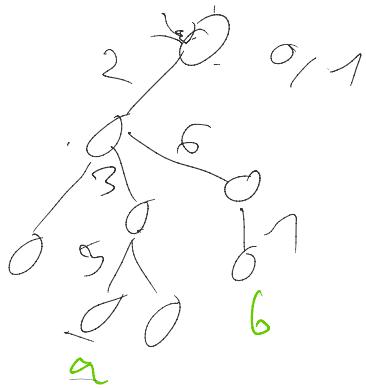


$$d(x_0) = d(x) + d(x_0)$$

$$4-1+3-1=4 \text{ B} - 2 \cdot 1$$

$$d(a, b) = d(r, a) + d(r, b) - 2 \cdot d(r, \text{lca}(a, b))$$

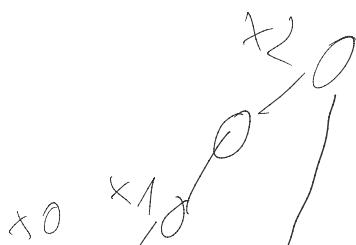


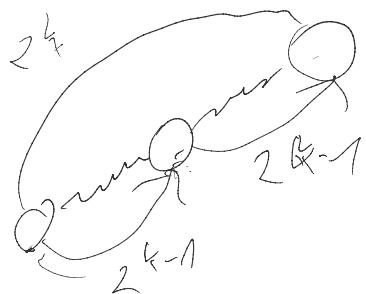
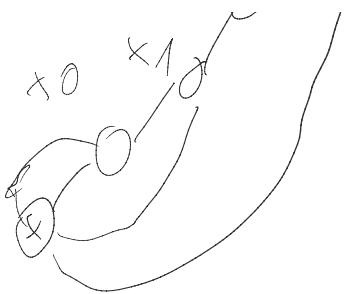
$$20 + 9 - 2 \cdot 2 = 15$$

Ancestor[x][y] = v

$$d(x, v) = 2^4$$

$\forall \epsilon > 0$





$$2^{k-1} + 2^{k-1} = 2^k$$

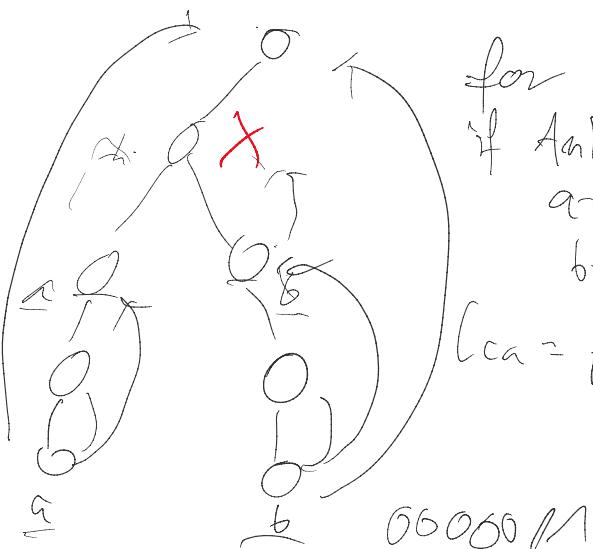
prep () {

Ancestor[x][0] = parent[x];

for (k=1 k <= 2^j)

for (x=1 x <= n)

Ancestor[x][k] = Ancestor[Ancestor[x][k-1]][k-1],



for (k=20 k >= 0)

if An[a][k] <= An[b][k]

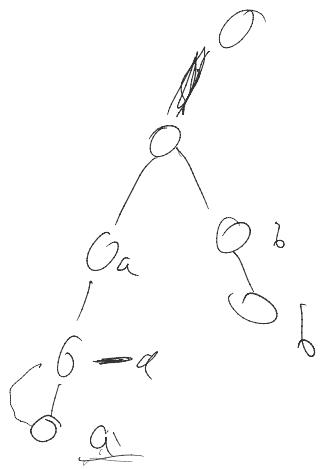
a = An[a][k]

b = An[b][k]

(ca = parent[a])



for (l=0 l < n)



```

for( k=20, k>=0)
  if( d[A_n[a][k]] >= d[B] )
    A=A_n[a][k];
  if(a==b)
    ref a;
  
```

