Readings

- [Lecture Notes Chapter 12: Integer Multiplication]
- [Lecture Notes Chapter 13: Stacks & Queues]

Integer Multiplication

See [these notes]

Problems

Problem 1

Given a full stack $S_1$ of size $n$ and an empty stack $S_2$ of size $n$, sort the $n$ elements in ascending order in $S_2$. You may only use the given 2 stacks $S_1$ and $S_2$ (each of size $n$) and $O(1)$ additional space. What is the running time of your sorting procedure?

Example:

```
4 3 1 5 2 → 1 2 3 4 5
```

*Hint:* Start with a simpler example:

```
3 2 1 → 1 2 3
```

Problem 2

You are given two stacks $S_1$ and $S_2$, each of size $n$.

Implement a queue using $S_1$ and $S_2$. Your queue’s `enqueue` and `dequeue` methods should be implemented using only your stacks’ `push`, `pop`, and/or `peek` methods. What are the running times of your new queue’s `enqueue` and `dequeue` methods?
Additional Practice Problems

Problem 3

Given: A binary tree $T$.
Objective: Print the level order traversal of the tree $T$.
Example:

Figure 1: For this tree, your function should print 1, 2, 3, 7, 6, 5, 4.

Problem 4

Given: A binary tree $T$.
Objective: Print the spiral order traversal of the tree $T$.
Example:

Hint: Try using 2 stacks.

Problem 5

Consider an indefinitely long stream of unsorted integers. We are interested in knowing the median (in sorted order) at any given time. How would we do this in an efficient manner?
Figure 2: For this tree, your function should print 1, 2, 3, 4, 5, 6, 7.