CS 302 - Week 12

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Midterm 2

Thursday, 5 to 7pm

What results are printed out?

```
Double d = new Double(5.2);

System.out.println( “result:” + ( d > 5));


double [][] d = { {5.6, 2.3},{2.7, 4.5}};

System.out.println( “d[1][1]:” + d[1][1]);
```

What is wrong?

```
public class C {
    private final int b;
    C() {
        b = 1;
    }
    public void setB( int newB) {
        b = newB;
    }
}
```

New Material

Inheritance and Polymorphism (chapter 11)

Exception Handling (chapter 12)

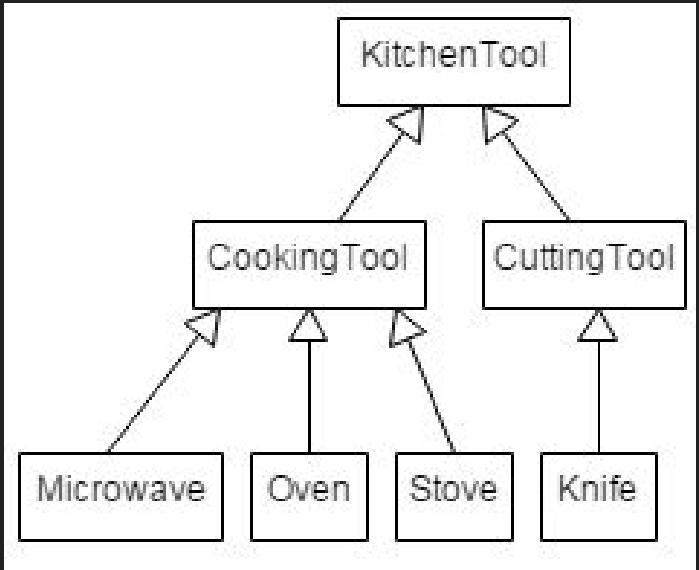
Text I/O (chapter 12)

Abstract Classes (chapter 13)

Interfaces (chapter 13)

Inheritance & Polymorphism

Hmmm...



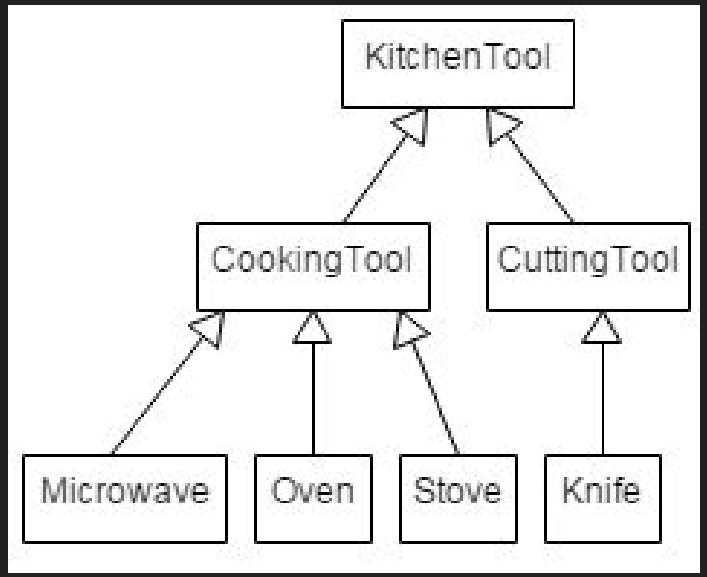
Assume:

KitchenTool kt = new Microwave();

CuttingTool ct = new CuttingTool();

1. Is kt instanceof Object?
2. Is kt instanceof CookingTool?
3. Is kt instanceof KitchenTool?
4. Is kt instanceof Oven?
5. Is kt instanceof Microwave?
6. Is ct instanceof CookingTool?
7. Is ct instanceof KitchenTool?
8. Is ct instanceof CuttingTool?

Hmmm...



