CBSE Test Paper 04

CH-16 Probability

1. The probability that a card drawn at random from a pack of 52 cards is either a king or a heart is

   a. 1/ 4

   b. 1/ 13

   c. 1/ 52

   d. 16/ 52

2. A pack of cards contain 4 aces, 4 kings, 4 queens and 4 jacks. Two cards are drawn at random. The probability that at least one of them is a king is

   a. $\frac{1}{5}$

   b. $\frac{3}{16}$

   c. $\frac{1}{9}$

   d. $\frac{9}{20}$

3. If the letters of the word ‘ INDEPENDENCE ‘ are written down at random in a row , then the chance that no two E’s occur together is

   a. 14/ 55

   b. none of these

   c. 1/ 55

   d. 54/ 55

4. From each of the four married couples, one of the partners is selected at random. The probability that those selected are of the same sex is

a. $\frac{1}{8}$

b. $\frac{1}{16}$

c. $\frac{1}{2}$

d. $\frac{1}{4}$

5. The probability that the length of a randomly chosen chord of a circle lies between 2/3 and 5/6 of it's diameter is

   a. 1/16

   b. 1/4

   c. 5/6

   d. 5/12

6. Fill in the blanks:

   For a random experiment, a set of events is said to be _____ , if one of them necessarily occurs whenever the experiment is performed.

7. Fill in the blanks:

   If an event E has only one sample point of a sample space, it is called a _____ or elementary event.

8. A coin is tossed. If it shows a tail, we draw a ball from a box which contains 2 red and 3 black balls. If it shows head, we throw a die. Find the sample space for this experiment.

9. Suppose 3 bulbs are selected at random from a lot. Each bulb is tested and classified as defective (D) or non-defective (N). Write the sample space of this experiment.

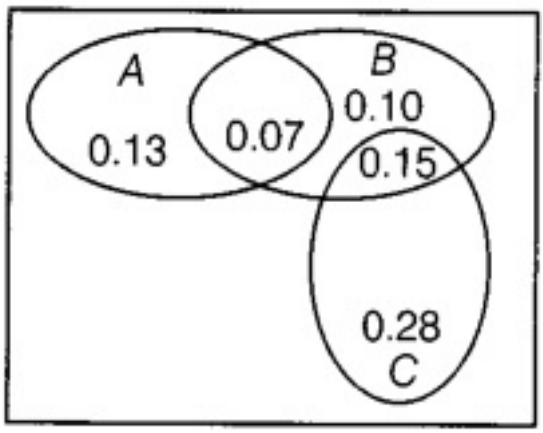
10. If the letters of the word ALGORITHM are arranged at random in a row, what is the probability that the letters GOR must remain together as a unit?

11. In a simultaneous throw of a pair of dice, find the probability of getting 8 as the sum.

12. In a simultaneous throw of a pair of dice, find the probability of getting a doublet of prime numbers.

13. 4 cards are drawn from a well-shuffled deck of 52 cards. What is the probability of obtaining 3 diamonds and one spade?

14. The accompanying Venn diagram shows three events A, B and C and also the probabilities of the various intersections [for instance P(A ∩ B) = 0.07].



Determine,

i. P(A)
ii. P(B ∩ $\overline{C}$)
iii. P(A ∪ B)
iv. P(A ∩ $\overline{B}$)
v. P(B ∩ C)
vi. Probability of exactly one of the three-event occurs.

15. A box contains 30 bolts and 40 nuts. Half of the bolts and half of the nuts are rusted. If two items are drawn at random, what is the probability that either both are rusted or both are bolts?

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Solution

1. (d) 16/ 52

   Explanation:

   Let s be the sample space then n(S) = ${}^{52}C_1$ = 52

   A be the event of getting a king then n(A) = ${}^{4}C_1$ =4,B be the event of getting a heart otherthan a king, then n(B) = ${}^{12}C_1$ =12

   Hence total number of ways, P(A or B) = P(A U B) = n(A U B)/n(S) =(${}^{4}C_1$ + ${}^{12}C_1$)/ ${}^{52}C_1$ = 16/52

2. (d) $\frac{9}{20}$

   Explanation: Required probability = 1 - P [none of the two cards is a king]

   $= 1 - \frac{12C_2}{16C_2}$

   $= 1 - \frac{11}{20} = \frac{9}{20}$

3. (a) 14/ 55

   Explanation:

   Let S be the sample space, then n(S) = $\frac{12!}{4!3!2!}$ as E is repeated four times,N three times and D two times

4. (a) $\frac{1}{8}$

   Explanation: Here, s = {(M M M M), (F F F F), ...}

   Clearly, n (s) = 16

   ∴ Required proability = P [(M M M M) or (F F F F)]

   = P [(M M M M) + (F F F F)]

   $\frac{2}{16} + \frac{2}{16} = \frac{4}{16} = \frac{1}{8}$

5. (b) 1/4

   Explanation: If l is the length of a chord, r, the distance of the mid-point of the chord from the centre of the circle and a radius of the given circle, then

   $r = a\cos\theta, l = 2a\sin\theta$

   Given $\frac{2}{3}2a < 2a\sin\theta < \frac{2}{3}2a$

   $\Rightarrow \frac{5}{6}a < a\cos\theta < \frac{\sqrt{5}}{3}a$

   $\Rightarrow \frac{\sqrt{11}}{6} < r < \frac{\sqrt{5}}{3}a$

   Thus the given condition is satisfied if the mid-point of the chord lies within the region between the concentric circles of radius

