

Week 5

Oct 31 Halloween

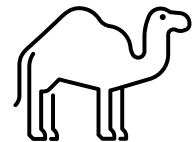
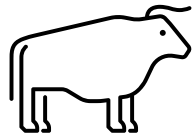
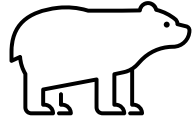
Topics to Cover

- Hash codes
 - Hash sets
 - Hash maps
 - Hash tables

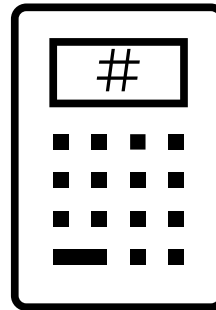
What is a hash code?

A hash code is a numeric representation of the contents (the individual data values) that are stored in an object.

Animal objects



Hash Function



Hash codes are
integers associate
with objects in Java

Hash codes

32154

54734

64789

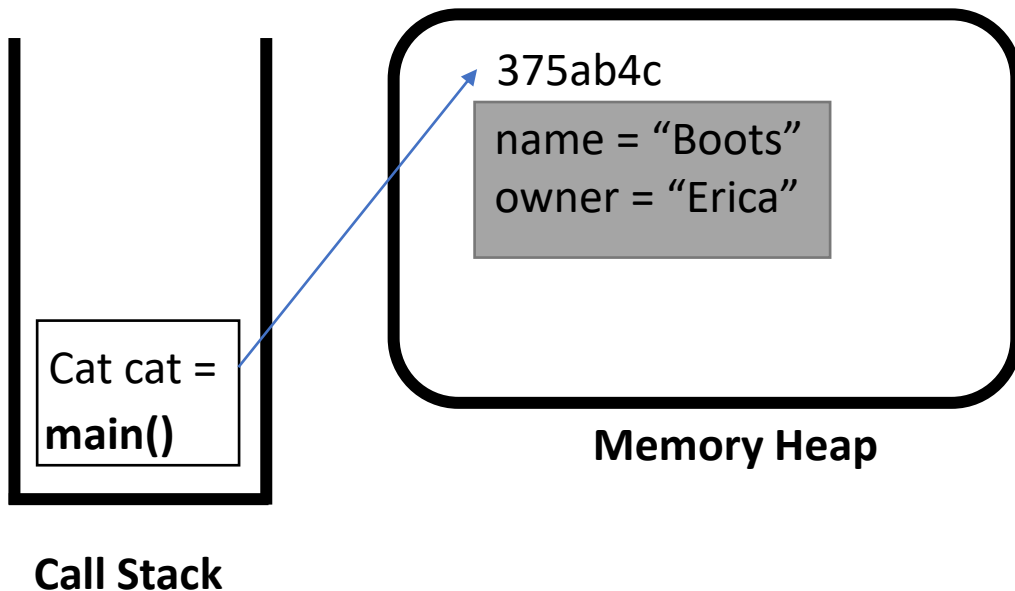
How to find the hash code?

- Method #1: Every class in java has a **.hashCode()** method inherited from the Object class, including user defined classes.
- Method #2: Objects.hashCode(...) lets us return the hash code of a single object.
- Method #3: Objects.hash(...) is capable of computing the combined hash code of one or more objects.

