While Loop

Purpose of a Loop: Often times we will want to repeat a particular group of statements multiple times. A loop gives us a control structure to do so, without having to write out the steps multiple times.

Here is the general syntax of a while loop:

```
while (<boolean expression>)
   stmt;
```

Remember that just as we can use a block of statements in an if statement, we can do the same with a while. In fact, the body of most while loops is more than a single statement. Thus, most while loops look like:

```
while (<boolean expression>) {
   stmt1;
   stmt2;
   ...
   stmtn;
}
stmtA;
```

Here is how this executes:

1) Evaluate the boolean condition.
2) If it's true, execute statements 1 through n in order.
3) If it's false, skip to after the end of the while loop and execute stmtA.
4) After you execute stmtn, you have complete a loop iteration. How, go back to step #1 in these directions and repeat.

Algorithm to figure out all the money you have for a booze run

```
#include <stdio.h>

int main() {

    double value, total = 0;
    char answer, dummy;

    printf("Does anyone have any money?\n");
    scanf("%c",&answer);
    while (answer == 'y' || answer == 'Y') {

        printf("Enter the amount of your donation.\n");
        scanf("%lf",&value);
        total += value;

        printf("Does anyone have any money?\n");
        scanf("%c%c",&dummy,&answer);
   }

   printf("As a group, you have collected $%lf for beer.\n",
              total);
   return 0;
}
```

Class Exercise: Write a program that computes 1+3+...+99

```
#include <stdio.h>
int main() {

   int val = 1;
   int sum = 0;

   while (val < 100) {
       sum = sum + val;
       val = val + 2;
   }
   printf("1+3+5+...+99=%d\n",sum);
   return 0;
}
```

A second approach to the problem:

```
#include <stdio.h>
int main() {

   int val = 1;
   int sum = 0;

   while (val < 100) {
       if (val%2 == 1)
           sum = sum + val;
       val = val + 1;
   }
   printf("1+3+5+...+99=%d\n",sum);
   return 0;
}
```

Here is a program that prints out a tip chart:

```
#include <stdio.h>

#define TIP_RATE   0.15
#define MAX_PRICE 100

int main() {

    int meal_value;
    double tip_amt;

    meal_value = 1; // Starting meal value.

    // Print out all tips until the maximum meal value.
    while (meal_value <= MAX_PRICE) {

        tip_amt = meal_value*TIP_RATE;
        printf("On a meal of $%d, you should tip $%.2lf\n",
                meal_value, tip_amt);
        meal_value++;
    }
    return 0;
}
```

Menu driven program set-up

```
int main() {

    int choice;
   // Print out the menu.
   scanf("%d",&choice);
   while (choice != <quitting choice>) {

        if (choice == 1) {
            // Execute this option
        }
        else if (choice == 2) {
            // Execute this option
        }
        ...
        else if (choice != <quitting choice>) {
             //Sorry that's not a valid menu choice!
         }
         // Print out the menu.
         scanf("%d",&choice);
   }
   return 0;
}
```