**CS 2050 Lab Assignment 4-Summer 2014**

**\*\*\* FAILURE TO RETURN THIS DOCUMENT TO THE TA WILL RESULT IN A ZERO GRADE FOR THE LAB \*\*\***

**Objectives:**

* Implement insertion sort on an array of strings
* Use malloc and free
* Begin to think about ADT (Abstract Data Types)

Definitions needed at the top of your program (**Bold only**):

**#include <stdio.h>**

**#include <string.h>**

**#include <ctype.h>**

**#include <stdlib.h>**

**#define MAX\_STR\_LEN 25**

**typedef struct FreightCars\_ {**

**char \*name;**

**int number;**

**struct FreightCars\_ \*next\_car;**

**}FreightCar;**

**void add\_car(FreightCar \*engine);**

**void update\_car(FreightCar \*engine);**

**void remove\_car(FreightCar \*engine);**

**void display\_train(FreightCar \*engine);**

**void free\_cars (FreightCar \*engine);**

Inside main:

Will assign a variable called size to the passed in integer from the command line. Next, create a local pointer of type FreightCar and malloc a single structure of type FreightCar to it. Next, create a loop that will ask the user to enter in additional freight cars until size. Inside the loop call add\_car on the local pointer. After loop is finished call remove\_car, and then update\_car with your local pointer. Lastly, call free\_cars on the linked list.

**void add\_car(FreightCar \*engine);**

Will add a new freight car to the end of the linked list. Remember that we need char \*name to be allocated, so make sure to call malloc on it times MAX\_STR\_LEN before trying to copy/read in a string into it.

**void free\_cars(FreightCar \*engine);**

Will free all the allocated freight cars in the linked list.

**void update\_car(FreightCar \*engine);**

Will update a freight cars number given a name to search through the linked list. Also, must handle the case of name not being in the linked\_list. Search method: linear search

**void remove\_car(FreightCar \*engine);**

Will remove any freight car from the linked list **except the head** doing a linear search given name. Also, must handle the case of name not being in the linked\_list. Search method: linear search

**void display\_train(FreightCar \*engine);**

Will traverse the linked list of freight cars and display the name and number.

Sample output:

Grading Rubric

**5 points: Header and Comments**

**5 points: add\_car**

**5 points: free\_cars**

**5 points: update\_car**

**5 points: remove\_car**

**5 points: display\_train**

**Bonus:**

**void sort(FreightCar \*engine);**

**Sort the linked list using a bubble sort, inside of the if statement instead of swapping inside it, call your created swap function, that swap the structures.**

**void swap(FreightCar \*\*a, FreightCar \*\*b);**

**swaps the structures by reference.**