Strings as function arguments, malloc, structures, unions, typedef

**1]** Create a program that will use a union structure to hold a string in two ways: pointer and string.

The program must follow the next steps:

a) Define a union "Name", containing:

* A pointer "np", to char (for an array)
* An array "na" of chars of 20 elements.

b) Define the type "Name\_t" with the union Name.

c) Declare the variable "person" of the type Name\_t.

d) Read from the keyboard a name, and write it into a string of 20 chars, named "temp".

e) Use malloc to reserve from memory the needed space to allocate the name and assign the pointer to the np member of person.

f) Copy the string from temp to the space pointed by np.

g) Print the name from person.np.

h) Liberate the space allocated with malloc.

i) Copy now from "temp" to "person.na" (remember to use strcpy).

j) Print it.

A screenshot of a computer program

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**2]** Circle all that apply:

In a structure declaration:

A. initialization of structure members is possible B. initialization of array of structures is possible

C. both options A and B D. initialization of arrays of structures are not possible

Typedef creates an alias for an existing data type A. Yes B. No

**3]** What’s the logical error in the following program?

**union uuu {**

**char c;**

**int i;**

**long long ll; //It’s LL lowercase!**

**} u1;**

**u1.c = 'A';**

**u1.i = 42;**

**u1.ll = 300000000000;**

Answer: There are no syntax errors, however logically, only the last assignment is what counts, as it is a union so it can only be one type at a time.

**4]** Write a program with an array of structures:

* Each structure should store: last name, first initial, GPA, and total number of credit hours taken by a student. (Choose appropriate types for each!)
* The array should be able to hold information for up to 100 students.
* Initialize the first two array elements with the following info:
  + Doe J 3.55 50
  + Smith K 2.80 60
* Initialize the last array element with:
  + Aaaa B 3.05 70
* Display the three records above on the screen.

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**Problems for the lab report**

For all problems marked with ►, take screenshots of both code and output, paste the screenshots in the report file to be submitted to Canvas.

**5]** Circle the correct answer(s):

Do all the members of a union need to have the same size? A. Yes B. No



It is possible to rewrite a program containing **typedef** to eliminate the **typedef**.

A. Always B. Sometimes C. Never  
  
Typedef just makes the code less confusing by renaming long names to shorter ones. Therefor it is always possible to remove typdef, it would simply makes the code longer and harder to read.



**6]** What’s the error in the following program?

**int i;**

**union uuu {**

**unsigned un;**

**int in;**

**float fl;**

**};**

**union uuu arr[3]; //array of 3 union elements**

**arr[0].un = 42;**

**arr[1].in = -42;**

**arr[2].fl = 42.0f;**

**for (i=0;i<3;i++)**

**printf("arr[%d] = %d\n", arr[i].un);**

Answer: The union is being used as a struct so when trying to print “arr[i].un” as a decimal. it is actually a float value, and will have unexpected consequences. Also, the print statement is expecting two decimal values, and only one value is provided (although I already spoke of the problems with that one.)

**7]** ► Modify the program from #4 above (array of structures) by introducing a pointer to a stucture, named **structPtr**.

* Initialize **structPtr** to point to point to the first structure in the array.
* Print the first structure using **structPtr** instead of the array name.
* Move **structPtr** forward (so it points to the second structure in the array) using
  + Array notation
  + Pointer notation

Which syntax is simpler? A: Pointer notation “structPtr++;”

Leave the simpler version in the code, and comment out the other.

* Print the second structure using **structPtr** instead of the array name.
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