
Severance, Charles

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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"
Several ifs

```python
faren = 120
if (faren > 90):
    print "Heat Warning"
if (faren < 32):
    print "Cold Warning"
```

Input Celsius Temperature
Fahrenheit = \(\frac{9}{5} \times \text{celsius} + 32\)
Print Fahrenheit

- Fahrenheit > 90?
  - yes: Print a Heat Warning
  - no: Fahrenheit < 30?
  - yes: Print a Cold Warning
  - no: Print a Cold Warning
Several ifs

faren = 120
if ( faren > 90) :
    print "Heat Warning"

if ( faren < 32) :
    print "Cold Warning"
Comparison Operators

- **Boolean expressions** using comparison operators evaluate to - True / False - Yes / No

- **Boolean expressions** ask a question and produce a Yes or No result which we use to control program flow

- **Comparison operators** look at variables but do not change the variables

<table>
<thead>
<tr>
<th>Python</th>
<th>Mathematics</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;</td>
<td>&lt;</td>
<td>Less than</td>
</tr>
<tr>
<td>&lt;=</td>
<td>≤</td>
<td>Less than or equal to</td>
</tr>
<tr>
<td>==</td>
<td>=</td>
<td>Equal to</td>
</tr>
<tr>
<td>&gt;=</td>
<td>≥</td>
<td>Greater than or equal to</td>
</tr>
<tr>
<td>&gt;</td>
<td>&gt;</td>
<td>Greater than</td>
</tr>
<tr>
<td>!=</td>
<td>≠</td>
<td>Not equal to</td>
</tr>
</tbody>
</table>

<expr> <relop> <expr>
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"
Review Indentation

• Must increase 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 can appear anywhere

• Comments on a line by themselves are 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
    # don’t matter
    # but can confuse you
    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
```
Nested Decisions

```python
define fline = "blah blah"

if len(fline) > 1 :
    print "More than one"
    if fline[0] == 'b' :
        print "Starts with a b"
print "All done"
```

print “All Done”
Nested Decisions

flines = "blah blah"

if len(fline) > 1:
    print "More than one"
    if fine[0] == 'b':
        print "Starts with a b"
print "All done"

print "All Done"
Nested Decisions

`fline = "blah blah"

if len(fline) > 1 :
    print "More than one"
    if fline[0] == 'b' :
        print "Starts with a b"

print "All done"

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 the hard way

\[ x = 4 \]

if \( x > 2 \):
    print “Bigger”

if \( x \leq 2 \):
    print “Smaller”
Two-way using else:

\[
x = 4
\]

if \( x > 2 \):
    print “Bigger”
else:
    print “Not bigger”

print “All done”
Two-way using else:

```python
x = 4
if x > 2:
    print "Bigger"
else:
    print "Smaller"
print "All done"
```
if \( x < 2 \):
\[\text{print "Small"}\]
elif \( x < 10 \):
\[\text{print "Medium"}\]
else:
\[\text{print "LARGE"}\]
\[\text{print "All done"}\]
Multi-way

\[ x = 0 \]

if \( x < 2 \):
    print “Small”
elif \( x < 10 \):
    print “Medium”
else:
    print “LARGE”
print “All done”
```
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?

```python
if x < 2 :
    print "Below 2"
elif x >= 2 :
    print "Two or more"
else :
    print "Something else"
```

```python
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.
$ python notry.py
Traceback (most recent call last):
  File "notry.py", line 6, in <module>
    istr = int(astr)
ValueError: invalid literal for int() with base 10: 'Hello Bob'

The program stops here
```python
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

Safety net
Sample try/except

```python
fname = raw_input("Enter a file name: ")
infile = open(fname, "r")
print "Blah..."
```

```
$ python frompart.py
Enter a file name: fred
Traceback (most recent call last):
  File "frompart.py", line 7, in <module>
    infile = open(fname, "r")
IOError: [Errno 2] No such file or directory: 'fred'
```
Sample try/except

fname = raw_input("Enter a file name: ")
try:
    infile = open(fname, "r")
except:
    print "File not found",fname
    exit()
print "Blah..."

$ python frompart.py
Enter a file name: fred
File not found fred
$
Another try/except

fname = 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 file name: 42
Nice work
$ python trynum.py
Enter a number: four
Not a number
$
Summary

- Indentation
- One Way Decisions
- Comparison operators $\equiv \leq \geq > < \neq$
- Nested Decisions
- Two way Decisions if: and else:
- Multiway decisions using elif
- Try / Except to compensate for errors