The event can be decomposed into the sum of simple events, when Q, K, and A are of some particular suits. There are $4^3$ such events (each of 3 cards can be of any one of 4 suits). Hence,

$$P_{Q-K-A} = 4^3 \cdot P_0,$$

where $P_0$ is the probability to get 3 given cards in the given order. The total number of such events is $P_{52}^3$, and we get

$$P_{Q-K-A} = \frac{4^3}{P_{52}^3} = \frac{4^3}{52 \cdot 51 \cdot 50}.$$

The same as (3) by conditional probabilities:

$$P_{Q-K-A} = P_Q \cdot P_{K|Q} \cdot P_{A|Q-K} = \frac{4}{52} \cdot \frac{4}{51} \cdot \frac{4}{50}.$$