Loops
The for statement

The general form of a for statement is:

```python
for <var> in <some kind of series>:
    print(i)
```

The easiest way to explain this is with an example:

```python
for i in [1, 2, 3]:
    print(i)
```

Produces the output:

1
2
3

- The thing in [ ] is called a list
- The number of times you go through the loop = the number of items in the list
- Each time you go through the loop, you assign the value of the next item to the variable in the for statement
- Don’t forget the colon
- Indentation is important!
The `range` function

`range(<number>)` produces a list of integers counting from zero up to `<number>-1`.

For example, `range(5)` gives you the list 0, 1, 2, 3, 4.

Example:

```python
for number in range(3):
    print(number)
```

produces the output:

```
0
1
2
```
The \texttt{range} function: more features

\texttt{range(<num1,,num2>) \ produces \ a \ list \ of \ ints \ counting \ from \ <num1> \ up \ to \ <num2>-1.}

For example, \texttt{range(3, 7)} gives you the list \texttt{3, 4, 5, 6}.

Finally, \texttt{range(<num1,,num2,,num3>) \ produces \ a \ list \ of \ ints \ counting \ from \ <num1> \ up \ to \ <num2>-1 \ counting \ by \ num3’s.}

For example, \texttt{range(4, 36, 5)} gives you the list \texttt{4, 9, 14, 19, 24, 29, 34}.
Quick check:

What is the output?
```
def main():
    for i in [2, 4, 6]:
        print(i)
main()
```

What is the output?
```
def main():
    for i in range(3,22,3):
        print(i+1)
main()
```
Another way to iterate: the **while** statement

The general form of a **while** statement is:

```python
while <boolean expression>:
```

Again, the easiest way to explain this is with an example:

```python
powerOf2 = 1
while (powerOf2 < 100):
    print(powerOf2)
    powerOf2 = powerOf2 * 2
```

Produces the output:

```
1
2
4
8
16
32
64
```
Functions
In general:

# define all of your functions
def <function>():
    def <function>():
        def <function>():
            def <function>():
                ..
                ..
            ..
        ..
    ..
# define your main program
def main():
    ..
    ..
# call your main program to start execution
main()
Things to remember about `def`

The `def` statement ends in a colon (":")

```python
def printMyName(name):
    print("***************")
    print(name)
    print("***************")
```

All statements that are part of the function definition must be indented. This is how the Python interpreter knows that these statements are part of the definition of the function (and not part of some other part of your program).
Exercise:

A *triangular number* is an integer that corresponds to the number of objects arranged in an equilateral triangle, as shown in the picture.

The *nth* triangular number $T_n$ is the number of dots in the triangular arrangement with $n$ dots on a side, and is equal to the sum of the $n$ natural numbers from 1 to $n$.

Write a function `triangle(n)` that accepts as an argument an `int`, and returns the *n*th triangular number.

Then write a main program that makes a table showing the first 20 triangular numbers.
Factorial Exercise:

The **factorial** function $n!$ in math is defined this way:

\[
1! = 1 \quad = 1 \\
2! = 1 \times 2 \quad = 2 \\
3! = 1 \times 2 \times 3 \quad = 6 \\
4! = 1 \times 2 \times 3 \times 4 \quad = 24 \\
\]

Write a function `factorial(myNumber)` that accepts as a parameter an `int`, and returns the factorial of that `int`.

Then write a main program that uses the `factorial` function to print out the factorials for numbers from 1 to 10.
Strings
String Length Exercise:

Write a program that asks the user to enter a series of strings one at a time, and then prints out either

   The string has an even number of characters.

or

   The string has an odd number of characters.

as appropriate for each one. When the user hits “enter” without typing in a string, terminate the program.
The general form of a for statement is:

for <var> in <some kind of series>:

The easiest way to explain this is with an example:

for i in [1, 2, 3]:
    print(i)

Produces the output:
1
2
3

• The thing in [ ] is called a list
• The number of times you go through the loop = the number of items in the list
• Each time you go through the loop, you assign the value of the next item to the variable in the for statement
• Don’t forget the colon
• Indentation is important!
There are a number of useful methods (functions) that apply to strings.

**isalpha()**  returns True if there is at least one character in this string and all characters are alphabetic.

**isdigit()**  returns True if this string contains only number characters.

**islower()**  returns True if there is at least one character in this string and all characters are lowercase.

**isupper()**  returns True if there is at least one character in this string and all characters are uppercase.

**isspace()**  returns True if this string only contains whitespace characters.
Additional Useful String Methods

- `upper()` convert all alphabetic characters to uppercase
- `lower()` convert all alphabetic characters to lowercase
- `capitalize()` make first character uppercase and the rest lowercase
- `replace(old, new)` replace all instances of `old` in string with `new`
- `lstrip()` remove all leading (left) whitespace from string
- `rstrip()` remove all trailing (right) whitespace from string
- `strip()` remove all leading and trailing whitespace from string
- `center(length)` creates a new string of the given length with the given string centered between spaces
- `ljust(length)` creates a new string of the given length consisting of the given string followed by spaces
- `rjust(length)` creates a new string of the given length consisting of spaces followed by the given string
A string is a *palindrome* if it reads the same backwards and forwards. "mom", "dad", and "noon" are all palindromes.

Write a program that prompts the user to enter a string and reported whether or not the string is a palindrome. Ignore blanks at the start and end of the string.

Have the program check whether the first character is the same as the last character. If they are, move to the second character and the second to the last character. Continue until either:

- a mismatch is found
- all characters have been checked
- the string has an odd number of characters, and all characters except the middle character have been checked.
Lists
The general form of a for statement is:

for <var> in <some kind of series>:

The easiest way to explain this is with an example:

for i in [1, 2, 3]:
    print(i)

Produces the output:

1
2
3

- The thing in [ ] is called a list
- The number of times you go through the loop = the number of items in the list
- Each time you go through the loop, you assign the value of the next item to the variable in the for statement
- Don’t forget the colon
- Indentation is important!
Summary of Common List Operations

list1 + list2  \text{ concatenates two lists list1 and list2}
myList * n, n * myList  \text{n copies of myList are concatenated together}

\text{len(myList)}  \text{ returns the number of elements in myList}
\text{min(myList)}  \text{ returns the smallest element in myList}
\text{max(myList)}  \text{ returns the largest element in myList}
\text{sum(myList)}  \text{ returns the sum of all elements in myList}

<, <=, >, >=, ==, !=  \text{ used to compare two lists}
x in myList  \text{ True if x is an element of the list myList}
x not in myList  \text{ True if x is not an element of the list myList}

\text{myList[i]}  \text{ the } i\text{th element of myList}
\text{myList[i:j]}  \text{ a sublist of myList consisting of the elements from } i \text{ to } j \text{ of myList}