Sets Practice

Answer each of the following questions. Some questions may require you to do a little research.

1. Is the following code [legal / illegal]? `Collection c = new Collection();`
2. Is the following code [legal / illegal]? `Collection c = new List();`
3. Is the following code [legal / illegal]? `Collection c = new ArrayList();`
4. Is the following code [legal / illegal]? `List x = new Set();`
5. Is the following code [legal / illegal]? `List x = new TreeSet();`
6. Is the following code [legal / illegal]? `Collection x = new TreeSet();`
7. What is the `big0` of the add, remove, and contains methods for a TreeSet?

[$O(\log_2 N)$ / $O(1)$ / $O(N)$]

8. What is the `big0` of the add, remove, and contains methods for a HashSet?

[$O(\log_2 N)$ / $O(1)$ / $O(N)$]

9. What is output by the code below?

```
Set<Integer> s = new TreeSet<Integer>();
System.out.println( s.add( 675 ) );
```

true

10. What is output by the code at right?

[5, 6, 7]

```
Set<Integer> s = new TreeSet<Integer>();
s.add(5);
s.add(6);
s.add(6);
s.add(7);
out.println(s);
```

11. What is output by the code at right?

true
false
[1, 6, 9]

```
Set<Integer> a = new TreeSet<Integer>();
a.add(9);
out.println(a.add(6));
out.println(a.add(6));
a.add(1);
out.println(a);
```

12. What is output by the code at right?

[6, A, a, d]

```
Set<String> b = new TreeSet<String>();
b.add("a");
b.add("6");
b.add("A");
b.add("d");
out.println(b);
```

13. What is a set?

A set is a group of items all of the same type with no duplicates.

14. What does it mean when two sets are disjoint?

They have no elements in common.

15. What is the cardinality of a set?

The # of elements in the set.

16. What is the complement of a set?

a. A set that contains all elements not in the other set
b. A set that contains only elements in the other set
c. An equal set
d. Elements that are in the set
e. Elements that are not in the set

17. What is the resulting set?

A = {1, 4, 5, 7}, B = {2, 4, 5, 9}

$A \cup B$ combine

{1, 2, 4, 5, 7, 9}

18. What is the resulting set?

A = {1, 4, 5, 7}, B = {2, 4, 5, 9}

$A \cap B$ intersect

{4, 5}

19. What is the resulting set?

A = {1, 4, 5, 7}, B = {2, 4, 5, 9}

$A \cap (A \cup B)$ first combine

{1, 2, 4, 5, 7, 9}

{1, 4, 5, 7}

20. What is the resulting set?

A = {1, 4, 5, 7}, B = {2, 4, 5, 9}, C = {1, 2, 7, 9}

$(A - B) \cap C$

a. {1, 4, 5, 7}
b. {2, 3, 5, 9}
c. {1, 2, 7, 9}
d. {1, 7}
e. ∅ (empty set)

21. What is the resulting set?

A = {1, 4, 5, 7}, B = {2, 4, 5, 9}, C = {1, 2, 7, 9}

$(A \cap B) \cap C$

a. {1, 4, 5, 7}
b. {2, 3, 5, 9}
c. {1, 2, 7, 9}
d. {1, 7}
e. ∅ (empty set)

22. What is the difference between a HashSet and TreeSet?

A hashset sorts elements by hashcode and is way more efficient than a treeset. A treset has its elements naturally sorted.

23. What set operation does Set.addAll() implement?

a. union
b. intersection
c. set difference
d. cartesian product
e. set complement

24. What set operation does Set.retainAll() implement?

a. union
b. intersection
c. set difference
d. cartesian product
e. set complement

25. What set operation does Set.removeAll() implement?

a. union
b. intersection
c. set difference
d. cartesian product
e. set complement