

CMSC 203 Lab 5

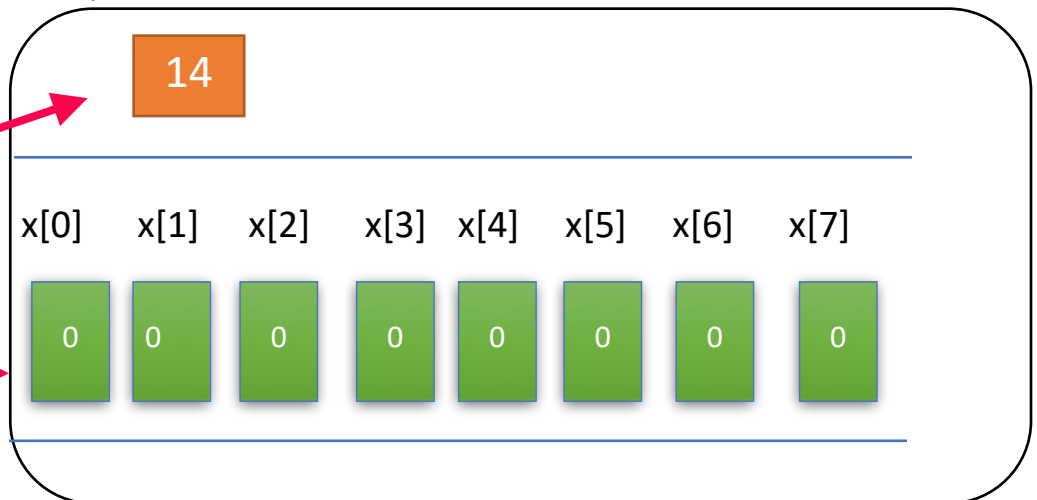
Memory Mapping

1. Draw the memory map of the following variable `int w` and one-dimensional array of type `int`.
`int w = 14;`
`int [] x = new int [8];`

Stack:



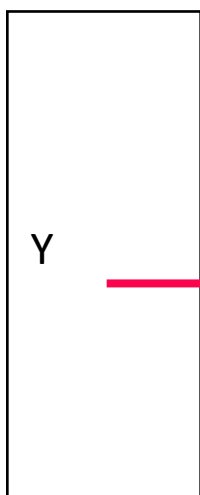
Heap:



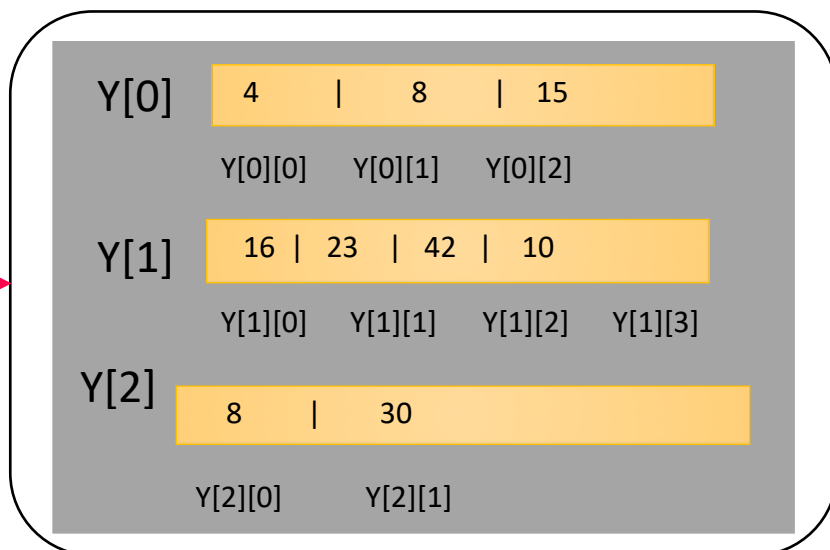
2. Draw the memory map of the following two-dimensional ragged array of ints.

```
int[][] y = {{4, 8, 15}, {16, 23, 42, 10}, {8, 30}};
```

Stack:



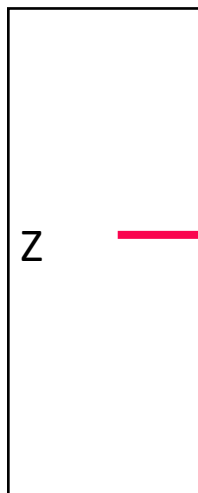
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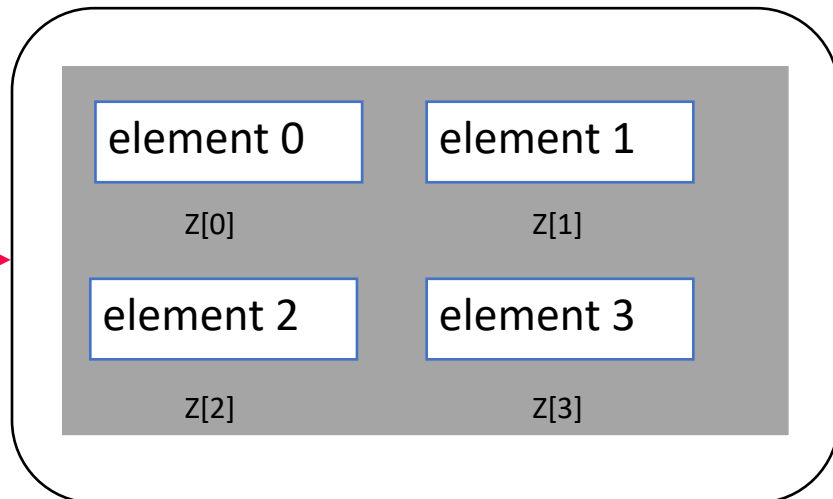
3. Draw the memory map of the following one-dimensional array of type String.

```
String[] z = new String[4];  
for (int i = 0; i < z.length; i++) {  
    z[i] = "element " + i;  
}
```

