Numbers are selected at random , one at a time, from the two digit numbers 00, 01, 02, ... , 99 with replacement. An event E occurs if & only if the product of the two digits of a selected number is 18. If four numbers are selected, find the probability that the event E occurs at least 3 times.

In a box , there are 8 alphabets cards with the letters : S, S, A, A,A, H, H, H . Find the probability that the word 'ASH' will form if :

(i) the three cards are drawn one by one & placed on the table in the same order that they are drawn.

(ii) the three cards are drawn simultaneously .

A pair of fair dice is tossed. Find the probability that the maximum of the two numbers is greater than 4.

In a given race, the odds in favour of four horses A, B, C & D are 1 : 3, 1 : 4, 1 : 5 and 1 : 6 respectively. Assuming that a dead heat is impossible, find the chance that one of them wins the race.

A covered basket of flowers has some lilies and roses. In search of rose, Sweety and Shweta alternately pick up a flower from the basket but puts it back if it is not a rose. Sweety is 3 times more likely to be the first one to pick a rose. If sweety begin this 'rose hunt' and if there are 60 lilies in the basket, find the number of roses in the basket.

The chance of one event happening is the square of the chance of a 2^{nd} event, but odds against the first are the cubes of the odds against the 2^{nd} . Find the chances of each. (assume that both events are neither sure nor impossible).

A box contains 5 radio tubes of which 2 are defective . The tubes are tested one after the other until the 2 defective tubes are discovered . Find the probability that the process stopped on the

(i) Second test; **(ii)** Third test. If the process stopped on the third test , find the probability that the first tube is non defective.

An aircraft gun can take a maximum of four shots at an enemy's plane moving away from it. The probability of hitting the plane at first, second, third & fourth shots are 0.4, 0.3, 0.2 & 0.1 respectively. What is the probability that the gun hits the plane .

One hundred management students who read at least one of the three business magazines are surveyed to study the readership pattern. It is found that 80 read Business India, 50 read Business world and 30 read Business Today. Five students read all the three magazines. A student was selected randomly. Find the probability that he reads exactly two magazines.

An author writes a good book with a probability of 1/2. If it is good it is published with a probability of 2/3. If it is not, it is published with a probability of 1/4. Find the probability that he will get atleast one book published if he writes two.

3 students {A, B, C} tackle a puzzle together and offers a solution upon which majority of the 3 agrees. Probability of A solving the puzzle correctly is p. Probability of B solving the puzzle correctly is also p. C is a dumb student who randomly supports the solution of either A or B. There is one more student D, whose probability of solving the puzzle correctly is once again, p. Out of the 3 member team {A, B, C} and one member team {D}, Which one is more likely to solve the puzzle correctly.

Two cards are drawn from a well shuffled pack of 52 cards. Find the probability that one of them is a red card & the other is a queen.

A cube with all six faces coloured is cut into 64 cubical blocks of the same size which are thoroughly mixed. Find the probability that the 2 randomly chosen blocks have 2 coloured faces each.

A player tosses an unbiased coin and is to score two points for every head turned up and one point for every tail turned up. If P_n denotes the probability that his score is exactly n points, prove that

$$P_n - P_{n-1} = \frac{1}{2}(P_{n-2} - P_{n-1}) \qquad n \geq 3$$

Also compute P_1 and P_2 and hence deduce the pr that he scores exactly 4.

Each of the 'n' passengers sitting in a bus may get down from it at the next stop with probability p. Moreover, at the next stop either no passenger or exactly one passenger boards the bus. The probability of no passenger boarding the bus at the next stop being p_o. Find the probability that when the bus continues on its way after the stop, there will again be 'n' passengers in the bus.

The difference between the mean & variance of a Binomial Variate 'X' is unity & the difference of their square is 11. Find the probability distribution of 'X'.

An examination consists of 8 questions in each of which the candidate must say which one of the 5 alternatives is correct one. Assuming that the student has not prepared earlier chooses for each of the question any one of 5 answers with equal probability.

(i) prove that the probability that he gets more than one correct answer is $(5^8 - 3 \times 4^8)/5^8$.
(ii) find the probability that he gets correct answers to six or more questions.
(iii) find the standard deviation of this distribution.

The probabilities that three men hit a target are, respectively, 0.3, 0.5 and 0.4. Each fires once at the target. (As usual, assume that the three events that each hits the target are independent)

(a) Find the probability that they all : **(i)** hit the target ; **(ii)** miss the target
(b) Find the probability that the target is hit : **(i)** at least once, **(ii)** exactly once.
(c) If only one hits the target, what is the probability that it was the first man?

Let A & B be two events defined on a sample space . Given P(A) = 0.4 ; P(B) = 0.80 and $P(\overline{A}/\overline{B}) = 0.10$. Then find ; (i) $P(\overline{A} \cup B)$ & $P\left[(\overline{A} \cap B) \cup (A \cap \overline{B})\right]$.

Three shots are fired independently at a target in succession. The probabilities that the target is hit in the first shot is 1/2, in the second 2/3 and in the third shot is 3/4. In case of exactly one hit, the probability of destroying the target is 1/3 and in the case of exactly two hits, 7/11 and in the case of three hits is 1.0. Find the probability of destroying the target in three shots.

In a game of chance each player throws two unbiased dice and scores the difference between the larger and smaller number which arise. Two players compete and one or the other wins if and only if he scores atleast 4 more than his opponent. Find the probability that neither player wins.

A certain drug, manufactured by a Company is tested chemically for its toxic nature. Let the event "THE DRUG IS TOXIC" be denoted by H & the event "THE CHEMICAL TEST REVEALS THAT THE DRUG IS TOXIC" be denoted by S. Let P(H) = a, $P(S/H) = P(\overline{S}/\overline{H}) = 1 - a$. Then show that the probability that the drug is not toxic given that the chemical test reveals that it is toxic, is free from 'a'.

A plane is landing. If the weather is favourable, the pilot landing the plane can see the runway. In this case the probability of a safe landing is p_1. If there is a low cloud ceiling, the pilot has to make a blind landing by instruments. The reliability (the probability of failure free functioning) of the instruments needed for a blind landing is P. If the blind landing instruments function normally, the plane makes a safe landing with the same probability p_1 as in the case of a visual landing. If the blind landing instruments fail, then the pilot may make a safe landing with probability $p_2 < p_1$. Compute the probability of a safe landing if it is known that in K percent of the cases there is a low cloud ceiling. Also find the probability that the pilot used the blind landing instrument, if the plane landed safely.

A train consists of n carriages , each of which may have a defect with probability p. All the carriages are inspected , independently of one another , by two inspectors ; the first detects defects (if any) with probability p_1 , & the second with probability p_2 . If none of the carriages is found to have a defect, the train departs . Find the probability of the event ; " THE TRAIN DEPARTS WITH ATLEAST ONE DEFECTIVE CARRIAGE ".

A is a set containing n distinct elements. A non-zero subset P of A is chosen at random. The set A is reconstructed by replacing the elements of P. A non-zero subset Q of A is again chosen at random. Find the probability that P & Q have no common elements.

n people are asked a question successively in a random order & exactly 2 of the n people know the answer :

(a) If $n > 5$, find the probability that the first four of those asked do not know the answer.

(b) Show that the probability that the r^{th} person asked is the first person to know the answer is :

$$\left[\frac{2(n-r)}{n(n-1)}\right], \text{ if } 1 < r < n.$$

A box contains three coins two of them are fair and one two – headed. A coin is selected at random and tossed. If the head appears the coin is tossed again, if a tail appears, then another coin is selected from the remaining coins and tossed.

(i) Find the probability that head appears twice.

(ii) If the same coin is tossed twice, find the probability that it is two headed coin.

(iii) Find the probability that tail appears twice.

In a multiple choice question there are five alternative answers of which one or more than one is correct. A candidate will get marks on the question only if he ticks the correct answers. The candidate ticks the answers at random. If the probability of the candidate getting marks on the question is to be greater than or equal to 1/3 find the least number of chances he should be allowed.

The ratio of the number of trucks along a highway, on which a petrol pump is located, to the number of cars running along the same highway is 3 : 2. It is known that an average of one truck in thirty trucks and two cars in fifty cars stop at the petrol pump to be filled up with the fuel. If a vehicle stops at the petrol pump to be filled up with the fuel, find the probability that it is a car.

A batch of fifty radio sets was purchased from three different companies A, B and C. Eighteen of them were manufactured by A, twenty of them by B and the rest were manufactured by C.
The companies A and C produce excellent quality radio sets with probability equal to 0.9 ; B produces the same with the probability equal to 0.6.
What is the probability of the event that the excellent quality radio set chosen at random is manufactured by the company B?

