Final Exam
- Sunday, May 8th, 2:45 to 4:45 pm
- UW ID required
- See posted exam information

Program 5 due 10 pm **Friday**, May 6th

Homework 10 due 10 pm **Wednesday**, May 4th

Last Time
Hashing
- choosing table size
- expanding a hash table
- handling collisions
Java Support for Hashing

Today
Tree Map vs. Hash Map (from last time)
Sorting Intro
Basic Sorts
- bubble sort
- insertion sort
- selection sort

Next Time
**Read**: continue *Sorting*
Better Sorts
- heap sort
- merge sort
- quick sort
Sorting

Problem

Solution

Complexity

In-Place Sorts

Basic In-Place Comparison Sorts
Bubble Sort

Idea

Psuedocode

```
int passes = A.length-1;

for (int i = 0; i < passes ; i++) {

    for (int j = A.length-1; j > i; j--) {
        if (A[j] < A[j-1]) {
            swap(A[j], A[j-1]);
        }
    }
}
```

Analysis

<table>
<thead>
<tr>
<th>kind of array</th>
<th>best case</th>
<th>worst case</th>
</tr>
</thead>
<tbody>
<tr>
<td># comparisons</td>
<td></td>
<td></td>
</tr>
<tr>
<td># swaps</td>
<td></td>
<td></td>
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<tr>
<td>total</td>
<td></td>
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</tbody>
</table>
Insertion Sort

Idea

Psuedocode (linear insertion)

```java
for (int i = 1; i < A.length; i++) {
    int temp = A[i];

    int j;
    for (j = i-1; j >= 0 && A[j] > temp; j--)

    A[j+1] = temp;
}
```

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<tr>
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<td></td>
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</tr>
</tbody>
</table>
Selection Sort

Idea

Psuedocode

```java
int passes = A.length-1;
for (int i = 0; i < passes; i++) {
    int minIndex = i;
    for (int j = i+1; j < A.length; j++) {
        if (A[j] < A[minIndex])
            minIndex = j;
    }
    swap(A[minIndex],A[i]);
}
```

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