CS 149

Professor: Kevin Molloy

(adapted from slides originally developed by Alvin Chao)

Arrays and Loops

The real power of arrays is the ability to process them using loops, i.e., performing the same task for multiple elements. The standard form of iteration is as follows:

```
for (int i = 0; i < array.length; i++) {
        ... process array[i] ...
}
```

For example:

```
// set all of the elements of x to -1.0
double[] x = new double[100];
for (int i = 0; i < x.length; i++) {
        x[i] = -1.0;
}
// sum the elements of scores
int sum = 0;
for (int i = 0; i < scores.length; i++) {
        sum += scores[i];
}
```

Tracing Array Code

What is the value of array and accumulator after the following iteration? Trace the loop by hand.

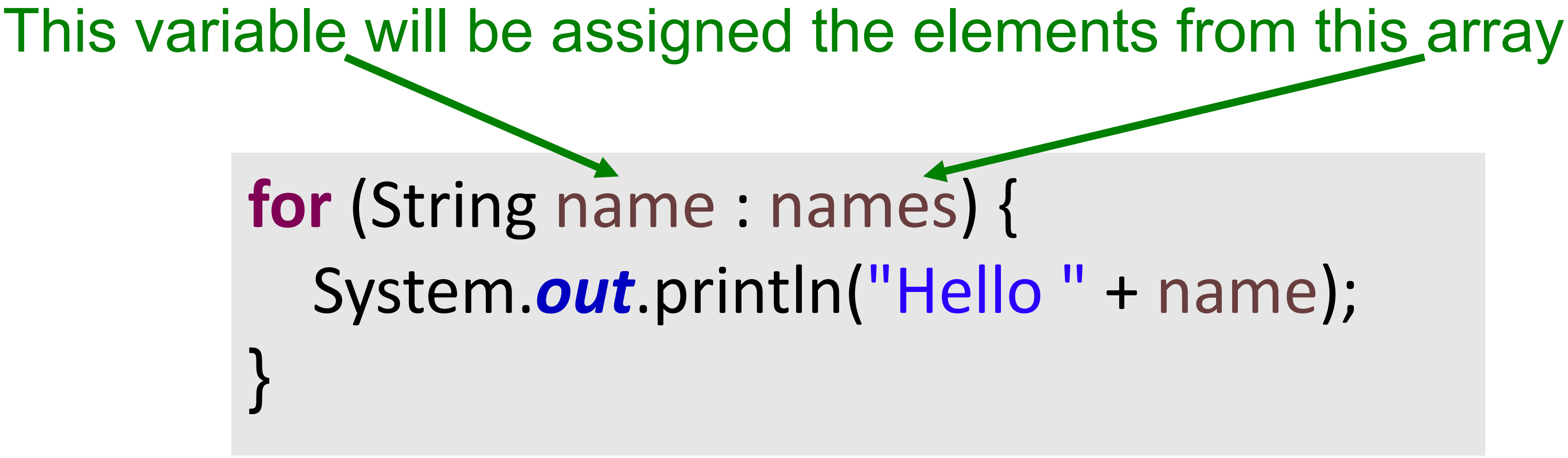
```
int[] array = {5, 26, 13, 12, 37};
int accumulator = 0;
for (int i = 0; i < array.length; i++) {
        if (array[i] % 2 == 1 && i + 1 < array.length) {
                array[i] *= -1;
                accumulator += array[i+1];
        }
}
```

Looping Over the Contents of an Array

- We often use a for loop to access each element in an array:

```
for (int i = 0; i < names.length; i++) {
    System.out.println("Hello " + names[i]);
}
```

- If only there were a better way…



This variable will be assigned the elements from this array

```
for (String name : names) {
    System.out.println("Hello " + name);
}
```

When To Use an Enhanced For Loop

- Always, unless:
  - Need to modify the array
  - Need to know the element index for some reason
  - Need to process the elements out of order
  - ...

Exercise #1

1)What will be printed by the following code?

2)Where is the style problem in this code?

```
String[] summer = {"June", "July", "August"};

String letters = "";

for (String i : summer) {
   letters += i.charAt(0);
}

System.out.println(letters);
```

Exercise #1

1) What will be printed by the following code?
   1) JJA

2) Where is the style problem in this code?

```
String[] summer = {"June", "July", "August"};

String letters = "";

for (String i : summer) {
  letters += i.charAt(0);
}

System.out.println(letters);
```

This is *not* an index variable, it requires a meaningful name (like “month”).

