

COP 3223 (Introduction to C Programming) Final Exam
Date(s): 5/2/2015

First Name: _____ **Last Name:** _____

1) (10 pts) Discount Diamonds gives an incentive to all buyers willing to purchase many of the same diamond. The first ten are purchased at regular price and all subsequent diamonds are 60% off. Complete the program below so that it reads in the price of a single diamond in the purchase as well as the number of diamonds in the purchase, calculates the total cost of the order and prints it. (Assume tax has already been added in.) For example, an order for 15 diamonds with an original cost of \$100 per diamond would cost $10 \times \$100 + 5 \times \$40 = \$1200$, since the last five diamonds are \$40 (which is 60% off \$100). Print the result in dollars to two decimal places.

```
#include <stdio.h>

int main() {

    double diamond_cost, total;
    int num_diamonds;
    printf("What is the cost of a single diamond?\n");

    _____ ;
    printf("How many diamonds are you getting?\n");

    _____ ;

    printf("Your total cost is $____.\n", total);
    return 0;
}
```

2) (10 pts) What is the output of the following program?

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

    int x = 2, y = 0;
    while (x < 17) {
        x = x + y;
        y++;
        if (y < 5)
            y++;
        printf("x = %d, y = %d\n", x, y);
    }
    return 0;
}
```

3) (10 pts) The following segment of code compiles but has multiple errors. What is the output of the code as written? There are most likely 3 logical errors in the segment of code. What are they and how should they be fixed?

```
int age = 15, bonus = 100; // line 1
if (age > 17); // line 2
    bonus = 200; // line 3
if (age = 16) // line 4
    bonus += bonus + 1000; // line 5
printf("age = %d, bonus = %d\n", age, bonus); // line 6
```

Current Output: _____

Error & Fix #1: _____

Error & Fix #2: _____

Error & Fix #3: _____

4) (12 pts) What is the output of the following program?

```
#include <stdio.h>

int f(int a, int *b, int c);
int main() {
    int a = 1, b = 2, c = 3;
    c = f(b-a, &c, b+a);
    printf("a = %d, b = %d, c = %d\n", a, b, c);
    a = f(c+a, &b, c-a);
    printf("a = %d, b = %d, c = %d\n", a, b, c);
    return 0;
}

int f(int a, int *b, int c) {
    int d = a - (*b) + 2*c;
    a = (3*a)%d;
    *b = 2*d - (*b);
    c -= a;
    printf("a = %d, b = %d, c = %d\n", a, *b, c);
    return (*b)-c;
}
```

5) (10 pts) Complete the function below so that it returns the sum of the digits of its input parameter n. (Hint: Think about how you might use integer division and mod.)

```
int sumofdigits(int n) {

}

}
```

6) (12 pts) Write a function that takes in an array of strings and reverses its order. For example, if the array `animals` stores `{"alligator", "bird", "camel", "dog"}`, then after the function call `reverse(animals, 4)`, the array `animals` will store `{"dog", "camel", "bird", "alligator"}`. Remember to use the string functions `strcmp`, `strcpy` and `strlen` as needed.

```
#include <string.h>
#define MAXLEN 100
```

```
void reverse(char list[][MAXLEN], int listLength) {
```

```
}
```

7) (15 pts) A valley sequence is a sequence of numbers $a_1, a_2, a_3, \dots, a_n$ such that there exists a k , with $1 < k < n$ and $a_1 > a_2 > a_3 \dots > a_k < a_{k+1} < a_{k+2} \dots < a_n$. For example, 5, 3, 1, 2, 4, 7 is a valley sequence and 3, 2, 12, 16, 18 is a valley sequence. But, 12, 8, 4, 2 is not a valley sequence because there's no "upward" slope of numbers at the end, 6, 3, 3, 4, 7 is not a valley sequence because consecutive values are identical in the sequence, and 12, 8, 4, 5, 9, 8, 12, 16 is not a valley sequence because after going down and going up, the sequence goes down again. Write a function `isValley` that takes in an array and its length, and returns 1 if the sequence stored in the array from index 0 to index length-1 forms a valley sequence and 0 otherwise.

```
int isValley(int array[], int length) {
```

```
}
```

The following 4 questions will concern the program on a separate handout that reads in a text file of employees, sorts them in a particular order, and outputs that sorted list to an output file of the user's choice.

7) (5 pts) What integer does the readfile function that starts on line 53 return? What is the purpose in having this function return this value?

8) (2 pts) If we were to call the comesbefore function on line 83 with two separate pointers to the same exact struct employee, what would the function return?

9) (3 pts) Explain in words in what order this program sorts a list of employees?

10) (10 pts) Rewrite the comesbefore function so that the program sorts the employees in the following manner:

- 1) All clerks come before all bosses.
- 2) All clerks are sorted in order from largest to smallest ID numbers.
- 3) All bosses are sorted in reverse alphabetical (according to strcmp) order by last name, with ties broken by first name.

```
int comesbefore(const struct employee *one, const struct employee *two) {
```

```
}
```

11) (1 pt) The movie Furious 7 was recently released, as part of the Fast and the Furious set of movies? How many movies are in the set so far?

Scratch Page - Please clearly mark any work on this page that you would like graded.