Lab 8

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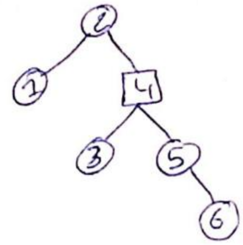
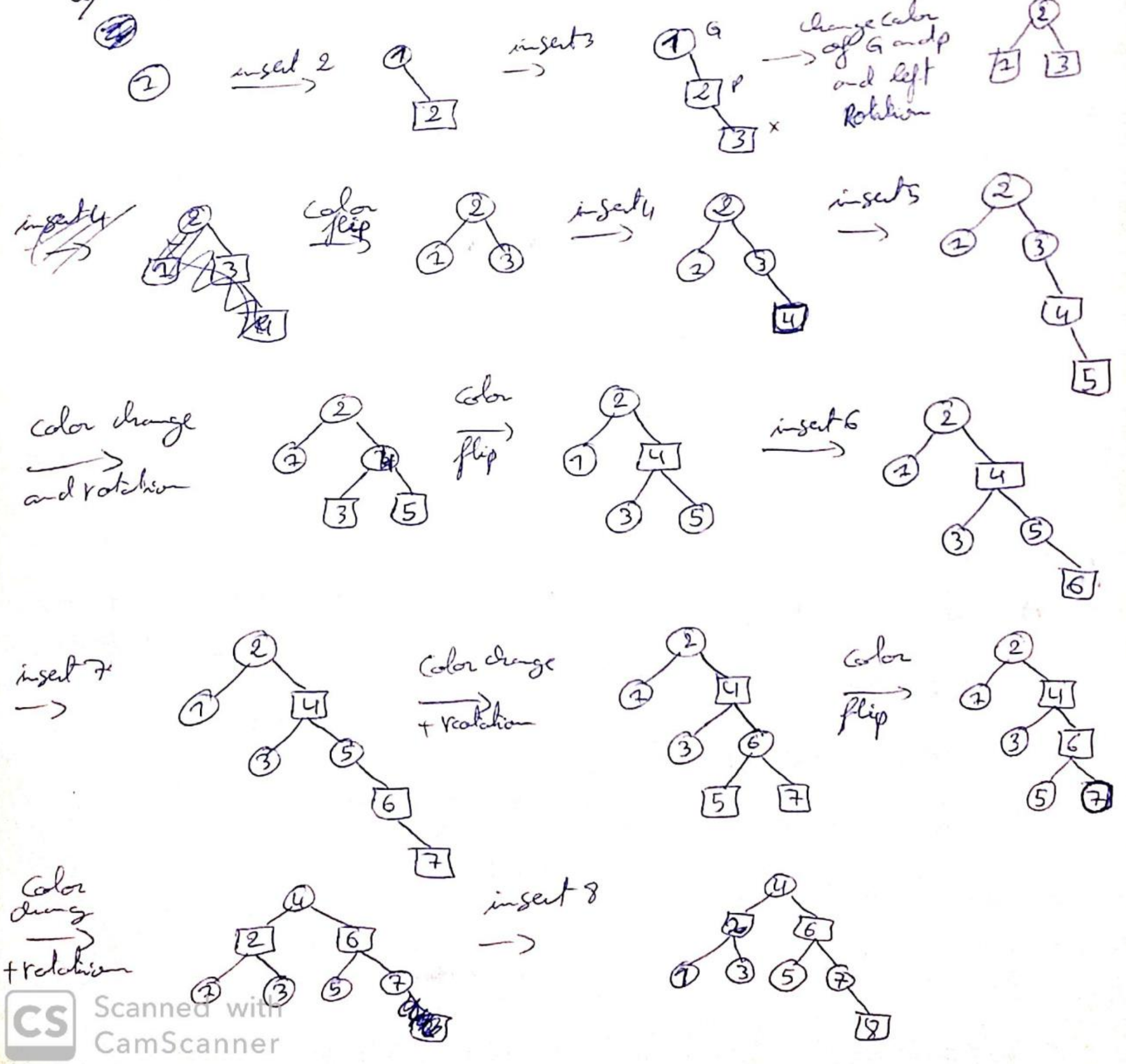
1&2/