Exercise #2

- Complete the following method using an enhanced for loop (reminder: use .equals to compare strings.)

```
/**
 * This method counts the number of times a target word occurs in
 * an array of words. Comparisons are case-sensitive.
 *
 * @param words  - The array to search
 * @param target - The word to search for
 * @return The word count
 */
public static int countWord(String[] words, String target) {
}
```

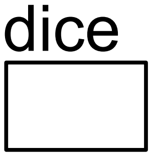
Reference Arrays

```
Die[] dice;

dice = new Die[4];

dice[0] = new Die(6);
dice[2] = new Die(5);

for (Die curDie : dice) {
  if (curDie != null) {
    curDie.roll();
  }
}
```


dice

Reference Arrays

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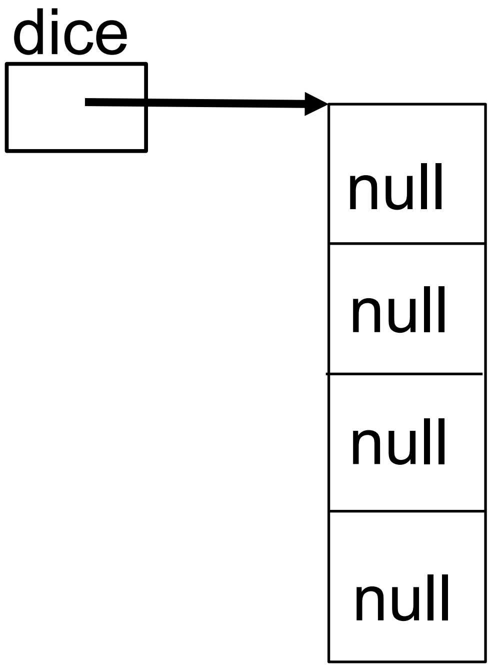

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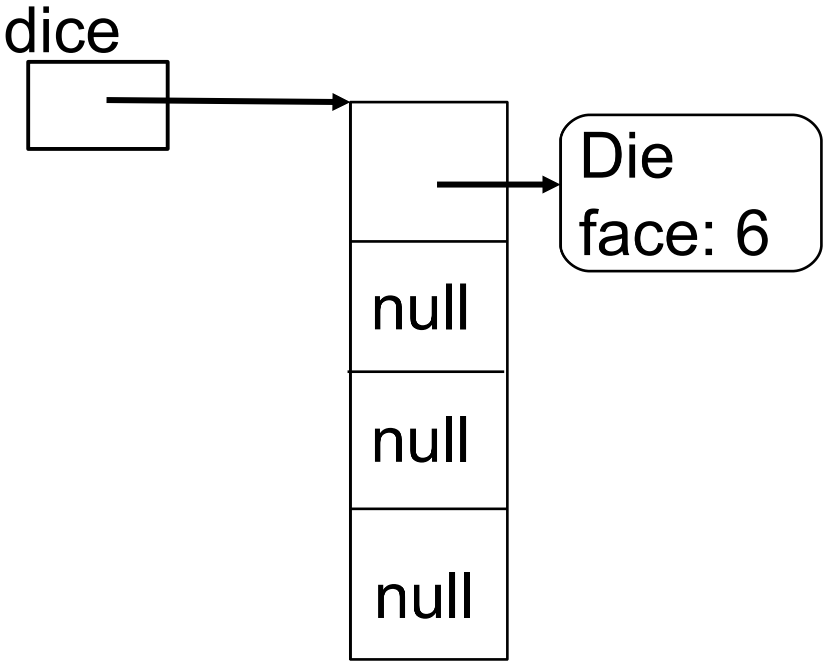

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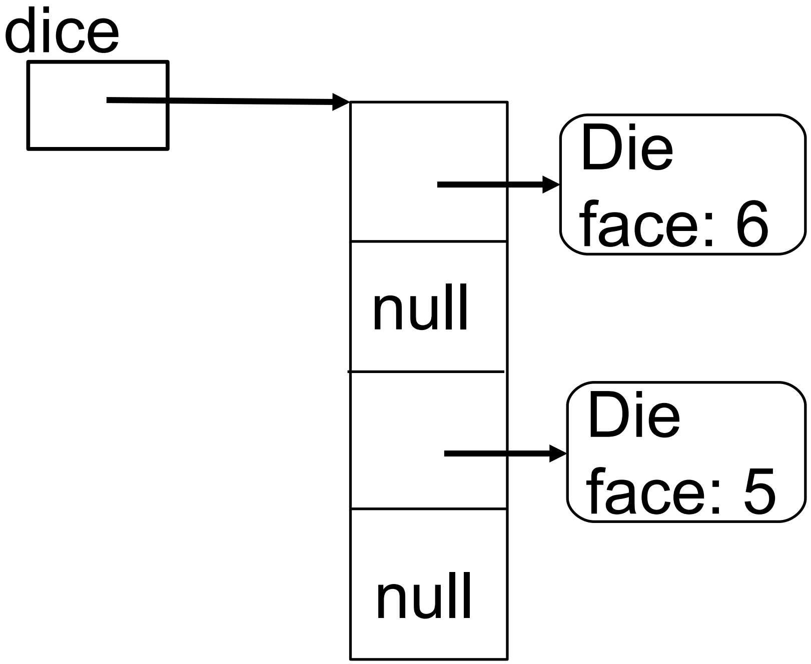

