

Probability

Required Probability $P(A) = \frac{\text{Favourable Cases}}{\text{Total Cases}}$ where $0 \leq P(A) \leq 1$

Q1) 6 boys and 6 girls are seated in a row. What is the probability that all the 6 girls are together.

Solution: As girls are always together so they are considered as a group. So there are 7 things to be arranged (6 boys, group of girls). They can be arranged in $7!$ ways.

Now internal arrangement of girls can be done in $6!$ ways.

Favorable ways = $7! \times 6!$ ways

Total ways = $12!$ ways

$$\text{Required probability} = \frac{7! \times 6!}{12!} = \frac{1}{132}$$

Q2) What is the probability that a card drawn at random from a pack of 52 cards is either a king or a spade? Bank Clerk 2010, PO 2014

- 1) $\frac{17}{52}$ 2) $\frac{4}{13}$ 3) $\frac{3}{13}$ 4) $\frac{1}{4}$

Solution: There are 13 spades and 3 other kings. So, required probability is $\frac{16}{52} = \frac{1}{4}$

Q3) A committee of 3 members is to be selected out of 3 men and 2 women. What is the probability that the committee has at least 1 women? Bank PO 2008, 2011, 2015

- 1) $\frac{1}{10}$ 2) $\frac{9}{10}$ 3) $\frac{1}{20}$ 4) $\frac{9}{20}$

Solution: Required probability = $1 - P(\text{No women}) = 1 - \frac{C(3,3)}{C(5,3)} = \frac{9}{10}$

Q4) A basket contains 3 blue and 4 red balls. If 3 balls are drawn at random from the basket, what is the probability that all the three balls are either blue or red? Bank PO 2010, 2017

- 1) $\frac{1}{7}$ 2) $\frac{3}{14}$ 3) $\frac{3}{28}$ 4) $\frac{9}{28}$

Solution:

Ways of getting blue balls = $C(3,3)$

Ways of getting red balls = $C(4,3)$

$$\text{Required probability} = \frac{C(3,3) + C(4,3)}{C(7,3)} = \frac{1}{7}$$

Q5) An urn contains 3 red and 4 green marbles. If 3 marbles are picked at random, what is the probability that 2 are green and 1 is red? New India Insurance 2009

- 1) $\frac{3}{7}$ 2) $\frac{5}{14}$ 3) $\frac{4}{21}$ 4) $\frac{18}{35}$

Solution: Number of ways of selecting 3 marbles out of 7 marbles = $C(7,3) = 35$

Ways of selecting 2 green and 1 red marble = $C(4,2) \times C(3,1) = 18$

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$$\text{Required probability} = \frac{18}{35}$$

Directions for Q6-Q9 Study the information given below and answer the questions that follow:

A basket contains 4 red, 5 blue and 3 green marbles.

Bank PO 2010, 2012

Q6) If 2 marbles are drawn randomly, then what is the probability that both are blue?

- 1) $\frac{7}{44}$ 2) $\frac{5}{33}$ 3) $\frac{1}{11}$ 4) $\frac{5}{66}$

Solution: Required probability = $\frac{C(5,2)}{C(12,2)} = \frac{10}{66} = \frac{5}{33}$

Q7) If 3 marbles are drawn at random, then what is the probability that at least one is blue? **Placement Papers**

- 1) $\frac{7}{44}$ 2) $\frac{37}{44}$ 3) $\frac{21}{44}$ 4) $\frac{23}{44}$

Solution: $n(S) = C(12,3) = 220$

Ways of selecting 3 marbles such that none is blue = $C(7,3) = 35$

Required probability = $1 - P(\text{No Blue}) = 1 - \frac{35}{220} = \frac{37}{44}$

Q8) If 3 marbles are picked at random, then what is the probability that all are of the same color? **Bank PO 2014, 2015**

- 1) $\frac{3}{44}$ 2) $\frac{7}{110}$ 3) $\frac{37}{44}$ 4) $\frac{1}{2}$

Solution: $n(S) = C(12,3) = 220$

Ways of selecting 3 marbles of same color = $C(4,3) + C(5,3) + C(3,3) = 15$

Required probability = $\frac{15}{220} = \frac{3}{44}$

Q9) If 3 marbles are picked at random, then what is the probability that exactly two are of the same color? **Bank PO 2010, 2012**

- 1) $\frac{29}{44}$ 2) $\frac{19}{220}$ 3) $\frac{29}{55}$ 4) $\frac{6}{11}$

Solution: $n(S) = C(12,3) = 220$

Ways of selecting 3 marbles such that exactly 2 are of same color = $C(4,2) \times C(8,1) + C(5,2) \times C(7,1) + C(3,2) \times C(9,1) = 145$

Required probability = $\frac{145}{220} = \frac{29}{44}$

Directions for Q10: Study the information given below and answer the questions that follow:

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A basket contains 3 blue, 5 red and 2 green balls.

Bank PO 2007, 2011, 2015

Q10) If 4 balls are picked at random, then what is the probability that two are blue and two are green?

