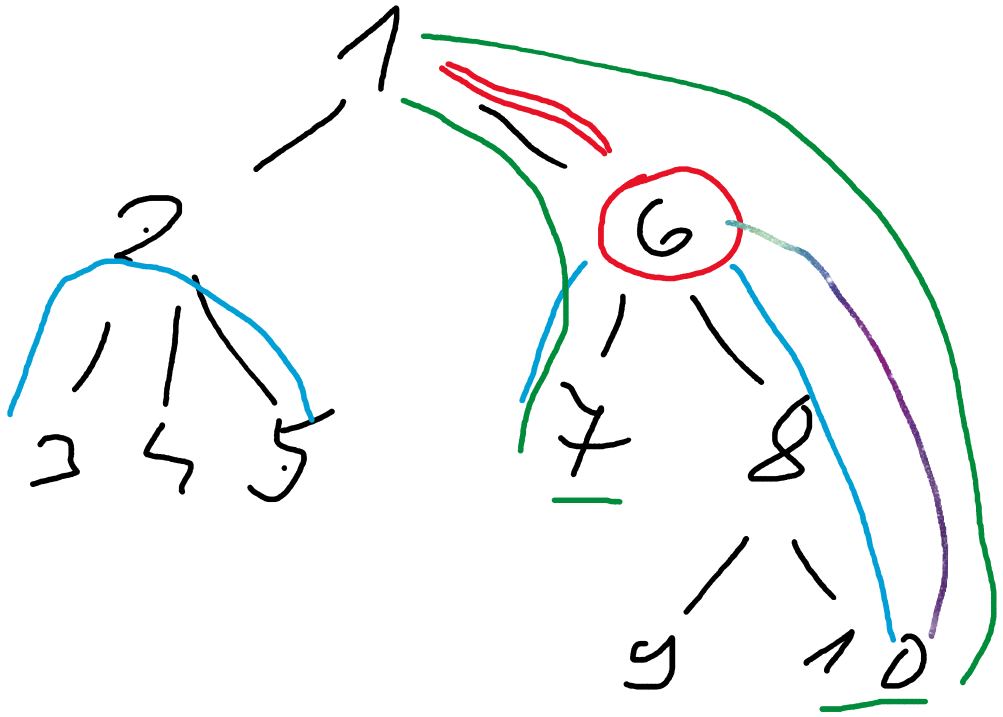
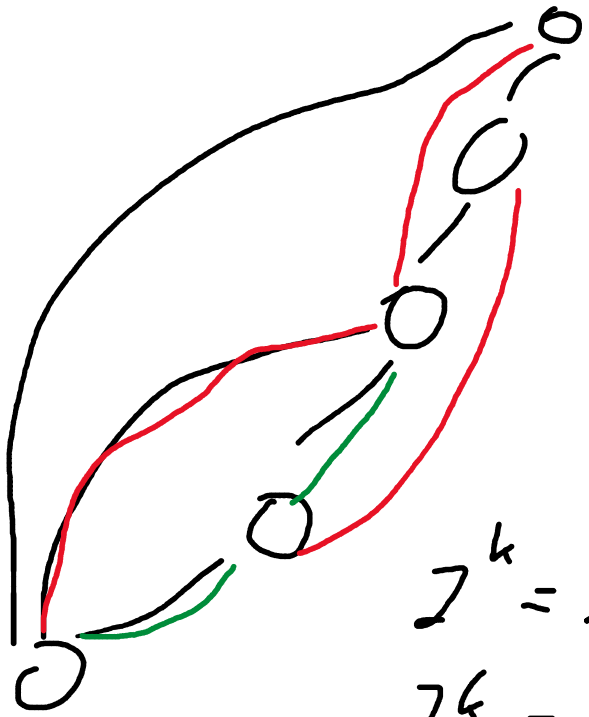
K05 - LCA

18 October 2024 18:41



$$d(a,b) = dep(1,a) + dep(1,b) - 2 \cdot dep(LCA(a,b))$$



$\log_2 n$

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

$$2^k = 2 \cdot 2^{k-1}$$

$2^k = 2 \cdot 2^{k-1}$

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for i < n
  anc[i][0] = p[i]

for k < 20
   for i < n
     anc[i][k] = anc[anc[i][k-1]][k-1]
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LCA(a, b)
  if(dep[b] < dep[a])
     swap(a, b)

for k = 20  k >= 0
   if dep[anc[b][k]] >= dep[a]
      b = anc[b][k]

if a == b  ret a
for k = 20  k >= 0
   if anc[a][k] != anc[b][k]
```

```
if anc[a][k] != anc[b][k]
    a = anc[a][k]
    b = anc[b][k]
ret p[a]
```