Exercise #3

- Draw the memory diagram and determine output.

```
Die single;
Die[] dice;
Dice   = new Die[4];
single = new Die(1);

for (int i = 0; i < dice.length; i++) {
  dice[i] = single;
}


dice[0].setFace(3);
for (Die curDie : dice) {
  System.out.println(curDie.getFace());
}
```

Exercise #3

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Die single;
Die[] dice;
Dice   = new Die[4];
single = new Die(1);

for (int i = 0; i < dice.length; i++) {
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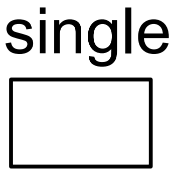

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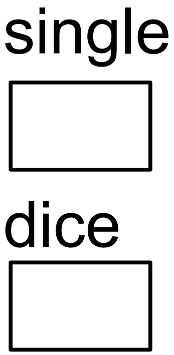

single

dice

Exercise #3

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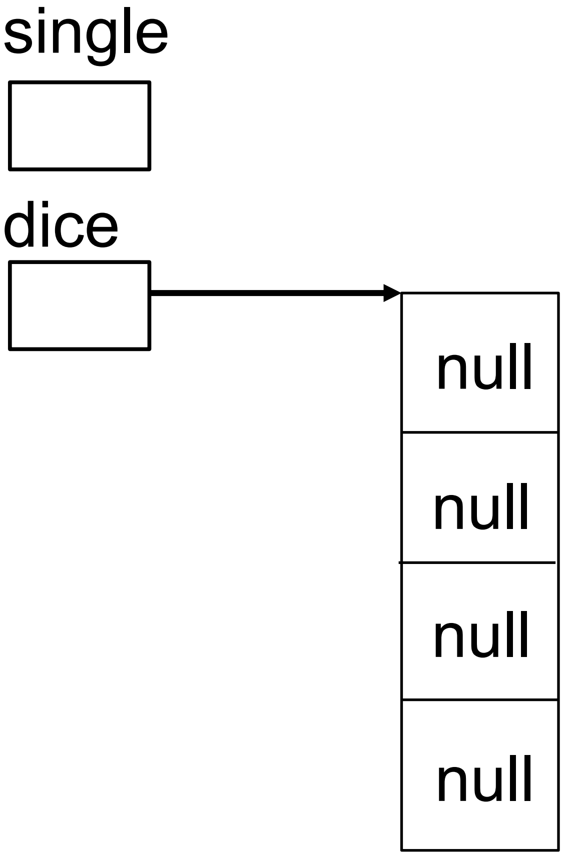

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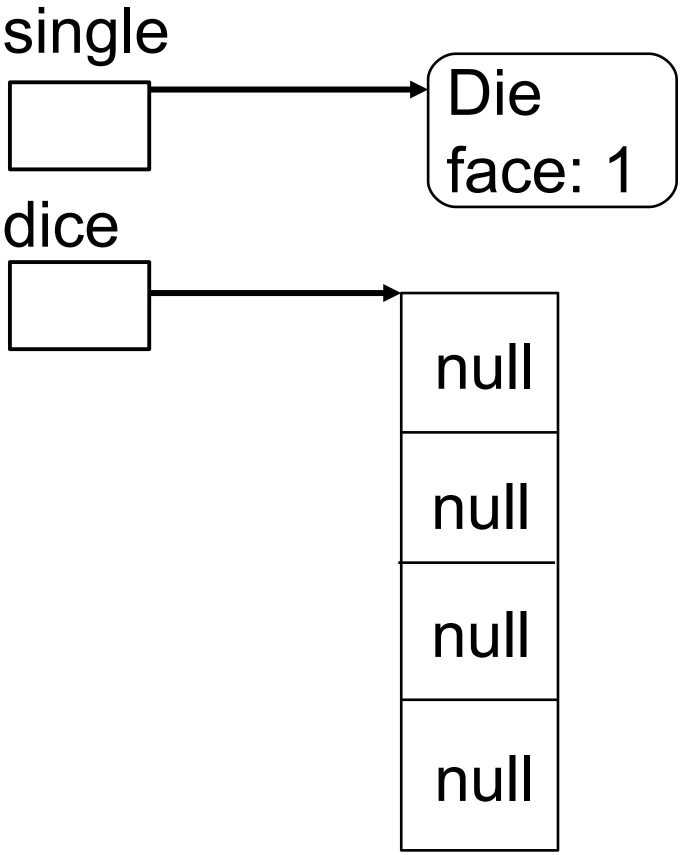

