More symbol tables, scope, conditionals

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CS151: Computational Thinking: Visual Media

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def convertFtoC(temp):
    convertedTemp = (5/9)*(temp - 32)
    print(temp, 'degrees in F is', convertedTemp, 'degrees in C. ')

# Main code
tempInF1 = 32
convertFtoC(tempInF1)

tempInF2 = 212
convertFtoC(tempInF2)
tempInF1 = 100
One more thing we now add to symbol tables: modules

Let's draw symbol table for the following

```python
import turtle
turtle.forward(10)
turtle.forward(20)
```
Scope

**Local scope:** the variables and functions only may be accessed or have local scope inside their respective current symbol table.

This is why we can’t access `convertedTemp` from main code.
Flavors of function parameters

There are two types: *positional arguments* and *keyword arguments*. 
Positional function arguments

In our temperature converter program, the function parameter `temp` in `convertFtoC(temp)` is a **positional argument**:

```python
def convertFtoC(temp):
    convertedTemp = (5/9)*(temp - 32)
    # blah blah blah
```

In general we can have lots of positional arguments as in `myFun(a, b, c, d, e)

- You are REQUIRED to specify ALL positional arguments in order to call the function.
Keyword function arguments

You have the option to omit when calling the function. If you do, the function uses a **default value** instead:

```python
def hexagon(x, y, s, penWidth=5, interiorColor='yellow'):
    # code here
```

- Valid call: `hexagon(0, 0, 1)`. Keyword arguments are **optional**.
- We can **override** a default value by just passing in a new value by name: `hexagon(0, 0, 1, interiorColor='red')`
- We can override as many or as few keyword arguments as we like.
def hexagon(x, y, s, penWidth=5, interiorColor='yellow'):
    # lots of code in here

These calls won't work:

# Invalid because a positional argument cannot follow an optional argument
hexagon(300, 300, 0.5, penWidth=5, 3)
# Why doesn't this work?
hexagon(300, 300, penWidth=5)

These do work:

# Keyword arguments order can be swapped
hexagon(300, 300, 0.5, interiorColor='yellow', penWidth=5)
# You can use use keywords to refer to positional arguments
hexagon(x=300, y=300, s=0.5)
Argument rules

1. All positional arguments must be provided when you call a function.

2. No positional arguments after keyword arguments

3. Keyword arguments can be specified in any order.

4. Positional arguments can be referred to by name, like keyword arguments.
Conditional statements

New type of statement to allow us to to to prepare for the unexpected!
if statement

if [Boolean condition statement]:
    [body]

If there’s traffic, then we want to take a different route. If it’s raining, go outside with an umbrella. If we’re drawing a house, we’ll want to draw a rectangle and triangle.

The condition MUST evaluate to True to enter the if statement body (indented).

Note the :
Example if statement

```python
if i_am_happy:
    print(':)')

print('hi 1')

if i_am_sad:
    print(':(')

print('hi 2')
```

- Code executes line-by-line, top-to-bottom like usual. `i_am_happy` and `i_am_sad` variables MUST be either `True` or `False` (boolean type).
- `print(':)')` only run IF `i_am_happy` is assigned the value `True` (otherwise `print('hi 1')` is run next after Line 1).
**if else statement**

After the body of the if statement, you have the option of putting an else statement (not required), and Python will evaluate code in the body of the else, assuming the Boolean condition evaluates to False:

```python
if [Boolean condition statement]:
    [body]
else:
    [body]
```

- Python *skips over the body of the else*, if it enters the if clause, which makes sense.
Example if else

```python
if i_am_happy:
    print('(:)')
else:
    print(':((')
print('hi')
```

- if `i_am_happy` is True, print `(:)`, run then print `hi`.
- if `i_am_happy` is False, print `:((`, run then print `hi`.

Adding more conditions to check with `elif` clauses

Short for `else if`.

```python
if isSnowing:
    getSkiJacket()
elif isRaining:
    getRainJacket()
else:
    getSunGlasses()
```

`isSnowing` and `isRaining` are booleans.
## Relational operators

<table>
<thead>
<tr>
<th>Operator</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;</td>
<td>strictly less than</td>
</tr>
<tr>
<td>&lt;=</td>
<td>less than or equal to</td>
</tr>
<tr>
<td>&gt;</td>
<td>strictly greater than</td>
</tr>
<tr>
<td>&gt;=</td>
<td>greater than or equal to</td>
</tr>
<tr>
<td>==</td>
<td>equal to</td>
</tr>
<tr>
<td>!=</td>
<td>not equal to</td>
</tr>
</tbody>
</table>

- Examples: \( x == y, x != 10, 4 > 2 \).
- All of these will evaluate to \text{True} or \text{False} (a Boolean value).
- These operators have lower precedence than math operators (which gets evaluated first?) and equal precedence amongst themselves.
Let's work on Question 1 of the conditional worksheet