Wednesday 29 October

Programming Assignment 07: due Wednesday 5 November

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

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

// prototypes

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( "\ndelta = %10.2f \ne = %d \nepsilon = %.3f"
            "\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 intitialized 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.