The contents of three urns 1, 2 & 3 are as follows :

1 W, 2 R, 3B balls

2 W, 3 R, 1B balls

3 W, 1 R, 2B balls

An urn is chosen at random & from it two balls are drawn at random & are found to be "**1 RED & 1 WHITE** ". Find the probability that they came from the 2^{nd} urn.

Suppose that there are 5 red points and 4 blue points on a circle. Let $\frac{m}{n}$ be the probability that a convex polygon whose vertices are among the 9 points has at least one blue vertex where m and n are relatively prime. Find $(m + n)$.

There are 6 red balls & 8 green balls in a bag . 5 balls are drawn out at random & placed in a red box ; the remaining 9 balls are put in a green box . What is the probability that the number of red balls in the green box plus the number of green balls in the red box is not a prime number?

Two cards are randomly drawn from a well shuffled pack of 52 playing cards, without replacement. Let x be the first number and y be the second number.
Suppose that Ace is denoted by the number 1; Jack is denoted by the number 11 ; Queen is denoted by the number 12 ; King is denoted by the number 13.
Find the probability that x and y satisfy $\log_3(x + y) - \log_3 x - \log_3 y + 1 = 0$.

(a) Two numbers x & y are chosen at random from the set {1,2,3,4,....3n}. Find the probability that $x^2 - y^2$ is divisible by 3 .
(b) If two whole numbers x and y are randomly selected, then find the probability that $x^3 + y^3$ is divisible by 8.

A hunter's chance of shooting an animal at a distance r is $\frac{a^2}{r^2}$ $(r > a)$. He fires when $r = 2a$ & if he misses he reloads & fires when $r = 3a$, $4a$, ... If he misses at a distance 'na', the animal escapes. Find the odds against the hunter.

An unbiased normal coin is tossed 'n' times. Let :
E_1 : event that both **Heads and Tails** are present in 'n' tosses.
E_2 : event that the coin shows up **Heads** atmost once.
Find the value of 'n' for which E_1 & E_2 are independent.

A coin is tossed $(m + n)$ times $(m>n)$. Show that the probability of at least m consecutive heads is $\frac{n+2}{2^{m+1}}$

There are two lots of identical articles with different amount of standard and defective articles. There are N articles in the first lot, n of which are defective and M articles in the second lot, m of which are defective. K articles are selected from the first lot and L articles from the second and a new lot results. Find the probability that an article selected at random from the new lot is defective.

m red socks and n blue socks $(m > n)$ in a cupboard are well mixed up, where $m + n \le 101$. If two socks are taken out at random, the chance that they have the same colour is 1/2. Find the largest value of m.

With respect to a particular question on a multiple choice test (having 4 alternatives with only 1 correct) a student knows the answer and therefore can eliminate 3 of the 4 choices from consideration with probability 2/3, can eliminate 2 of the 4 choices from consideration with probability 1/6, can eliminate 1 choice from consideration with probability 1/9, and can eliminate none with probability 1/18. If the student knows the answer, he answers correctly, otherwise he guesses from among the choices not eliminated.

If the answer given by the student was found correct, then the probability that he knew the answer is $\frac{a}{b}$ where a and b are relatively prime. Find the value of $(a + b)$.

In a knockout tournament 2^n equally skilled players; $S_1, S_2, \ldots\ldots\ldots\ldots S_{2^n}$ are participating. In each round players are divided in pairs at random & winner from each pair moves in the next round. If S_2 reaches the semifinal then find the probability that S_1 wins the tournament.

There is 30% chance that it rains on any particular day . What is the probability that there is at least one rainy day within a period of 7 – days ? Given that there is at least one rainy day, what is the probability that there are at least two rainy days ?

If $\bar{E}$ & $\bar{F}$ are the complementary events of events E & F respectively & if $0 < P(F) < 1$, then :

(A) $P(E|F) + P(\bar{E}|F) = 1$ (B) $P(E|F) + P(E|\bar{F}) = 1$

(C) $P(\bar{E}|F) + P(E|\bar{F}) = 1$ (D) $P(E|\bar{F}) + P(\bar{E}|\bar{F}) = 1$

If from each of the 3 boxes containing 3 white & 1 black, 2 white & 2 black, 1 white & 3 black balls, one ball is drawn at random, then the probability that 2 white & 1 black ball will be drawn is :

(A) 13/32 (B) 1/4 (C) 1/32 (D) 3/16

3 players A, B & C toss a coin cyclically in that order (that is A, B, C, A, B, C, A, B, ...) till a head shows . Let p be the probability that the coin shows a head. Let α, β & γ be respectively the probabilities that A, B and C gets the first head . Prove that

$\beta = (1 - p)\alpha$. Determine α, β & γ (in terms of p).

If the integers m and n are chosen at random between 1 and 100, then the probability that a number of the form $7^m + 7^n$ is divisible by 5 equals

(A) $\frac{1}{4}$ (B) $\frac{1}{7}$ (C) $\frac{1}{8}$ (D) $\frac{1}{49}$

The probability that a student passes in Mathematics, Physics and Chemistry are m, p and c respectively. Of these subjects, the student has a 75% chance of passing in at least one, a 50% chance of passing in at least two, and a 40% chance of passing in exactly two, which of the following relations are true?

(A) $p + m + c = \frac{19}{20}$ (B) $p + m + c = \frac{27}{20}$ (C) $pmc = \frac{1}{10}$ (D) $pmc = \frac{1}{4}$

Eight players $P_1, P_2, P_3, ...P_8$ play a knock-out tournament. It is known that whenever the players P_i and P_j play, the player P_i will win if $i < j$. Assuming that the players are paired at random in each round, what is the probability that the player P_4 reaches the final.

A coin has probability 'p' of showing head when tossed. It is tossed 'n' times. Let p_n denote the probability that no two (or more) consecutive heads occur. Prove that,

$$p_1 = 1,\ p_2 = 1 - p^2\ \&\ p_n = (1-p)\,p_{n-1} + p\,(1-p)\,p_{n-2},\ \text{for all } n \geq 3.$$

A and B are two independent events. The probability that both occur simultaneously is 1/6 and the probability that neither occurs is 1/3. Find the probabilities of occurance of the events A and B separately.

An unbiased die, with faces numbered 1, 2, 3, 4, 5, 6 is thrown n times and the list of n numbers showing up is noted. What is the probability that among the numbers 1, 2, 3, 4, 5, 6, only three numbers appear in the list.

A box contains N coins, m of which are fair and the rest are biased. The probability of getting a head when a fair coin is tossed is 1/2, while it is 2/3 when a biased coin is tossed. A coin is drawn from the box at random and is tossed twice. The first time it shows head and the second time it shows tail. What is the probability that the coin drawn is fair?

(a) A person takes three tests in succession. The probability of his passing the first test is p, that of his passing each successive test is p or p/2 according as he passes or fails in the preceding one. He gets selected provided he passes at least two tests. Determine the probability that the person is selected.

(b) In a combat, A targets B, and both B and C target A. The probabilities of A, B, C hitting their targets are 2/3, 1/2 and 1/3 respectively. They shoot simultaneously and A is hit. Find the probability that B hits his target whereas C does not.

(a) Three distinct numbers are selected from first 100 natural numbers. The probability that all the three numbers are divisible by 2 and 3 is

(A) $\frac{4}{25}$ (B) $\frac{4}{35}$ (C) $\frac{4}{55}$ (D) $\frac{4}{1155}$

(b) If A and B are independent events, prove that $P(A \cup B) \cdot P(A' \cap B') \leq P(C)$, where C is an event defined that exactly one of A or B occurs.

(c) A bag contains 12 red balls and 6 white balls. Six balls are drawn one by one without replacement of which atleast 4 balls are white. Find the probability that in the next two draws exactly one white ball is drawn (leave the answer in terms of ${}^nC_r$).

(a) A six faced fair dice is thrown until 1 comes, then the probability that 1 comes in even number of trials is

(A) 5/11 (B) 5/6 (C) 6/11 (D) 1/6

Comprehension

There are n urns each containing $n + 1$ balls such that the i^{th} urn contains i white balls and $(n + 1 - i)$ red balls. Let u_i be the event of selecting i^{th} urn, $i = 1, 2, 3, ..., n$ and w denotes the event of getting a white ball.

(a) If $P(u_i) \propto i$ where $i = 1, 2, 3, ..., n$ then $\lim\limits_{n\to\infty} P(w)$ is equal to

(A) 1 (B) 2/3 (C) 3/4 (D) 1/4

(b) If $P(u_i) = c$, where c is a constant then $P(u_n/w)$ is equal to

(A) $\frac{2}{n+1}$ (B) $\frac{1}{n+1}$ (C) $\frac{n}{n+1}$ (D) $\frac{1}{2}$

(c) If n is even and E denotes the event of choosing even numbered urn $(P(u_i) = \frac{1}{n})$, then the value of $P(w/E)$, is

(A) $\frac{n+2}{2n+1}$ (B) $\frac{n+2}{2(n+1)}$ (C) $\frac{n}{n+1}$ (B) $\frac{1}{n+1}$

An instrument is being tested , upon each trial the instrument fails with probability p. After the first failure the instrument is repaired and after the second failure it is considered to be unfit for operation. Find the probability that the instrument is rejected exactly in the k^{th} trial.

