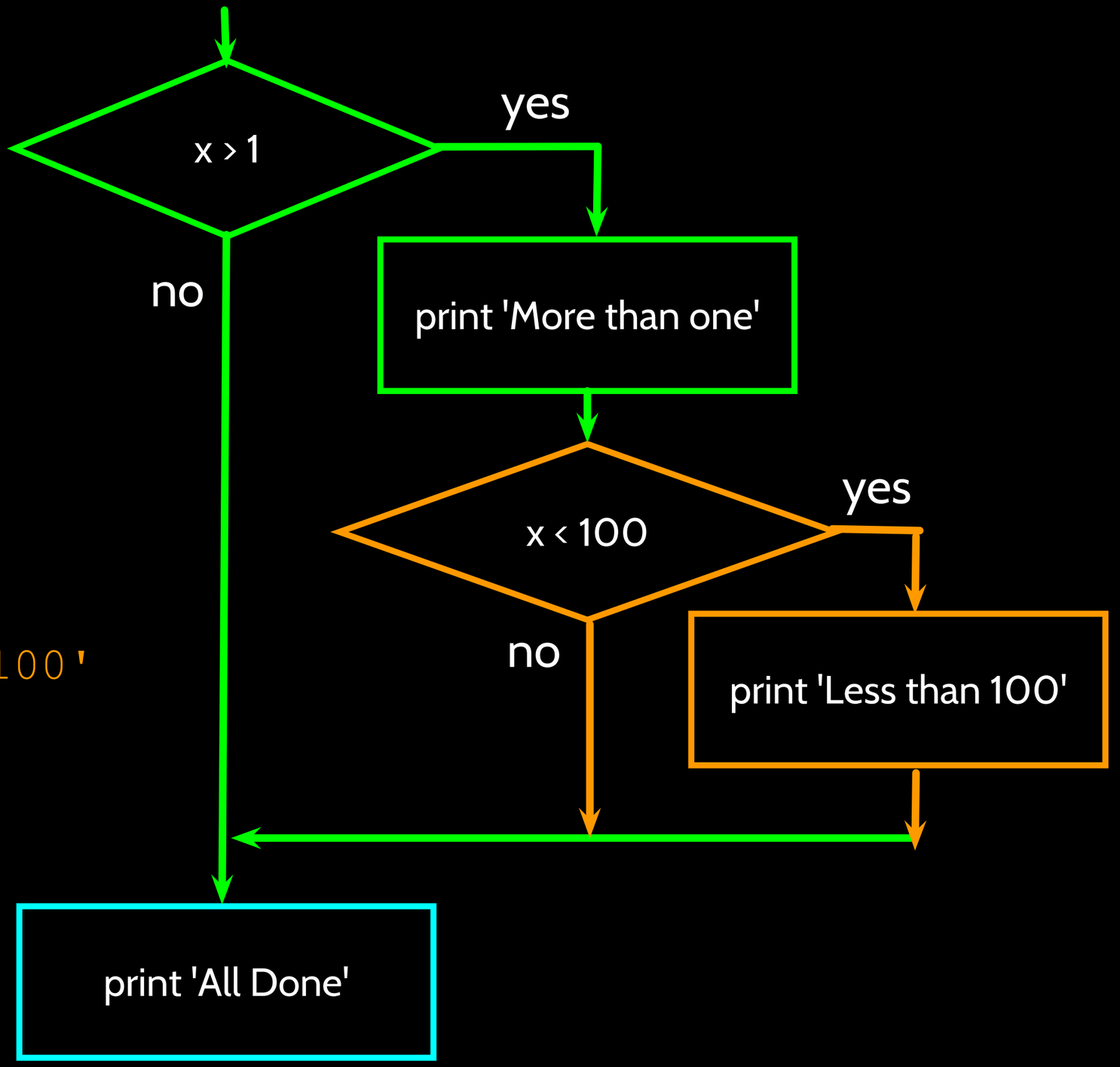
decrease to indicate end of block



```
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'
```

