

CS106B Midterm ANSWER KEY, Fall 2024

Problem 1, (1 part): 15pts

```
Vector<string> wordWrap(string paragraph, int maxLineLength) {
    Vector<string> lines;
    string line;
    string word;
    for (int i = 0; i < paragraph.length(); i++) {
        char ch = paragraph[i];
        word += ch;
        if (ch == ' ' || i == paragraph.length() - 1) {
            // we have a word or end of paragraph
            if (line.length() + word.length() <= maxLineLength) {
                line += word;
            } else {
                lines.add(line);
                line = word;
            }
            word = "";
        }
    }
    // don't forget the last line
    if (line != "") {
        lines.add(line);
    }
    return lines;
}
```

Problem 2: 15pts

Set unionStackAndQueue(Stack&stack, Queue&queue) { Set setUnion; Stack extraStack; // step 1: dequeue entire queue to set and back into queue int origQueueSize = queue.size(); for (int i = 0; i < origQueueSize; i++) { int n = queue.dequeue(); setUnion.add(n); queue.enqueue(n); }

```
// step 2: pop all of stack and put in set and temp stack
while (!stack.isEmpty()) {
    int n = stack.pop();
    setUnion.add(n);
    extraStack.push(n);
}
```

```
// step 3: push all of extraStack back to stack
```

```

while (!extraStack.isEmpty()) {
    int n = extraStack.pop();
    stack.push(n);
}

return setUnion;
}

```

Problem 3: 18pts (3 points each part)

- 3a) $O(N^2)$
- 3b) $O(\log N)$
- 3c) $O(N)$
- 3d) $O(N^2)$
- 3e) $O(a^N)$ (exponential)
- 3f) $O(N)$

Problem 4, 18pts

4a)

```

long numberOfJumpingSolutions(int numberOfPads) {
    Map<int, long> memo = {{0, 0}, {1, 1}, {2, 2}, {3, 4}};
    return solutionsHelper(numberOfPads, memo);
}

```

4b)

```

long solutionsHelper(int numberOfPads, Map<int, long> &memo) {
    if (memo.containsKey(numberOfPads)) {
        return memo[numberOfPads];
    }
    long currentSolution = solutionsHelper(numberOfPads - 1, memo) +
        solutionsHelper(numberOfPads - 2, memo) +
        solutionsHelper(numberOfPads - 3, memo);
    memo[numberOfPads] = currentSolution;
    return currentSolution;
}

```

Total: 66 points