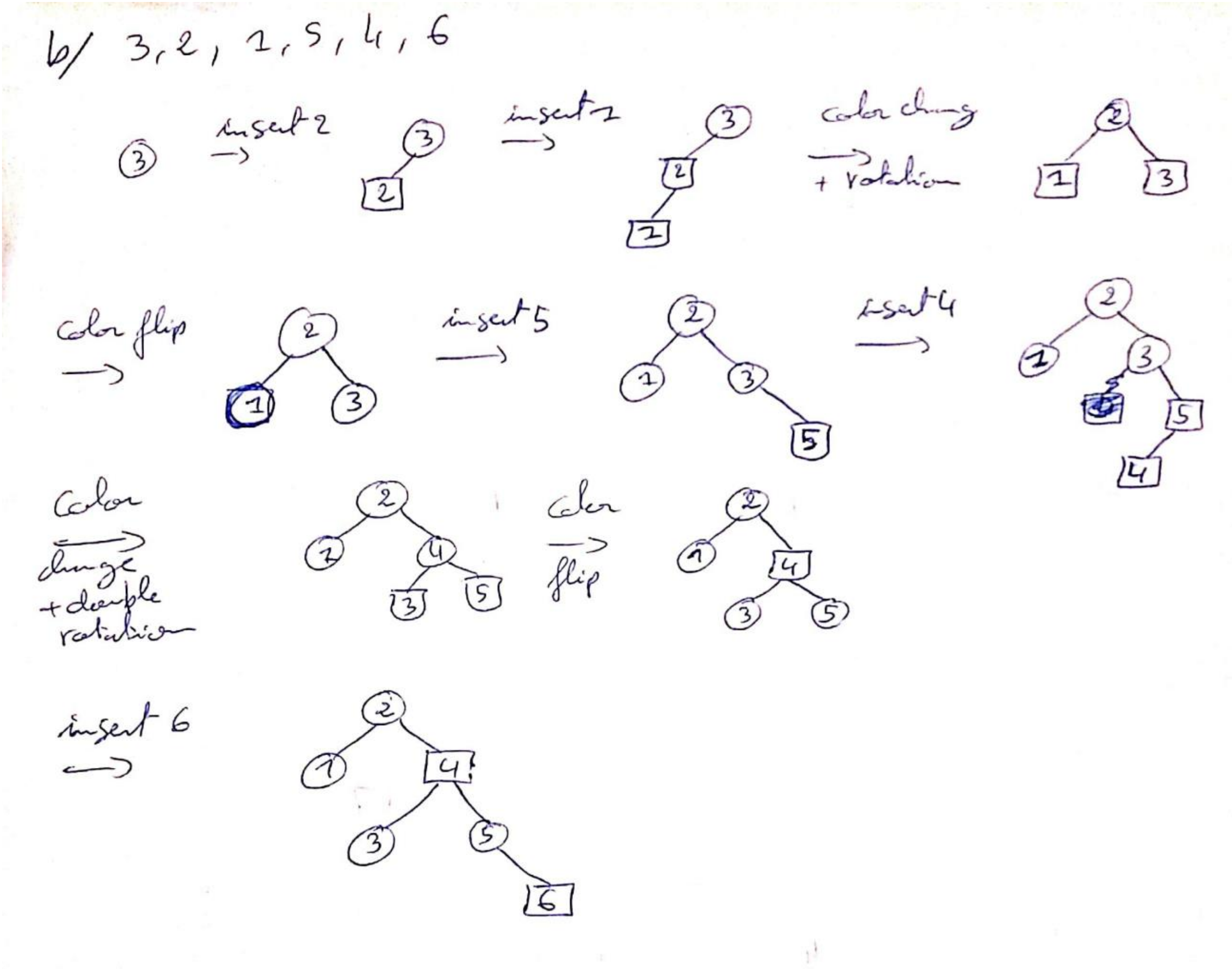
1/



this red-black tree doesn't satisfy the AVL balance condition.

