

COP 3502 Section 18 Quiz #1 - Part A (Dynamic Memory Allocation) Solution

Date: 5/29/2020

Start Time: 3:30 pm EST

End Time: 3:55 pm EST

1) (10 pts) Write three lines of code in C that do the following: (a) dynamically allocate an integer array of size 1,000,000, and (b), initializing all the values in the array such that in index i , the value i is stored. ((a) will take 1 line, and (b) will take 2 lines.)

Solution

```
int* array = malloc(1000000*sizeof(int));
for (int i=0; i<1000000; i++)
    array[i] = i;
```

Grading: 4 pts first line, 3 pts second line, 3 pts last line, decide partial as needed.

2) (10 pts) Included below is a section of code allocating memory dynamically for a data structure. A required struct for the section of code is included. Properly free the memory that is allocated by the code segment. Just write the code that would go where the comment says, "Free everything here."

```
typedef struct item {
    char* name;
} item;

int main(void) {

    int n;
    scanf("%d", &n);
    item* = malloc(n*sizeof(item));

    for (int i=0; i<n; i++) {
        char temp[100];
        scanf("%s", temp);
        item[i].name = malloc((strlen(temp)+1)*sizeof(char));
        strcpy(item[i].name, temp);
    }

    // Do stuff.

    // Free everything here.

    return 0;
}
```

Solution

```
for (int i=0; i<n; i++)
    free(list[i].name);
free(list);
```

Grading: 3 pts for loop, 5 pts free(list[i].name), 2 pts free(list). Take off 1 pt if order is invalid. Award 3 pts for free(list[i]) out of 5 pts.

3) (5 pts) Give a practical example where one would use an array of arrays to store data, where the different arrays in the large array were different sizes themselves.

Solution

Consider storing results of coronavirus tests for each county in Florida. Since there are 67 counties, we could store an array of results for each county, thereby having 67 arrays. Each array would store one entry per test, and naturally, there are likely to be more tests done in some counties than others (Orange County, for example, has a much larger population than Liberty County), thus, each of these 67 arrays would be different sizes, according to the number of tests given in each county.

Grading: Be pretty lenient here, any reasonable explanation where there are multiple sets of data should be accepted, with any reason given as to why the different sets of data might be different sizes. If it's clear the student doesn't understand the abstract structure of what is being asked, give a maximum of 2 points out of 5. If a student probably understands the structure but the communication is unclear, give 3 or 4 points.