An agent sells life insurance policies to five equally aged, healthy people. According to recent data, the probability of a person living in these conditions for 30 years or more is 2/3. Calculate the probability that after 30 years:

**1.** All five people are still living.

**2.** At least three people are still living.

**3.** Exactly two people are still living.

$X$ = number of people living 30 years or more under terms of insurance policy

$p = 2/3 \quad , \quad n = 5$

1. $P(X=5) = \dfrac{5!}{(5-5)!\,5!} \cdot (2/3)^{5}(1-2/3)^{5-5} =$

2. $P(X \geq 3) = P(X=3) + P(X=4) + P(X=5)$ or

$= 1 - P(X<3) = 1 - [P(X=0) + P(X=1) + P(X=2)]$

$= \dfrac{5!}{(5-3)!\,3!} \cdot (2/3)^{5}(1-2/3)^{5-3} + \dfrac{5!}{(5-4)!\,4!} \cdot (2/3)^{5}(1-2/3)^{5-4} + \ldots$

3. $P(X=2) = \dfrac{5!}{(5-2)!\,2!} \cdot (2/3)^{5}(1-2/3)^{5-2} =$

A pharmaceutical lab states that a drug causes negative side effects in 3 of every 100 patients. To confirm this affirmation, another laboratory chooses 5 people at random who have consumed the drug. What is the probability of the following events?

**1.** None of the five patients experience side effects.

**2.** At least two experience side effects.

**3.** What is the average number of patients that the laboratory should expect to experience side effects if they choose 100 patients at random?

$X$ = patients having side effects from this medication

$n = 5$

$p = 3/100 = 0.03$

1. $P(X=0) = {}^5C_0\,(0.03)^5(1-0.03)^{5-0} =$

2. $P(X \geq 2) = P(X=2) + P(X=3) + P(X=4) + P(X=5)$

or

$= 1 - P(X < 2)$

$= 1 - [P(X=0) + P(X=1)]$

$= 1 - [{}^5C_0\,(0.03)^5(1-0.03)^{5-0} + {}^5C_1\,(0.03)^5(1-0.03)^{5-1}]$

$=$

3. $\mu = np = 100(0.03) = 3$ patients