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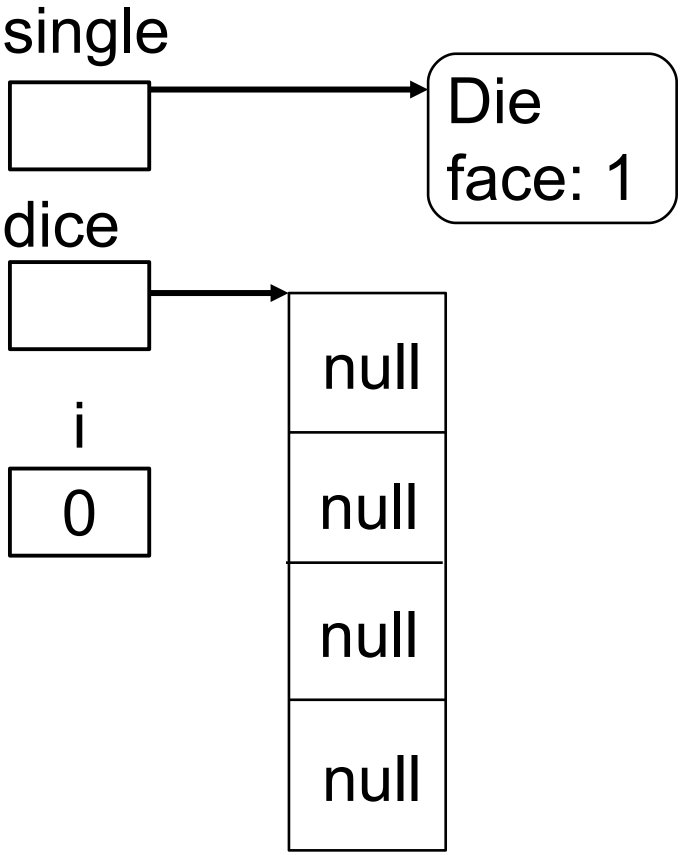

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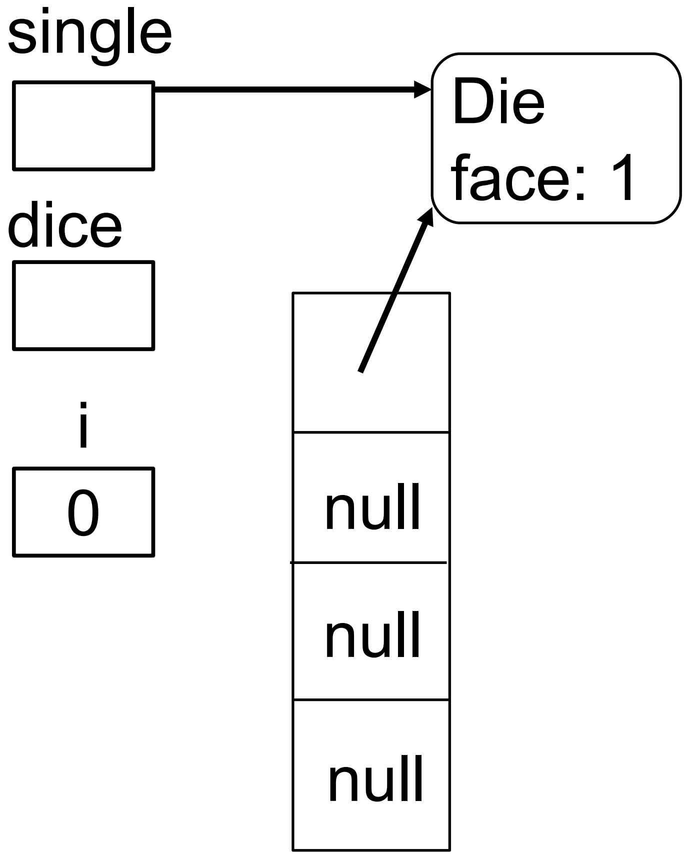