(a) Prove that if A, B & C are random events in a sample space & A, B, C are pairwise independent and A is independent of $(B\cup C)$ then A , B & C are mutually independent.

(b) An event A is known to be independent of the events $B, B\cup C$ & $B\cap C$. Show that it is also independent of C .

A slip of paper is given to a person **"A"** who marks it with either a (+)ve or a (−)ve sign, the probability of his writing a (+)ve sign being 1/3. **"A"** passes the slip to **"B"** who may leave it alone or change the sign before passing it to **"C"**. Similarly **"C"** passes on the slip to **"D"** & **"D"** passes on the slip to Refree , who finds a plus sign on the slip . If it is known that B, C & D each change the sign with a probability of 2/3 , then find the probability that **"A"** originally wrote a (+)ve sign.

Match the following column–I with column–II.

	Column – I		Column – II
(A)	One ball is drawn from a bag containing 4 balls and is found to be white. The events that the bag contains 1 white, 2 white, 3 white and 4 white balls are equally likely. If the probability that all the balls are white is $\frac{p}{15}$ then the value of p is	(p)	9
(B)	From a set of 12 persons if the number of different selection of a committee, its chairperson and its secretary (possibly same as chairperson) is $13 \cdot 2^{10} m$ then m is	(q)	3
(C)	If x, y, z > 0 and x + y + z = 1, then the least value of $\frac{5x}{2-x}+\frac{5y}{2-y}+\frac{5z}{2-z}$ is	(r)	8
(D)	If $\sum_{K=1}^{12} 12K \cdot {}^{12}C_K \cdot {}^{11}C_{K-1}$ is equal to $\frac{12\times 21\times 19\times 17\times .....\times 3}{11!}\times 2^{12}\times p$ the p is	(s)	6
		(t)	12

A biased coin is tossed repeatedly until a tail appears for the 1st time. The head is 2 times likely to appear as tail. The probability that the number of tosses required will be more than 6 given that in 1st three toss no tail has occured is/are

(A) $\frac{16}{81}$ (B) $\frac{32}{243}$

(C) $\frac{64}{729}$ (D) none of these

Read the following write up carefully and answer the following questions:

Let B_n denotes the event that n fair dice are rolled once with $P(B_n)=\frac{1}{2^n}$, $n \in N$. e.g. $P(B_1)=\frac{1}{2}$, $P(B_2)=\frac{1}{2^2}$, $P(B_3)=\frac{1}{2^3}$, ... and $P(B_n)=\frac{1}{2^n}$. Hence B_1, B_2, B_3, ... B_n are pairwise mutually exclusive and exhaustive events as $n \to \infty$. The event A occurs with atleast one of the event B_1, B_2, ..., B_n and denotes that the sum of the numbers appearing on the dice is S.

14. If even number of dice has been rolled, the probability that S = 4, is

(A) very closed to $\frac{1}{2}$ (B) very closed to $\frac{1}{4}$

(C) very closed to $\frac{1}{8}$ (D) very closed to $\frac{1}{16}$

15. Probability that greatest number on the dice is 4 if three dice are known to have been rolled, is

(A) $\frac{37}{216}$ (B) $\frac{64}{216}$

(C) $\frac{27}{216}$ (D) $\frac{31}{216}$

Let S = set of triplets (A, B, C) where A, B, C are subsets of {1, 2, 3, ... n}. E_1 = event that a selected triplet at random from set S will satisfy $A \cap B \cap C = \phi$, $A \cap B \neq \phi$, $B \cap C \neq \phi$. E_2 = events that a selected triplet at random from set S will satisfy $A \cap B \cap C = \phi$, $A \cap B \neq \phi$ $B \cap C \neq \phi$, $A \cap C \neq \phi$. P (E) represents probability of an event E than

13. $P(E_1)$ is equal to

(A) $\frac{7^n - 6^n + 5^n}{8^n}$ (B) $\frac{7^n - 2\times 6^n + 5^n}{8^n}$

(C) $\frac{7^n - 2\times 6^n}{8^n}$ (D) $\frac{7^n - 2\times 6^n + 5^n}{8^n}$

14. $P(E_2)$ is equal to

(A) $\frac{7^n - 3\times 6^n + 5^n}{8^n}$ (B) $\frac{7^n - 3\times 6^n + 3\times 5^n - 4^n}{8^n}$

(C) $\frac{7^n - 2\times 6^n + 2\times 5^n - 4^n}{8^n}$ (D) $\frac{7^n - 6^n + 5^n - 4^n}{8^n}$

A number is chosen at random from the set of integers {1, 2, 3, 4,……., n}. Let A denote the event that the number chosen is divisible by 4, B denote the event that the number chosen is divisible by 5 and C denote the event that the number chosen is divisible by 7. Then,
(A) A, B, C are always mutually independent
(B) A and B are always independent
(C) B and C are independent if n is of the form 35k (k positive integer)
(D) A and C are independent if n is of the form 28 λ (λ positive integer)

2n boys are randomly divided into two subgroups containing n boys each. The probability that the two tallest boys are in different groups is

(A*) $\frac{n}{2n-1}$ (B) $\frac{n-1}{2n-1}$ (C) $\frac{2n-1}{4n^2}$ (D) none of these

Odds in favour of A's speaking the truth are 1 : 2 and odds against B's speaking the truth are 1 : 3. A die is thrown. Both A and B assert that on the die 4 has turned up. Then the probability of the truth of their assertion is

(A) $\frac{1}{30}$ (B) $\frac{1}{24}$ (C) $\frac{11}{360}$ (D*) $\frac{15}{17}$

In throwing a die let A be the event 'coming up of an odd number', B be the event 'coming up of an even number', C be the event 'coming up of a number ≥ 4' and D be the event 'coming up of a number < 3', then
(A*) A and B are mutually exclusive and exhautive
(B) A and C are mutually exclusive and exhautive
(C*) A, C and D form an exhautive system
(D) B, C and D form an exhautive system

If M & N are any two events, then which one of the following represents the probability of the occurance of exactly one of them ?
(A*) $P(M) + P(N) - 2P(M \cap N)$ (B) $P(M) + P(N) - P(M \cap N)$
(C*) $P(\overline{M}) + P(\overline{N}) - 2P(\overline{M} \cap \overline{N})$ (D*) $P(M \cap \overline{N}) + P(\overline{M} \cap N)$

If M & N are independent events such that $0 < P(M) < 1$ & $0 < P(N) < 1$, then:

(A) M & N are mutually exclusive (B*) M & $\overline{N}$ are independent

(C*) $\overline{M}$ & $\overline{N}$ are independent (D*) $P(M/N) + P(\overline{M}/N) = 1$

A local post office is to send M telegrams which are distributed at random over N communication channels, (N > M). Each telegram is sent over any channel with equal probability. Chance that not more than one telegram will be sent over each channel is:

(A*) $\frac{{}^{N}C_{M}\,.\,M!}{N^{M}}$ (B) $\frac{{}^{N}C_{M}\,.\,N!}{M^{N}}$ (C) $1 - \frac{{}^{N}C_{M}\,.\,M!}{M^{N}}$ (D) $1 - \frac{{}^{N}C_{M}\,.\,N!}{N^{M}}$

A bag contains 7 tickets marked with the numbers 0, 1, 2, 3, 4, 5, 6 respectively. A ticket is drawn & replaced. Then the chance that after 4 drawings the sum of the numbers drawn is 8 is:
(A) 165/2401 (B*) 149/2401 (C) 3/49 (D) none

Two whole numbers are randomly selected & multiplied. If the probability that the units place in their product is "Even" is p & the probability that the units place in their product is "Odd" is q, then p/q is:
(A) 4 (B*) 3 (C) 2 (D) 1

In a purse there are 10 coins, all 5 paise except one which is a rupee. In another purse there are 10 coins all 5 paise. 9 coins are taken out from the former purse & put into the latter & then 9 coins are taken out from the latter & put into the former. Then the chance that the rupee is still in the first purse is:
(A) 9/19 (B*) 10/19 (C) 4/9 (D) none

15 coupons are numbered 1, 2, 3,....., 15 respectively. 7 coupons are selected at random one at a time with replacement. The probability that the largest number appearing on a selected coupon is 9 is:

(A) $\left(\frac{9}{16}\right)^{6}$ (B) $\left(\frac{8}{15}\right)^{7}$ (C) $\left(\frac{3}{5}\right)^{7}$ (D*) $\frac{9^7 - 8^7}{15^7}$

A bag contains (n + 1) coins. It is known that one of these coins has a head on both sides, whereas the other coins are normal. One of these coins is selected at random & tossed. If the probability that the toss results in head, is 7/12, then the value of n is.
(A*) 5 (B) 6 (C) 4 (D) 3

If $\frac{(1+3p)}{3}, \frac{(1-p)}{4}$ & $\frac{(1-2p)}{2}$ are the probabilities of three pair wise exclusive events then the set of all values of p is.

