

## ECE 3331, Dr. Hebert, Fall 2023 HW 12 due Friday 11/17 at 11:59 pm

### Problem 1. Section 10.1, Exercise 9

Exercises 9 through 17 assume the declaration

```
struct animal {
    int    id;
    char   type[ 30 ];
    char   name[ 30 ];
    float  age;
};
```

9. Define a variable **temp** and an array **menagerie** with 200 cells, each of type **struct animal**.

### Problem 2. Section 10.1, Exercise 24

24. Each record in an input file occupies one line and is terminated by a newline. Columns 1 through 29 contain the composer; columns 30 through 58 contain the work; columns 59 through 64 contain the id; and columns 65 through 70 contain the price:

Ives, Charles

Three Places in New England 302932 12.95

The structure **cd** is defined as

```
struct disc {
    char composer[ 30 ];
    char work[ 30 ];
    long id;
    float price;
} cd;
```

Which of the following (if any) will correctly read one record (including the terminating newline) from the standard input and store it in **cd**? (The data in **cd.composer** and **cd.work** need not be null terminated.)

- (a) `scanf( "%29c%29c%6ld%6f", cd.composer, cd.work, &cd.id, &cd.price );`
- (b) `scanf( "%29c%29c%6ld%6f ", cd.composer, cd.work, &cd.id, &cd.price );`
- (c) `scanf( "%29c%29c%6ld%6.2f ", cd.composer, cd.work, &cd.id, &cd.price );`
- (d) `fgets( cd.composer, 30, stdin );`  
`fgets( cd.work, 30, stdin );`  
`scanf( "%6ld%6f ", &cd.id, &cd.price );`
- (e) `fgets( cd.composer, 29, stdin );`  
`fgets( cd.work, 29, stdin );`  
`scanf( "%6ld%6f ", &cd.id, &cd.price );`
- (f) `scanf( "%29s%29s%6ld%6f ", cd.composer, cd.work, &cd.id, &cd.price );`

Problem 3. Section 10.3, Exercise 3

3. In the following code, clarify the difference between **house** and **HOUSE**:

```
struct house {
    char address[ 25 ];
    int rooms;
    float asking_price;
};
typedef struct house HOUSE;
```

Problem 4. Section 10.4, Exercise 1

```
typedef struct bicycle {
    char* brand_name;
    int  spokes_per_wheel;
    int  links_in_chain;
    float height;
    float length;
    float price;
} BIKES;
BIKES bike1, bike2;
```

1. Write code that assigns values to all the members of **bike1** and then copies these values to the members of **bike2**. Assign each member of **bike2** individually, using the assignment operator.

Problem 5. Section 10.4, Exercise 5

5. Declare a structure that has as members a two-dimensional array of **char**, an **int** variable, and a **float** variable. Define two variables of this type and initialize them at definition time. (Keep the array small so that the initialization is not tedious.)

Problem 6. Section 10.5, Exercise 1

1. Given

```
typedef struct soldier {
    char  name[ 50 ];
    char  rank[ 15 ];
    int   serial_number;
} SOLDIER;
SOLDIER soldier1, soldier2, soldier3, *ptr;
```

write a statement that assigns to **ptr** the address of **soldier3**.

Problem 7. Section 10.5, Exercise 2

2. Assume the code of Exercise 1. Suppose that the character string **"Captain"** has been assigned to the array **soldier3.rank** and that **ptr** points to **soldier3**. Explain the error.

```
printf( "%s", *ptr.rank );
```

Problem 8. Section 10.5, Exercise 5

5. What is printed?

```
typedef struct soldier {
    char* name;
    char* rank;
    int  serial_number;
} SOLDIER;
SOLDIER soldier1, soldier2, soldier3, *ptr;
ptr = &soldier3;
soldier3.name = "Audie Murphy";
printf( "\n%s", (*ptr).name );
printf( "\n%c", *ptr -> name );
printf( "\n%c", *soldier3.name );
printf( "\n%c", *(ptr -> name + 3) );
```

Problem 9. Chapter 10, Programming Exercises problem 10.4 pg 545.

- 10.4. Write a program that prompts the user to enter two points  $v = (v_1, v_2, v_3)$  and  $w = (w_1, w_2, w_3)$  in three-space. The program then computes the lengths of the vectors  $ov$ ,  $ow$ , and  $vw$ ; the dot product of  $ov$  and  $ow$ ; the angle between  $ov$  and  $ow$ ; and the cross product  $ov \times ow$ , where  $o$  is the origin  $(0,0,0)$ . The vector  $ab$  is the vector from point  $a$  to point  $b$ . Represent the points and vectors using structures. If  $a = (a_1, a_2, a_3)$  and  $b = (b_1, b_2, b_3)$ , the length of  $ab$  is given by the formula

$$|ab| = \sqrt{(b_1 - a_1)^2 + (b_2 - a_2)^2 + (b_3 - a_3)^2}$$

The dot product of  $ov$  and  $ow$  is given by the formula

$$ov \cdot ow = v_1 w_1 + v_2 w_2 + v_3 w_3$$

Problem 10. Section 10.8, Exercise 2.

2. What is the key difference between a structure and a union?

Problem 11. Section 10.9, Exercise 1.

1. What is printed?

```
enum good_jobs { tinker, tailor, soldier, spy }
    job1, job2;
job1 = tinker;
job2 = spy;
printf( "\n%d\n%d", job1, job2 );
```

Problem 12. Section 10.9, Exercise 5.

5. Is the following code legal?

```
enum good_jobs { tinker = 1, tailor = 2 } job1, job2;
job1 = 99;
job2 = -99;
```