1. The following snippets are all valid uses of the for loop. Write what each snippet will output below. If you aren't sure, try running the code in PythonTutor.

   (a) .

```
my_string = "hello"
for char in my_string:
  print(char)
```

h
e
l
l
o

   (b) .

```
my_list = [1, 2, "hello", 3.2, "u"]
for item in my_list:
  print(item)
```

1
2
hello
3.2
u

   (c) .

```
my_list = [10, 4, 6.7, "goodbye"]
for i in range(len(my_list)):
  print(f"The item at index {i} is {my_list[i]}")
```

The item at index 0 is 10
The item at index 1 is 4
The item at index 2 is 6.7
The item at index 3 is goodbye

2. Re-write this code so that it functions the same way, but uses a while loop instead of a for loop:

```
#initialize a list of words
words = ["I", "am", "a", "list", "with", "several", "strings"]

#print each word in the list
for word in words:
    print(word)

#exit
print("Goodbye!")
```

Write your while loop here:

words list is here

```
words list
index = 0
while index < len(words):
    print(words[index])
print("Goodbye!")
index += 1
```

3. Consider the following code:

```
#define the exponent and base to calculate
exponent = 10
base = 3

#multiply the base by itself 'exponent' number of times
i = 0
while i < exponent:
    base = base * base
    i += 1

#print out the calculated number
print(base)
```

(a) Re-write this code so that it functions the same way, but uses a for loop instead of a while loop. (Hint: You will want to use the range() function):

Write your for loop here:

```
exponent = 10
base = 3
for i in range(exponent):
    base = base * base

print(base)
```

(b) Is there a way to re-write the code from lines 5-9 to a single line/instruction? (That is, not using a loop at all?) If so, what is it?

Print(base ** exponent)

4. Can every while loop easily be translated to a for loop in python? If not, what is an example?

No, in situations you don't know how many iterations you'll need.

while True:

↖ Cannot be a for loop

5. Consider the following code:

```
1  # Set up list of numbers
2  intList = [0, 1, 2, 3, 4, 5]
3
4  for i in range( len(intList) ):
5    # multiply the number at index i by three
6    intList[i] = intList[i] * 3
7    # integer divide the number at index i by two
8    intList[i] = intList[i] // 2
9
10 #print the new int list
11 print(intList)
```

(a) How many lines of code are executed within each iteration of the for loop?

2

(b) How many times does the for loop iterate?

6 times

6. What is a benefit of using for loops instead of while loops? When might you use one in your own code?

   For loops have simplified syntax for iteration and has a defined iteration range.

   Use it when iterating over a range:

   ```
   for i in range(4)
       print(i)
   ```

7. Consider the following problem:

   Given an array *arr* consisting of n elements, find the maximum possible sum the array can have after performing the following operation **any number of times**: choose two adjacent elements and flip both of their signs. For example, given the array [1, 2, 3, -4], we could flip the signs of 3 and -4 so the array now contains [1, 2, -3, 4]. We can continue to apply this operation as many times as necessary until the array has the maximum possible sum.

   (a) Perform some critical thinking to determine the solution to this problem (analyze some examples, consider cases such as all negative numbers, etc.). Write 1-2 sentences describing the solution below.

   (b) Once you are certain your idea is correct, write pseudocode to implement your solution. After the studio for this week opens, submit your working program to the "NegativesAndPositives" studio problem for testing and credit.