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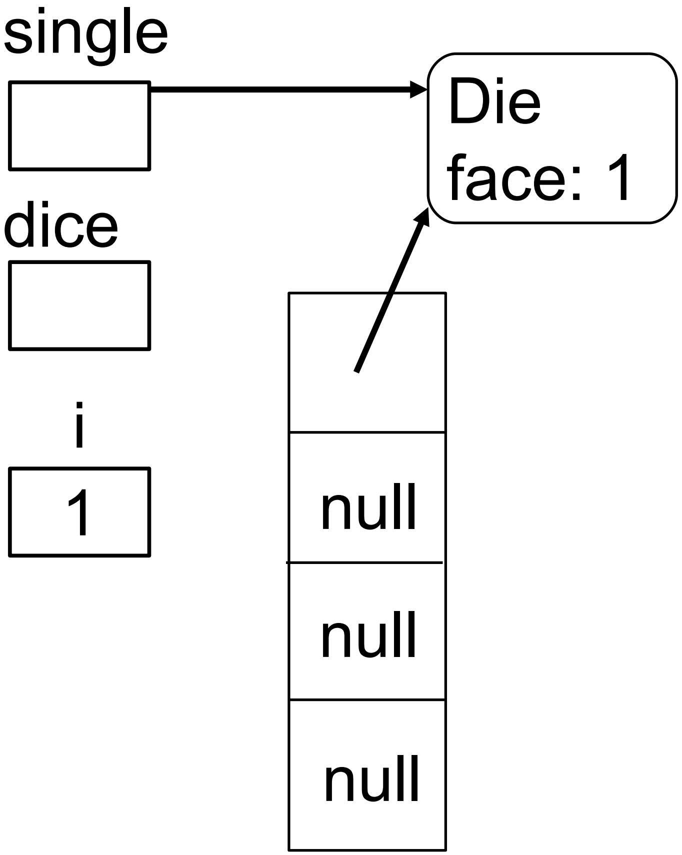

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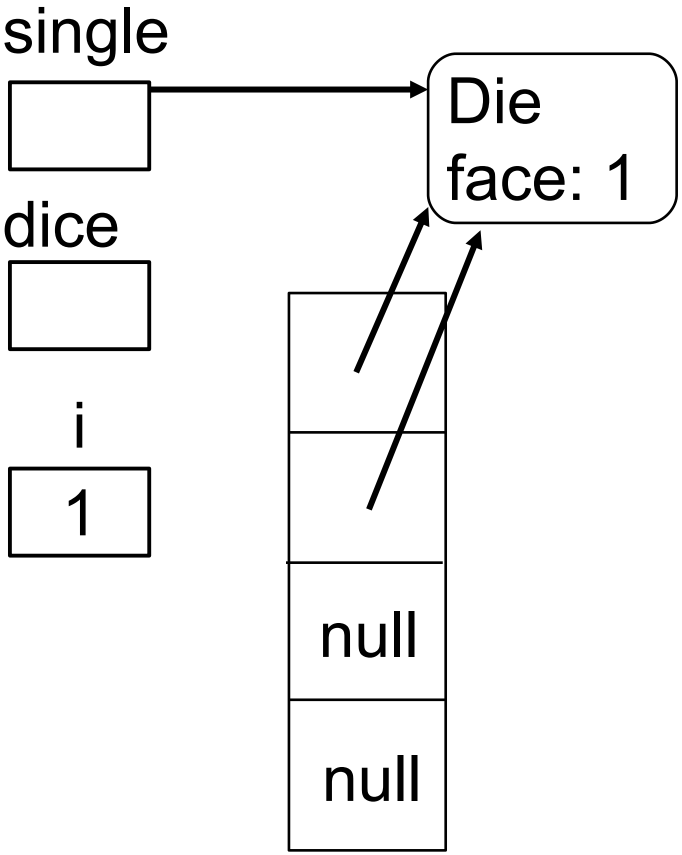

