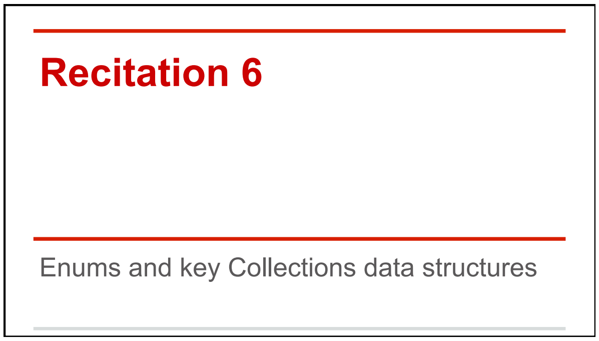
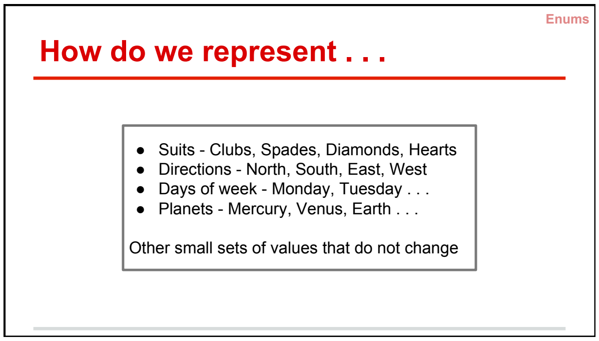


Recitation 6

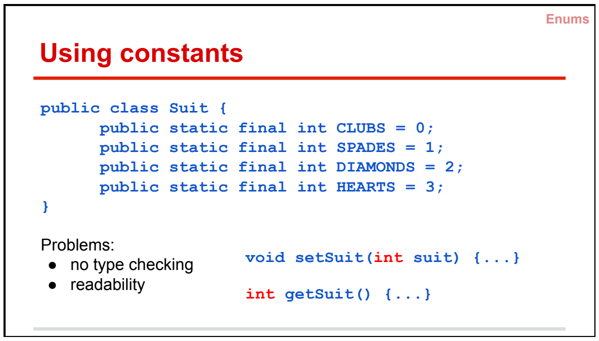
Enums and key Collections data structures



How do we represent . . .

- Suits - Clubs, Spades, Diamonds, Hearts
- Directions - North, South, East, West
- Days of week - Monday, Tuesday . . .
- Planets - Mercury, Venus, Earth . . .

Other small sets of values that do not change



Using constants

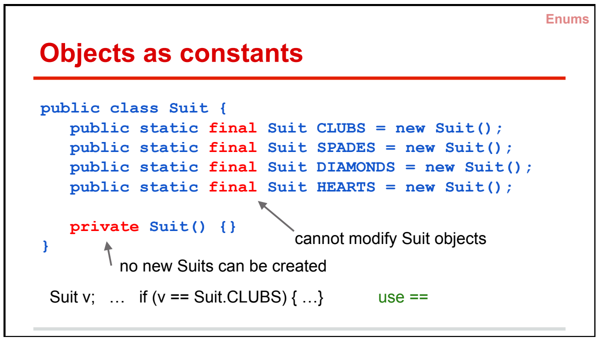
```
public class Suit {
      public static final int CLUBS = 0;
      public static final int SPADES = 1;
      public static final int DIAMONDS = 2;
      public static final int HEARTS = 3;
}
```

Problems:

- no type checking
- readability

```
void setSuit(int suit) {...}

int getSuit() {...}
```



Objects as constants

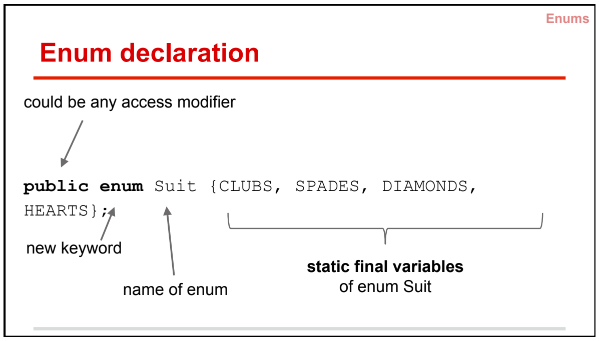
```
public class Suit {
   public static final Suit CLUBS = new Suit();
   public static final Suit SPADES = new Suit();
   public static final Suit DIAMONDS = new Suit();
   public static final Suit HEARTS = new Suit();

   private Suit() {}
}
```