   $\frac{\sqrt{11}}{6}$ and $\frac{\sqrt{5}}{3}$

   Hence, required probability = $\frac{\text{The area of the circular annulus}}{\text{Area of the given circle}}$

   $= \left(\frac{5}{9} - \frac{11}{36}\right) = \frac{1}{4}$

6. exhaustive

7. simple

8. When a coin is tossed then outcomes are H, T.

   When the coin shows T then a ball drawn from a box containing 2 red and 3 black balls,

   then the outcomes are R_1, R_2, R_1, R_2, R_3

   When the coin shows H then a die is thrown,

   then the outcomes are 1., 2, 3, 4, 5, 6

   Hence the required sample space (S) is given by

   S= {TR_1, TR_2, TB_1, TB_2, TB_3, H1, H2, H3, H4, H5, H6}.

9. Given that, defective bulbs are denoted by D and non-defective bulbs are denoted by N.

   So the sample space when 3 bulbs are selected at random from a lot is given by

   S - {DDD, DDN, DND, NDD, DNN, NDN, NND, NNN}

10. The 9 letters in word ALGORITHM can be arranged in a row in 9! ways.

    $\therefore$Total number of elementary events $= 9!$

    Consider GOR as one letter,

$\therefore$Favourable number of elementary events $= 7!$

$\therefore$ Required probability = $\frac{7!}{9!} = \frac{1}{72}$

11. Since a pair of dice have been thrown,

    $\therefore$ Numbers of elementary events in sample space is $6^2 = 36$

    Suppose E be the event that the sum 8 appear on the faces of dice,

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

    $\therefore n(E) = 5$

    $\therefore P(E) = \frac{5}{36}$

12. Suppose E be the event that a doublet of prime number appear.

    $\therefore$ E = {(2,2), (3,3), (5,5)}

    $n(E) = 3$

    $\therefore P(E) = \frac{3}{36} = \frac{1}{12}$

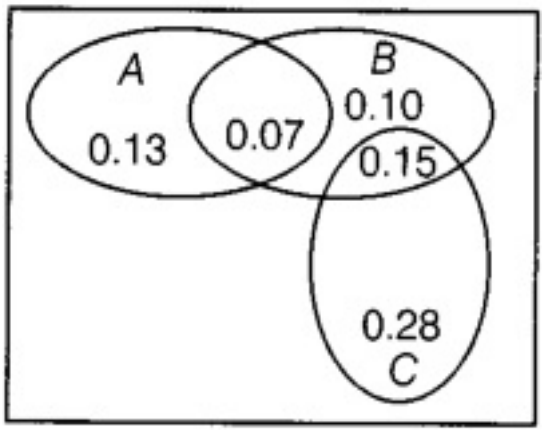
13. From a pack of 52 cards, 4 cards can be drawn in ${}^{52}C_4$ ways.

    There are 13 cards of diamond and 18 cards of spades

    Now 3 cards of diamond out of 18 cards of diamond can be drawn in ${}^{13}C_3$ ways and 1 card of spade out of 13 cards of spade can be drawn in ${}^{13}C_1$ ways.

    Thus the probability of obtaining 3 diamond and 1 spade card

    $= \frac{{}^{13}C_3 \times {}^{13}C_1}{{}^{52}C_4}$

14. 

    i. $P(A) = 0.13 + 0.07 = 0.20$

    ii. P(B $\cap$ $\overline{C}$) = P(B) - P(B $\cap$ C)

    $= (0.07 + 0.10 + 0.15) - (0.15) = 0.17$

    iii. P(A $\cup$ B) = P(A) + P(B) - P(A $\cap$ B)

$= 0.20 + (0.07 + 0.10 + 0.15) - (0.07)$

$= 0.20 + 0.25 = 0.45$

iv. P(A $\cap \overline{B}$) = P(A) - P(A $\cap$ B)

$= 0.20 - 0.07 = 0.13$

v. P(B $\cap$ C) = 0.15

vi. P (exactly one of the three events occurs)

= P(A only) + P(B only) + P(C only)

$= 0.13 + 0.10 + 0.28 = 0.51$

15. A box contains 30 - bolts and 40 - nuts.

Since two items are drawn,

$\therefore n(S) = {}^{70}C_2$

Half the bolts and nuts are rusted,

$\therefore$ Rusted bolts $= 15$ and Rusted nuts $= 20$

Suppose A be the event of choosing both are rusting items.

$\therefore P(A) = \frac{{}^{35}C_2}{{}^{70}C_2}$ = $\frac{35\times34}{70\times69}$

Suppose B be the event of choosing both are bolts.

$\therefore P(B) = \frac{{}^{30}C_2}{{}^{70}C_2}$ = $\frac{30\times29}{70\times69}$

Also, $n(A \cap B) = 15$ [bolts that are rusted]

$\therefore P(A \cap B) = \frac{{}^{15}\mathrm{C}_2}{{}^{70}\mathrm{C}_2}$ = $\frac{15\times14}{70\times69}$

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

= $\frac{35\times34}{70\times69} + \frac{30\times29}{70\times69} - \frac{15\times14}{70\times69}$

= $\frac{1850}{4830}$

= $\frac{185}{483}$