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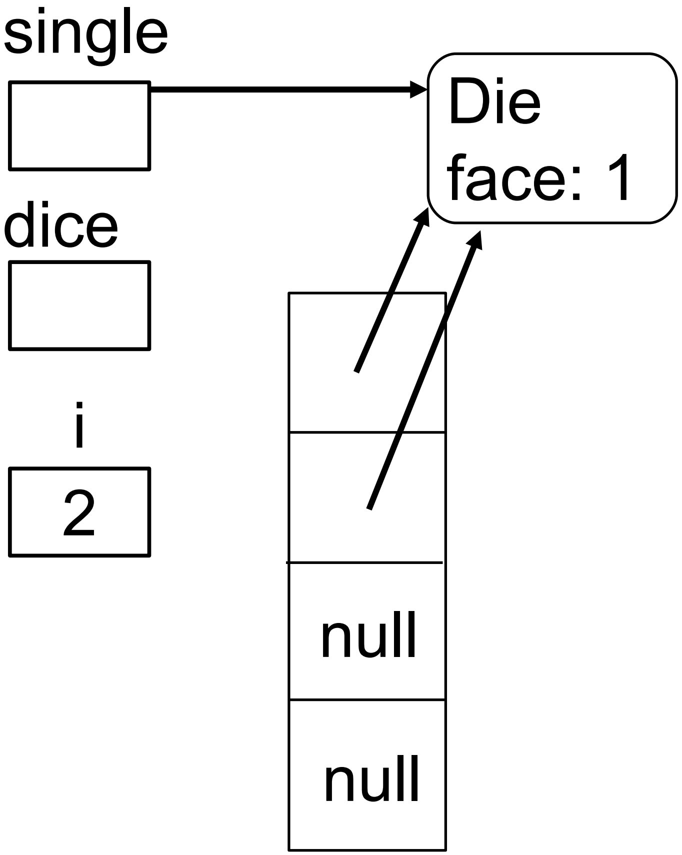

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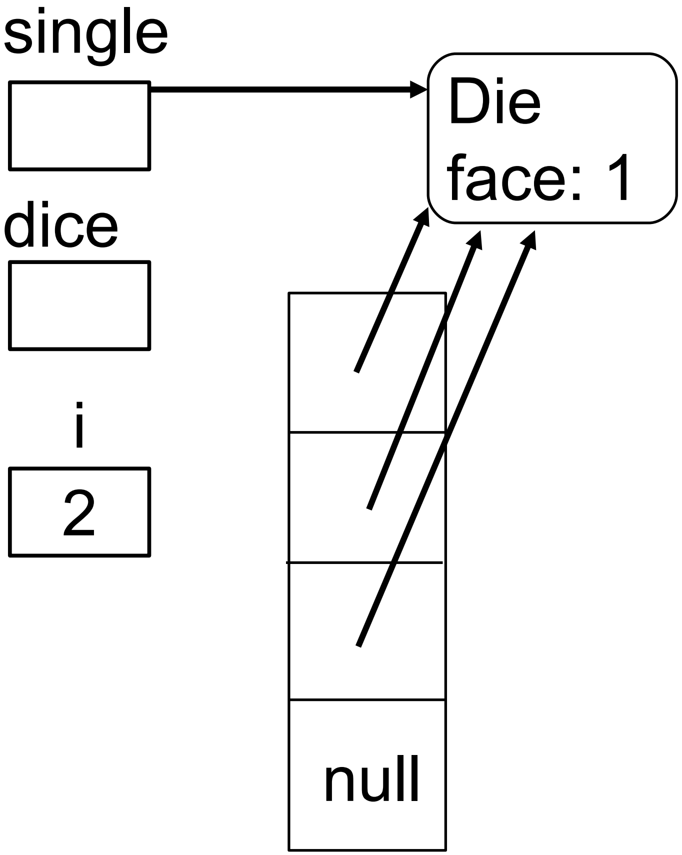

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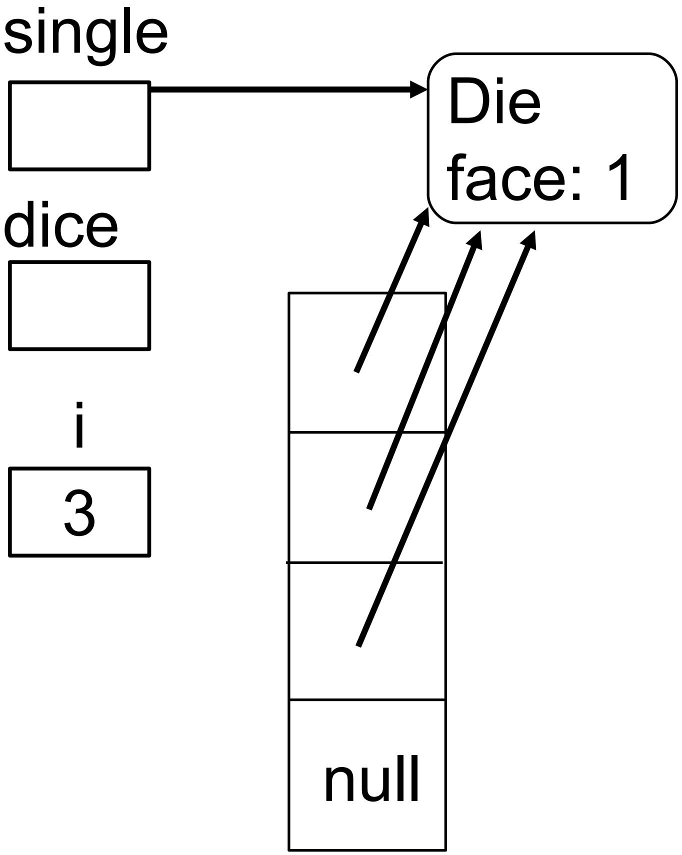

