

1. Willy's boxed integers do not override equals() and hashCode(). Comparison of two boxed integers will have unexpected results, and consequently values will only ever be written to his cache, never read.

```
class WillysInteger {
    private int value;
    private WillysInteger(int value) {
        this.value = value;
    }
    private static Map<WilysInteger, WilysInteger> cache =
        new HashMap<WilysInteger, WilysInteger>();
    public static WilysInteger valueOf(int value) {
        WilysInteger tmp = new WilysInteger(value);
        if (cache.containsKey(tmp))
            return cache.get(tmp);
        else {
            cache.put(tmp,tmp);
            return tmp;
        }
    }
    public boolean equals(Object o) {
        if (this == o) return true;
        if (! (o instanceof WilysInteger)) return false;
        return this.value == ((WilysInteger)o).value;
    }

    public int hashCode() {
        return value;
    }
}
```

2. Procedural, Interpreter, Visitor

3.

```
BooleanExp exp = new OrExp(
    new NotExp(
        new OrExp(
            new VarExp("x"),
            new NotExp(
                new Constant(true)))),
    new AndExp(
        new VarExp("y"),
        new VarExp("z")));
```

4. Adapter