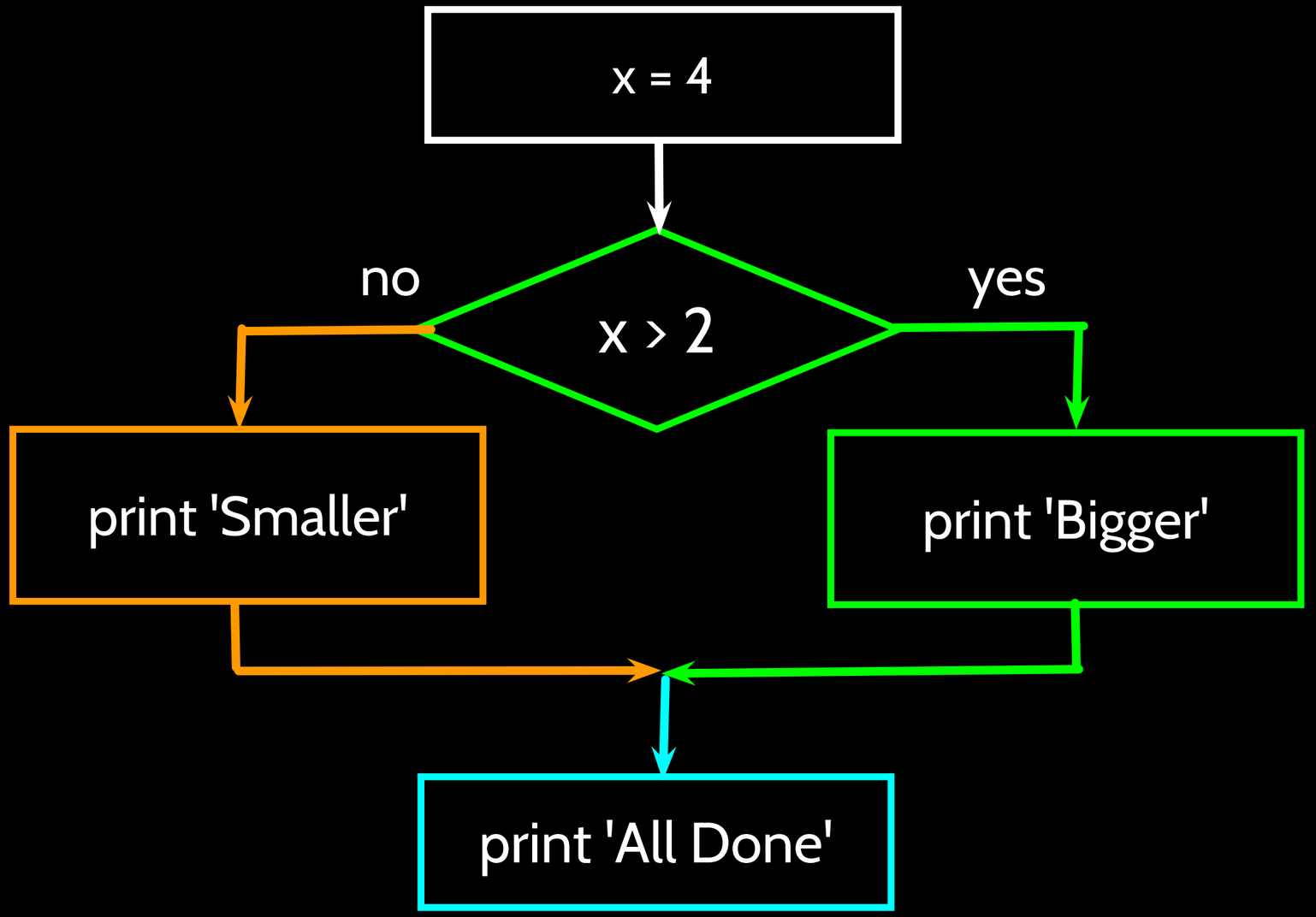
Nested Decisions

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



