CS 271 - August 24, 2017

Practice Exercises - Chapter 3
This is a modified version of exercise 3.23.

```
// Input a list of integers.
// Calculate and display the max, min, and the average.
// Print the average with 3 decimal places.

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

    // declare variables all variables at the top of the block
    int num, max, min, count = 0, sum = 0;
    double average;

    // input values until a negative number is reached
    // this is called a sentinel loop

    printf("Enter a number");
    scanf("%d", &num);

    while ( num >= 0 ) {
        if (count == 0) {
            max = min = num;
        }

        count++;
        sum += num;
        if (num > max) max = num;
        if (num < min) min = num;
        printf("Enter a number (enter a negative to quit)");
        scanf("%d", &num);
    } // end while

    if (count > 0) {
        average = (double) sum / count;
        printf("The maximum is %d.\n", max);
        printf("The minimum is %d.\n", min);
        printf("The average is %.3f.\n", average);
    }
    else
        printf("You didn't enter any non-negative numbers.\n");

    return 0; // this is optional
              // the compiler supplies a return statement for
              // the main function
} // end main
```

Exercise 3.24

Print a table of numbers. Columns are labeled N, 10*N, 100*N, and 1000*N. The values of N go from 1 to 10.

The numbers are left-aligned in columns and the field width is 7.

```
#include <stdio.h>

int main(void) {

   // declare variables
   int n;

   // print table heading
   printf("N      10*N   100*N  1000*N\n");

   // print the columns of numbers
   for ( n = 1; n <= 10; ++n ) {
      printf("%-7d%-7d%-7d%-7d\n", n, 10*n, 100*n, 1000*n);
   } // end for

 } // end main
```

4.27
Display a list of Pythagorean triples (integers that satisfy the Pythagorean theorem $a^2 + b^2 = c^2$)

The first set is 3, 4, 5. However, we don't want to see 4, 3, 5, which is just a permutation of 3, 4, 5.

```
#include <stdio.h>

int main (void) {

   // variables
   int a, b, c;
   for ( a = 3; a < 500; a++ )
       for ( b = a + 1; b < 500; b++ )
           for ( c = b + 1; c < 500; c++ )
                if ( c * c == a * a + b * b )
                    printf("%d, %d, %d\n", a, b, c);
 } // end main
```

4.31

Print a diamond shape. The input is the total number of lines in the diamond. For example, if the input is 5 we should see:

```
    *
   ***
  *****
   ***
    *
```

If the input is 6, we should see:

```
    *
   ***
  *****
  *****
   ***
    *
```

Note: this has been revised since we discussed it in class. It works for both even and odd values of num.

```
int main (void) {

   // declare variables
   int num, count = 0, line = 1, numStars=1, numSpaces;

   // input num
   printf("Enter the number of lines in the diamond\n");
   scanf("%d", &num);

      for ( line = 1; line <= num; line++ )
      {
          numSpaces = (num - numStars)/2;

          // print spaces
          for ( count = 1; count <= numSpaces; count++)
              printf(" ");

          // print stars
          for ( count = 1; count <= numStars; count++)
              printf("*");
          printf("\n");

          if (line <  num/2.0)
              numStars = numStars + 2;
          else if (line > num/2.0)
              numStars = numStars - 2;

      } // end for

} // end main
```