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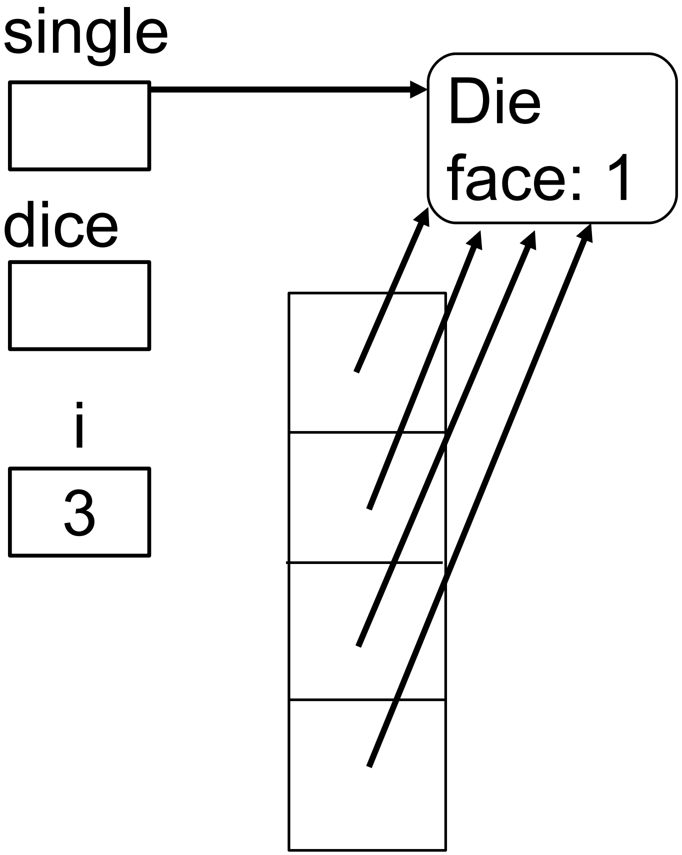

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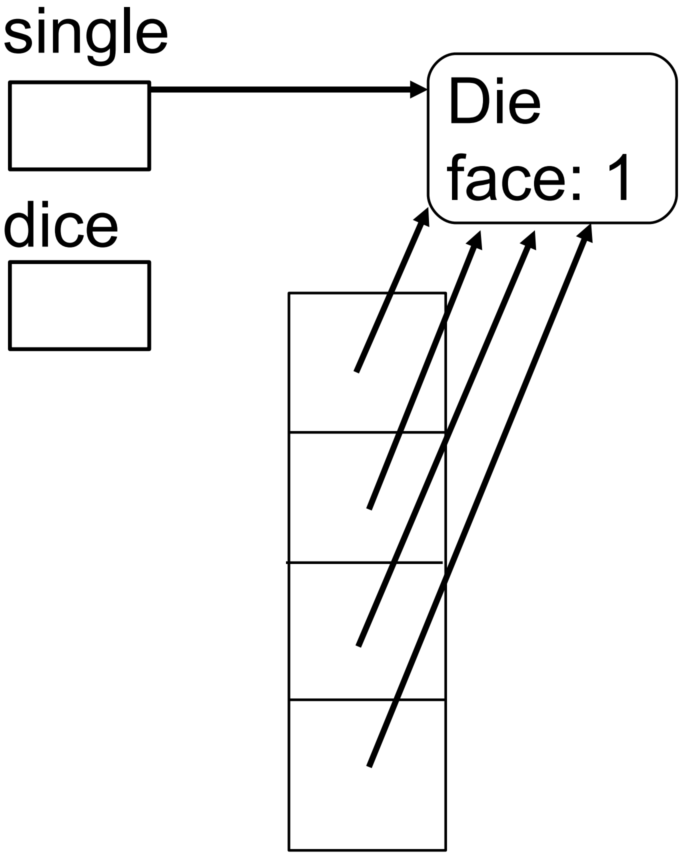