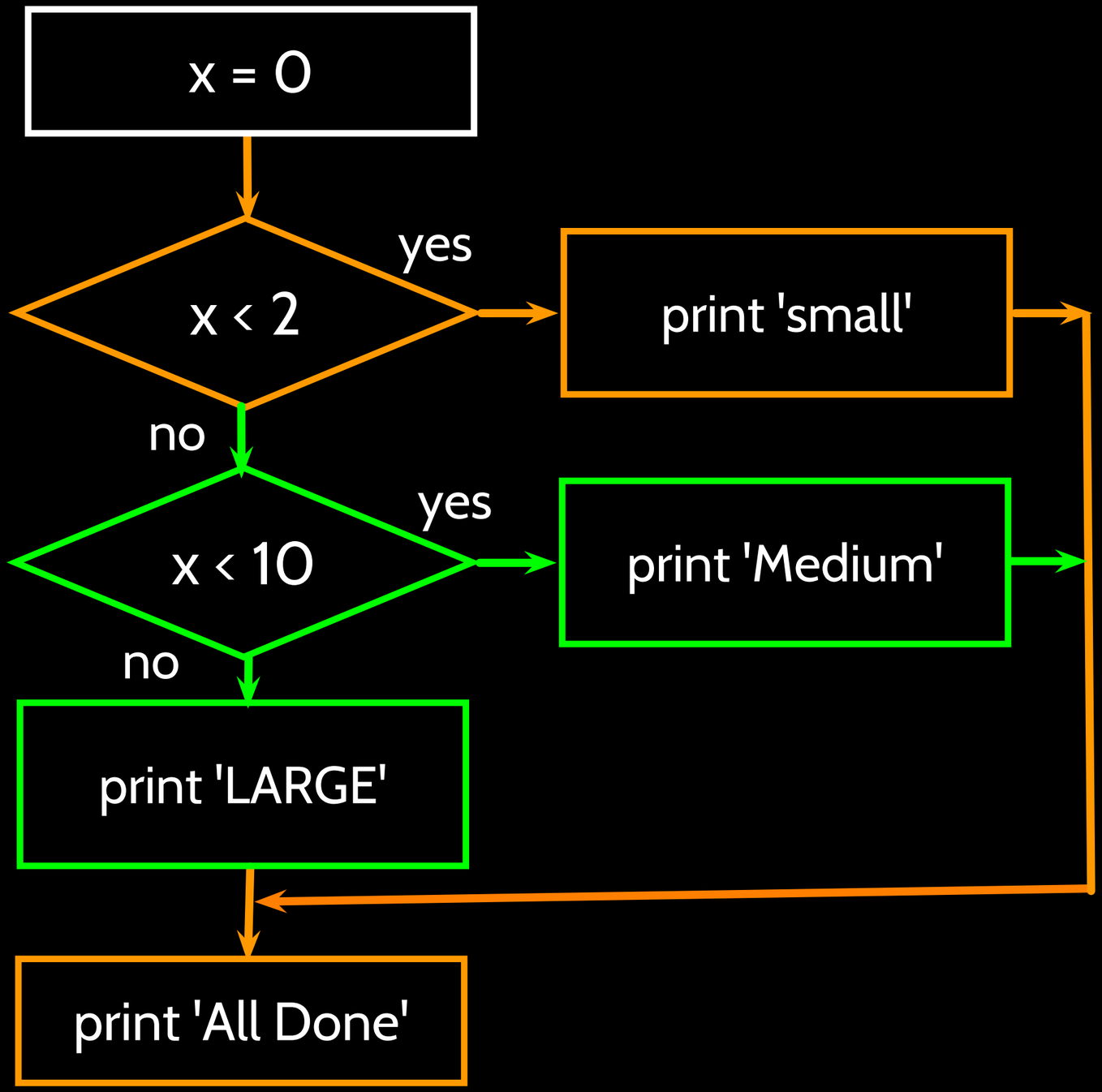
Two-way using else :

```
x = 4

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

print 'All done'
```