Memory Address vs Hash Code

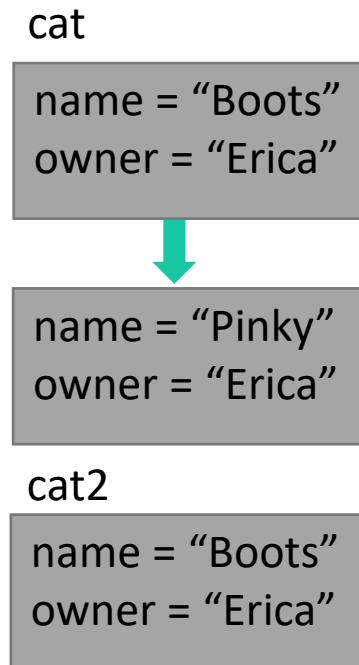
Memory Address

- Represents **where** the object is stored



Hash Code

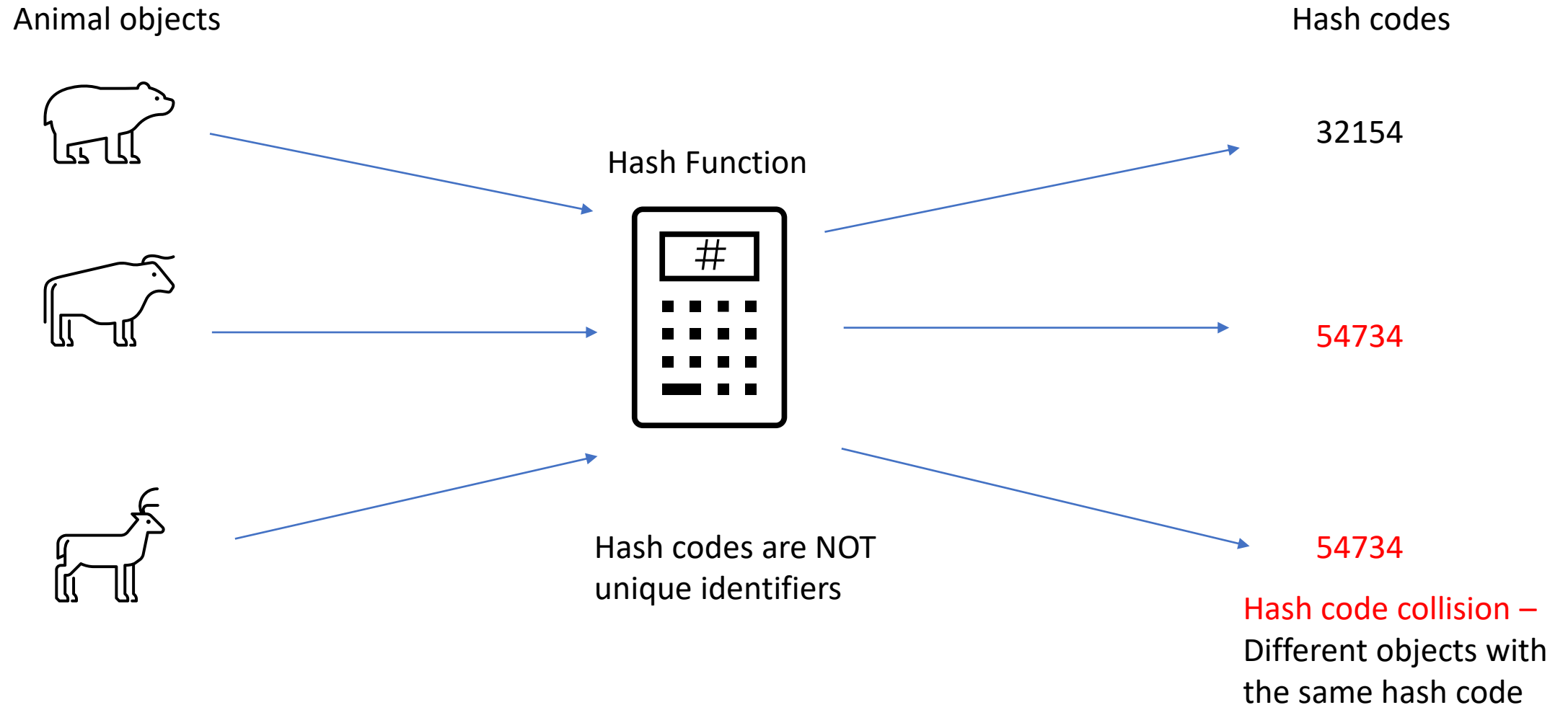
- Represents **what** the object contains



```
System.out.println(cat.hashCode());  
cat1.name = "Pinky";  
System.out.println(cat.hashCode());  
System.out.println(cat2.hashCode());
```

366712642
1829164700
366712642

What is a hash code NOT?



Hash Code Equals Contract

DOES SAY

- ✓ If two objects have identical values, the `.equals` method must return true
- ✓ If two objects have identical values, they must also have the same hash code
- ✓ Therefore, if we override the `.equals()` method, we must override the `.hashCode()` method

DOES NOT SAY

- ✗ If two objects have unidentical values, they must also have unidentical hash codes
- ✗ If two objects have the same hash code, they must also have the same values