NAME:

CS 2301
Exam 1
B-term 2010

Question 1: _____   (15)

Question 2: _____   (15)

Question 3: _____   (25)

Question 4: _____   (15)

Question 5: _____   (15)

Question 6: _____   (15)

TOTAL: _____   (100)

You may refer to one sheet of notes as you take this exam. Notes may not be shared between students during the exam. Please do not open this exam until you are told to do so.

1. (15 points) Write a C program segment that uses **nested for-loops** to display the following pattern of numbers:

```
1
1 2
1 2 3
1 2 3 4
1 2 3 4 5
1 2 3 4 5 6
1 2 3 4 5 6 7
1 2 3 4 5 6 7 8
1 2 3 4 5 6 7 8 9
1 2 3 4 5 6 7 8 9 10
```

i.e., when your program segment is executed, 10 lines of output will be displayed, with the number 1 on the first line, the numbers 1 and 2 on the second line, etc., up to the tenth line. You do not have to write a complete C program, just a program segment. Declare any variables you use.

2. (15 points)

(a) A C program contains the following statements:

```
float f;
f = 4 + 15 / 2;
```

After the statements have executed, what value will be stored in the variable f?
(If an error would occur as a result of executing these statements, write ERROR).

(b) A C program contains the following statements:

```
int i;
i = 9 % 4 + 6 * 3.0;
```

After the statements have executed, what value will be stored in the variable i?
(If an error would occur as a result of executing these statements, write ERROR).

(c) A C program contains the following statements:

```
int j;
j = 6;
if (!j)
   j++;
else
   j--;
```

After the statements have executed, what value will be stored in the variable j?
(If an error would occur as a result of executing these statements, write ERROR).

3. (25 points) A catering firm charges for events. The basic cost for an event is $50 per attendee, regardless of the duration of the event. However, for events that exceed 100 attendees, the catering firm needs to hire additional waitstaff. One additional waitperson is hired for every 20 attendees (or fraction thereof), over and above 100 (so one additional waitperson would be hired for an event with 101 - 120 attendees, two additional waitpersons would be hired for an event with 121-140 attendees, etc.) These additional waitpersons charge $15 per hour for their services, and this additional cost is added to the total cost of the event. The duration of a catered event is measured in hours (i.e. an event that lasts 90 minutes would be charged for 1.5 hours). Finally, an additional charge of $5 per attendee is levied if china plates and silverware are used instead of paper plates and plastic cutlery.

You are hired to design a function called `eventCost` that determines the total cost for a catered event.

(a) Draw a **black box** (as we did in class) for *eventCost* with inputs and outputs shown as labelled arrows. Indicate the data type associated with each arrow.

(b) Write **two test cases** for this function. At least one of your two test cases should be for an event with more than 100 attendees. (Write your test cases using `printf` statements as we did in class.)

(c) Write the function *eventCost* as a **stub**.

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4. (15 points) For each description of a C function given below, write the function proto-
type. *Do not write the entire function, just write the function prototype.*

```
Example:  Write a prototype for a function that calculates the area
          of a triangle, given the lengths of the three sides of the
          triangle.  All lengths are of type float.

Answer:   float areaTriangle (float side1, float side2, float side3);
```

(a) Write a prototype for a function that displays the lyrics to the song "Eleanor
Rigby".

(b) Write a prototype for a function that calculates the number of grade points a
student earned in a course, based on a student's letter grade in the course and the
number of credit hours for the course. The number of grade points is calculated
by multiplying the number of credit hours for the course by the number of points
earned for a given grade in the course. A grade of A is worth 4 points, B is worth
3 points, C is worth 2 points, D is worth 1 point, and F is worth 0 points.

(c) Write a prototype for a function that takes an array (of type *int*), and the number
of elements in the array, and displays each of the elements in the array, one per
line.

5. (15 points) What will be displayed when the following program executes?

```c
#include <stdio.h>

void FuncA (int a, int b);
int FuncB (int a, int b);

int main()
{
  int a=4, b=5;
  printf ("a = %d, b = %d\n", a, b);

  FuncA (a,b);
  printf ("a = %d, b = %d\n", a, b);

  b = FuncB(a, b);
  printf ("a = %d, b = %d\n", a, b);

  return 0;
}

void FuncA (int a, int b)
{
  a = 10;
  b = 20;
  printf ("a = %d, b = %d\n", a, b);
  return;
}

int FuncB (int a, int b){
  int c;
  c = 3;
  return (a + b) * c;
}
```

6. (15 points) The main function in a C program declares an array as follows:

```
#define MAX 1000;
char symbols[MAX];
```

The array is initialized so that each of the 1000 locations of the array contain a character.

Write a C program segment that will determine and print out the number of characters in the array `symbols` that belong to the set of symbols *, &, and #. So if the array contained 3 *'s, no &'s, and 5 #'s, the code should print out the value 8. (You do not have to define a complete function, just a program segment.) Make sure you declare any additional variables you use.