A tree diagram with nodes: -11, 10, -12, 6, 10, 5, 3, 7, 8, 11, 8, 9, 19, with markings +1 (red).

$$r[a]++;$$
$$r[b]++;$$
$$r[lca(a,b)]--;$$
$$r[p[lca(a,b)]]--;$$

max postorder

$a \wedge b = c$

$c \wedge b = a$

$c \wedge a = b$

$a \quad b$

$1 \quad 3$

$$a_1 \wedge a_2 \wedge a_3$$

$$a_1 - a_2 - a_3 - a_4 - a_5$$

$$a_1 = a_1 \wedge a_3 \wedge a_2 \wedge a_4$$

$$a_{1,3,2}$$

$x/$ $\quad$ $\searrow x$

a_3 $\qquad$ a_2