Tutorial W12 bis – Q&A

2. A small company has two automobiles in its car pool. Each automobile may break down (only once) or not break down on any given day. An experiment consists of counting the number of automobile breakdowns to occur on a randomly selected day.

1 Specify a sample space for the experiment.

2 List all possible events.

3 Suppose one car breaks down on a randomly selected day. List the event(s) in part (2) that has (have) occurred.

Solution

Because only two cars are in the car pool, neither, one, or both may break down on a randomly selected day.

That is, S = {0, 1, 2}.

2 Recall that if a sample space has n outcomes, it has 2^n possible events.

Here S has three outcomes, so there are $2^3 = 8$ events:

$\varnothing$, {0}, {1}, {2}, {0, 1}, {0, 2}, {1, 2}, and S.

3 If one car breaks down, any event with the outcome 1 as a member will have occurred; that is, {1}, {0, 1}, {1, 2}, and S.

Nota bene: Every outcome of an event need not be observed for the event to occur; if any outcome in an event is observed, the event has occurred.

2:

There are 2 red colored, 3 green colored and 2 blue colored balls in a bag.

Two balls need to be drawn at random.

Find the probability that none of the balls drawn is blue in color.

Answer:

Total number of balls = 2 red + 3 green + 2 blue = 7 balls

S is the sample space.

Two balls need to be drawn at random.

P (an event) = count of outcomes in event/ total count of outcomes

n (S) = number of methods of drawing 2 balls out of 7 balls
=C(7, 2) = 7!/5! 2! = 21

Let E be the event of drawing 2 balls such that none of the balls drawn is blue in color.

Number of blue balls = 2

Number of other colored balls = 5

n (E) =C(5, 2) = 5!/2! 3! = 10

P (E) = n (E) / n (S) = 10 / 21

3.

There are 300 students in a school. Out of them, 95 students play cricket, 120 students play football, 80 students play volleyball and 5 students don't play any games. A student is chosen randomly, find the probability that the chosen student:
a] plays volleyball
b] either cricket or volleyball sport
c] neither football nor volleyball

Answer:

Total number of students = 300
95 students play cricket.
120 students play football.
80 students play volleyball.
5 students don't play any games.
P (an event) = count of outcomes in event / total count of outcomes

a] **plays volleyball**

P (chosen student plays volleyball) = number of students playing volleyball / total number of students

= 80 / 300 = 4 / 15

b] **either cricket or volleyball sport**

P (chosen student plays either cricket or volleyball) = (sum of the students who play cricket and volleyball) / total number of students
= (95 + 80) / 300 = 175 / 300 = 7 / 12

c] **neither football nor volleyball**

P (chosen student plays neither football nor volleyball) = (total number of students – number of students who play football – number of students who play volleyball) / total number of students
= (300 – 120 – 80) / 300 = 100 / 300 = 1 / 3

4.

Two fair dice are rolled. What is the probability of the following events?
a] probability that the sum is 1.
b] probability that the sum is 4.
c] probability that the sum is less than the number 13.

Answer:
The sample space when two fair dice are rolled is given below.
S = {(1, 1), (1, 2), (1, 3), (1, 4), (1, 5), (1, 6)
(2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6)
(3, 1), (3, 2), (3, 3), (3, 4), (3, 5), (3, 6)
(4, 1), (4, 2), (4, 3), (4, 4), (4, 5), (4, 6)
(5, 1), (5, 2), (5, 3), (5, 4), (5, 5), (5, 6)
(6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6)}

P (an event) = count of favorable outcomes / total count of outcomes a] probability that the sum is 1.

There are no outcomes from the sample that gives the sum as 1.

P (the sum is 1 when two fair dice are rolled) = 0 / 36 = 0

b] probability that the sum is 4.

The outcome that gives the sum as 4 = {(1, 3), (2, 2), (3, 1)} = 3 outcomes

P (the sum is 4 when two fair dice are rolled) = 3 / 36 = 1 / 12

c] probability that the sum is less than the number 13.

All the outcomes in the sample space give the sum that is less than the number 13.

P (the sum is less than the number 13 when two fair dice are rolled) = 36 / 36 = 1

5.

There are 90 discs that are numbered from 1 to number 90 in a box. 1 disc is selected at random from the box given. Find the probability that:
a] 2-digit numbers are obtained
b] perfect squares are obtained
c] multiples of number 5 are obtained
d] numbers that are divisible by 3 and 5 are obtained

Answer:

P (an event) = count of favorable outcomes / total count of outcomes

a] **a 2-digit number is obtained**
Total number of possible outcomes = 90 (given)
Let E be the event of getting a 2-digit number.

Number of 2-digit numbers from 1 to 90 = 90 – 9 = 81 (the single-digit numbers are from 1 to 9).

P (a 2-digit number is obtained) = Number of 2-digit numbers from 1 to 90 / total number of outcomes = 81 / 90 = 9 / 10

b] **a perfect square is obtained**
Total number of possible outcomes = 90 (given)
Let F be the event of obtaining perfect squares.
The number of perfect squares from 1 to 90 = {1, 4, 9, 16, 25, 36, 49, 64 and 81} = 9

P (F) = count of perfect squares from 1 to 90 / total number of possible outcomes
= 9 / 90 = 1 / 10

c] **multiples of number 5 are obtained**

Total number of possible outcomes = 90 (given)
Let G be the event of obtaining multiples of number 5.
The number of multiples of number 5 from 1 to 90 is 18.

P (G) = P (multiples of number 5 are obtained) = number of multiples of number 5 from 1 to 90 / total number of possible outcomes
= 18 / 90 = 1 / 5

d] **numbers that are divisible by 3 and 5 are obtained**

Total number of possible outcomes = 90 (given)
Let H be the event of obtaining the numbers that are divisible by 3 and 5.
The count of the numbers divisible by 3 and 5 is 6.
P (H) = P (numbers that are divisible by 3 and 5 are obtained) = 6 / 90 = 1 / 15