

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 convert from Katydid to Locust
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)

```
@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)

```
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)