

0.1 Mathematics of Chance

Concepts

- a) There is a concept known as the Fundamental principle of counting. If a process can be completed in m different ways, another concept can be completed in n ways then both processes can be completed in $m \times n$ ways.
- b) Let us see an example. The journey from Kochi to Mumbai can be completed in 4 ways. Journey from Mumbai to Delhi can be completed in 3 ways. The journey from Kochi to Delhi can be completed in the following ways .
 (Rail,Rail),(Rail ,Road), (Rail , Air)
 (Road,Rail),(Road, Road), (Road, Air)
 (Air,Rail),(Air ,Road), (Air , Air)
 (Sea ,Rail),(Sea ,Road), (Sea, Air)
 Total number of ways is $4 \times 3 = 12$.

- 1) A box contains three paper slips carrying numbers 2, 3, 4 . Another box contains paper slips carrying fractions $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}$. One is taken from each box at random
- How many pairs are possible?
 - What is the probability of getting the product of numbers in each pair a natural number?
 - What is the probability of not getting the numbers in the pair whose product is not a natural number?

Answers

- a) Number of pairs = $3 \times 3 = 9$
 $(2, \frac{1}{2}), (2, \frac{1}{3}), (2, \frac{1}{4})$
 $(3, \frac{1}{2}), (3, \frac{1}{3}), (3, \frac{1}{4})$
 $(4, \frac{1}{2}), (4, \frac{1}{3}), (4, \frac{1}{4})$
- b) Pairs with the product a natural number are $(2, \frac{1}{2}), (3, \frac{1}{3}), (4, \frac{1}{4}), (4, \frac{1}{2})$
 There are four such pairs.
 Probability of getting the product a natural number is $= \frac{4}{9}$
- c) Probability of not getting the product a natural number is $1 - \frac{4}{9} = \frac{5}{9}$

- 2) A box contains 4 black balls and 3 white balls. Another box contains 5 black balls and 3 white balls. One from each box is taken at random.
- How many pair of balls are possible ?
 - What is the probability of getting both balls black?
 - What is the probability of getting both balls white?
 - What is the probability of getting balls of different colours?

Answers

- a) Total number of possible selections = $(3 + 4) \times (5 + 3) = 7 \times 8 = 56$
- b) Probability of getting both black $\frac{4 \times 5}{56} = \frac{20}{56}$
- c) Probability of getting both white $\frac{3 \times 3}{56} = \frac{9}{56}$
- d) Probability of getting balls of different colours $\frac{(4 \times 3) + (3 \times 5)}{56} = \frac{27}{56}$

- 3) A box contains four paper slips carrying numbers 1, 2, 3, 4. Another box contains paper slips carrying numbers 1, 2, 3. One from each box is taken at random and entered as pairs.
- How many pairs are possible ?
 - What is the probability of getting a pair with the product of the digits odd?
 - What is the probability of getting a pair with the product of the digits even?

Answers

- Number of pairs $4 \times 3 = 12$
 (1, 1), (1, 2), (1, 3)
 (2, 1), (2, 2), (2, 3)
 (3, 1), (3, 2), (3, 3)
 (4, 1), (4, 2), (4, 3)
- Pairs of getting product odd are (1, 1)(1, 3), (3, 1)(3, 3)
 Probability $\frac{4}{12} = \frac{1}{3}$
- Probability of getting product even = $1 - \frac{1}{3} = \frac{2}{3}$

- 4) There are 30 boys and 20 girls in 10A. There are 15 boys and 25 girls in 10B. One student is selected from each class at random.
- How many ways the selections can be made ?
 - What is the probability of getting both boys?
 - What is the probability of getting both girls?

Answers

- Total number of pairs $(20 + 30) \times (15 + 25) = 50 \times 40 = 2000$
- Probability of selecting both boys = $\frac{30 \times 15}{2000} = \frac{450}{2000} = \frac{9}{40}$
- Probability of getting both girls = $\frac{20 \times 25}{2000} = \frac{500}{2000} = \frac{1}{4}$

- 5) From all two digit numbers with digits 1, 2 and 3 one number is chosen
- What is the probability of both digits being same ?
 - What is the probability of sum of the digits 4?

Answers

- Numbers are 11, 12, 13, 21, 22, 23, 31, 32, 33
 Probability of getting both digits same is $\frac{3}{9} = \frac{1}{3}$
- Probability of getting the sum 4 is $\frac{3}{9}$