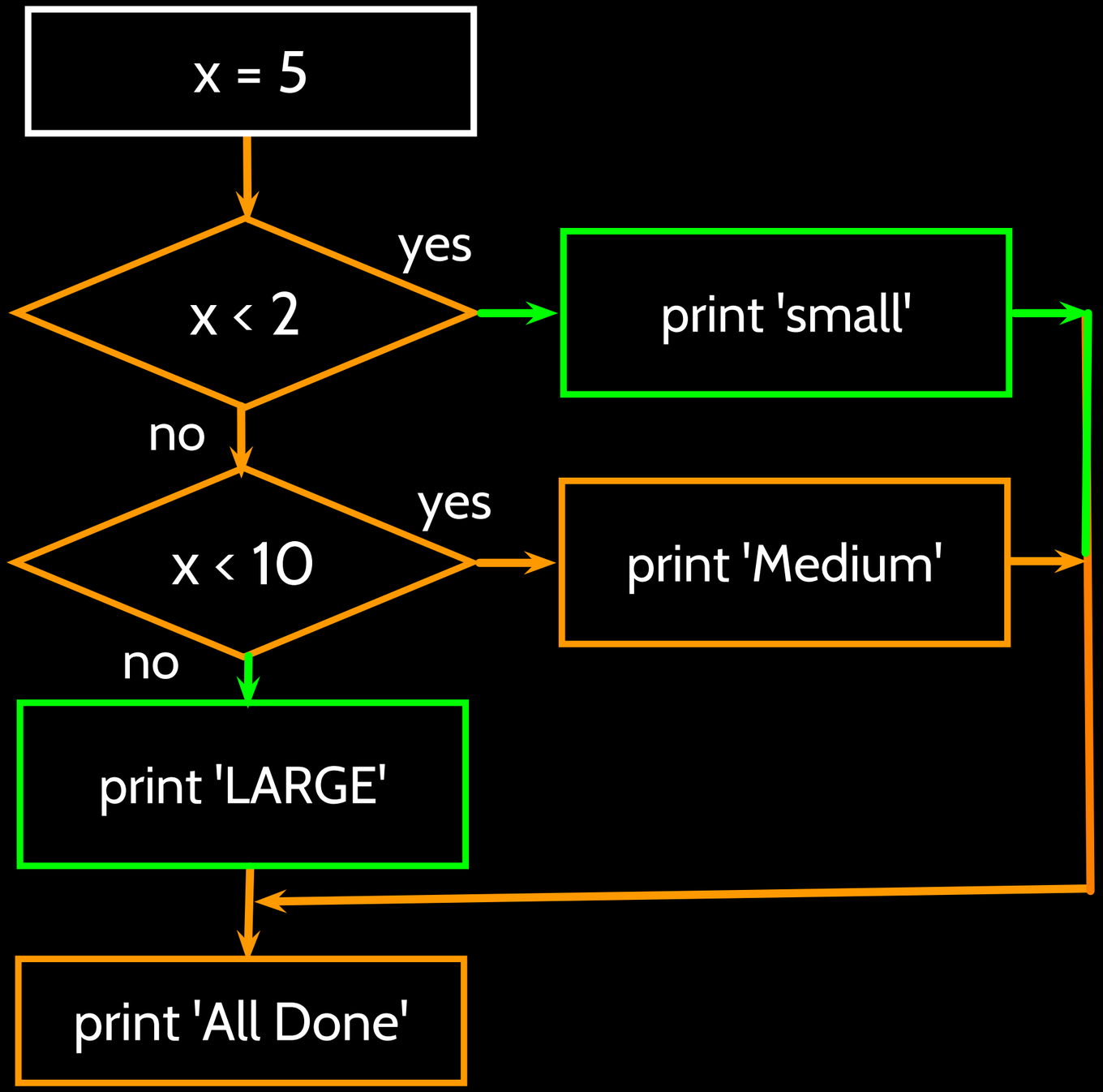
Multi-way

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



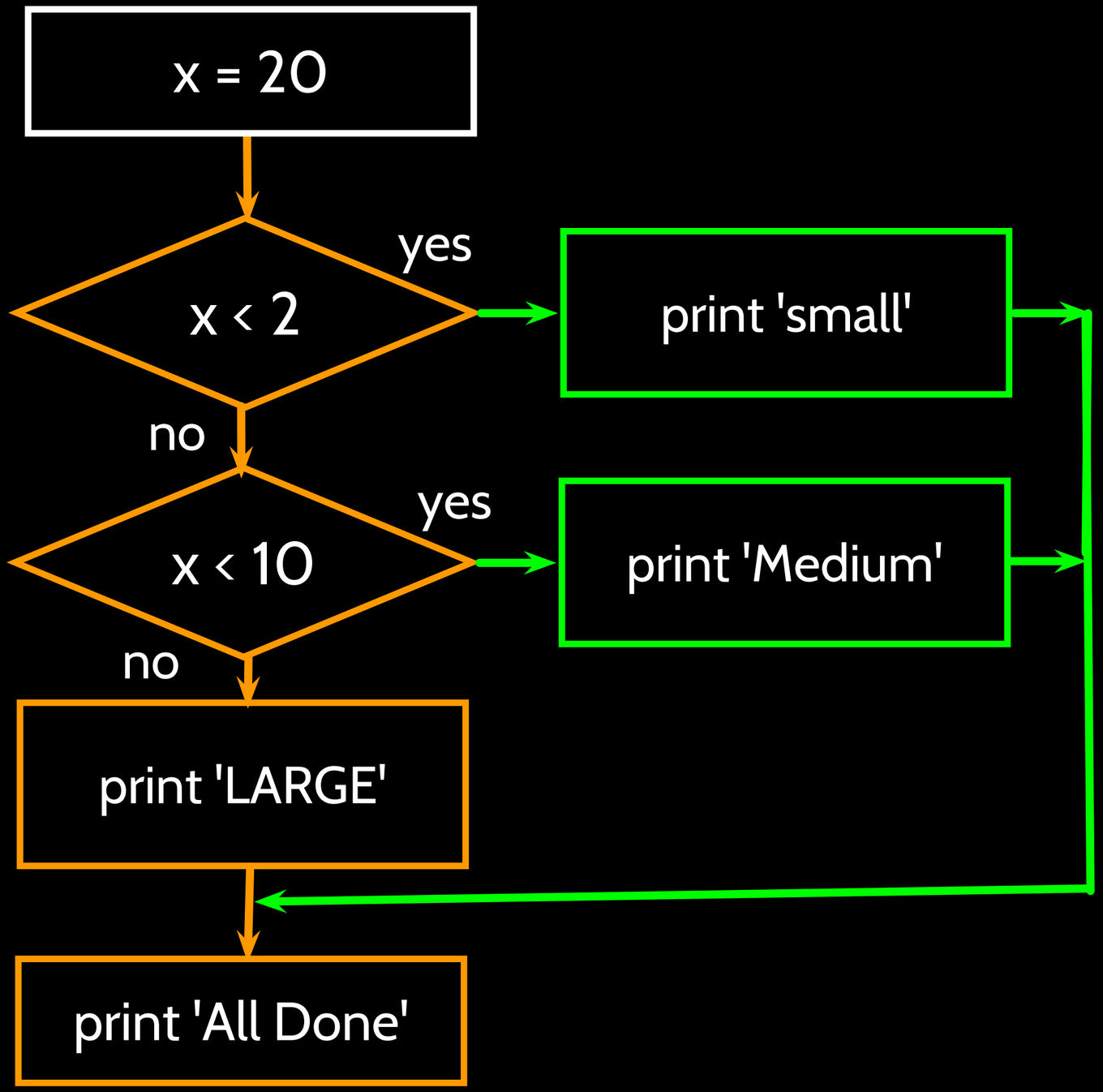
Multi-way

```
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'
```

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

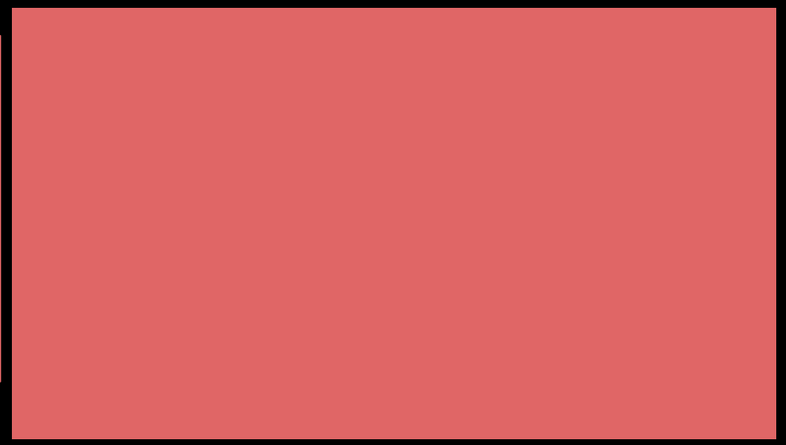
```
$ cat notry.py
astr = 'Hello Bob'
istr = int(astr)
print 'First', istr
astr = '123'
istr = int(astr)
print 'Second', istr
```

```
$ python 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

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

The program stops here



```
$ python 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

```
$ cat tryexcept.py
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
```