Assume:
Object o = new Microwave();
CuttingTool ct = new CuttingTool();
Knife k = new Knife();

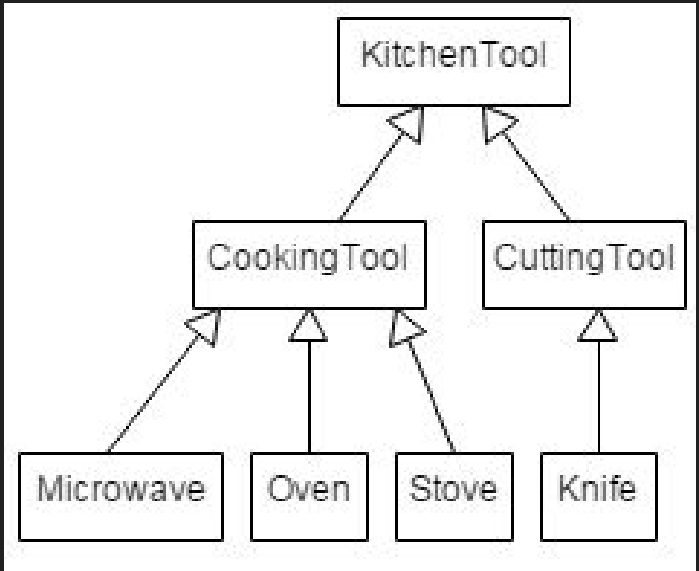
If method turnOn() is defined in CookingTool,

1. can ct invoke this method?
2. can o invoke this method?
3. Is ((CookingTool)o).turnOn() legal?

If method cut() is defined in CuttingTool

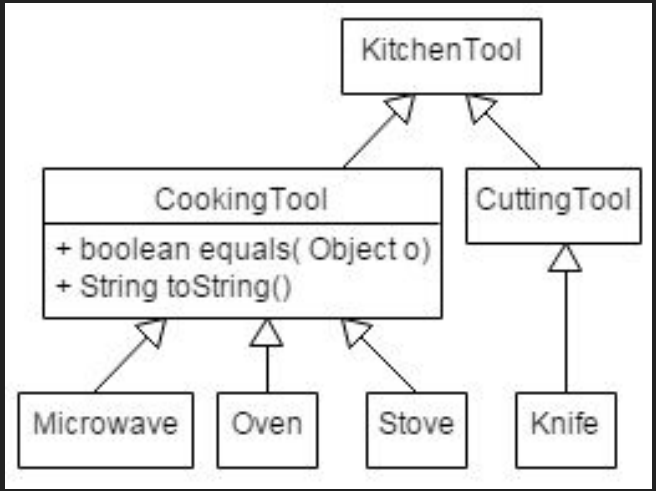
4. is ct.cut() legal?
5. is k.cut() legal?

What is wrong with?




```
class Kitchen {
        public static void main(String [] args) {
                Object o = new CookingTool();
                Oven oven = (Oven)o;
        }
}

class KitchenTool { }
class CookingTool extends KitchenTool { }
```

Hmmm...




```
Stove s = new Stove();
Object o = new CookingTool();
KitchenTool kt = new KitchenTool();
Knife k = new Knife();
```

Assume CookingTool has an equals method,
Which equals method will

1. s.equals(o) call?
2. o.equals(s) call?
3. kt.equals(o) call?
4. is s.toString() legal?
5. is o.toString() legal?
6. is k.toString() legal?

```
public class Stove {
  int heat = 5;
  public boolean equals(Stove s) {
    return this.heat == s.heat;
  }
  public boolean equals(Object o) {
    return this.heat == ((Stove)o).heat;
  }
  public static void main( String []args) {
    Object o = new Stove();
    Stove s1 = new Stove();
    Stove s2 = new Stove();
    System.out.println( s1.equals(o));
    System.out.println( o.equals(s1));
    System.out.println( s1.equals(s2));
}
```

1. Will this compile?
2. Which equals method overrides Object's?
3. Are the equals methods overloaded?
4. s1.equals(o) which method is called?
5. o.equals(s1) which method is called?
6. s1.equals(s2) which method is called?
7. Is the explicit cast an upcast or downcast?
8. Is the explicit cast safe? If not, what would safe syntax be?

What is the error?

```
package a;
public class A {
	int a;
}

package b;
import a.A;
public class B extends A {
	int b = super.a;
}
```

What is the error?

```
package a;
public final class A {
	int a;
}

package b;
import a.A;
public class B extends A {
	int b = super.a;
}
```

What is the bug?

```
class IntList {
        private ArrayList<Integer> list
                = new ArrayList<>();
        public void add( int i) {
                list.add( new Integer(i));
        }
        public void add2( int i, int j) {
                add( i);    add( j);
        }
}
```

```
class TrackCount extends IntList {
        int count = 0;
        public void add( int i) {
                this.count++;
                super.add( i);
        }
        public void add2( int i, int j) {
                this.count += 2;
                super.add2( i, j);
        }
}
```

```
//TEST CODE
TrackCount tc = new TrackCount();
tc.add(3); tc.add2( 2, 4);
System.out.println( "tc.count=" + tc.count);
```

What is the bug?