- 1) $\frac{1}{70}$ 2) $\frac{1}{210}$ 3) $\frac{1}{3}$ 4) $\frac{12}{35}$

Solution: Favorable cases = $C(3,2) \times C(2,2) = 3$

Total cases = $C(10,4) = 210$

Required probability = $\frac{3}{210} = \frac{1}{70}$

Directions for Q11: Study the information given below and answer the questions that follow:

A basket contains 4 red, 6 blue, 3 yellow and 2 green marbles.

Bank PO 2010

Q11) If 4 marbles are picked at random, what is the probability that two are red, one is yellow and one is green?

- 1) $\frac{13}{35}$ 2) $\frac{1}{13}$ 3) $\frac{6}{91}$ 4) $\frac{12}{455}$

Solution: Ways of selecting 4 marbles = $C(15,4)$

Ways of selecting 2 red marbles = $C(4,2)$

Ways of selecting a yellow marble = $C(3,1)$

Ways of selecting a green marble = $C(2,1)$

Required probability = $\frac{C(4,2) \times C(3,1) \times C(2,1)}{C(15,4)} = \frac{6 \times 3 \times 2}{1365} = \frac{12}{455}$

Q12) A die is thrown twice. What is the probability of getting a 4 or 5 on the first throw and a 2 or 3 on the second throw?

Placement Papers

- 1) $\frac{1}{3}$ 2) $\frac{2}{3}$ 3) $\frac{1}{6}$ 4) $\frac{1}{9}$

Solution: Probability of getting a 4 or 5 on the first throw = $\frac{2}{6} = \frac{1}{3}$

Probability of getting a 2 or 3 on the second throw = $\frac{2}{6} = \frac{1}{3}$

Required probability = $\frac{1}{3} \times \frac{1}{3} = \frac{1}{9}$

Q13) A speaks truth in 75% cases and B in 80%. In what percentage of cases are they likely to contradict each other when describing the same event?

Placement Paper

- 1) 35% 2) 30% 3) 25% 4) 20%

Solution: Required probability = $\frac{3}{4} \times \frac{1}{5} + \frac{1}{4} \times \frac{4}{5} = \frac{7}{20}$ or 35%

Probability

Directions for Q14-Q15: Study the information given below and answer the questions that follow:

A bag contains 4 white and 2 black balls. Another contains 3 white and 5 black balls. If one ball is drawn from each bag, find the probability that

Q14) Both are white?

Solution: Probability of getting white ball from bag 1: $\frac{4}{6}$

Probability of getting white ball from bag 2: $\frac{3}{8}$

Required probability = $\frac{4}{6} \times \frac{3}{8} = \frac{1}{4}$

Q15) One is white and one is black?

Solution: Required probability = P(Black from 1st and white from 2nd) + P(White from 1st and black from 2nd) = $\frac{2}{6} \times \frac{3}{8} + \frac{4}{6} \times \frac{5}{8} = \frac{13}{24}$

Q16) A bag contains 4 red and 3 black balls. A second bag contains 2 red and 4 black balls. One bag is selected at random. From the selected bag, one ball is drawn. Find the probability that the ball drawn in red.

Solution: Required probability = Select Bag – 1 and get a red ball + Select Bag – 2 and get a red ball = $\frac{1}{2} \times \frac{4}{7} + \frac{1}{2} \times \frac{2}{6} = \frac{19}{42}$

Q17) What is the probability that birthday of 12 people will fall in 12 different calendar months (Assuming equal probabilities for 12 months).

- 1) $\frac{12!}{12^{12}}$ 2) $\frac{11!}{12^{12}}$ 3) $\frac{1}{12}$ 4) $\frac{12!}{12^{11}}$

Solution: Total number of cases = 12^{12}

Favorable Cases = $12 \times 11 \times 10 \times \dots \times 3 \times 2 \times 1 = 12!$

Required probability = $\frac{12!}{12^{12}}$

Q18) Three persons A, B and C throw a dice in succession till one gets a six and wins the game. Find the probability of A winning, if A begins.

Solution: A can win the game if he gets a six in the 1st, 4th, 7th throw

$$P(A) = \frac{1}{6}, P(A^c) = 1 - P(A) = \frac{5}{6}$$

A will get fourth throw if he fails in the first, B fails in the second, C fails in the third.

$$\text{Probability of A winning in the fourth throw} = \frac{1}{6} \times \left(\frac{5}{6}\right)^3$$

$$\text{Similarly, Probability of A winning in the seventh throw} = \frac{1}{6} \times \left(\frac{5}{6}\right)^6$$

$$\text{Probability of A winning} = \frac{1}{6} + \frac{1}{6} \times \left(\frac{5}{6}\right)^3 + \frac{1}{6} \times \left(\frac{5}{6}\right)^6 + \dots = \frac{\frac{1}{6}}{1 - \left(\frac{5}{6}\right)^3} = \frac{36}{91}$$

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