

$$\binom{112023}{8675309} = \binom{3^5 \cdot 461}{8675309} \quad (1)$$

$$= \binom{3}{8675309} \binom{461}{8675309} \quad (2)$$

$$= (-1)^{(3-1)(8675309-1)/4} \binom{8675309}{3} \binom{461}{8675309} \quad (3)$$

$$= \binom{2}{3} \binom{461}{8675309} \quad (4)$$

$$= - \binom{461}{8675309} \quad (5)$$

$$= -(-1)^{(461-1)(8675309-1)/4} \binom{8675309}{461} \quad (6)$$

$$= - \binom{211}{461} \quad (7)$$

$$= -(-1)^{(211-1)(461-1)/4} \binom{461}{211} \quad (8)$$

$$= - \binom{39}{211} \quad (9)$$

$$= - \binom{3}{211} \binom{13}{211} \quad (10)$$

$$= -(-1)^{(3-1)(211-1)/4} \binom{211}{3} \binom{13}{211} \quad (11)$$

$$= - \binom{2}{3} \binom{13}{211} \quad (12)$$

$$= \binom{13}{211} \quad (13)$$

$$= (-1)^{(13-1)(211-1)/4} \binom{211}{13} \quad (14)$$

$$= \binom{3}{13} \quad (15)$$

$$= (-1)^{(3-1)(13-1)/4} \binom{1}{3} \quad (16)$$

$$= 1 \quad (17)$$