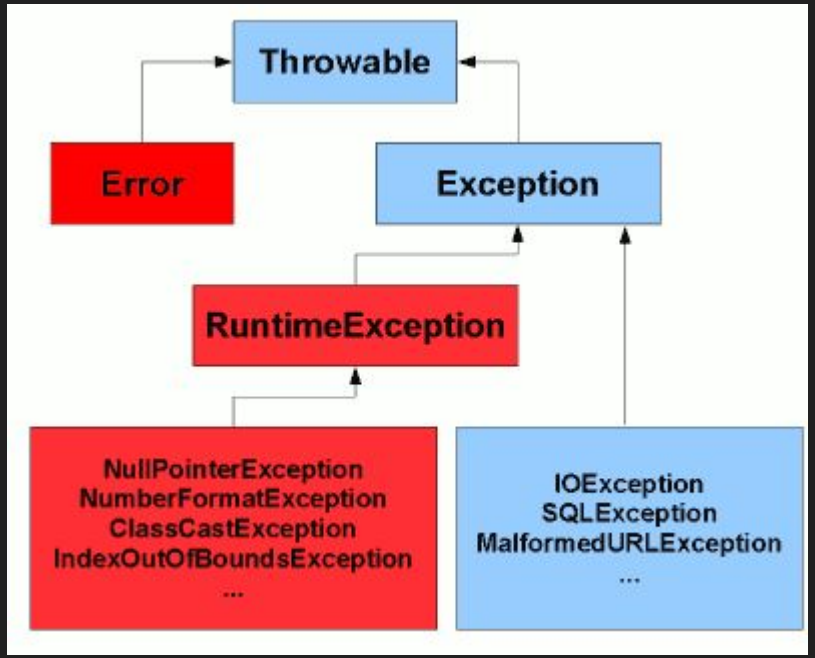
```
public class Super {
	public Super() {
		overrideMe();
	}
	public void overrideMe() {

	}
}
```

```
public final class Sub extends Super {
	private final Date date;
	Sub() {
		date = new Date();
	}
	@Override
	public void overrideMe() {
		System.out.println(date);
	}
}
```

```
//Test Code
Sub sub = new Sub();
sub.overrideMe();
```

From Joshua Bloch, Effective Java

Exception Handling



Runtime Errors

Unchecked Exceptions

Error - internal system errors

RuntimeException

Checked Exceptions

Exception

http://www.javamex.com/tutorials/exceptions/exceptions_hierarchy.shtml

RuntimeExceptions - Programming Errors

```
System.out.println( 1 / 0);

int[] list = new int[4];
System.out.println( list[4]);

String s = “abc”;
System.out.println( s.charAt(3));

Object o = new Object();
String d = (String)o;

Object o = null;
o.toString();
```

RuntimeExceptions - Programming Errors

```
System.out.println( 1 / 0);      //ArithmeticException

int[] list = new int[4];
System.out.println( list[4]);    //ArrayIndexOutOfBoundsException

String s = “abc”;
System.out.println( s.charAt(3));  //StringIndexOutOfBoundsException

Object o = new Object();
String d = (String)o;            //ClassCastException

Object o = null;
o.toString();                    //NullPointerException
```

Javadocs

http://docs.oracle.com/javase/7/docs/api/java/lang/RuntimeException.html

Exception in thread "main" java.lang.ClassCastException: java.lang.Object cannot be cast to java.lang.String
    at Test.method2(Test.java:5)
    at Test.method1(Test.java:9)
    at Test.main(Test.java:27)

Checked Exceptions

Not Error or RuntimeException

Compiler forces programmer to check and deal with them.

//declare method throws them

```
public void myMethod() throws IOException {  }
```

Catching Exceptions

```
try {
        some statements;
} catch ( Exception1 e) {
} catch ( Exception2 e) {
}
```

Throwing Exceptions

```
public void myMethod(int i) throws IllegalArgumentException {
    if ( i < 0) {
        throw new IllegalArgumentException(“i cannot be negative”);
    }
}
//IllegalArgumentException is a RuntimeException
```

What happens when...

```
try {
        statement1;
        statement2;  //throws an exception
        statement3;
} catch( Exception1 e) {

} catch( Exception2 e) {

}
statement4;
//will statement 3 be executed?
//if exception is not caught will statement 4 be executed?
//if the exception is caught will statement 4 be executed?
```

What happens when...

```
try {
        statement1;
        statement2;
        statement3;
} catch( Exception1 e) {

} finally {
        statement4;
}
```