Problem Statement 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.

Solution:

Formula to calculate k successes in n trials = C(n,k) sk(1−s)(n−k) C(n,k) sk(1−s)(n−k)

Here, n = 20, n - k = 5, k = 20 - 5 = 15

Here the probability of success = probability of giving a right answer = s = 1414

Hence, the probability of failure = 1 - 1414 = 3434

So, P (exactly 5 out of 20 answers incorrect) = C (20, 5) **(14)(14) 1515** (34)(34) 55

→→ P (5 out of 20) =

(20∗19∗18∗17∗16)(5∗4∗3∗2∗1)(20∗19∗18∗17∗16)(5∗4∗3∗2∗1) **(14)(14) 1515** (34)(34)

55

= 0.0000034 (approximately)

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Problem Statement 2:

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

Solution:

Here, n = 50, k = 5, n - k = 4/5.

The probability of success = probability of getting a "D"= s = 1/5

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

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Problem Statement 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.

Solution:

First determine the probabilities of the events.

Table of Probability of events	
Events	**Probability**
RR	(4/10)(3/9) = 2/15
RB	(4/10)(6/9) = 4/15
BR	(6/10)(4/9) = 4/15
BB	(6/10)(5/9) = 1/3

The probability of 0 black balls (RR)is 2/15

The probability of 1 black ball is (RB or BR) is 4/15+4/15 = 8/15

The probability of 2 black balls (BB) is 1/3

If Z is the random variable representing the number black balls. The probability distribution will be :

Z	p(Z)
0	2/15
1	8/15
2	1/3

Notice that the sum of the probabilities = 2/15+8/15+1/3 = 1

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