UMassAmherst | Manning College of Information & Computer Sciences

Programming Methodology

Lab 3: Lists

Wednesday September 17, 2025

Weekly Lab Agenda

- Go over reminders/goals
- Review past material
- Work in groups of 2-3 to solve a few exercises
  - Please sit with your group from last week.
- Discussion leaders will walk around and answer questions
- Solutions to exercises will be reviewed as a class
- Attendance taken at the end

Reminders

- Homework 3 is due Sunday (9/21) at 11:59pm
  - Come to office hours for help!
- If you need to miss lab and have a valid reason according to the syllabus (medical, other personal) please fill out the questionnaire on Canvas before the start time of your lab.
  - Waking up late, bus was late are NOT valid reasons to miss lab.

Today's Goals

- Lists
- Reduce

Lists - review

Lists are **recursive**
Lists are either

- empty
- or an **element** followed by a **list**

Lists are an **abstract data type** with the following methods:

- list.**isEmpty()**
  - returns **True** if the list is empty()
  - returns **False** if the list is **node(data,next)** [an element followed by a list]
- list.**head()**
- list.**tail()**

Exercise 1

Given two ordered lists, merge them such that the resulting list is an ordered list (ascending).

```
// merges two ordered lists
function merge(list1: List<number>, list2: List<number>): List<number>
```

Review of Reduce

```
function reduce<T, U>(
    a: T[],
    f: (acc: U, e: T) => U,
    init: U
): U {
    let result = init;
    for (let i = 0; i < a.length; ++i) {
        result = f(result, a[i]);
    }
    return result;
}
```

Reduce is used to combine array elements with the same function.

Example: Find the product of all elements of an array a = [3, 2, 6, 2, 2, 0]

```
a.reduce((prod, e) => prod * e, 1);
```

Array Destructuring

JavaScript lets us destructure arrays:

```
let [a, b] = [1, 2]; // a = 1 and b = 2
```

What does ... (spread syntax) do?

```
const c = [1, 2, 3];
const d = [4, 5, 6];
const e = [...c, ...d]; // e = [1, 2, 3, 4, 5, 6]

[a, b, ...rest] = ['a', 'b', 'c', 'd', 'e'];
// a = 'a', b = 'b', rest = ['c', 'd', 'e'];
```

Exercise 2

Return the sum of all positive and the sum of all negative numbers from an array.

```
function sumPositivesAndNegatives(arr: number[]): [number, number]
```

Bonus Exercise 3

Write a function **`reverseFilter`** that filters a list based on a predicate and returns the filtered elements in reverse order.

```
function reverseFilter<T>(list: List<T>, filterF: (x: T) => boolean): List<T>
```

Example:

Input List: -2, -1, 0, 1, 2

filterF: (e: number) => e >= 0

Output List: 2, 1, 0