(A) $\left[\frac{1}{2}, \frac{2}{3}\right]$ (B*) $\left[\frac{1}{3}, \frac{1}{2}\right]$ (C) $\left[\frac{1}{4}, \frac{1}{2}\right]$ (D) $\left[\frac{1}{3}, \frac{2}{3}\right]$

Let p be the probability that a man aged x years will die in a year time. The probability that out of 'n' men $A_1, A_2, A_3, \ldots, A_n$ each aged 'x' years. A_1 will die & will be the first to die is:

(A) $\frac{1-p^n}{n}$ (B) $\frac{p}{n}$ (C) $\frac{p(1-p)^{n-1}}{n}$ (D*) $\frac{1-(1-p)^n}{n}$

There are 4 urns. The first urn contains 1 white & 1 black ball, the second urn contains 2 white & 3 black balls, the third urn contains 3 white & 5 black balls & the fourth urn contains 4 white & 7 black balls. The selection of each urn is not equally likely. The probability of selecting i^{th} urn is $\frac{i^2+1}{34}$ (i = 1, 2, 3, 4). If we randomly select one of the urns & draw a ball, then the probability of ball being white is :

(A*) $\frac{569}{1496}$ (B) $\frac{27}{56}$ (C) $\frac{8}{73}$ (D) none of these

Two whole numbers are randomly selected & multiplied. The probability that the unit's place in their product is 0 or 5 is:

(A) 1/3 (B) 16/25 (C*) 9/25 (D) none

The contents of urn I and II are as follows,

Urn I: 4 white and 5 black balls

Urn II: 3 white and 6 black balls

One urn is chosen at random and a ball is drawn and its colour is noted and replaced back to the urn. Again a ball is drawn from the same urn, colour is noted and replaced. The process is repeated 4 times and as a result one ball of white colour and 3 of black colour are noted. Find the probability the chosen urn was I.

(A*) $\frac{125}{287}$ (B) $\frac{64}{127}$ (C) $\frac{25}{287}$ (D) $\frac{79}{192}$

A letter is known to have come either from "KRISHNAGIRI" or "DHARMAPURI". On the post mark only the two consecutive letters "RI" are visible. Then the chance that it came from Krishnagiri is:

(A) 3/5 (B) 2/3 (C*) 9/14 (D) none

A student appears for tests I, II & III. The student is successful if he passes either in tests I & II or tests I & III. The probabilities of the student passing in the tests I, II & III are p, q &
1/2 respectively. If the probability that the student is successful is 1/2, then:

(A*) p = 1, q = 0 (B*) p = 2/3, q = 1/2

(C*) p = 3/5, q = 2/3 (D*) there are infinitely many values of p & q.

An unbiased coin is tossed n times. Let X denote the number of times head occurs. If P(X = 4), P (X = 5) and P(X = 6) are in AP, then the value of n can be

(A*) 7 (B) 10 (C) 12 (D*) 14

(MATCH THE COLUMN)

	Column – I		Column – II
(A)	If the probability that units digit in square of an even integer is 4 is p, then the value of 5p is	(p)	1
(B)	If A and B are independent events and $P(A \cap B) = \frac{1}{6}$, $P(\overline{A}) = \frac{2}{3}$, then $6P(B/A) =$	(q)	2
(C)	Among 2 children, a child may equally be a boy or a girl if the probability that exactly one of them is a boy is p, then 6p =	(r)	3
(D)	A boy has 20% chance of hitting at a target. Let p denote the probability of hitting the target for the first time at the n^{th} trial. If p satisfies the inequality $625p^2 - 175p + 12 < 0$, then value of n is	(s)	4

Ans. (A) → (q), (B) → (r), (C) → (r), (D) → (r)

	Column – I		Column – II
(A)	A pair of dice is thrown. If total of numbers turned up on both the dies is 8, then the probability that the number then up on the second die is 5' is	(p)	5/16
(B)	A box contains 4 white and 3 black balls. Two balls are drawn successively and is found that second ball is white, then the probability that Ist ball is also white is	(q)	1/3
(C)	A biased coin with probability p, $0 < p < 1$ of heads is tossed until a head appears for the first time. If the probability that the number of tosses required is even is 2/5, then p equals	(r)	$\frac{1}{2}$
(D)	A coin whose faces are marked 3 and 5 is tossed 4 times : what is the probability that the sum of the numbers thrown being less, than 15?	(s)	$\frac{1}{5}$

Ans. (A) → (s), (B) → (r), (C) → (q), (D) → (p)

Consider the experiment of distribution of balls among urns. Suppose we are given M urns, numbered 1 to M, among which we are to distribute n balls ($n < M$). Let P(A) denote the probability that each of the urns numbered 1 to n will contain exactly one ball. Then answer the following questions.

If the balls are different and any number of balls can go to any urns, then P(A) is equal to

(A) $\frac{M!}{n^M}$ (B*) $\frac{n!}{M^n}$ (C) $\frac{n!}{{}^{M}P_{n}}$ (D) $\frac{1}{M^n}$

If the balls are identical and any number of balls can go to any urns, then P(A) equals

(A) $\frac{1}{M^n}$ (B*) $\frac{1}{{}^{M+n-1}C_{M-1}}$ (C) $\frac{1}{{}^{M+n-1}C_{n-1}}$ (D) $\frac{1}{{}^{M+n-1}P_{M-1}}$

If the balls are identical but atmost one ball can be put in any box, then P(A) is equal to

(A) $\frac{1}{{}^{M}P_{n}}$ (B) $\frac{n!}{{}^{n}C_{M}}$ (C) $\frac{n!}{{}^{M}C_{n}}$ (D*) $\frac{1}{{}^{M}C_{n}}$

A clerk was asked to mail four report cards to four students. He addresses four envelops that unfortunately paid no attention to which report card be put in which envelope. What is the probability that exactly one of the students received his (or her) own card?

Two cubes have their faces painted either red or blue. The first cube has five red faces and one blue face. When the two cubes are rolled simultaneously, the probability that the two top faces show the same colour is 1/2. Number of red faces on the second cube, is

(A) 1 (B) 2 (C) 3 (D) 4

There are 6 red balls and 6 green balls in a bag. Five balls are drawn out at random and placed in a red box. The remaining seven balls are put in a green box. If the probability that the number of red balls in the green box plus the number of green balls in the red box is not a prime number, is $\frac{p}{q}$ where p and q are relatively prime, then find the value of $(p + q)$

Indicate the correct order sequence in respect of the following :

I. If the probability that a computer will fail during the first hour of operation is 0.01, then if we turn on 100 computers, exactly one will fail in the first hour of operation.

II. A man has ten keys only one of which fits the lock. He tries them in a door one by one discarding the one he has tried. The probability that fifth key fits the lock is 1/10.

III. Given the events A and B in a sample space. If P(A) = 1, then A and B are independent.

IV. When a fair six sided die is tossed on a table top, the bottom face can not be seen. The probability that the product of the numbers on the five faces that can be seen is divisible by 6 is one.

(A) FTFT (B) FTTT (C) TFTF (D) TFFF

If mn coins have been distributed into m purses, n into each find

(1) the chance that two specified coins will be found in the same purse, and

(2) what the chance becomes when r purses have been examined and found not to contain either of the specified coins.

The contents of three Urns w.r.t. the Red, White and Green balls is as shown in the table given.

Urn	R	W	G
I	2	3	1
II	3	2	1
III	3	1	2

A coin when tossed is twice as likely to come heads as compared to tails. Such a coin is tossed two times. If both heads and tails are present then 3 balls are drawn simultaneously from the Urn-I, if head appears on both the occassions then 3 balls are drawn in a similar manner from Urn-II and if no head appears in both the tosses then 3 balls from the Urn-III are drawn in the same manner.

