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## 1 Creating Cats

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Given the `Animal` class, fill in the definition of the `Cat` class so that when `greet()` is called, the label "Cat" (instead of "Animal") is printed to the screen. Assume that a `Cat` will make a "Meow!" noise, and that this is all caps for cats younger than 5 years old.

```
1 public class Animal {
2     protected String name, noise;
3     protected int age;
4
5     public Animal(String name, int age) {
6         this.name = name;
7         this.age = age;
8         this.noise = "Huh?";
9     }
10
11    public String makeNoise() {
12        if (age < 5) {
13            return noise.toUpperCase();
14        } else {
15            return noise;
16        }
17    }
18
19    public void greet() {
20        System.out.println("Animal " + name + " says: " + makeNoise());
21    }
22 }
```

```
public class Cat extends Animal {
```

```
}
```

## 2 Raining Cats and Dogs

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Assume that `Animal` and `Cat` are defined as above. What will be printed at each of the indicated lines?

```
1 public class TestAnimals {
2     public static void main(String[] args) {
3         Animal a = new Animal("Pluto", 10);
4         Cat c = new Cat("Garfield", 6);
5         Dog d = new Dog("Fido", 4);
6
7         a.greet();           // (A) _____
8         c.greet();           // (B) _____
9         d.greet();           // (C) _____
10
11        a = c;
12        ((Cat) a).greet();    // (D) _____
13        a.greet();           // (E) _____
14    }
15 }
16
17 public class Dog extends Animal {
18     public Dog(String name, int age) {
19         super(name, age);
20         noise = "Woof!";
21     }
22
23     @Override
24     public void greet() {
25         System.out.println("Dog " + name + " says: " + makeNoise());
26     }
27
28     public void playFetch() {
29         System.out.println("Fetch, " + name + "!");
30     }
31 }
```

Consider what would happen if we added the following to the bottom of `main`:

```
a = new Dog("Spot", 10);
d = a;
```

Why would this code produce a compiler error? How could we fix this error?

### 3 An Exercise in Inheritance Misery

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Cross out any lines that cause compile-time errors, and put an X through runtime errors (if any). What does the main program (in class D) output after removing these lines? Note: There are many cases covered here and possibly not enough time to finish in discussion. Remember that solutions will be posted online later this week.

```
1 class A {
2     public int x = 5;
3     public void m1() {System.out.println("Am1-> " + x);}
4     public void m2() {System.out.println("Am2-> " + this.x);}
5     public void update() {x = 99;}
6 }
7
8 class B extends A {
9     public void m2() {System.out.println("Bm2-> " + x);}
10    public void m2(int y) {System.out.println("Bm2y-> " + y);}
11    public void m3() {System.out.println("Bm3-> " + "called");}
12 }
13 class C extends B {
14     public int y = x + 1;
15     public void m2() {System.out.println("Cm2-> " + super.x);}
16     public void m4() {System.out.println("Cm4-> " + super.super.x);}
17     public void m5() {System.out.println("Cm5-> " + y);}
18 }
19 class D {
20     public static void main (String[] args) {
21         B a0 = new A();
22         a0.m1();
23         a0.m2(16);
24         A b0 = new B();
25         System.out.println(b0.x);
26         b0.m1();
27         b0.m2();
28         b0.m2(61);
29         B b1 = new B();
30         b1.m2(61);
31         b1.m3();
32         A c0 = new C();
33         c0.m2();
34         C c1 = (A) new C();
35         A a1 = (A) c0;
36         C c2 = (C) a1;
37         c2.m3();
38         c2.m4();
39         c2.m5();
40         ((C) c0).m3();
41         (C) c0.m3();
42         b0.update();
43         b0.m1();
44     }
45 }
```