

Q.1. Given that the two numbers appearing on throwing two dice simultaneously are different. Find the probability of the event that sum of the numbers on the dice is 4.

Solⁿ Given, two dice are throwing simultaneously.
 Sample space $S = \{(x, y) : x, y \in 1, 2, 3, 4, 5, 6\}$

Let E = Event that sum of the numbers on the dice is 4

$$= \{(1, 3), (2, 2), (3, 1)\}$$

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Classes

F = Event that two numbers, appearing are different

$$= \{(1, 2), (1, 3), (1, 4), (1, 5), (1, 6), (2, 1), (2, 3), (2, 4), (2, 5), (2, 6), (3, 1), (3, 2), (3, 4), (3, 5), (3, 6), (4, 1), (4, 2), (4, 3), (4, 5), (4, 6), (5, 1), (5, 2), (5, 3), (5, 4), (5, 6), (6, 1), (6, 2), (6, 3), (6, 5), (6, 4)\}$$

$$E \cap F = \{(1, 3), (3, 1)\}$$

$$\therefore P(E/F) = \frac{P(E \cap F)}{P(F)}$$

$$= \frac{2/36}{30/36} = \frac{2}{30} = \frac{1}{15}$$

Q.2. Two dice are thrown. Find the probability that the sum of the numbers coming up on them is 9. If it is known that the number 5 always occurs on the first die.

Solⁿ

Two dice are thrown,

Sample space $S = \{(x, y) : x, y \in \{1, 2, 3, 4, 5, 6\}\}$

Let $E =$ Event that the sum of numbers on the dice is 9.

$$= \{(3, 6), (4, 5), (5, 4), (6, 3)\}$$

$F =$ Event that the number 5 always occurs on first die.

$$= \{(5, 1), (5, 2), (5, 3), (5, 4), (5, 5), (5, 6)\}$$

$$E \cap F = \{(5, 4)\}$$

$$\begin{aligned} \therefore P(E/F) &= \frac{P(E \cap F)}{P(F)} \\ &= \frac{1/36}{6/36} \\ &= \frac{1}{6} \end{aligned}$$

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Q.8. In answering a question on a multiple choice test, a student either knows the answer or guesses. Let $\frac{3}{4}$ be probability that he knows the answer and $\frac{1}{4}$ be the probability that he guesses. Assuming that a student who guesses at the answer will be correct with probability $\frac{1}{4}$, what is the probability that student knows the answer given that he answered it correctly.

Solⁿ

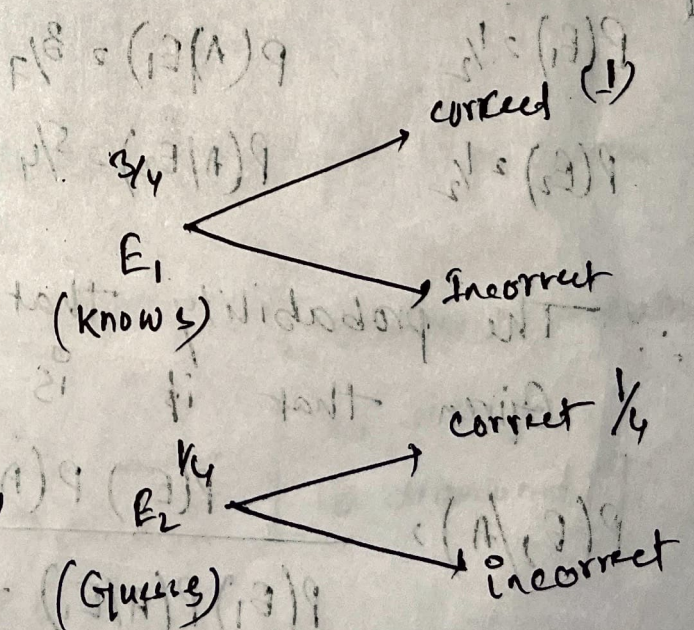
Let E_1 = Event that the student knows the answer.

E_2 = Event that " " guesses at the answer.

A = Event that the given answer by the student is correct.

A/Q. $P(E_1) = \frac{3}{4}$ $P(A|E_1) = 1$

$P(E_2) = \frac{1}{4}$ $P(A|E_2) = \frac{1}{4}$



The probability that student knows the answer given that he answered correctly (Given)

$$P(E_1/A) = \frac{P(E_1) P(A|E_1)}{P(E_1)P(A|E_1) + P(E_2)P(A|E_2)}$$

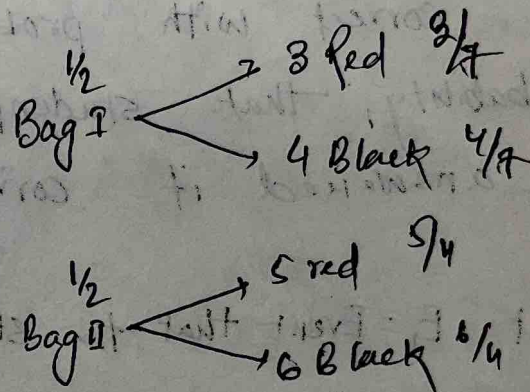
$$= \frac{\frac{3}{4} \times 1}{\frac{3}{4} \times 1 + \frac{1}{4} \times \frac{1}{4}} = \frac{\frac{3}{4}}{\frac{3}{4} + \frac{1}{16}} = \frac{\frac{3}{4}}{\frac{12+1}{16}} = \frac{3}{4} \times \frac{16}{13} = \frac{12}{13}$$

Q.4. Bag I contains 3 red and 4 Black balls while another bag II contains 5 red and 6 black balls. One ball is drawn at random from one of the bags and it is found to be red. Find the probability that it was drawn from bag II

Solⁿ

Let E_1 = Event that the drawn ball is from bag I

E_2 = Event that the drawn ball is from bag II



A = Event that drawn ball is red.

