Class Activity 19:

Objectives:
Learn about formatted display in C.
Practice program design methodology.

Activity 1:
Project/program *ca19a.cpp* (in the get files) is displayed here

```c
/*
 * program ca19a.cpp
 * Your Name(s)
 * Engineering 12, Fall Term 2003
 * Class Activity 19-1
 */
#include<stdio.h>

main()
{ // begin main
    // variable declaration
    int    a = 3,
            b = 3,
            c = 2,
            d = 7,
            e, f;
    double alfa = 2.0,
             beta = 5.0,
             gamma = 4.0,
             delta, epsilon;
    // algorithm
    delta = (a*b/c)*gamma;
    e    = d%b;
    epsilon = (alfa*beta/gamma)*b;
    beta = (1/2)*beta;
    f    = d/b;
    printf( "\n\ndelta = %10.2f \ne = %d \nepsilon = %.3f"
            "\n\nbeta = %f \nf = %8d \n\n",
         delta, e, epsilon, beta, f);
} // end main
```

(a) Create a “memory” map for this program.
(b) How are variables initialized? What variables are not initialized by the beginning of the algorithm?
(c) Work through the program using your memory map - record changes in the variable values as they occur.

(d) What will be displayed by the `printf`? (pay attention to formatting!!! show spaces with ^).
   note: default for `%lf` is six decimal places; default for `%d` is the number of spaces required. also note: any real number can be displayed under the `%f`, `%lf`, `%e`, or `%le` placeholders this is not true for `scanf` - must use the proper placeholder.

(e) Run the program and check your predictions. Were you right?

**Activity 2:**
Develop a preliminary program design (problem analysis, problem statement, design requirements, top level design) for a program to determine the force and work in stretching a spring as a function of the length stretched. Pay attention to passing information between functions - what does each need from `main`? what does each need from the user? what does each return to `main`?

(a) What does the control (`main`) algorithm look like?

(b) Design a function to get the length stretched from the user.
   Needs from `main`:
   Returns to `main`:

(c) Design a function to calculate the force required to stretch the spring.
   Needs from `main`:
   Returns to `main`:

(d) Design a function to calculate the work required to stretch the spring.
   Needs from `main`:
   Returns to `main`:

(e) Design a function to display the inputs and calculated results from your program.
   Needs from `main`:
   Returns to `main`:

**Turn in:** Your handwritten memory map/trace from activity 1. Your (handwritten) program design from activity 2.