

## Homework Assignment #4

Due Monday, April 30, at the **start** of lecture. As always, turn in a typed hardcopy of your answers. You should not use any advanced functions that you find in the text or elsewhere to aid you in solving these problems; you should only use the functions that we've discussed in class.

1. For the version of association lists implemented as part of homework #3, implement a function `alist_map: ('k*'v -> 'a) * ('k,'v) assoc_list -> 'a list` that takes a mapping function `f` and an association list and returns the list of results of applying `f` to each key/value pair of the association list.
2. Use `alist_map` to implement a function `team_names` that extracts the list of all the team names from an association list of type `Records` from homework #3. Use an anonymous function as the argument to `alist_map`. Show how your function works on sample inputs.

The analogue for association lists of the list `reduce` function is

`alist_reduce: ('k*'v*'a -> 'a) * 'a * ('k,'v) assoc_list -> 'a` which takes a reduction function `f`, an initial base value `b`, and an association list and returns the result of successively applying `f` to each key and value in the association list and result of previous reductions to produce a new reduction result, starting with `b` as the initial reduction result of the empty association list. It can be defined as follows:

```
fun alist_reduce(f, b, nil) = b
  | alist_reduce(f, b, (k,v)::rest) = f(k, v, alist_reduce(f, b, rest))
```

3. Use `alist_reduce` to define a function `best_record: Records -> {wins:int, losses:int}` that computes the maximum team record, using `better_record` as the comparison function. Use an anonymous function as the argument to `alist_reduce`.
4. Write a function `all_games_back: Records -> (string * real) list` that produces for each team the number of games back that team is from the first-place team. The number of games back is computed as  $(\text{the number of additional losses relative to the first-place team} - \text{the number of additional wins}) / 2$ . Use `best_record` and either `alist_map` or `alist_reduce`, whichever is most appropriate, in your solution. Show how your function works on sample inputs. (Recall that to convert an `int` to a `real` you can use the function `real: int -> real`.)