cannot modify Suit objects

no new Suits can be created

Suit v; … if (v == Suit.CLUBS) { …} use ==



Enum declaration

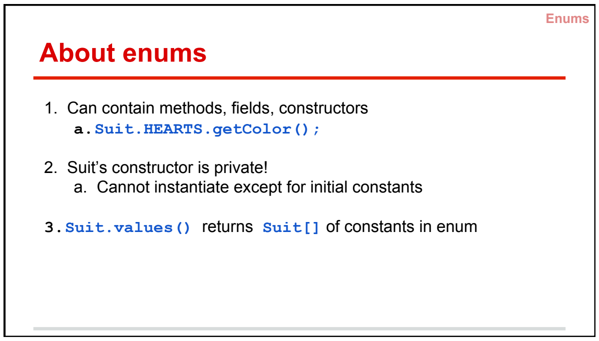
could be any access modifier

```
public enum Suit {CLUBS, SPADES, DIAMONDS,
HEARTS};
```

new keyword

name of enum

static final variables
of enum Suit

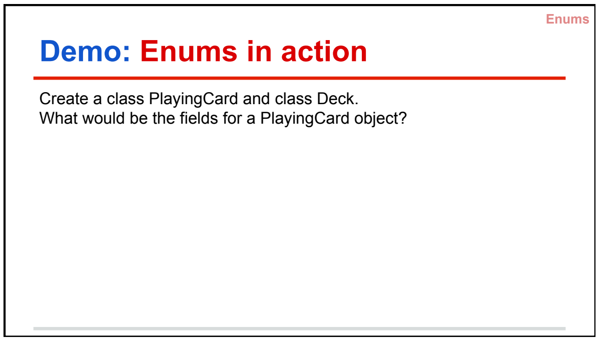


About enums

1. Can contain methods, fields, constructors
   a. `Suit.HEARTS.getColor();`

2. Suit's constructor is private!
   a. Cannot instantiate except for initial constants

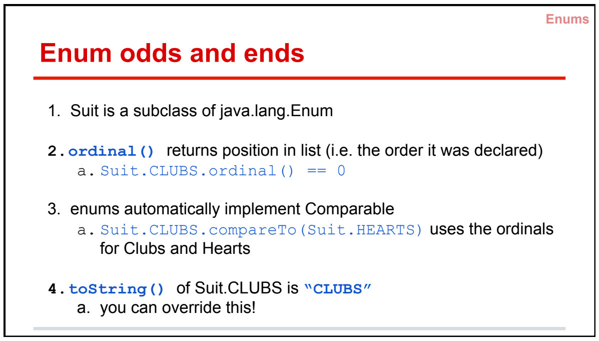
3. `Suit.values()` returns `Suit[]` of constants in enum



Enums

Demo: Enums in action

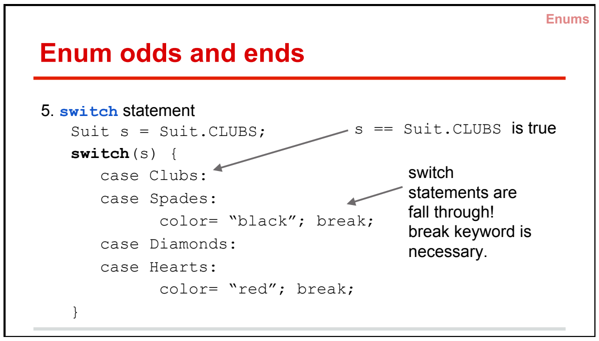
Create a class PlayingCard and class Deck.
What would be the fields for a PlayingCard object?



Enums

Enum odds and ends

1. Suit is a subclass of java.lang.Enum
2. `ordinal()` returns position in list (i.e. the order it was declared)
   a. `Suit.CLUBS.ordinal() == 0`
3. enums automatically implement Comparable
   a. `Suit.CLUBS.compareTo(Suit.HEARTS)` uses the ordinals for Clubs and Hearts
4. `toString()` of Suit.CLUBS is `"CLUBS"`
   a. you can override this!



