CSC209H Worksheet: Strings

1. Write a program that declares 3 strings. The first named `first` should be set to the value `"Monday"`, and be stored on the stack frame for `main`. `second` should be a string literal with the value `"Tuesday"`. `third` should have value `"Wednesday"` and be on the heap. The pointers for `second` and `third` will be in stack frame for `main`.

   Then beside it, draw the memory model for your program after all three strings have been created. Using the starter code posted on the course website, type your program into your computer (or work with a friend on their computer.)

```
int main()
{
    char first[7] = "Monday";
    char *second = "Tuesday";
    char *third = malloc(10*sizeof(char));
    third = "Wednesday"; //Wrong
    strcpy(third, "Wednesday");

    char *string_list[3];
    string_list[0] = first;
    string_list[1] = second;
    string_list[2] = third;
```

Section	Address	Value	Label
Read-only	0x100	T u e s	
	0x104	d a y \0	
	0x108	W e d n	
	0x10c	e s d a	
	0x110	y \0	
	⋮	⋮	
Heap	0x23c	W e d n	
	0x240	e s d a	
	0x244	y \0	
	0x248		
	0x24c		
	⋮	⋮	
stack frame for main	0x454	M o n d	first[0] &first
	0x458	a y \0	
	0x45c	0x100	second
	0x460		
	0x464	0x23c	third
	0x464		
string_list	0x468	0x454	
	0x46c		
	0x470	0x100	
	0x474		
	0x478	0x23c	
	0x47c		

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2. Add to your program so that it declares an array `string_list` of 3 pointers to char and point the elements to `first`, `second`, and `third`, respectively. So now you have an array of strings. Where is the memory allocated for this array? Add to your memory model diagram as well. Once you have this complete, show it to a TA or the professor and ask for the next handout which has the solutions to questions 1 and 2 and a place to answer question 3.

3. Now, add a new function `build_month_list` that allocates, initializes and returns an array of 3 strings with the values `"January"`, `"February"`, and `"March"`. All the strings need to be mutable, so that the `main` function can shorten them. Remember to uncomment the code in `main` that tests that `build_month_list` is testable.

4. If you are finished (or if you can't figure out why your code isn't working), draw a memory diagram illustrating your program at the moment just before `build_month_list` returns.

```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>

// Part 3: Implement build_month_list.
```

```
char ** build_month_list(){
    char ** month_list =malloc (3 * sizeof(char *));
    month_list[0] = malloc ((strlen ("January")+1) * sizeof(char));
    strcpy (month_list[0], "January");

    month_list[1] = malloc ((strlen ("February")+1) * sizeof(char));
    strcpy (month_list[1], "February");
    month_list[2] = malloc ((strlen ("March")+1) * sizeof(char));
    strcpy (month_list[2], "March");
    return month_list;
}
```

```
int main() {
    // Part 1: Declare and initialize first, second, and third.
    char first[7] = "Monday";
    char *second = "Tuesday";
    char *third = malloc(10 * sizeof(char));
    //third = "Wednesday";  <- DOES NOT WORK make sure you understand why!
    strcpy(third,"Wednesday");

    printf("%s %s %s\n", first, second, third);

    // Part 2: Declare and initialize string_list.
    char *string_list[3];
    string_list[0] = first;
    string_list[1] = second;
    string_list[2] = third;

    printf("%s %s %s\n", string_list[0], string_list[1], string_list[2]);

    char **months = build_month_list();
    for(int i = 0; i < 3; i++) {
        printf("%s ", months[i]);
    }
    printf("\n");

    for(int i = 0; i < 3; i++) {
        months[i][3] = '\0';
        printf("%s ", months[i]);
    }
    printf("\n");

return 0;
}
```