The probability that 3 drawn balls are 1 each of different colours, is

(A) 10% (B) 15% (C) 30% (D) 90%

Sixteen players $s_1, s_2, ..., s_{16}$ play in a tournament. They are divided into eight pairs at random. From each pair a winner is decided on the basis of a game played between the two players of the pair. Assume that all the players are of equal strength. The probability that "exactly one of the two players s_1 & s_2 is among the eight winners" is

(A) $\frac{4}{15}$ (B) $\frac{7}{15}$ (C) $\frac{8}{15}$ (D) $\frac{9}{15}$

The number 'a' is randomly selected from the set {0, 1, 2, 3, ... 98, 99}. The number 'b' is selected from the same set. Probability that the number $3^a + 7^b$ has a digit equal to 8 at the units place, is

(A) $\frac{1}{16}$ (B) $\frac{2}{16}$ (C) $\frac{4}{16}$ (D) $\frac{3}{16}$

For any two events A & B defined on a sample space,

(A) $P(A/B) \geq \frac{P(A)+P(B)-1}{P(B)}$, $P(B) \neq 0$ is always true

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

(C) $P(A \cup B) = 1 - P(A^c).\ P(B^c)$, if A & B are independent

(D) $P(A \cup B) = 1 - P(A^c).\ P(B^c)$, if A & B are disjoint

Six faces of a die are marked with numbers 1, –1, 0, –2, 2, 3 and the die is thrown thrice. The probability that the sum of the numbers thrown is six, is

1) $\frac{3}{216}$ 2) $\frac{6}{216}$ 3) $\frac{10}{216}$ 4) $\frac{18}{216}$

The probability that in a group of *n* people, atleast two of them will have the same date of birth of a non leap year (Assuming a year is having 365 days)

1) $1 - \frac{^{365}P_n}{(365)^n}$ 2) $\frac{^{365}P_n}{(365)^n}$ 3) $\frac{1}{(365)^n}$ 4) $\frac{365 \times 364}{(365)^n}$

Two squares are chosen at random on a chess board. The probability that they have a side in common is

1) $\frac{1}{9}$ 2) $\frac{2}{7}$ 3) $\frac{1}{18}$ 4) $\frac{1}{3}$

Three squares of normal chess board are chosen. The probability of getting two squares of one colour and the other of different colour is

1) $\frac{16}{21}$ 2) $\frac{8}{21}$ 3) $\frac{8}{64\times63\times62}$ 4) $\frac{7}{21}$

Three squares of a chess board are chosen at random, the probability that two are of one colour and one of another is

1) $\frac{16}{21}$ 2) $\frac{8}{21}$ 3) $\frac{32}{[illegible]}$ 4) $\frac{16}{27}$

If 4 squares are chosen at random on a chess board, the probability that they lie on a diagonal line is

1) $\frac{4\sum_{n=4}^{8} {}^{n}C_4}{{}^{64}C_4}$ 2) $\frac{2\sum_{n=4}^{8} {}^{n}C_4}{{}^{64}C_4}$ 3) $\frac{2\sum_{n=4}^{7} {}^{n}C_4+{}^{8}C_4}{{}^{64}C_4}$ 4) $\frac{4\sum_{n=4}^{7} {}^{n}C_4+2({}^{8}C_4)}{{}^{64}C_4}$

Out of (2n+1) tickets consecutively numbered, three are drawn at random. The chance that the numbers on them are in A.P. is

1) $\frac{n}{n^2-1}$ 2) $\frac{3n}{n^2-1}$ 3) $\frac{3n}{4n^2-1}$ 4) $\frac{3n}{4n^2+2n-1}$

A determinant is chosen at random from the set of all determinants of order 2 with elements 0 or 1 only. The probability that the determinant chosen is negative is

1) 5/8 2) 3/8 3) 1/16 4) 3/16

A mapping is selected at random from the set of all mappings of the set A = {1, 2, 3,4} into itself. The probability that the mapping selected is a bijection.

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

Using the vertices of a polygon having 8 sides a triangle is constructed at random. The probability that the triangle so formed is such that no side of the polygon is side of the triangle is

1) $\frac{18}{55}$ 2) $\frac{28}{55}$ 3) $\frac{2}{7}$ 4) $\frac{3}{7}$

Three persons *A*, *B*, *C* in order cut a pack of cards replacing them after each cut. The person who first cuts a spade shall win a prize. The probability that *C* wins the prize is

1) $\frac{16}{37}$ 2) $\frac{9}{37}$ 3) $\frac{12}{37}$ 4) $\frac{1}{37}$

A and B throw a pair of dice. A wins if he throws 6 before B throws 7 and B wins if he thro 7 before A throws 6. If A begins, his chance of winning is

1) $\frac{5}{61}$ 2) $\frac{30}{61}$ 3) $\frac{35}{61}$ 4) $\frac{60}{61}$

. Les S be the sample space of the random experiment of throwing simultaneously two unbaised dice with six faces (numbered 1 to 6) and let $E_K = \{(a,b) \in S : ab = k\}$ for $k \geq 1$. If $P_k = P(E_k)$ for $k \geq 1$ then the correct, among the following is

1) $p_1 < p_{30} < p_4 < p_6$
2) $p_{36} < p_6 < p_2 < p_4$
3) $p_1 < p_{11} < p_4 < p_6$
4) $p_{36} < p_{11} < p_6 < p_4$

. Urn A contains 6 red and 4 black balls and urn B contains 4 red and 6 black balls. One ball is drawn at random from urn A and placed in urn B. Then one ball is drawn at random from urn B and placed in urn A. If one ball is now drawn from urn A, the probability that it is found to be red is

1) 32/55
2) 42/55
3) 36/55
4) none

There are 4 machines out of which 2 are defective. They are tested one by one at random till both the defective machines are identified. The probability that only 2 tests are needed for this is

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

The probability of India winning a test match against West-Indies is 1/2 assuming independence from match to match. The probability that in a match series India's second win occurs at the third test is

1) $\frac{1}{8}$
2) $\frac{1}{4}$
3) $\frac{1}{2}$
4) $\frac{2}{3}$

. In a multiple choice question, there are four alternative answers, of which one or more are correct. A candidate will get marks in the question only if he ticks all the correct answers. The candidate decides to tick answers at random. If he is allowed upto 3 chances to answer the question, the probability that he will get marks in the question is

1) 1/15
2) 2/15
3) 3/15
4) 4/15

10 boys and 2 girls are divided into 3 groups of 4 each. The probability that the girls will be in different groups is

1) $\frac{1}{6}$
2) $\frac{3}{11}$
3) $\frac{4}{5}$
4) $\frac{8}{11}$

. The probability that the birthdays of six different persons will fall in exactly two calendar month is

1) $\frac{{}^{12}C_2(2^6-1)}{{}^{12}C_6}$
2) $\frac{{}^{12}C_2(2^6-2)}{{}^{12}C_6}$
3) $\frac{{}^{12}C_2(2^6-2)}{12^6}$
4) $\frac{1}{12^6}$

. A bag contains some white and some black balls, all combinations of balls being equally likely. The total number of balls in the bag is 10. If three balls are drawn at random without replacement and all of them are found to be black, the probability that the bag contians 1 white and 9 black balls is

1) $\frac{14}{55}$
2) $\frac{12}{55}$
3) $\frac{2}{11}$
4) $\frac{8}{55}$

A set A has 22 elements a subset P of A is selected at random. After replacing the elements, again subset Q of A is selected. The probability that P and Q have exactly 5 elements in common is

a) $\left(\frac{3}{4}\right)^{22}$ b) ${}^{22}C_5 \times \left(\frac{3}{4}\right)^{22}$ c) ${}^{22}C_{17}.\frac{3^{17}}{4^{22}}$ d) ${}^{22}C_5.\frac{3^5}{2^{44}}$

There are 17 railway stations in a railway track between A and B. The train stops at 4 intermediate stations at random. Then the probability that atleast two of these 4 stations are consecutive is

a) $\frac{197}{340}$ b) $\frac{227}{340}$ c) $\frac{143}{340}$ d) $\frac{113}{340}$

A box contains N coins, m of which are fair and the rest are baised. The probability of getting a head when a fair coin is tossed is $\frac{1}{2}$, while it is $\frac{2}{3}$ when a biased coin is tossed. A coin is drawn from the box at random and is tossed twice. Then the probability that the coin drawn is fair, when first toss head, second toss tail is

a) $\frac{9m}{8N+m}$ b) $\frac{9m}{8N-m}$ c) $\frac{9m}{8m-N}$ d) $\frac{9m}{8m+N}$

If 8 letters are placed in 8 addressed envelopes, then the probability that exactly 3 letters go correct envelopes and none of the remaining letters go into correct envelop is

a) $\frac{11}{180}$ b) $\frac{{}^8C_3 \times 6!}{8!}$ c) $\frac{{}^8C_3 \times 76}{81}$ d) $\frac{{}^8C_3 \times 60}{81}$

Passage - I :

A set A contains 10 elements A subset E of A is selected at random and after noting the el... they are replaced. Again a subset F of A is selected at random.

