CS360 Lab #3
Due 11:59PM, Tuesday, September 10

This assignment concentrates on using red-black trees. See the lecture notes in the directories `/bl-green/homes/plank/cs360/notes/Rbtree-1` and `Rbtree-2` for instruction on how to use the dlist library.

Part 1

Implement `mysort2.c` (from `/bl-green/homes/plank/cs360/notes/Rbtree-1`) using `rb_traverse`. In other words, you want to sort standard input in reverse lexicographic order, but you want to traverse your red-black tree in the forward direction. To do this, you should use `rb_insertg` so that you can insert lines into the red-black tree and they will be sorted in reverse lexicographic order. See the lecture notes in `/bl-green/homes/plank/cs360/notes/Rbtree-2` for a discussion of `rb_insertg`.

Part 2

Modify `read_roster.c` from `/bl-green/homes/plank/cs360/notes/Rbtree-2` to do the following: Instead of just prompting the user for the last name, give the user four options:

1. Search on the last name and print out a full roster entry. If more than one player has that last name, print out all the first names (in alphabetical order), and have the user enter one. Print out that player's roster entry.
2. Search on the first three letters of the last name and print out all players that match, one line per player. Make sure players are in alphabetical order (sorted by last name, then first).
3. Search on the position and print out all players that match, one line per player. Make sure players are in alphabetical order (sorted by last name, then first).
4. Print out the entire roster in alphabetical order (sorted by last name, then first). Print all information as in the original roster file.

You may assume that no players have the same first and last name.

There should be *no linear search* in any part of this program. A good strategy for coding this will be to have:

- One rb-tree keyed on last name. The `v.val` field of this tree should be a rb-tree keyed on first name, with a `v.val` of the `info` structure. This composite rb-tree can be used to handle options 1 and 4 above.

- One rb-tree keyed on the first three letters of the last name. The `v.val` field of should be an rb-tree keyed on the full name of the player (in the format "last, first"), and with no `v.val` field.
- One rb-tree keyed on position. The `v.val` field of this tree should also be an rb-tree keyed on the full name of the player, with a `v.val` field that is null.

With such a setup, each time you read a line from the roster file, you will add a node to each of the above rb-trees.

Use the file `/bl-green/homes/plank/cs360/labs/lab3/roster` as your roster file. On the next page is an example of how the program should run on that file (you can also use the program `/bl-green/homes/plank/cs360/bin/rr` as an example of how it should work).

```
UNIX> rr
Enter:
  1 -- To search on the last name
  2 -- To search on the first three letters of the last name
  3 -- To search on the position
  4 -- To print out the entire roster
: 1
Enter last name: Colquitt
Jerry Colquitt:
  Height:    6.4
  Position:  QB
  Year:      Sr
  Team:      Tennessee
  Home Town: Oak Ridge, TN

Enter:
  1 -- To search on the last name
  2 -- To search on the first three letters of the last name
  3 -- To search on the position
  4 -- To print out the entire roster
: 1
Enter last name: Stewart
Enter first name (Branndon, Brian, James): James
James Stewart:
  Height:    6.1
  Position:  RB
  Year:      Sr
  Team:      Tennessee
  Home Town: Morristown, TN

Enter:
  1 -- To search on the last name
  2 -- To search on the first three letters of the last name
  3 -- To search on the position
  4 -- To print out the entire roster
: 2
Enter first three letters: Sto
Stokes, J.J.
Stone, Cory

Enter:
  1 -- To search on the last name
  2 -- To search on the first three letters of the last name
  3 -- To search on the position
  4 -- To print out the entire roster
: 3
Enter position: S
Austin, Raymond
Parker, Jason

Enter:
  1 -- To search on the last name
  2 -- To search on the first three letters of the last name
  3 -- To search on the position
  4 -- To print out the entire roster
: 4
Austin     Raymond  5.11    S       So      Tennessee       Lawton, OK
Becksvoort John     6.1     PK      Sr      Tennessee       Chattanooga, TN
Burton     Shane    6.5     DE      Jr      Tennessee       Catawba, NC
Colquitt   Jerry    6.4     QB      Sr      Tennessee       Oak Ridge, TN
Davis      Ronald   5.11    CB      Sr      Tennessee       Bartlett, TN
....
```