Com S 228

Spring 2015

Exam 1 Sample Solution

1.

```Behavior b = new Locust(2, "Black");``` ```b.move();```	hop
```Insect i = new Insect(3, "Green");```	compile error: Cannot instantiate the type `Insect`

```Insect b = new Bee(1, "Golden-Black", "Lake");```
```System.out.println(b.getColor());```
```System.out.println(b.getSwarm());```
	compile error: `getSwarm()` undefined for Insect

```Mantis m = new Mantis(5, "Green");```
```m.move();```
```Insect i = m.preyOn();```
```System.out.println(i.getColor());```
	crawl
	Brown

```Grasshopper g = new Locust(3, "Red");``` ```Katydid k = (Katydid) g;```	ClassCastException

```Grasshopper g = new Katydid(2, "Green");```
```g.attack();```
```g = new Locust(3, "Black");```
```System.out.println(((Locust) g).antennae());```
```Behavior b = g;```
	bite
	Short

```Insect k = new Katydid(2, "Green");```
```Grasshopper g = (Katydid) k;```
```Locust l = (Katydid) k;```
	compile error: Cannot cast from Locust to Katydid

```Insect i = new Mantis(4, "Yellow");```
```((Mantis) i).move();```
```((Mantis) i).preyOn().attack();```
```i = new Bee(1, "Golden-Black", "Hill");```
```((Bee) i).makeHoney();```
	crawl
	bite
	Orange Blossom

2a)

```java
@Override
public boolean equals(Object o)   // 10 pts
{
        if (o == null || o.getClass() != getClass())
        {
                return false;
        }

        // typecast o to Bee so that we can compare data members
        Bee b = (Bee) o;

        // Compare the data members and return accordingly
        return b.size == size
            && (b.color == color || b.color != null && b.color.equals(color))
            && (b.swarm == swarm || b.swarm != null && b.swarm.equals(swarm));
}


@Override
public Object clone()  // 4 pts
{
        Bee b = new Bee(size, color, swarm);
        return b;
}
```

b)

```java
public class InsectComparator implements Comparator<Insect>
{
        public int compare(Insect i1, Insect i2)
        {
                return i1.getSize() - i2.getSize();
        }
}
```

3a)
- i) n
- ii) $n - i$
- iii) $O(n^2)$

b)
- i) $O(\log n)$
- ii) $O(n^2)$
- iii) $O(n^2 \log n)$
- iv) $O(n^2 \log n)$

c)
- i) n
- ii) $O(n)$

d) $n \log n$

4a) C (MERGESORT)

b) B (INSERTIONSORT)

c) A (SELECTIONSORT)
d) D (QUICKSORT)
e) D (QUICKSORT)
f) C (MERGESORT)