Example problem.

How many 5-card hands have an odd number of kings?

Answer: There are 2 cases: 1 king or 3 kings.

Case 1: 1 king.

1. Choose suit of the king $\binom{4}{1} = 4$ ways.
2. Choose the other 4 cards from non-kings: $\binom{48}{4}$ ways.

By mult. principle, there are $4 \cdot \binom{48}{4}$ hands with 1 king.

Case 2: 3 kings

1. Choose suits for 3 kings $\binom{4}{3}$ ways
2. Choose other 2 cards: $\binom{48}{2}$ ways

By mult. principle, there are $\binom{4}{3} \cdot \binom{48}{2}$ ways to choose hands with 3 kings

Since these cases are disjoint (can't have both 1 and 3 kings) and cover all the cases (odds ≤ 5 are 1, 3, 5, and you can't have 5 kings), the total # of hands w/ an odd # of kings is $\boxed{4 \cdot \binom{48}{4} + \binom{4}{3} \cdot \binom{48}{2}}$ by the addition principle.