

Assignment_16.11438 - Statistics 2

Problem 1:

A test is conducted which is consisting of 20 MCQs (multiple choices questions) with every MCQ having its four options out of which only one is correct. Determine the probability that a person undertaking that test has answered exactly 5 questions wrong.

Answer:

Here, $n = 20$

$n - k = 5,$

$k = 20 - 5 = 15$

Here the probability of success = probability of giving a right answer = $p = 1/4$

Hence, the probability of failure = probability of giving a wrong answer = $(1 - p) = 1 - 1/4 = 3/4$

When we substitute these values in the formula for Binomial distribution we get,

$$P(X = x) = \frac{n!}{x!(n-x)!} p^x (1-p)^{(n-x)}$$

$$\text{So, } P(5 \text{ out of } 20) = \frac{20!}{15!5!} (1/4)^{15} * (3/4)^5$$

$$P(5 \text{ out of } 20) = (20*19*18*17*16)/(5*4*3*2*1) * (1/4)^{15} * (3/4)^5$$
$$= 0.0000034 \text{ (approximately)}$$

Probability that a person undertaking that test has answered exactly 5 questions wrong is 0.0000034

Problem 2:

A die marked A to E is rolled 50 times. Find the probability of getting a "D" exactly 5 times.

Ans :

Here, $n = 50$, $k = 5$, $n - k = 45$

Here the probability of success = probability of getting "D" = $1/5$

Hence, the probability of failure = probability of not getting a "D" = $1 - s = 1 - 1/5 = 4/5$.

Problem 3:

Two balls are drawn at random in succession without replacement from an urn containing 4 red balls and 6 black balls. Find the probabilities of all the possible outcomes.

Ans :

Probabilities of all the possible outcomes.

$$RR (4/10)(3/9) = \mathbf{2/15}$$

$$RB (4/10)(6/9) = \mathbf{4/15}$$

$$BR (6/10)(4/9) = \mathbf{4/15}$$

$$BB (6/10)(5/9) = \mathbf{1/3}$$

Red Balls

The probability of 0 Red balls (BB) = $\mathbf{1/3}$

The probability of 1 Red ball is (RB or BR) is $4/15 + 4/15 = \mathbf{8/15}$

The probability of 2 Red balls (RR) = $\mathbf{2/15}$

Black balls

The probability of 0 black balls (RR) = $\mathbf{2/15}$

The probability of 1 black ball is (RB or BR) is $4/15 + 4/15 = \mathbf{8/15}$

The probability of 2 black balls (BB) = $\mathbf{1/3}$