A/Q

$P(E_1) = \frac{1}{2}$ $P(A|E_1) = \frac{3}{7}$

$P(E_2) = \frac{1}{2}$ $P(A|E_2) = \frac{5}{11}$

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The probability that Ball is from bag II given that it is red.

$$P(E_2/A) = \frac{P(E_2) P(A|E_2)}{P(E_1) P(A|E_1) + P(E_2) P(A|E_2)}$$

$$= \frac{\frac{1}{2} \times \frac{5}{11}}{\frac{1}{2} \times \frac{3}{7} + \frac{1}{2} \times \frac{5}{11}}$$

$$= \frac{\frac{1}{2} \times \frac{5}{11}}{\frac{1}{2} \times \left(\frac{3}{7} + \frac{5}{11} \right)}$$

$$= \frac{\frac{5}{22}}{\frac{1}{2} \left(\frac{32 + 35}{77} \right)} = \frac{5}{11} \times \frac{77}{32 + 35} = \frac{5}{11}$$

$$2 \frac{13}{52} \times \frac{12}{51}$$

$$\frac{13}{52} \times \frac{12}{51} + \frac{39}{52} \times \frac{13}{51}$$

$$2 \frac{1}{52 \times 51} [13 \times 12]$$

$$\frac{1}{52 \times 51} [13 \times 12 + 39 \times 13]$$

$$2 \frac{13 \times 12}{2 \times 1}$$

$$13 \times \frac{12 \times 4}{2 \times 1} + 39 \times \frac{13 \times 12}{2 \times 1}$$

$$2 \frac{13 \times 1}{2 \times 1} [12 \times 11]$$

$$\frac{13}{2 \times 1} [12 \times 4 + 39 \times 12]$$

$$\frac{12 \times 11}{12 (11 + 13 \times 3)}$$

$$2 \frac{4}{50} \quad 4$$

ATTENTION
ANSWER

Q. 6. Two cards are drawn at random and without replacement from a pack of 52 playing cards. Find the probability that both cards are black.

Solⁿ
Let A = Event that first drawn card is black.
B = Event that second drawn card is black.

∴ Probability that both drawn cards are black

$$P(A \cap B) = P(A) P(B/A)$$

$$= \frac{26}{52} \times \frac{25}{51}$$

$$= \frac{1}{2} \times \frac{25}{51}$$

$$= \frac{25}{102}$$

PATTERN
CLASSES

PATTERN
CLASSES

Q.7. Probability that solving specific problem independently. Find the probability by A and B are $\frac{1}{2}$ and $\frac{1}{3}$ respectively. If both try to solve the problem independently. Find the probability that.

(i) The problem is solved.

(ii) Exactly one of them solves the problem.

Solⁿ:

Let A = Event that A solved the problem

B = Event that B solved the problem.

$$P(A) = \frac{1}{2}, \quad P(B) = \frac{1}{3}$$

(i) The probability that the problem is solved.

$$P(\text{solved by A or B or both})$$

$$= P(A \cup B)$$

$$= P(A) + P(B) - P(A \cap B)$$

$$= P(A) + P(B) - P(A)P(B) \quad [\text{Independent events}]$$

$$= \frac{1}{2} + \frac{1}{3} - \frac{1}{2} \times \frac{1}{3}$$

PATTERN

$$= \frac{1}{2} + \frac{1}{3} - \frac{1}{6}$$

$$= \frac{3+2-1}{6}$$

$$= \frac{4}{6}$$

$$= \frac{2}{3}$$

(a) The probability that exactly one of them solved.

$$= P(A \cup B) - P(A \cap B)$$

$$= \frac{2}{3} - \frac{1}{2} \times \frac{1}{3}$$

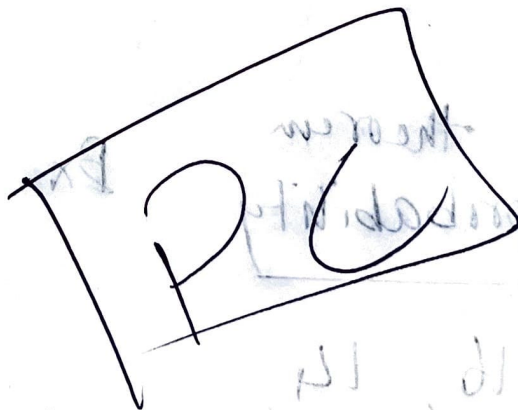
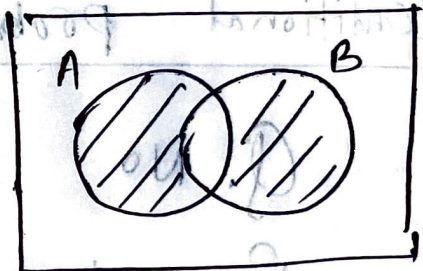
$$= \frac{2}{3} - \frac{1}{6}$$

$$= \frac{4-1}{6}$$

$$= \frac{3}{6}$$

$$= \frac{1}{2}$$

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Most important Questions

Bayes theorem Ex 13.2.

Q. No. 3, 12, 16, 7,

Example 18 (HIV test)

Conditional probability Ex 13.1

Q. No. 12, 13, 15

Example: 7

QUESTION

Multiplicat theorem of probability Ex 13.2

Q No 16, 14,

Miscellaneous

(18)