Sets

- Set is an unordered list of items
  - Items are unique! Only one copy of each item in set!
- In Java we will use TreeSet to manipulate a set
  - A TreeSet is a a particular implementation of a Set
- Operations:
  - Create a set
  - Add an item to a set
  - Check if item is in a set
  - Is set empty?
  - Remove item from set

Example – Create and add to Set

```java
TreeSet<String> firstnames = new TreeSet<String>();
firstnames.add("John");
firstnames.add("Emily");
firstnames.add("Alex");
firstnames.add("Mike");
firstnames.add("John");
firstnames.add("Mike");
```

```
Alex
Mike
John
Emily
```

Example – Is object in set?

```java
if (firstnames.contains("Zed"))
    System.out.println("Zed is in the set.");
else
    System.out.println("Zed is not in the set.");
if (firstnames.contains("Mike"))
    System.out.println("Mike is in the set.");
else
    System.out.println("Mike is not in the set.");
```

Iterator – Look at each element in a Set

- Can create an iterator to look at each element in the set (as covered recently)
- Don’t know the order of the elements
- Guaranteed to give you all the elements in the set – one at a time
Iterate over elements in Set firstnames

- With collections loop, iterator is automatically created for you!

```java
// Print elements in set
for (String name: firstnames)
{
    System.out.println(name);
}
```

Alternative way to use Iterator

```java
// you must create iterator for set
Iterator<String> iter2 = firstnames.iterator();
// use iterator to print elements in set
while (iter2.hasNext())
{
    System.out.println(iter2.next());
}
```

Example – Other Operations on Sets

- `size()` – returns size of set
  ```java
  System.out.println("Size of set is ", firstnames.size());
  ```
- `remove(object)` – remove object from set if there
- `isEmpty()` – return true if set is empty

- See “Sets” and “Iterator” on Java API page

Output for Code shown
(Set only printed once)

```
Zed is not in the set.
Mike is in the set.
Alex
Emily
John
Mike
Size of set is 4
```
Set Operations

- Union of two sets
  - all the elements from both sets
- Intersection of two sets
  - the elements that are in both sets
- Difference of two sets (A – B)
  - the elements in A that are not in B

Classwork Today

- Implement set operations for two sets
  - Union, intersection, difference
- Implement set operations for array of sets
  - Union, intersection