1. Probability that E and F have no common elements is

a) $\frac{{}^{20}C_{10}}{4^{10}}$ b) $\frac{1}{2^{10}}$ c) $\frac{10 \times 3^8}{4^9}$ d) $\frac{3^{10}}{4^{10}}$

2. Probability that E and F have equal number of elements is

a) $\frac{{}^{20}C_{10}}{4^{10}}$ b) $\frac{10 \times 3^8}{4^9}$ c) $\frac{1}{2^{10}}$ d) $\frac{3^{10}}{4^{10}}$

3. Probability that E and F have exactly 3 elements in common is

a) $\frac{3^{10}}{4^{10}}$ b) $\frac{10 \times 3^8}{4^9}$ c) $\frac{1}{2^{10}}$ d) $\frac{{}^{20}C_{10}}{4^{10}}$

A bag A contains 4 red and 5 black balls another bag B contains 6 red and 3 black balls and a third bag C contains 3 red and 6 black balls. A bag is selected and A ball is drawn at random from the bag. Let A,B,C denote the events of selecting the bags A,B,C respectively and E, F denote the events of getting red, black ball respectively. Then

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

a) 4/13 b) 1/2 c) 5/9 d) 14/27

$P(A/E) =$

a) 4/13 b) 4/7 c) 1/2 d) 5/9

$P(F) =$

a) 5/9 b) 4/7 c) 4/13 d) 14/27

Passage - IV :

6 letters are written by a person to his 6 friends. The address of each friend is written on 6 envelopes. Letters are put in the addressed envelopes at random then

10. The probability that no letters goes into correct envelope is

a) 0 b) $\frac{53}{144}$ c) $\frac{719}{920}$ d) $\frac{7}{90}$

11. The probability that exactly two letters go into correct envelopes is

a) $\frac{3}{16}$ b) $\frac{53}{144}$ c) $\frac{719}{920}$ d) $\frac{7}{90}$

12. The probability that at least two letters go into wrong envelopes is

a) 0 b) $\frac{3}{16}$ c) $\frac{53}{144}$ d) $\frac{719}{720}$

'assage - V :

There are four boxes A_1, A_2, A_3, A_4. Box A_i has i cards and on each card a number is printed. T numbers are from 1 to i. A box is selected randomly, the probability of selection of box A_i is $\frac{i}{10}$ a then a card is drawn. Let E_i represents the event that a card with number 'i' is drawn.

13. $P(E_1)$ is equal to

a) $\frac{1}{5}$ b) $\frac{1}{10}$ c) $\frac{2}{5}$ d) $\frac{1}{4}$

14. $P(A_3/E_2)$ is equal to

a) $\frac{1}{4}$ b) $\frac{1}{3}$ c) $\frac{1}{2}$ d) $\frac{2}{3}$

15. Expectation of the number on the card is

a) 2 b) 2.5 c) 3.5 d) 3

COLUMN I	COLUMN -II
A) Probability that last digit is 1 or 3 or 7 or 9	p) $\frac{8^n - 4^n}{10^n}$
B) Probability that last digit is 2 or 4 or 6 or 8	q) $\frac{10^n - 8^n - 5^n + 4^n}{10^n}$
C) Probability that last digit is 5	r) $\frac{5^n - 4^n}{10^n}$
D) Probability that last digit is 0	s) $\left(\frac{4}{10}\right)^n$

A coin has probability p of showing head when tossed. It is tossed n times. Let p_n denote t probability that no two (or more) consecutive heads occur, then

COLUMN I	COLUMN -II
A) p_1	p) $1 - 2p^2 + p^3$
B) p_2	q) $1 - p^2$
C) p_3	r) 1
D) p_n	s) $(1-p)\, p_{n-1} + p(1-p)\, p_{n-2}$

Supoose n (> 6) people are asked successively in a random order and exactly 3 out of n people know the answer. Let p_r denotes the probability that rth person asked is the first to know the answer, then

COLUMN I	COLUMN -II
A) probability first four do not know the answer	p) $\frac{3(n-3)}{n(n-1)}$
B) p_2	q) $\frac{(n-4)(n-5)(n-6)}{n(n-1)(n-2)}$
C) p_{n-2}	r) $1/\,{}^nC_3$
D) p_r	s) $\frac{3(n-r)(n-r-1)}{n(n-1)(n-2)}$

If 12 identical coins are distributed among three children at random. The probability of distributing so that each child gets atleast two coins is $\frac{k}{13}$ then k is

A point $P(x,y)$ is selected at random inside the square with boundaries $x = 0, y = 0$ and $x = 4, y = 4$. The probability that P is inside the parabola $y^2 = x$ is $\frac{k}{9}$ then k is

There are two red, two blue, two white and certain number (greater than 0) of green socks in a drawer. If two socks are taken at random from the drawer with out replacement, the probability that they are of the same colour is $\frac{1}{5}$, then the number of green socks are

Each of the n urns contains 4 white and 6 black balls. The $(n+1)$th urn contains 5 white and 5 black balls. Out of the $(n+1)$urns, an urn is chosen at random and two balls are drawn from it without replacement. Both the balls turn out to be black.If the probability that the $(n+1)$th urn was chosen to draw the balls is $\frac{1}{16}$, then the value of $\frac{n}{2}$ is

A artillery target may be either at point I with probability $\frac{8}{9}$ or at point II with probability $\frac{1}{9}$. We have 21 shells each of which can be fired either at point I or II. Each shall may hit the target independently of the other shall with probability 1/2. The number of shells must be fired at point I to hit the target with maximum probability is x, then $\frac{x}{2}$ is

Five digit numbers are formed in all possible ways using the digits 0,1,2,3,5,6 with out repetition. If one such number is selected at random, then

The probability that it is divisible by 3 is

a) $\frac{23}{51}$ b) $\frac{8}{25}$ c) $\frac{17}{100}$ d) $\frac{5}{36}$

The probability that it is divisible by 6 is

a) $\frac{7}{25}$ b) $\frac{8}{25}$ c) $\frac{17}{100}$ d) $\frac{23}{51}$

The probability that it is divisible by 5 but not divisible by 4 is

a) $\frac{7}{25}$ b) $\frac{23}{51}$ c) $\frac{17}{100}$ d) $\frac{1}{4}$

Two non - negative integers are chosen at random from a set of non - negative integer with replacement. If the probability that sum of the squares divisible by 10 is P then $50P$ is

Five ordinary dice are rolled at random and sum of the numbers on them is 16. If K is the probability that the numbers shown on each is any one from 2, 3, 4 or 5. Then 49 K is

Two different numbers are taken from the set {0,1,2,3,4,5,6,7,8,9,10}. The probability that their sum and positive difference are both multiple of 4 is $\frac{x}{55}$, then x equals.

A die is weighted such that the probability of rolling the face numbered n is proportional t n^2 (n = 1,2,3,4,5,6). The die is rolled twice, yielding the numbers a and b. The probability that $a<$

is P. Then the value of $\left[\frac{2}{P}\right]$ is where [.] represent the greatest integer function.

If $P(A) = 0.6$ and the greatest value of $P(A \cap B) = 0.4$, then the greatest value of $P(B)$ is $\frac{K}{10}$. Then value of K is

Players P_1, P_2, P_3, P_4 play knock out tournament. It is known that if P_i and P_j play, then P_i will win if $i < j$. If they are paired at random for the first round the probability that P_3 reaches the second round is

a) 1/3 b) 2/3 c) 1/6 **d) None of these**

3 vertices are chosen at random from the vertices of a regular hexagon. If p_1, p_2, p_3 are respective the probabilities that the triangle formed by the 3 selected vertices is right-angled, obtuse angle acute angled, then

a) $p_1 < p_2 < p_3$ b) $p_1 > p_2 > p_3$ c) $p_1= p_2+3(p$ d) $p_1= 2(p_2) = 3(p_3)$

...tching type questions

A is a setcontaining n elements. A subset P of A is chosen at random. The set A is reconstructed by replacing the elements of the subset P. A subset Q of A is again chosen at random. The probability that

COLUMN - I	COLUMN - II
A) $P \cap Q = \phi$	p) $n(3^{n-1})/4^n$
B) $P \cap Q$ = is a singleton	q) $(3/4)^n$
C) $P \cap Q$contains 2 elements	r) ${}^{2n}C_n / 4^n$
D) $\lvert P\rvert = \lvert Q\rvert$ where $\lvert X\rvert$ =number of elements in X	s) $9n(n-1)/2(4^n)$

Two buses A and B are scheduled to arrive at a town central bus station at noon. The probability that bus A will be late is $\frac{1}{5}$. The probability that bus B will be late is $\frac{7}{25}$. The probability that the bus B is late given that bus A is late is $\frac{9}{10}$. Then probability that

a) neither bus will be late on a particular day is $\frac{7}{10}$

b) the bus A is late given than bus B is late is $\frac{9}{14}$

c) at least one bus is late is $\frac{3}{10}$

d) at least one bus is in time is $\frac{4}{5}$

Passage - II :

