Probability Examples

A jar contains 30 red marbles, 12 yellow marbles, 8 green marbles and 5 blue marbles

What is the probability that you draw and replace marbles 3 times and you get NO red marbles?

- There are 55 marbles, 25 of which are not red
- \( P(\text{getting a color other than red}) = P(\frac{25}{55}) \approx .455 \)
- Probability of this happening 3 times in a row is found by \( .455 \times .455 \times .455 \approx .094 \)
Example 2: At least 1 Red

- A jar contains 30 red marbles, 12 yellow marbles, 8 green marbles and 5 blue marbles

- What is the probability that you draw and replace marbles 3 times and you get at least 1 Red?

  - It's easier to calculate the probability of getting NO red marbles, and subtract that from 1 (we use the complement rule: $P(A^C) = 1 - P(C)$)

  - From previous example, it is $1 - .094 = .906$
Example 3: The First Red

- A jar contains 30 red marbles, 12 yellow marbles, 8 green marbles and 5 blue marbles.

- You draw and replace marbles 3 times. What is the probability the third marble is the first red marble?

- This means the first two are not red. We calculated $P(\text{drawing a non-red}) = .455$. Therefore, $P(\text{red})=.545$

- $P(\text{non-red & non-red & Red}) = P(\text{non-red}) \times P(\text{non-red}) \times P(\text{red}) = .455 \times .455 \times .545 = .113$
Example 4: Red, Yellow and Blue

• A jar contains 30 red marbles, 12 yellow marbles, 8 green marbles and 5 blue marbles

• You draw and replace marbles 3 times. What is the probability you draw 1 Red, 1 Yellow, and 1 Blue?

  • This is harder, because we are drawing marbles in an order, but we don't care about which order we get Red, Yellow and Blue, just that there is 1 of each.

  • But we can do it!
Example 4: Continued

- Let RBY = “Draw a Red, then Blue, then Yellow”
- So all disjoint events we want to consider are: RBY, RYB, YRB, YBR, BYR, BRY – there are 6 of them.
- \( P(RBY) = P(R) \times P(B) \times P(Y) = \left(\frac{30}{55}\right) \times \left(\frac{5}{55}\right) \times \left(\frac{12}{55}\right) = .0108 \)
- But we have 6 disjoint cases. Because each one is calculated as a product of the three, and each disjoint case has the same probability (each order is equally likely), our answer is \( 6 \times .0108 = .0649 \)