Stack:



Heap:



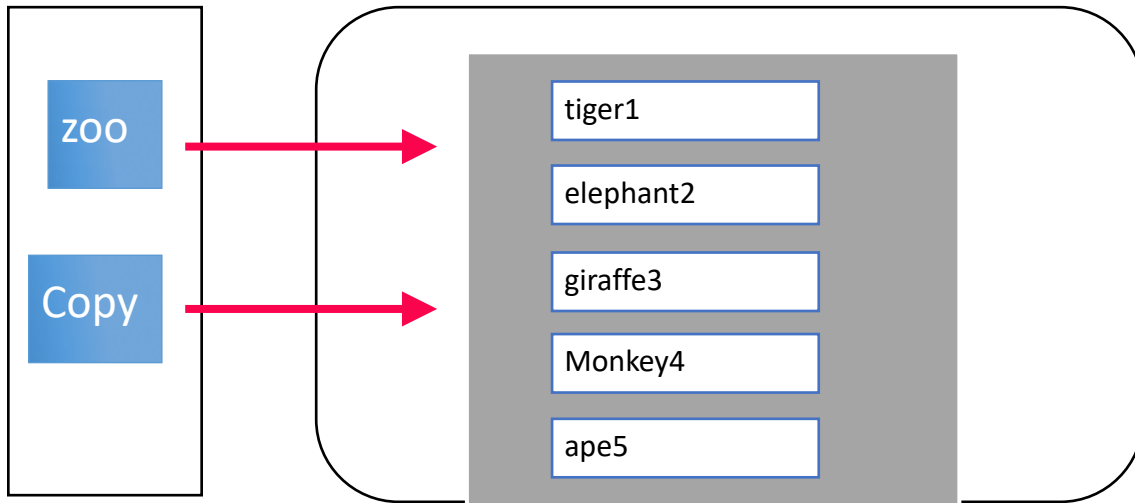
4. a. Write a shallow copy of the following in code. (Assume the five animal objects are already instantiated.)

```
Animal[] zoo = {tiger1, elephant2, giraffe3, monkey4, ape5};  
Animal[] copy= new Animal[zoo.length];  
for(int i=0; i<copy.length; i++){  
    copy[i] = zoo[i];  
}
```

- b. Draw the memory map.

Stack:

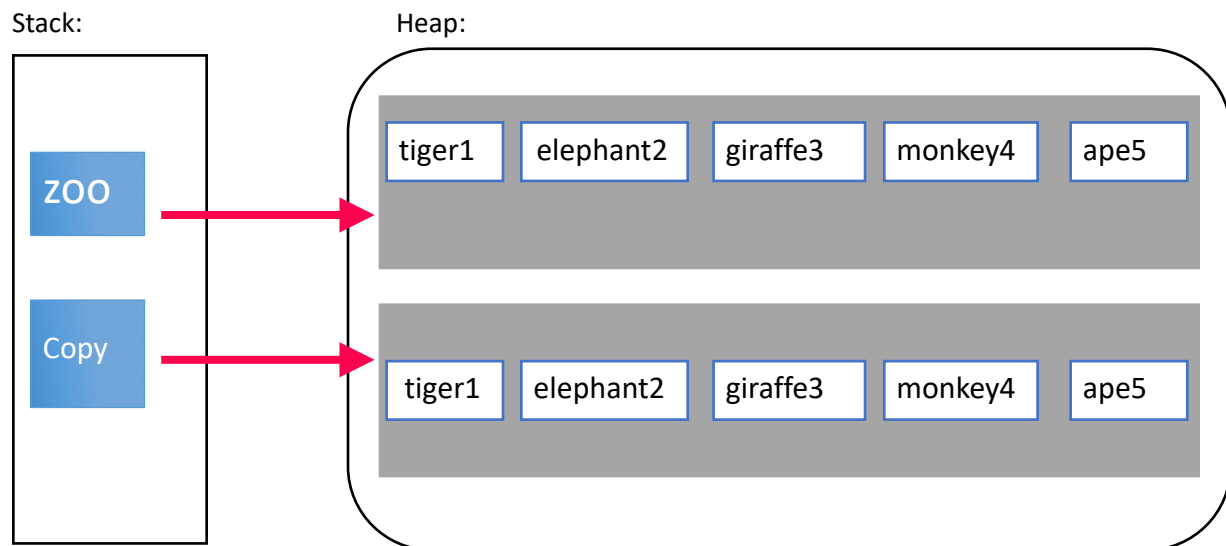
Heap:



5. a. Write the deep copy of the following in code.

```
Animal[] zoo = {tiger1, elephant2, giraffe3, monkey4, ape5};  
Animal[] copy;  
Animal[] copy= new Animal[zoo.length];  
for(int i=0; i<copy.length; i++){  
    copy[i] = new Animal(zoo[i]);  
}
```

- b. Draw the memory map.



6. What is garbage collection? Where does it happen?

Garbage collection is the process of automatically freeing up memory occupied by objects that are no longer in use by the program. This includes objects that no longer have any references pointing to them, making them unreachable by the program.

7. What is the difference between the two operators, equals() and ==?

The `==` comparison operator is used for comparison and returns a boolean value. It compares primitive data values directly and compares memory addresses when used to compare instance data values. On the other hand, the `equals()` method is also used for comparison and returns a boolean value. It compares the values of instance data types rather than their memory addresses. This method is typically overridden in classes to provide customized comparison logic.