CS 441 – Fall 2019
Assignment #6
Due: 12/13/2019

For this assignment you will be completing three different tasks in your exploration of the functional programming language: SML. This assignment will be your last of the semester and I expect you to use all of the lessons learned throughout to truly master its requirements.

You will be responsible for creating SML functions that satisfy the following problems:

1. Write an SML function that computes the Greatest Common Divisor of two positive integer values. The mapping of this function should be as follows:

```
val it = fn : int * int -> int
```

For instance (user input is in **red**):

```
- gcd(12,30);
val it = 6 : int
```

2. Write an SML function that takes a list and reverses the elements in said list. Your function should have the following mapping:

```
val it = fn : 'a list -> 'a list
```

For instance (user input is in **red**):

```
- val x = [7,10,15];
val x = [7,10,15] : int list

- reverse(x);
val it = [15,10,7] : int list

- val y = [[2,4,6], [3,5,7], [2,4,8,16]];
val y = [[2,4,6],[3,5,7],[2,4,8,16]] : int list list

- reverse(y);
val it = [[2,4,8,16],[3,5,7],[2,4,6]] : int list list

- val z = [[2,4,6], nil];
val z = [[2,4,6],[]] : int list list

- reverse(z);
val it = [[],[2,4,6]] : int list list
```

3. Write a SML function that performs Insertion Sort (`sort`) on a given list `x` – returning the sorted list. The function should use recursion to accomplish the task. The mapping of the function should be:

```
val it = fn : int list -> int list
```

We will assume that the list does not contain any sub lists. For instance (user input is in **red)**:

```
- val x = [2,3,5,2,1];
val x = [2,3,5,2,1] : int list

- sort(x);
val it = [1,2,2,3,5] : int list
```

Development Process:

The code must compile and run on Thomas (**thomas.butler.edu**) using the SML version installed. Each solution should be in its own SML file (e.g., `Ans1.ml, Ans2.ml, Ans3.ml`)

In addition to the three SML programs you will be submitting – you are also expected to submit a report that demonstrates that you have "tested" each program along with a brief discussion on how each was implemented in the SML language. You should highlight what you learned during this exercise and how this language compares to any and all imperative languages you have previously used. You are expected to submit a "professional" report with this submission (either a PDF or a Word document). This report should include answers and discussion to the above listed questions.

Make sure to include the Honor Pledge and Digital Signature in your source files! You can include comments in SML using the following block comment feature:

```
(* This is a comment *)
```

Submission:

All assignments must be submitted on Butler GitHub (**github.butler.edu**). The name of your Butler GitHub repository must be as follows: **cs441_fall2019**

Make sure your repository is **private** and that I (**rrybarcz**) am added as a collaborator. Failure to do so will result in a loss of points.

The following assignment should be done individually. All work is expected to be your own.