2) a/ 1, 2, 3, 4, 5, 6, 7, 8





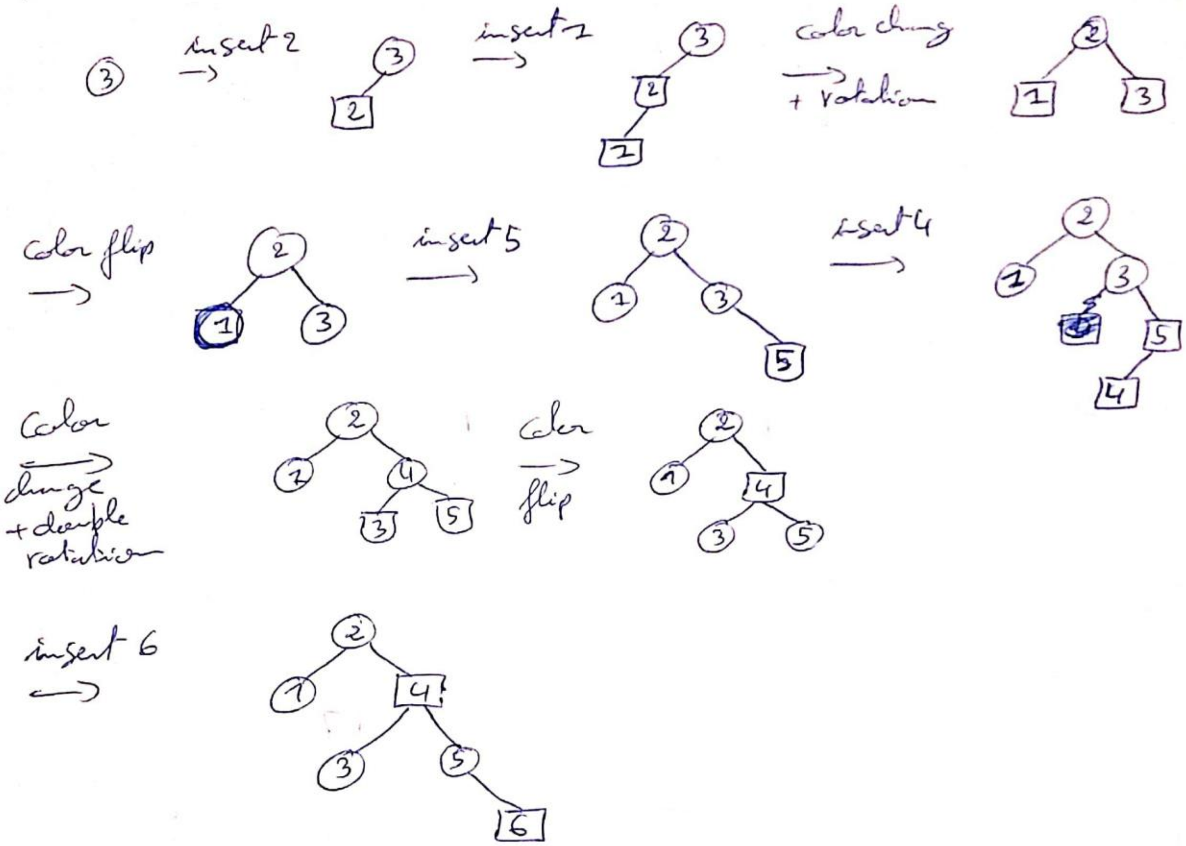
3/

```
public static boolean isPrime(int n, int i) {
            if(n==1) return false;
            if(n==2) return true;
            if(i*i>n) return true;
            if(n%i==0) return false;
            else i++;
            return isPrime(n,i);
      }
```

The running time of this algorithm is O($\sqrt{n}$), because we test the modulo of all the numbers under root square of n. This a mathematical theory if the modulo of all the numbers (except 1) under the root square of n with n is different from zero, the number n is prime.

4/

b/ 3, 2, 1, 5, 4, 6



4/ A/ the complexity of our algorithm as shown before is $O(\sqrt{n})$ in terms of input values. and since n is $O(2^{length(n)})$ in term of input size Isprime runs in $O\left(\sqrt{2^{length(n)}}\right)$ which is $O\left(2^{\frac{length(n)}{2}}\right)$, which is exponential in term of size.

B/ We show that b^2 is $O\left(2^{\frac{b}{2}}\right)$

So we have $\lim_{b\to+\infty} \frac{b^2}{2^{\frac{b}{2}}} = \frac{\lim_{b\to+\infty} 2b}{\lim_{b\to+\infty} 2^{\frac{b}{2}} \times \ln 2} = \lim_{b\to+\infty} \frac{2}{(\ln 2)^2} \times \frac{1}{2^{\frac{b}{2}}} = 0$

we applied theorem of l'hopital 2 times so b^2 is $O\left(2^{\frac{b}{2}}\right)$.