Guide to:
Probability equation questions

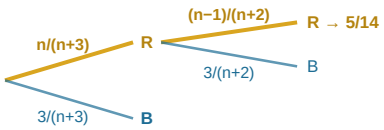
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Explanation:

Algebraic probability questions give the number of counters in terms of **n** or **x** (or a ratio) and state the numerical probability of a two-step event without replacement. Write the branch probabilities as algebraic fractions, remembering to **subtract 1 from the total denominator** on the second pick.

Multiply (and add if there are multiple valid paths), equate your algebraic fraction to the given probability, cross-multiply to clear fractions, and rearrange into a quadratic equation $\mathbf{an^2 + bn + c = 0}$. Always reject negative or non-integer roots.

Example 1: A bag has n red counters and 3 blue counters. Two are taken without replacement. Given P(both red) = $\frac{5}{14}$, find n.



Solution:

$\frac{n}{n+3} \times \frac{n-1}{n+2} = \frac{5}{14} \Rightarrow 14n(n-1) = 5(n+3)(n+2)$

$3n^2 - 13n - 10 = 0 \Rightarrow (3n+2)(n-5) = 0 \Rightarrow$ **Answer: n = 5**

Example 2: A bag has x green and (10 − x) yellow balls. Two are picked without replacement. Given P(both green) = $\frac{1}{3}$, find x.

Solution:

Total balls = 10: $P(GG) = \frac{x}{10} \times \frac{x-1}{9} = \frac{1}{3}$

$\frac{x(x-1)}{90} = \frac{1}{3} \Rightarrow x^2 - x = 30$

$x^2 - x - 30 = 0 \Rightarrow (x-6)(x+5) = 0$

Answer: x = 6

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