20. A purse contains two coins of which one is two headed coin and the other is a fair coin. A person selects one of the coins at random and tosses. It if he gets head, he tosses the other coin, otherwise he tosses the same coin. It is given that he got head in the second toss. The probability that this first selection is a fair coin and getting head is that

a) 5/8 b) 1/4 c) 2/5 d) 2/3

21. Every evening, Mr. X either reads a book or watches T.V. The probability that he watches T.V. is 4/5. If he watches T.V., there is a probabiity of 3/4 that he falls a sleep. If he reads a book the probability that he falls asleep is 1/4. On one evening, Mr. X is found to be asleep. The probability that he watched T.V. is

a) 1/13 b) 12/13 c) 13/20 d) 2/3

22. A pack of 52 playing cards is counted with face downwards. It is found that one card is missing. One card is drawn and is found to be red. The probability that the missing card is red is

a) 25/51 b) 26/51 c) 1/2 d) 2/3

In a tournament, there are sixteen players S_1, S_2, ..., S_{16} and divided into eight pairs at random. From each game a winner is decided on the basis of a game played between the two players of the pair. Assuming that all the players have equal strength

COLUMN - I	COLUMN - II
A) The probability that S_1 is one of the winners	p) $\frac{8}{15}$
B) The probability that exactly one of S_1 or S_2 is a winner	q) $\frac{1}{2}$
C) Both S_1 and S_2 are among eight winners	r) $\frac{7}{30}$
D) Both S_1 and S_2 are not among winners	s) $\frac{1}{240}$

COLUMN-I	COLUMN-II
A) Six different balls are put in three different boxes, none being empty. The probability of putting the balls in equal number is	P) 20/27
B) Six letters are posted in three letter boxes. The probability that no letter box remains empty is	Q) 1/6
C) Two persons A and B throw two dice each. If A throw a sum of 9, then the probability of B throwing a sum greater than A is	R) 1/3
D) If A and B are independent and P(A) = 0.3 and $P(A \cup \overline{B}) = 0.8$, then P(B) is equal to	S) 2/7

If the probability of getting sum 10 when 4 fair dice are rolled is $\frac{5}{P}$, then the sum of digits of P is

Let the sides of a triangle be decided by throwing a die thrice. If the probability that the triangle is isosceles or equilateral is $\frac{p}{q}$, where p,q are relatively prime positive integers, then $q - p$ is

A consignment of 15 record players contains 4 defectives. The record players are selected at random one by one without replacement and examined.

a) probability of getting exactly 3 defective in the examination of 8 record players is $\frac{{}^4C_3 \times {}^{11}C_5}{{}^{15}C_8}$

b) Probability that 9th one examined is the last defective, is $\frac{8}{195}$

c) Probability that 9th examined player is defective given that there were 3 defectives in the first 8 players examined is $\frac{1}{7}$

d) probability that 9th examined player is the last defective is $\frac{8}{197}$

A player throws an ordinary die with faces numbered 1 to 6. Whenever he throws 1, he gets an additional throw. The probability of obtaining a total score n is

a) $\frac{1}{5}\left(\frac{6^4-1}{6^4}\right)$, if n = 5

b) $\frac{1}{5}\left(\frac{6^5-1}{6^5}\right)$, if n = 5

c) $\frac{1}{30}\left(\frac{6^5-1}{6^5}\right)$, if n = 7

d) $\frac{1}{30}\left(\frac{6^6-1}{6^6}\right)$, if n=7

Three unbiased dice are rolled and the numbers on them are noted as a,b,c. The probability that the planes $ax + by + cz = 0$, $bx + cy + az = 0$, $cx + ay + bz = 0$

a) Intersect along a line is 0 b) Intersect at only one point is $\frac{105}{108}$

c) Form a triangular prism is 0 d) Form a triangular prism is $\frac{3}{108}$

In a gambling between Mr. A and Mr. B a machine continues tossing a fair coin until either HT or TT on consecutive throws are obtained for the first time. If it is HT, Mr. A wins and if it is TT, Mr. B wins. Which of the following are true ?

a) Probability of winning Mr.A is $\frac{3}{4}$ b) Probability of winning Mr. B is $\frac{1}{4}$

c) Probability of winning Mr.A if first toss is head is 1

d) probability of winning Mr.A, if first toss is tail is $\frac{1}{2}$

Consider the sets A = {1,2,3} and B = {1,2,3,4,5,6}

The probability of getting an increasing function from A to B, when a mapping is selected at random from the set of all mappings from A to B is

a) $\frac{1}{27}$ b) $\frac{2}{27}$ c) $\frac{5}{54}$ d) $\frac{7}{54}$

The probability of getting a non decreasing functions from A to B, when a mapping is selected at random from the set of all mappings from A to B is

a) $\frac{7}{27}$ b) $\frac{5}{27}$ c) $\frac{2}{27}$ d) $\frac{8}{27}$

The probability of getting onto function from B to B such that $f(i) \neq i$, $i = 1,2,\ldots\ldots 6$, when a mapping is selected at random from the set of all mappings from B to B is

a) $\frac{25}{72}$ b) $\frac{29}{72}$ c) $\frac{53}{144}$ d) $\frac{35}{144}$

There are 8 seats in the front row of a theatre in which 4 persons are to be seated. Then the probability of seating them so that

No 2 persons sit side by side, is

a) $\frac{1}{14}$ b) $\frac{3}{14}$ c) $\frac{1}{7}$ d) $\frac{3}{7}$

. Each person has exactly one neighbour is

a) $\frac{1}{14}$ b) $\frac{3}{14}$ c) $\frac{1}{7}$ d) $\frac{3}{7}$

. All of them sit together in a row avoiding the 2 end seats, is

a) $\frac{3}{14}$ b) $\frac{3}{70}$ c) $\frac{9}{70}$ d) $\frac{5}{14}$

Three six - faced fair die are thrown together. Let $P(K)$ denote the probability that the sum of numbers appearing on the dice is K. If $S=\sum_{K=9}^{14} P(k)$, then the value of $54S$-30 is

A coin is tossed $(m+n)$ times $(m>n)$. Show that the probability of atleast m consecutive heads is $\frac{(n+2)}{2^{m+1}}$

Let v and w be distinct, randomly chosen roots (real or complex) of the equation $z^9-1=0$. The probability that $1 \le |v+w|$

(A) $\frac{^6C_2}{^9C_2}$ (B) $\frac{3}{^9C_2}$

(C) $\frac{4}{9}$ (D) $\frac{16}{81}$

Suppose there are 8 white and 2 red balls in a packet, each time one ball is drawn and replaced by a white one. Then probability of drawing out all the red balls just in the 4^{th} draw is:

(A) 0.0534 (B) 0.0434

(C) 0.12 (D) none of these

Four dice are thrown simultaneously, given that 4 and 2 has appeared on any two of them, the probability that 3 has appeared on the remaining dice is

(A) $\frac{^4P_2.36}{1296}$ (B) $\frac{12}{6^4-2.5^4-4^4}$

(C) $\frac{12}{6^4-4^4}$ (D) $\frac{6}{151}$

Consider a function $f:\{1,2,3,.........13\} \rightarrow \{1,2,3.....9\}$. Given that function is surjective and non-decreasing, the probability that $f(7)=4$ is

(A) $\frac{^6C_3}{^{12}C_4}$

(B) $\frac{^6C_1}{^{12}C_4}$

(C) $\frac{^6C_4}{^{12}C_4}$

(D) $\frac{^6C_3\,^6C_1}{^{12}C_4}$

Two numbers a and b are chosen at random from the set of first 30 natural numbers. Probability that a^2-b^2 is divisible by 3 is

(A) $\frac{^{10}C_2}{^{30}C_2}$

(B) $\frac{47}{87}$

(C) $\frac{^{20}C_2}{^{30}C_2}$

(D) $\frac{57}{87}$

If n different objects are distributed among n + 2 persons, then

(A) Probability that exactly 2 persons will get nothing is $\frac{(n+1)!}{2.(n+2)^{n-1}}$

(B) Probability that exactly 3 persons will not get anything is $\frac{^{n+2}C_3(n-1)(^nC_2)(n-2)!}{(n+2)^n}$

(C) Probability that exactly 3 persons will not get anything is $\frac{n.(n-1)^2.(n+1)}{12(n+2)^{n-1}}$

(D) Probability that exactly 2 persons will get nothing is $\frac{n^2.(n-1)^2}{(n+2)^{n-1}}$

If p and q are chosen randomly from the set {1, 2, 3, 4, 5, 6, 7, 8, 9, 10} with replacement, then the probability that the roots of the equation $x^2+px+q=0$

(A) are real is $\frac{33}{50}$

(B) are imaginary is $\frac{19}{50}$

(C) are real and equal is $\frac{3}{100}$

(D) are real and distinct is $\frac{3}{5}$

Die A has 2 white and 4 red faces whereas die B has 4 white and 2 red faces. A coin is flipped once. If it shows a head, the game continues by throwing die A, if it shows tail, then die B is to be used. If the probability that die A is used is $\frac{32}{33}$ when it is given that red turns up every time in first n throws. Then find the value of n _____ f is any function from A to A where $A = \{1, 2, \ldots 10\}$. The discrete points on the graph of f(x) are joined with line segments the probability that f is onto and the resulting graph has only one local minima and no local maxima is $\frac{2^k - 2}{10^{10}}$ then k is _____

Of the three independent events E_1, E_2, and E_3, the probability that only E_1 occurs is α, only E_2 occurs is β and only E_3 occurs is γ. Let the probability p that none of events E_1, E_2 or E_3 occurs satisfy the equations $(\alpha - 2\beta)\, p = \alpha\beta$ and $(\beta - 3\gamma)\, p = 2\beta\gamma$. All the given probabilities are assumed to lie in the interval (0, 1).