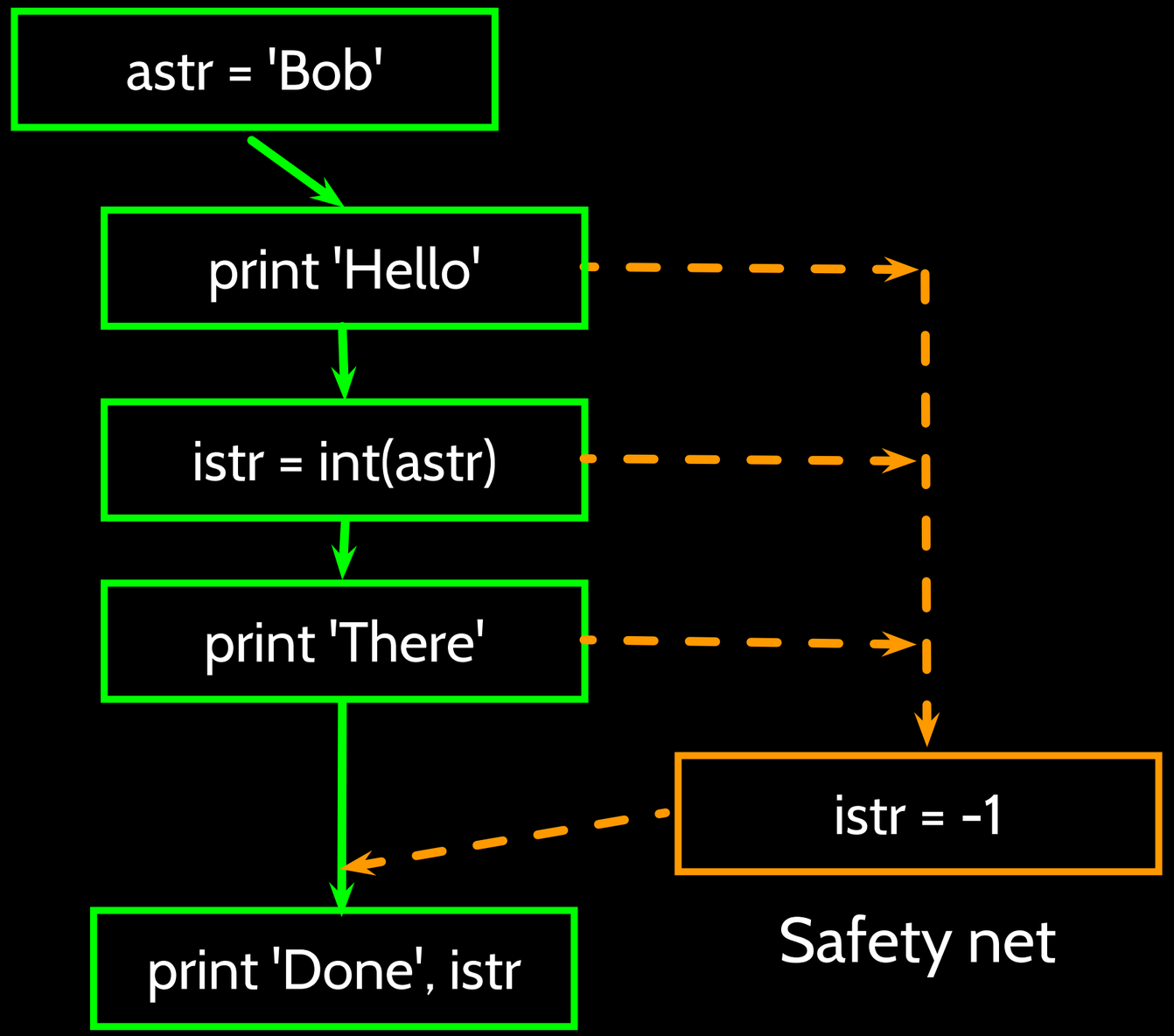
When the first conversion fails - it just drops into the except: clause and the program continues.

```
$ 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 = 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:forty-two
Not a number
$
```

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

Summary

- Comparison operators
  `==` `<=` `>=` `>` `<` `!` `=`
- Logical operators: and or not
- Indentation
- One-way Decisions
- Two-way decisions:
  if: and else:
- Nested Decisions
- Multi-way decisions using elif
- try / except to compensate for errors
- Short circuit evaluations

Acknowledgements / Contributions

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