CSC209H Worksheet: structs

1. Here is the beginning of a program involving structs. You will need to fill in missing bits. If you can work with a partner with a machine and actually compile your program at each step, do that. If not, work on paper.

```
#define MAX_AREA_SIZE 16
#include <stdio.h>
#include <string.h>
#include <stdlib.h>

struct faculty {
    char *name;
    char area[MAX_AREA_SIZE];
    int num_students;
};

int main() {
    // Declare a struct faculty called p1.



    // Initialize p1 to represent Professor Roger Grosse, whose research area
    // is ML (Machine Learning).  He is supervising 11 graduate students.
```

2. Here we have added a declaration for a pointer to a struct faculty. Allocate space for the struct on the heap and have `p2_pt` point to that memory.

   Error-checking: Look at the man page for `malloc` to see what it returns if it is unable to allocate memory. Now add code to check if the memory allocation for `p2_pt` was successful, and if it failed, exit the program with a non-zero exit status.

```
    struct faculty *p2_pt;




    // Set the values of *p2_pt to represent Professor Sheila McIlraith. Her research area
    // is KR (Knowledge Representation).  She is supervising 11 graduate students.
```

CSC209H Worksheet: structs

3. Write a function `add_grad_student` that increments the `num_students` count for the faculty passed as the function's argument. Think carefully about what the type of the function parameter should be.

4. Show how to make calls to `add_grad_student` using `p1` and `p2_pt`.

5. Suppose we have the following function declaration.

   ```
   void f(struct faculty p) { // Body hidden }
   ```

   Now suppose we call it from `main` using `f(p1)`. Draw the memory diagram of the program immediately after `f` is called, but before it starts executing. For extra practice, include `p2_pt` and related memory in your diagram.

6. Something to think carefully about: can the body of `f` affect the local `p1` of `main`? In other words, after `f(p1)` exits, can any data associated with `p1` have changed?

7. On a new sheet of paper, repeat the previous two questions when you call `f(*p2_pt)` instead.