# Com S 228

## Spring 2015

## Sample Solutions to Exam 1 Practice Problems

1.

| | |
|---|---|
| `BigCat mufasa = new Lion("Mufasa", Sex.MALE);`<br>`mufasa.speak();` | `Roar!` |
| `Interspecies das = new Tiger("Das", Sex.MALE);` | `compile error: Cannot convert from Tiger to Interspecies` |
| `IRoar kofi = new IRoar();`<br>`BigCat thema = new BigCat("Thema", Sex.FEMALE);` | `compile error: Cannot instantiate the type IRoar or BigCat` |
| `BigCat sanjeev;`<br>`sanjeev = new Tiger("Sanjeev", Sex.MALE);`<br>`sanjeev.speak();`<br>`sanjeev = new Liger("Vijay", Sex.MALE,`<br>`  new Lion("Simba", Sex.MALE),`<br>`  new Tiger("Maha", Sex.FEMALE));`<br>`sanjeev.speak();` | `Growl!`<br>`Roar-Growl!` |
| `IRoar nala = new Lion("Nala", Sex.FEMALE);`<br>`Tiger rita = (Tiger) nala;` | `ClassCastException` |
| `BigCat vijay, nala;`<br>`vijay = new Tiger("Vijay", Sex.MALE);`<br>`nala = new Lion("Nala", Sex.FEMALE);`<br>`Interspecies ife = new Tigon("Ife", Sex.MALE,`<br>`  (Tiger) vijay, (Lion) nala);`<br>`ife.getParents();` | `Dad: Tiger (Vijay)`<br>`Mom: Lion (Nala)` |
| `IRoar nala;`<br>`nala = new Lion ("Nala", Sex.FEMALE);`<br>`nala.getParents();` | `compile error: getParents() undefined for IRoar` |

2a)

```
public boolean equals(Object another)
 {
       // check if another is null and the types match
       if (another == null || another.getClass()!= getClass())
           return false;

       Dictionary d = (Dictionary) another;

       // check null word
       if (word == null && d.word == null) return true;

       if ( (word == null && d.word != null) ||
              (word != null && d.word == null) )
              return false;

       // neither name nor and another.getName() is null
       // check length
       if (word.length != d.word.length) return false;

       // check words one by one
       for (int i=0; i<word.length; i++)
       {
              if (!equals(word[i], d.word[i]))
              {
                     return false;
              }
       }

       return true;
 }
```

b)

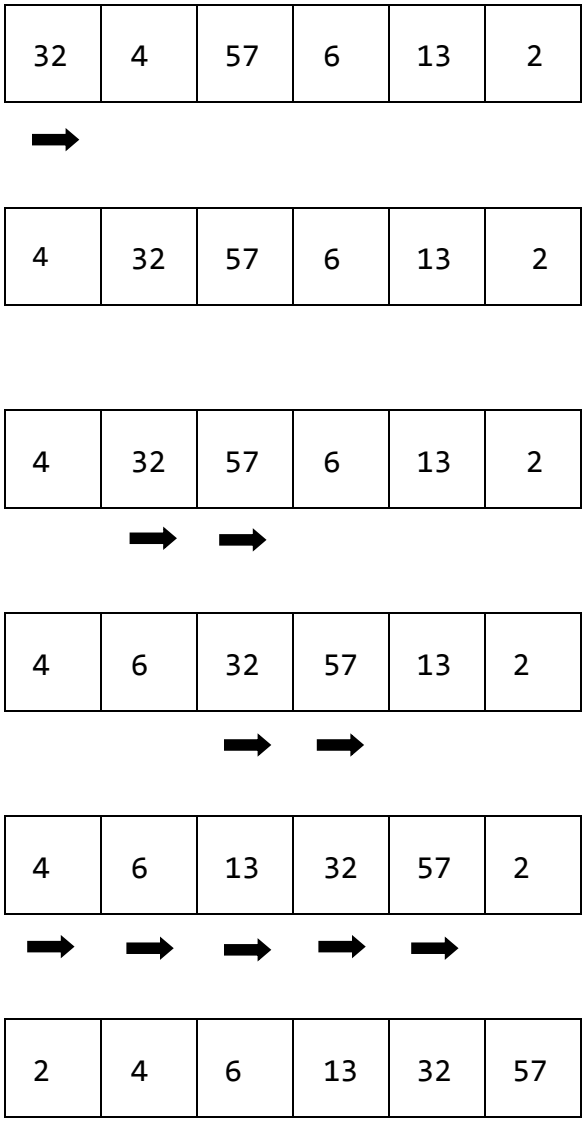
```
public Dictionary makeClone()
{
      // TODO
      if (word == null)
      {
            return new Dictionary(null);
      }

      String[] wordCopy = new String[word.length];
      for (int i=0; i<word.length; i++)
      {
            wordCopy[i] = new String(word[i]);
      }

      return new Dictionary(wordCopy);
}
```

3a) $O(n)$ (exactly $n$); $O(n)$ (exactly $n - i$); $O(n^2)$
b) $O(n)$ (exactly $n - 1$); $O(n)$
c) $O(\log n)$; $O(n^2)$; $O(n^2 \log n)$
d) $O(n \log n)$

4a)




b) 10 right shifts (shown by the arrows above)

c)

Quick Sort:

| 40 | 12 | 34 | 52 | 78 | 9 | 21 | 67 | 11 | 93 |
|---|---|---|---|---|---|---|---|---|---|
| 40 | 12 | 34 | 52 | 78 | 9 | 21 | 67 | 11 | 93 |
| 9 | 11 | 34 | 52 | 78 | 40 | 21 | 67 | 12 | 93 |
| 9 | 11 | 12 | 52 | 78 | 40 | 21 | 67 | 34 | 93 |
| 9 | 11 | 12 | 21 | 34 | 40 | 52 | 67 | 78 | 93 |
| 9 | 11 | 12 | 21 | 34 | 40 | 52 | 67 | 78 | 93 |
| 9 | 11 | 12 | 21 | 34 | 40 | 52 | 67 | 78 | 93 |
| 9 | 11 | 12 | 21 | 34 | 40 | 52 | 67 | 78 | 93 |