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October 21, 2018

## 1 R13.1

- A. Recursion is where a function calls it self.
- B. Iteration is where an iterate with a loop
- C. Infinite Recursion is where there is no special case and it keeps calling it self with out returning anything.
- D. Helper Methods are Methods that are used to make a one parameter to two or more.

## 2 R13.4

```
public class Sort{
    public int [] sort(int [] arr){
        return bubble(arr, arr.length);
    }
    public int [] bubble(int [] arr, int n){
        ...
        if (n-1>1){
            return bubble(arr, n-1);
        }
    }
}
```

## 3 R13.9

```
public class Fib {
    static int fibcount=0;
    public static int fib(int n)
    {
        fibcount+=1;
        if (n <= 1) return n;
        else return fib(n-1) + fib(n-2);
    }

    public static void main(String [] args) {
        for(int i=1; i<1000; i++) {
            fibcount=0;
            System.out.println(i+" :: "+fib(i) + " :: " + fibcount);
        }
    }
}
```

```
    }
}
```

the first couple of out puts are:

fib index :: fib number :: fibcount

1::1::1

2::1::3

3::2::5

4::3::9

5::5::15

6::8::25

7::13::41

8::21::67

9::34::109

10::55::177

...

37::24157817::78176337

38::39088169::126491971

39::63245986::204668309

40::102334155::331160281

41::165580141::535828591

42::267914296::866988873

the later numbers it looks like the operations approached  $2^n$  where n is the fib index

## 4 R13.5

```
public static String flip(String s)
{
    if(s.length()==0) {
        return "";
    }
    return flip(s.substring(1))+s.charAt(0);
}
```