Question: The percentage of American men who say they would marry the same woman if they had to do it over again is 65% what is the probability that in a group of 10 married American men, no more than 3 will claim that they would marry the same woman again? what is a probability that at least 6 will say this?

Solution: Event A: "randomly chosen men belongs to a group of men that would marry the same woman if they had to do it over again". P(A) = 0.65.

Let X be a random variable of the number of successes in a sequence of 10 independent experiments, where success probability is P(A) = 0.65. X follows the binomial distribution with parameters n = 10, p= 0.65. P(X = k) = $\binom{n}{k}p^k(1-p)^{n-k} = \binom{10}{k}0.65^k 0.35^{10-k}$ for k = 0, 1, …,10.

• The probability that in a group of 10 married American men, no more than 3 will claim that they would marry the same woman again is

P(X ≤ 3) = P(X = 0) + P(X = 1) + P(X = 2) + P(X = 3) = $\binom{10}{0}0.65^0 0.35^{10} + \binom{10}{1}0.65^1 0.35^9 + \binom{10}{2}0.65^2 0.35^8 + \binom{10}{3}0.65^3 0.35^7 = 0.35^7(0.35^3 + 10 * 0.65 * 0.35^2 + 45 * 0.65^2 * 0.35 + 120 * 0.65^3) = 0.35^7 * 40.4485 \approx 0.026.$

• The probability that at least 6 will say this:

P(X ≥ 6) = 1 – P(X ≤ 5) = 1 – (P(X = 0) + P(X = 1) + P (X = 2) + P(X = 3) + P(X = 4) + P(X = 5)) = 1 – ($0.35^7 * 40.4485$ + P(X = 4) + P(X = 5)) = $1 - 0.35^7 * 40.4485 - \binom{10}{4}0.65^4 0.35^6 - \binom{10}{5}0.65^5 0.35^5 = 1 - 0.35^7 * 40.4485 - 0.65^4 0.35^4(210 * 0.35^2 + 252 * 0.65 * 0.35) = 1 - 0.35^7 * 40.4485 - 0.65^4 0.35^4 * 83.055 \approx 0.751.$

Answer: The probability that in a group of 10 married American men, no more than 3 will claim that they would marry the same woman again is ≈ 0.026.

The probability that at least 6 will say this is ≈ 0.751.