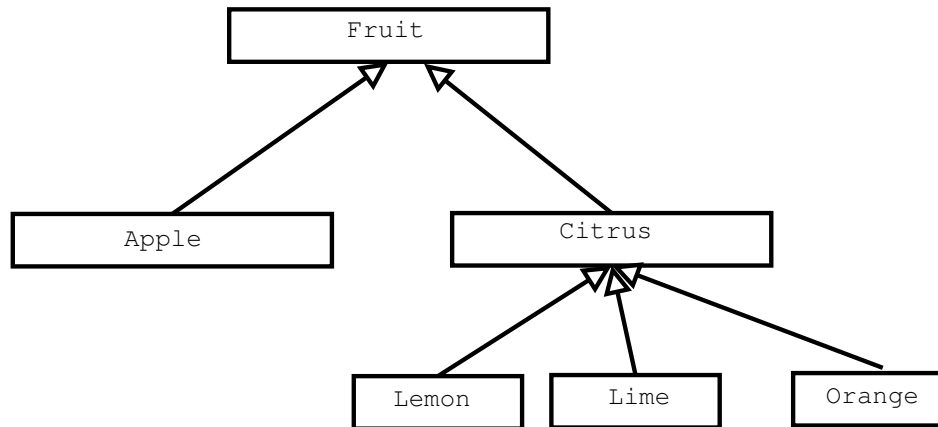




Homework Assignment 1

Problem 1

Suppose that Fruit, Apple, Citrus, Lemon, Lime, Orange are classes defined in the following inheritance hierarchy.



1. Can you create the following objects in a way specified? For each of them state "yes" if you can, or explain why not. Assume that each class provides default constructor.
 - (a) `Fruit f = new Citrus();`
 - (b) `Fruit f = new Lime();`
 - (c) `Citrus c = new Fruit();`
 - (d) `Citrus c = new Orange();`
 - (e) `Apple a = new Citrus();`
 - (f) `Citrus c = new Citrus();`
2. Each of the default constructors contains a print statement that states which classes constructor is called. Fruit class constructor prints "Fruit constructor called"; Apple class constructor prints "Apple constructor called"; and so on. Show the output when the following objects are created:
 - (a) `Fruit f = new Lemon();`
 - (b) `Apple a = new Apple();`

Problem 2

Write a method that given a sorted ArrayList object of Java strings (objects of class String) removes all duplicates. Your method should modify the ArrayList object passed to it. The method should return a boolean value indicating if the list was modified or not (true for "has been modified", false for "has not been modified"). For example, if the original list passed to your method contains the following strings:

Argentina, Chile, Chile, Czech Republic, France, Georgia, India, India,
Poland, Romania, Romania

your method should remove one occurrence of Chile, India and Romania. The resulting list should contain:

Argentina, Chile, Czech Republic, France, Georgia, India, Poland, Romania



Problem 3

Consider the following class definition

```
1 public class Foo implements Comparable<Foo>{
2
3     double x;
4     double y;
5
6     public Foo ( double x, double y ) {
7         this.x = x;
8         this.y = y;
9     }
10
11    public int compareTo ( Foo other ) {
12        double d1 = x*x + y*y;
13        double d2 = other.x * other.x + other.y * other.y;
14        if ( d1 < d2 ) return -1 ;
15        if ( d1 == d2 ) return 0;
16        return 1;
17    }
18
19    public String toString ( ) {
20        return "( " + x + " , " + y + " )"; //returns ( x, y )
21    }
22 }
```

Given the array `fooList` of `Foo` objects pictured below (the values of `x` and `y` data fields are stated for each array element), show what the array will look like after the call to `Arrays.sort(fooList)`.

0	1	2	3	4	5	6	7	8	9
x=1.0 y=1.0	x=-2.0 y= 2.0	x=1.0 y=2.0	x= 1.0 y=-1.0	x=2.5 y=0.0	x=-1.0 y= 0.0	x=0.0 y=3.0	x=-1.0 y=-4.0	x=0.0 y=0.0	x=0.0 y=1.5

Problem 4

Given the definition of the `Foo` class in **Problem 2**, write the lines of code that are needed to create an `ArrayList` object and fill it with ten (10) `foo` objects initialized with random values of `x` and `y` (Hint: this should be done with a loop). Do not hand in the entire program, just the lines that create and populate the `ArrayList` object.