Enums

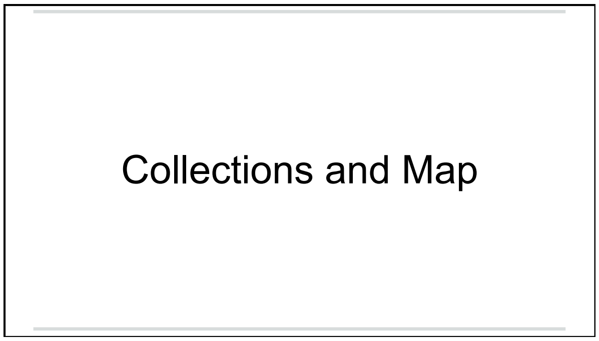
Enum odds and ends

5. `switch` statement

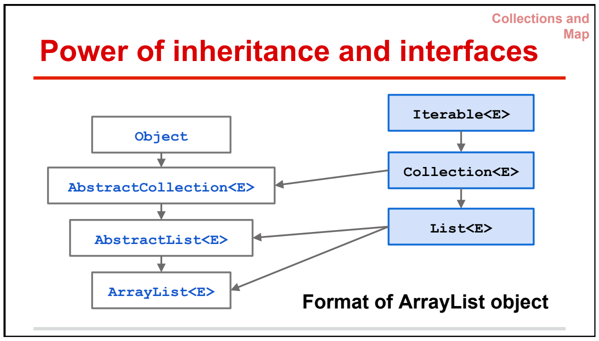
```
   Suit s = Suit.CLUBS;
   switch(s) {
      case Clubs:
      case Spades:
            color= "black"; break;
      case Diamonds:
      case Hearts:
            color= "red"; break;
   }
```

`s == Suit.CLUBS` is true

switch statements are fall through! break keyword is necessary.



Collections and Map



Collections and Map

Power of inheritance and interfaces

Object

AbstractCollection<E>

AbstractList<E>

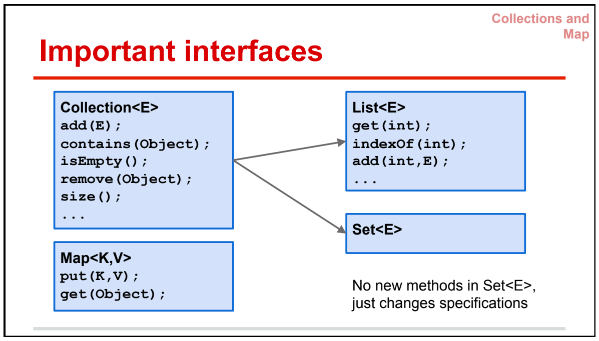
ArrayList<E>

Iterable<E>

Collection<E>

List<E>

Format of ArrayList object



Collections and Map

Important interfaces

Collection<E>
```
add(E);
contains(Object);
isEmpty();
remove(Object);
size();
...
```

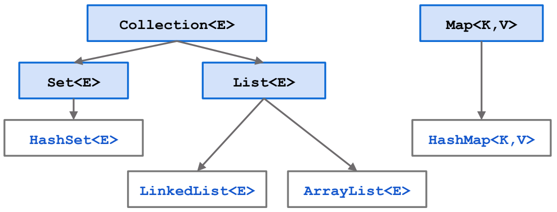
List<E>
```
get(int);
indexOf(int);
add(int,E);
...
```

Set<E>

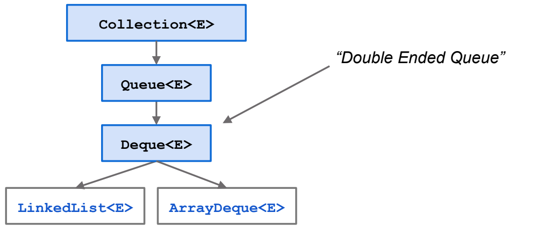
Map<K,V>
```
put(K,V);
get(Object);
```

No new methods in Set<E>, just changes specifications

Important classes



Queues? Stacks?



"Double Ended Queue"

Collections problems

1. Remove duplicates from an array
2. Find all negative numbers in array
3. Create ransom note
4. Implement a Stack with a max API
5. Print a binary tree in level-order
6. Braces parsing

Collections problems

Complete

```
Integer[] removeDuplicates(int[])

Remove all duplicates from an array of
integers.

Very useful HashSet method:
hs.toArray(new Integer[hs.size()]);
```

Collections problems

Find Negative Numbers

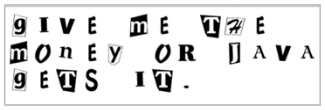
Find all negative numbers in array and return an array with those integers

```
Very useful ArrayList method:
lst.toArray(new Integer[lst.size()]);
```

Collections problems

Create Ransom Note

Given a note (String) that you would like to create and a magazine (String), return whether you can create your note from the magazine letters.



Collections and Map

Collections problems

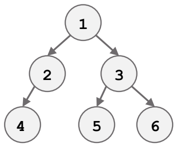
Implement a Stack<E> with a max() function in O(1) time

No matter how full the stack is, the max function should be in constant time. (ie you should not iterate through the Linked List to find the maximum element)

Collections and Map

Collections problems

Print a binary tree in level-order



```
Output: 1 2 3 4 5 6


Challenge Problem
Output:
1
2 3
4 5 6
```

Collections and Map

Collections problems

Braces parsing in O(n) time

```
Return whether a String has the right format of
square brackets and parenthesis.

e.g.
“array[4] = ((( new Integer(3) )));”  <- is true
“(   ) [   ] ]” <- is false
“)(” <- is false
“ ( [ ) ] ” <- is false
```