Logistics

- First midterm is Wednesday, March 1st, in class!

- I will be out of town all next week. Prof Engel will conduct class on Monday, and either she or Prof Versoza will proctor the exam on Wednesday.

- Start reviewing. Ask me or tutors for help on concepts you don't understand. You'll review in class on Monday with Prof. Engel.

- Should have received grades for assignments 1-3 on Classes website.
Condition Controlled Loops in Practice

Introduction to Programming - Python
While Loop Basics
While Loop Basics

- Programmers commonly find that they need to write code that performs the same task over and over again.

- One solution to this kind of problem is to use "while" loop, which involves the following:
  - Write the code for the task one time.
  - Place the code into a while loop which causes Python to repeat it over and over.
  - Writing a condition that can be used to stop the loop once the desired # of repetitions has been achieved.
  - Then double-check your work by asking: which tasks happen before the loop? Which tasks happen during the loop? Which tasks happen after the loop?
**While Loop Basics**

- Evaluate a Boolean expression.
- If it is False, skip the block of statements associated with the while loop and condition the program as normal.
- If it is True:
  - Execute a series of statements.
  - At the end of the statement block re-evaluate the condition.
    - If it is True, repeat the block of statements.
    - If it is False, skip the block of statements associated with the while loop and continue the program as normal.
While Loop Basics

```
while condition:
  statement
  statement
  statement
  statement
```

- Standard Boolean condition that evaluates to True or False
- The statements that will be repeated
- Indentation indicates that the statements under the while loop should be repeated
When to use a While loop

- We can use while loops when we need to repeat a task multiple times in order to solve a particular problem. For example:
  - Print the phrase "Hello, World" 100 times
  - Ask the user to enter 10 price values and add them to an accumulator variable

- A while loop works well for tasks that require an unknown number of iterations. For example:
  - Ask the user to enter in a positive number. If the user enters a negative number, re-prompt them until they supply a positive number.
Do we need a While loop to solve this problem?

- Write a program that asks the user for two numbers

- If the first number is greater than the second number, add the numbers and display the total

- If the second number is greater than the first number, multiply the numbers and display the product

Enter 1st number: 5

Enter 2nd number: 10

Product: 50
Do we need a While loop to solve this problem?

- Write a program that asks the user for two numbers. Only accept positive values.

- If the first number is greater than the second number, add the numbers and display the total.

- If the second number is greater than the first number, multiply the numbers and display the product.

Enter 1st number: 5
Enter 2nd number: -10
Sorry, try again
Enter 2nd number: 10
Product: 50
Do we need a While loop to solve this problem?

- Ask the user to enter in 5 price values
- Add these values to a total variable
- Print out the total at the end of the program plus 7% sales tax

Enter price: 1.00
Enter price: 2.00
Enter price: 3.00
Enter price: 3.00
Enter price: 1.00

Your total: 10.00
Tax: 0.70
Grand total: 10.07
Do we need a While loop to solve this problem?

- Ask the user to enter in a potentially *unlimited* number of price values
- Add these values to a total variable
- Print out the total at the end of the program plus 7% sales tax

Enter price, 0 to end: 1.00
Enter price, 0 to end: 2.00
Enter price, 0 to end: 3.00
Enter price, 0 to end: 3.00
Enter price, 0 to end: 1.00
Enter price, 0 to end: 0

Your total: 10.00
Tax: 0.70
Grand total: 10.07
Programming Challenges
Programming Challenge: Combo Lock

- Write a program that asks the user for three numbers.

- Test those numbers against three “secret” numbers that represent the combination to a virtual padlock.

- If the user gets the numbers right you should let them know that they have gained access to your program.

- If not, allow them to continue to enter combinations until they guess correctly.
Write a program that converts kilograms to pounds. Convert all values between 1kg and 200 kg. Use the conversion rate of 1.0kg = 2.2lbs

Prepare your output as follows:

<table>
<thead>
<tr>
<th>Kilograms</th>
<th>Pounds</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2.2</td>
</tr>
<tr>
<td>2</td>
<td>4.4</td>
</tr>
<tr>
<td>3</td>
<td>6.6</td>
</tr>
<tr>
<td>...</td>
<td></td>
</tr>
<tr>
<td>199</td>
<td>437.8</td>
</tr>
<tr>
<td>200</td>
<td>440.0</td>
</tr>
</tbody>
</table>
Programming Challenge: Marbles

- Assume you have a jar that contains 5 marbles. The jar can hold 10 marbles total.

- Continually ask the user if they want to add or remove a marble

- If they add a marble you should increase the total # of marbles in the jar. If the jar is full tell the user and end the program.

- If they remove a marble you should decrease the # of marbles in the jar. If the jar is empty you should tell the user and end the program.
Programming Challenge

- Write a program that asks the user for a price value
- When the user enters the word “end” you should stop asking the user for prices and display the following:
  - The # of items they purchased
  - Their total bill
  - 7% sales tax
  - Their total bill w/ tax
  - The highest priced item
  - The lowest priced item
Programming Challenge

- Ask the user to enter in a positive number
- Only accept positive numbers – if the user supplies 0 or a negative number you should re-prompt them
- Once the user has supplied a positive number you should print out that many star characters to the screen

Enter a number of stars (positive #'s only): -5
Invalid number, try again
Enter a number of stars (positive #'s only): 10
**********
Programming Challenge

- Extend your program so that you print out a "triangle" pattern instead of a single row of stars (see output to the right)

Enter a number of stars (positive #'s only): 10

**********
**********
**********
**********
**********
*****
****
***
**
*
Programming Challenge: Spin the Wheel

- Start the user with $100
- Ask them to guess a number between 1 and 12
- Next, spin a virtual wheel and tell the user which number came out
- Each spin costs $10
- If their number is spun then they win $100
- Stop when the user loses all of their money, or when they choose to retire from the game
Homework Questions
Paper-based Practice Questions
Quick Review
What is... 

- Algorithm 
- Statement 
- Expression 
- Block 
- Variable 
- Function 
- Module 
- Binary 
- Flag 

- Literal 
- Data type 
- Operator 
- Operand 
- Sequence structure 
- Selection statement 
- While Loop 
- Accumulator variable 
- What types of errors are there?