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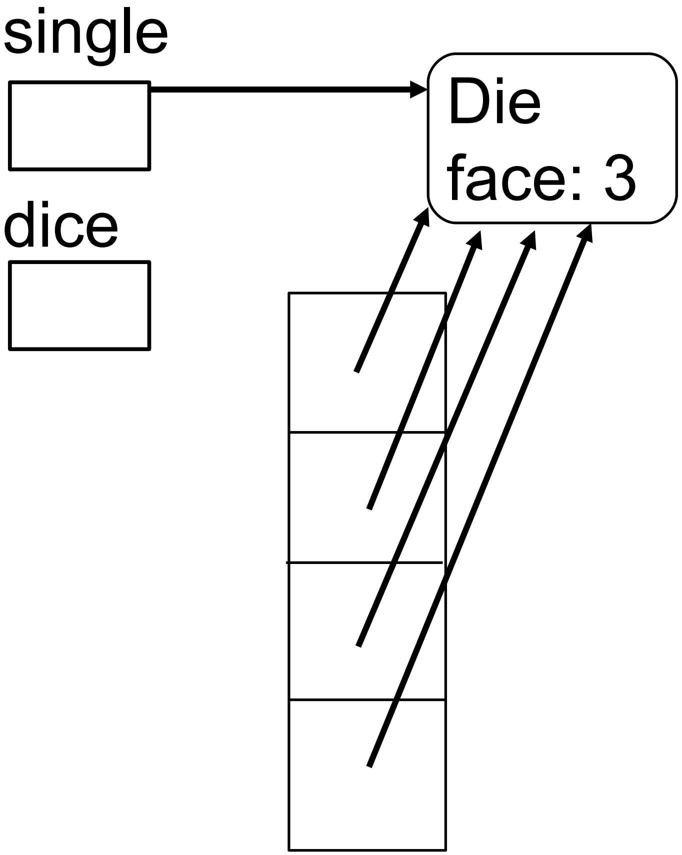

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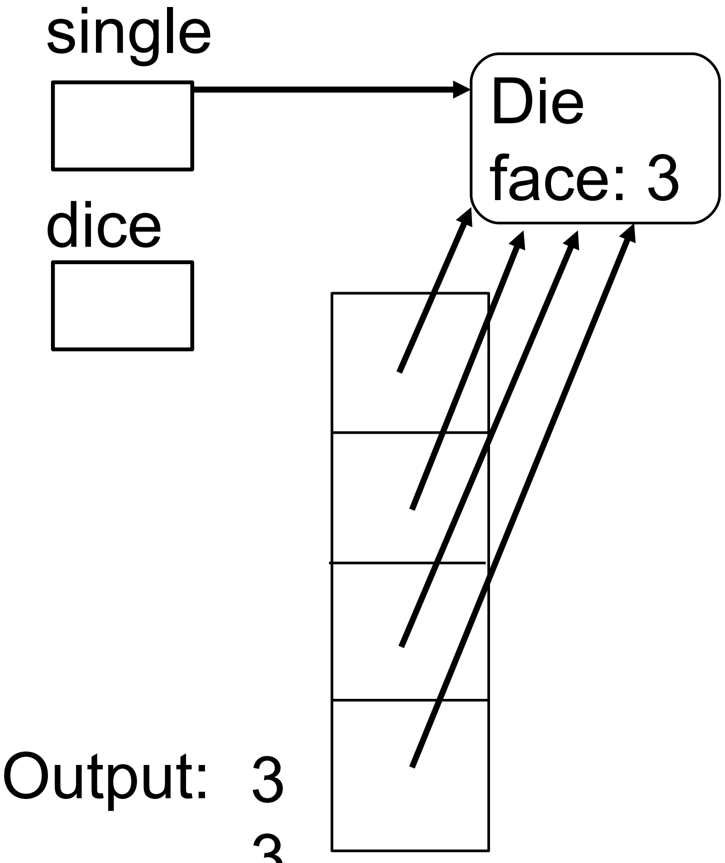

```
Output:  3
         3
         3
         3
```

Exercise #4

Complete the following method

```java
/**
  * This method creates a Die array, and populates it with
  * Die objects. Each Die object will be initialized with
  * a random face value (using the zero argument constructor).
  *
  * @param numDice - The number of Die objects in the new array
  * @return The array of Die objects
  */
 public static Die[] createDice(int numDice) {

 }
```

- **Acknowledgements**

Parts of this activity are based on materials developed by Chris Mayfield and Nathan Sprague.

</end>