Select all statements that are true of the following method. *   3 points

```java
public int orderMarugame(int n) {

    for (int i = 1; i < n; i *= 2) {
        System.out.println("another shrimp tempura, please!");
    }

    if (n % 2 == 0) {
        for (int i = 0; i < n; i++) {
            System.out.println("another sweet potato, please!");
        }
    }

}
```

☐ The best case runtime is θ(n)

☐ The worst case runtime is θ(n)

☐ The function runs in θ(n)

☐ The function runs in O(n)

☐ The function runs in O(log n)

☐ The function runs in O(n²)

True or False: Increasing the max items per node in a B-Tree (L) strictly   1 point
improves the runtime to find an element.

○ True. As we increase the max items/node, the overall height will decrease. This decreases the worst case time it takes to travel from the root to a leaf node, so the time it takes to find any given element in the tree will decrease.

○ False. As we increase the max items/node, the height may decrease but the time time it takes to linearly scan all items in a single node can increase. For a very high L, all of a user's elements might fit into a single node, in which case the runtime would be equivalent to scanning a list.
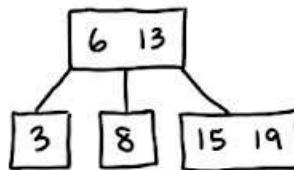
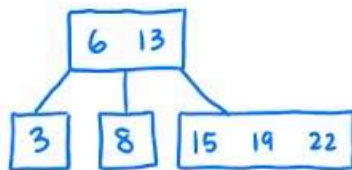What does the following 2-3 Tree look like after we insert **22**?   2 points

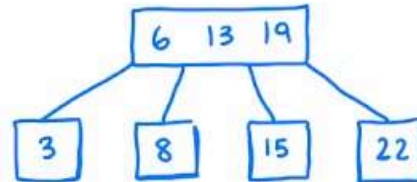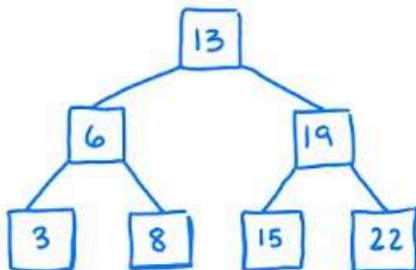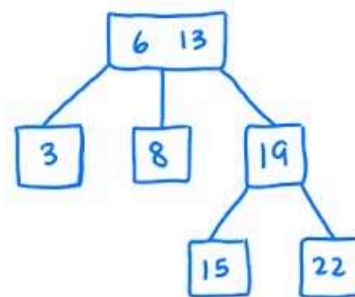As a reminder, 2-3 trees can have a maximum of 2 items per node.

ORIGINAL

A 2-3 tree with root node [6 13] and children [3], [8], [15 19].

OPTION A

Root [6 13] with children [3], [8], [15 19 22].

OPTION B

Root [6 13 19] with children [3], [8], [15], [22].

OPTION C

Root [13] with children [6] and [19]; [6] has children [3] and [8]; [19] has children [15] and [22].

OPTION D

Root [6 13] with children [3], [8], [19]; [19] has children [15] and [22].

○ Option A

○ Option B

○ Option C

○ Option D

Which of the following are true invariants of B-Trees? *   2 points

Select all that apply

☐ All leaves must be the same distance from the root.

☐ The number of items on the left side of the root will always equal the number of items on the right.

☐ Adding an item to the tree will never increase the overall number of nodes in the tree.

☐ A non-leaf node with k items must have exactly k+1 children.

A copy of your responses will be emailed to yiyunchen@berkeley.edu.

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