

CS33 Homework Assignment 2 Solutions

Fall 2021

1. Consider the following 2D array in C:

```
int A[M][N];
```

- a. We'd like to work with column 1 of the array, i.e., the data in $A[0][1]$, $A[1][1]$, $A[2][1]$, etc. In particular, we want an *int* * that refers to a 1D array containing this column. Can this be done by setting such a pointer to point to the column's first element, or must we copy the elements of the column into a separate 1D array?

Answer: you must copy the elements of the column into a separate 1D array.

- b. We'd now like to work with row 1 of the array, i.e., the data in $A[1][0]$, $A[1][1]$, $A[1][2]$, etc. In particular, we want an *int* * that refers to a 1D array containing this row. Can this be done by setting such a pointer to point to the row's first element, or must we copy the elements of the row into a separate 1D array?

Answer: setting a pointer is sufficient.

2. We want a (3D) array of the 2D arrays of problem 1, i.e., we'd like to organize P $M \times N$ arrays as a single $P \times M \times N$ array.

- a. How does one declare an array of P of the 2D arrays of problem 1?

Answer: `int A[P][M][N];`

- b. We would like a pointer *ptr* that refers to a 2D array (of problem 1), so that we can use it to iterate through the array of such 2D arrays. How would one declare such a pointer? (It's definitely not cheating to test your answer using gcc!)

Answer: `int ((*ptr)[M][N]);`

also correct: `int (*ptr)[M][N];`

- c. We would like a function *func* that takes an *int* as an argument and returns a pointer to our 2D array. How would one declare such a function?

Answer: `int (*func(int))[M][N];`

also correct: `int (*func(int))[M][N];`

3. What's wrong, if anything, with each of the following?

- a.

```
int proc(int m) {
```

```

    static int array[m];
    // ...
}

```

Answer: the bounds for *array* must be known before the program is run, since the array must be allocated when the program is run. As written, *array*'s size could be different on each invocation of *proc*, which makes no sense, since *array* is allocated when the program starts.

b.

```

int *array;

void init(void) {
    int A[20];
    array = A;
}

int main(void) {
    init();
    array[7] = 6;
    // ...
}

```

Answer: the array *A* that is assigned to *array* in *init* goes out of scope once *init* returns. However, it is subsequently referred to within *main*.

c.

```

struct array_struct {
    int array[20];
};

struct array_struct init(void) {
    struct array_struct a_s;
    for (int i=0; i<20; i++)
        a_s.array[i] = i;
    return a_s;
}

int main(void) {
    struct array_struct x = init();
    // ...
}

```

Answer: there is nothing wrong with this code!

d.

```

int main(int argc, char *argv[]) {

```

```

int a=0, b=0;
int c;

if (argc != 3) {
    fprintf(stderr, "Wrong number of args\n");
    exit(1);
}
a = atoi(argv[1]);
b = atoi(argv[2]);
switch(a) {
case 0:
    c=b;
    break;
case 1:
    a=b;
    break;
default:
    c=a;
}
return a+b+c;
}

```

Answer: if a is inputted as 1, then c will be undefined and the result returned will be indeterminate.