

Due 2:00PM, Thursday, April 2nd, 2009

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Name \_\_\_\_\_

CSE Login \_\_\_\_\_

**Instructions** Follow instructions *carefully*, failure to do so may result in points being deducted. For written questions: type your answers; for programming code, use a monotype font (like `Courier New`). Print your answers hardcopy and staple this cover page to the front of your assignment. Be sure to write your name on the front.

For each of the programs, place your source code into files named `homework04program01.c`, `homework04program02.c`, etc. and turn them in using the webhandin available on the course webpage. You do not need to print out your source code for the programs.

You may discuss problems with your classmates, but all work must be your own. The CSE academic dishonesty policy is in effect (see [http://www.cse.unl.edu/undergrads/academic\\_integrity.php](http://www.cse.unl.edu/undergrads/academic_integrity.php)).

Question	Points	Score
1	10	
2	10	
3	10	
4	15	
5	20	
6	20	
7	15	
Total:	100	

1. 10 points Assume that the integer `x` has a value of 6 and is located at memory location 300. Assume `y` has a value of 11 and is located at memory location 421. What would be the value of the following expressions:
  - (a) `x + y`
  - (b) `(int)&x + y`
  - (c) `(int)&x + (int)&y`
  - (d) `*(&x) + *(&y)`
  - (e) `(int)&x + *(&y)`
2. 10 points Write the following function:  

```
int *mergeSortedArrays(int *a, int *b, int sizeOfA, int sizeOfB);
```

which creates a new array that holds the merged contents of `a`, `b` which are assumed to be sorted in ascending order. This should be done in a direct manner without sorting. (adapted from Project 11, Chapter 8, p428)
3. 10 points Write a function that, given an integer array of size  $n$ , returns the value of the *median* element. The median is defined as follows:
  - If  $n$  is odd, the median is the  $\frac{n+1}{2}$ -th largest element
  - If  $n$  is even, the median is the average of the  $\frac{n}{2}$  and the  $(\frac{n}{2} + 1)$ -th largest elements
4. 15 points **Program 1** (Adapted from Programming Project 2 in Chapter 8 (p423)) If  $n$  points,  $(x_1, y_1), (x_2, y_2), \dots, (x_n, y_n)$  in two-dimensions are connected to form a closed polygon, the area  $A$  of the polygon can be computed as

$$A = \frac{1}{2} \left| \sum_{i=0}^{n-2} (x_{i+1} + x_i)(y_{i+1} - y_i) \right|$$

Note, that the initial and end point will be the same,  $(x_0, y_0) = (x_n, y_n)$ . Write a program to read in  $n$  and then reads in  $n$   $x, y$  pairs, and computes the area of the polygon.

5. 20 points **Program 2** This question is regarding matrix multiplication. Write a function that takes two *square* integer matrices  $A, B$  which are passed by reference and returns a dynamically allocated matrix  $C$  which is the product,  $A \times B$ . The product of two matrices of dimension  $n \times n$  is defined as follows:

$$c_{ij} = \sum_{k=1}^n a_{ik} b_{kj}$$

Where  $1 \leq i, j \leq n$  and  $c_{ij}$  is the  $(i, j)$ -th entry of the matrix  $C$ . Also write a driver program to compute the multiplication of the following matrices:

$$A = \begin{bmatrix} 3 & 1 & 5 & 42 & 35 \\ 8 & 34 & 64 & 21 & 68 \\ 61 & 41 & 55 & 32 & 87 \\ 17 & 14 & 53 & 52 & 12 \\ 35 & 54 & 15 & 12 & 12 \end{bmatrix} \quad B = \begin{bmatrix} 16 & 10 & 5 & 74 & 35 \\ 71 & 8 & 68 & 38 & 98 \\ 13 & 31 & 51 & 42 & 74 \\ 22 & 61 & 35 & 67 & 43 \\ 54 & 47 & 12 & 11 & 33 \end{bmatrix}$$

6. 20 points **Program 3** Write a program that reads in a string from the user (maximum of 100 characters) that represents a noun and forms a plural based on the following rules:
1. If the noun ends in “y,” remove the “y” and add “ies”
  2. If the noun ends in “s,” “ch,” or “sh,” add “es”
  3. In all other cases, just add “s”

Print out the original noun and its plural. Example:

```
1 Enter a noun> dairy
2 The plural of 'dairy' is 'dairies'
```

7. 15 points **Program 4** Write a program that computes the longest common prefix between two words. Your program will prompt the user to input two strings (maximum of 100 characters) and output the longest common prefix.

```
1 Enter the first word> global
2 Enter the second word> glossary
3 The longest common prefix of 'global' and
4 'glossary' is 'glo'
```

In the case that there is no common prefix, output the empty string, ''.