

a) $\frac{7}{8}$

b) $\frac{17}{20}$

c) $\frac{14}{17}$

d) $\frac{1}{8}$

9. A pair of fair dice is thrown independently 4 times. The probability of getting a score of 5 exactly twice is: [1]

a) $\frac{128}{2187}$

b) $\frac{16}{729}$

c) $\frac{64}{243}$

d) $\frac{32}{81}$

10. It has been found that, if A and B play a game 12 times, A wins 6 times, B wins 4 times and they draw twice. A and B take part in a series of 3 games. The probability that they win alternately, is [1]

a) $\frac{19}{27}$

b) $\frac{5}{27}$

c) $\frac{5}{36}$

d) $\frac{5}{12}$

SECTION B

11. Using the principal values, write the value of $\cos^{-1}\left(\frac{1}{2}\right) + 2\sin^{-1}\left(\frac{1}{2}\right)$. [2]

OR

Find the value of $\sin\left[2\cot^{-1}\left(\frac{-5}{12}\right)\right]$

12. Given that the events A and B are such that $P(A) = \frac{1}{2}$, $P(A \cup B) = \frac{3}{5}$ and $P(B) = p$. [2]

Find p if they are independent.

SECTION C

13. Let the function $f : \mathbb{R} \rightarrow \mathbb{R}$ be defined by $f(x) = \cos x$, $\forall x \in \mathbb{R}$. Show that f is neither one-one nor onto. [3]

14. If R is a relation defined on the set of natural numbers N as follows: $R = \{(x, y) : x \in \mathbb{N}, y \in \mathbb{N} \text{ and } 2x + y = 24\}$, then find the domain and range of the relation R. Also, find whether R is an equivalence relation or not. [3]

15. A bag I contains 3 red and n black balls and another bag II contains 5 red and 12 black balls. A ball is drawn at random from bag I and transferred to bag II. If the probability of drawing a red ball from bag I, after transfer, is $\frac{1}{3}$, then find the value of n. [3]

16. Two marbles are drawn successively from a box containing 3 black and 4 white marbles. Find the probability that both the marbles are black, if the first marble is not replaced before the second draw. [3]

OR

Assume that each child born is equally likely to be a boy or a girl. If a family has two children, what is the conditional probability that both are girls given that

i. the youngest is a girl

ii. at least one is a girl?

SECTION D

17. Let $A = \mathbb{R} - \{3\}$ and $B = \mathbb{R} - \{1\}$. Consider the function of $f: A \rightarrow B$ defined by $f(x) = \frac{x-2}{x-3}$, is one - one and onto. [5]

OR

Let $A = \{1, 2, 3, \dots, 9\}$ and R be the relation in $A \times A$ defined by $(a, b) R (c, d)$ if $a + d = b + c$ for $(a, b), (c, d)$ in $A \times A$. Prove that R is an equivalence relation and also obtain the equivalence class $[(2, 5)]$.

18. In answering a question on a multiple choice test, a student either knows the answer or guesses. Let $\frac{3}{4}$ be the probability that he knows the answer and $\frac{1}{4}$ be the probability he guesses. Assuming that a student who guesses at the answer will be correct with probability $\frac{1}{4}$. What is the probability that the student knows the answer given that he answered it correctly. [5]

SECTION E-CASE BASED QUESTIONS

19. Akshat and his friend Aditya were playing the snake and ladder game. They had their own dice to play the game. [4]
 Akshat was having red dice whereas Aditya had black dice. In the beginning, they were using their own dice to play the game. But then they decided to make it faster and started playing with two dice together.



100	99	98	97	96	95	94	93	92	91
81	82	83	84	85	86	87	88	89	90
80	79	78	77	76	75	74	73	72	71
61	62	63	64	65	66	67	68	69	70
60	59	58	57	56	55	54	53	52	51
41	42	43	44	45	46	47	48	49	50
40	39	38	37	36	35	34	33	32	31
21	22	23	24	25	26	27	28	29	30
20	19	18	17	16	15	14	13	12	11
1	2	3	4	5	6	7	8	9	10

Snake and Ladders Game

Aditya rolled down both black and red die together.

1. Find the conditional probability of obtaining a sum greater than 9, given that the black die resulted in a 5.
2. Find the conditional probability of obtaining the sum 8, given that the red die resulted in a number less than 4.