# ICS 240 Introduction to Data Structures

Jessica Maistrovich

Metropolitan State University

# Generics

# Java Collection Classes

- Java provides a library of collection classes which are generic

- Java also provides some generic interfaces

- And you can implement your own generic classes and interfaces

# Using a Generic Interface

- Insert the type inside the <angle brackets>

```
public class Book implements Comparable<Book>

public class Phonebook implements
Comparable<Phonebook>
```

# ArrayList <E>

- https://docs.oracle.com/javase/8/docs/api/java/util/ArrayList.html

- What is it a list of?

- Objects vs primitive data types
- Autoboxing/Wrapper classes

| | | | |
|---|---|---|---|
| Integer | Short | | |
| Double | Float | | |
| Boolean | Long | | |
| Character | Byte | | |

# Converting Your Collection Class to a Generic Collection

## IntArrayBag

```java
public class IntArrayBag{

    private int[] data;

    private int manyItems;

    public IntArrayBag(int initialCapacty){}

    public void add(int element){}

    public boolean remove(int target){}

    public int grab(int index){}

    public int countOccurences(int elemnt){}

    public int size(){}

    public String toString(){ }

}
```

## ArrayBag<E>

```java
public class ArrayBag<E> {

    private Object[] data;

    private int manyItems;

    public ArrayBag(int initialCapacty){}

    public void add(E element){}

    public boolean remove(E target){}

    public E grab(int index){}

    public int countOccurrences(E elemnt){}

    public int size(){}

    public String toString(){}

}
```

# Generic Class Restrictions

- The data type that is used to instantiate the generic type parameter must be an object (not a primitive type).

  - This is illegal: **ArrayBag&lt;int&gt;**

  - Use wrapper classes instead, for example, **ArrayBag&lt;Integer&gt;**

- You **cannot** create an array of generic type. The following is illegal:

  ```
  private E[] data;
  ```

  - Instead, use:

  ```
  private Object[] data;
  data = new Object[capacity];
  ```

- You cannot call a constructor for a generic type.

  - The following is illegal:

  ```
  E item = new E();
  ```

# Try it!

- Convert the AnimalNode class to a generic Node class in the AnimalShelter project.