Then $\frac{\text{Probability } of\ occurrence\ of\ E_1}{\text{Probability } of\ occurrence\ of\ E_3}$ = __________

(6)

A box B_1 contains 1 white ball, 3 red balls and 2 black balls. Another box B_2 contains 2 white balls, 3 red balls and 4 black balls. A third box B_3 contains 3 white balls, 4 red balls and 5 black balls.

If 1 ball is drawn from each of the boxes B_1, B_2 and B_3, the probability that all 3 drawn balls are of the same colour is

(A) $\frac{82}{648}$ (B) $\frac{90}{648}$

(C) $\frac{558}{648}$ (D) $\frac{566}{648}$

(A)

If 2 balls are drawn (without replacement) from a randomly selected box and one of the balls is white and the other ball is red, the probability that these 2 balls are drawn from box B_2 is

(A) $\frac{116}{181}$ (B) $\frac{126}{181}$

(C) $\frac{65}{181}$ (D) $\frac{55}{181}$

(D)

Three boys and two girls stand in a queue. The probability, that the number of boys ahead of every girl is at least one more than the number of girls ahead of her, is

(A) $\frac{1}{2}$ (B) $\frac{1}{3}$

(C) $\frac{2}{3}$ (D) $\frac{3}{4}$

Box 1 contains three cards bearing numbers 1, 2, 3 ; box 2 contains five cards bearing numbers 1, 2, 3, 4, 5 ; and box 3 contains seven cards bearing numbers 1, 2, 3, 4, 5, 6, 7. A card is drawn from each of the boxes. Let x_i be the number on the card drawn from the i^{th} box, $i = 1, 2, 3$.

51. The probability that $x_1 + x_2 + x_3$ is odd, is

(A) $\frac{29}{105}$ (B) $\frac{53}{105}$

(C) $\frac{57}{105}$ (D) $\frac{1}{2}$

52. The probability that x_1 , x_2 , x_3 are in an arithmetic progression, is

(A) $\frac{9}{105}$ (B) $\frac{10}{105}$

(C) $\frac{11}{105}$ (D) $\frac{7}{105}$

The minimum number of times a fair coin needs to be tossed, so that the probability of getting at least two heads is at least 0.96 is

PARAGRAPH

Let n_1 and n_2 be the number of red and black balls, respectively, in box I. Let n_3 and n_4 be the number of red and black balls, respectively, in box II.

One of the two boxes, box I and box II, was selected at random and a ball was drawn randomly out of this box. The ball was found to be red. If the probability that this red ball was drawn from box II is $\frac{1}{3}$, then the correct option(s) with the possible values of n_1, n_2, n_3 and n_4 is(are)

(A) $n_1 = 3, n_2 = 3, n_3 = 5, n_4 = 15$ (B) $n_1 = 3, n_2 = 6, n_3 = 10, n_4 = 50$

(C) $n_1 = 8, n_2 = 6, n_3 = 5, n_4 = 20$ (D) $n_1 = 6, n_2 = 12, n_3 = 5, n_4 = 20$

A ball is drawn at random from box I and transferred to box II. If the probability of drawing a red ball from box I, after this transfer, is $\frac{1}{3}$, then the correct option(s) with the possible values of n_1 and n_2 is(are)

(A) $n_1 = 4, n_2 = 6$ (B) $n_1 = 2, n_2 = 3$

(C) $n_1 = 10, n_2 = 20$ (D) $n_1 = 3, n_2 = 6$

A computer producing factory has only two plants T_1 and T_2. Plant T_1 produces 20% and plant T_2 produces 80% of the total computers produced. 7% of computers produced in the factory turn out to be defective. It is known that

P(computer turns out to be defective given that it is produced in plant T_1)

= 10 P(computer turns out to be defective given that it is produced in plant T_2),

where P(E) denotes the probability of an event E. A computer produced in the factory is randomly selected and it does not turn out to be defective. Then the probability that it is produced in plant T_2 is

(A) $\frac{36}{73}$ (B) $\frac{47}{79}$

(C) $\frac{78}{93}$ (D) $\frac{75}{83}$

(C)

PARAGRAPH

Football teams T_1 and T_2 have to play two games against each other. It is assumed that the outcomes of the two games are independent. The probabilities of T_1 winning, drawing and losing a game against T_2 are $\frac{1}{2}$, $\frac{1}{6}$ and $\frac{1}{3}$, respectively. Each team gets 3 points for a win, 1 point for a draw and 0 point for a loss in a game. Let X and Y denote the total points scored by teams T_1 and T_2, respectively, after two games.

1. $P(X > Y)$ is

(A) $\frac{1}{4}$ (B) $\frac{5}{12}$

(C) $\frac{1}{2}$ (D) $\frac{7}{12}$

(B)

:2. $P(X = Y)$ is

(A) $\frac{11}{36}$ (B) $\frac{1}{3}$

(C) $\frac{13}{36}$ (D) $\frac{1}{2}$

(C)

Let X and Y be two events such that $P(X) = \frac{1}{3}$, $P(X|Y) = \frac{1}{2}$ and $P(Y|X) = \frac{2}{5}$. Then

[A] $P(X'|Y) = \frac{1}{2}$ [B] $P(X \cap Y) = \frac{1}{5}$

[C] $P(X \cup Y) = \frac{2}{5}$ [D] $P(Y) = \frac{4}{15}$

A, D

Three randomly chosen nonnegative integers x, y and z are found to satisfy the equation $x + y + z = 10$. Then the probability that z is even, is

[A] $\frac{36}{55}$ [B] $\frac{6}{11}$

[C] $\frac{1}{2}$ [D] $\frac{5}{11}$

B

PARAGRAPH

There are five students S_1, S_2, S_3, S_4 and S_5 in a music class and for them there are five seats R_1, R_2, R_3, R_4 and R_5 arranged in a row, where initially the seat R_i is allotted to the student S_i, $i = 1, 2, 3, 4, 5$. But, on the examination day, the five students are randomly allotted the five seats.

Q.17 The probability that, on the examination day, the student S_1 gets the previously allotted seat R_1, and **NONE** of the remaining students gets the seat previously allotted to him/her is

(A) $\frac{3}{40}$ (B) $\frac{1}{8}$

(C) $\frac{7}{40}$ (D) $\frac{1}{5}$

Sol. **A**

For $i = 1, 2, 3, 4$, let T_i denote the event that the students S_i and S_{i+1} do **NOT** sit adjacent to each other on the day of the examination. Then, the probability of the event $T_1 \cap T_2 \cap T_3 \cap T_4$ is

(A) $\frac{1}{15}$ (B) $\frac{1}{10}$

(C) $\frac{7}{60}$ (D) $\frac{1}{5}$

C

There are three bags B_1, B_2 and B_3. The bag B_1 contains 5 red and 5 green balls, B_2 contains 3 red and 5 green balls and B_3 contains 5 red and 3 green balls. Bags B_1, B_2 and B_3 have probabilities $\frac{3}{10}, \frac{3}{10}$ and $\frac{4}{10}$ respectively of being chosen. A bag is selected at random and a ball is chosen at random from the bag. Then which of the following options is/are correct?

A. Probability that the chosen ball is green equals $\frac{39}{80}$

B. Probability that the chosen ball is green, given that the selected bag is B_3, equals $\frac{3}{8}$

C. Probability that the selected bag is B_3 and the chosen ball is green equals $\frac{3}{10}$

D. Probability that the selected bag is B_3, given that the chosen ball is green, equals $\frac{5}{13}$

A, B

The probability that a missile hits a target successfully is 0.75. In order to destroy the target completely, at least three successful hits are required. Then the minimum number of missiles that have to be fired so that the probability of completely destroying the target is NOT less than 0.95, is _____

6

Two fair dice, each with faces numbered 1, 2, 3, 4, 5 and 6, are rolled together and the sum of the numbers on the faces is observed. This process is repeated till the sum is either a prime number or a perfect square. Suppose the sum turns out to be a perfect square before it turns out to be a prime number. If p is the probability that this perfect square is an odd number, then the value of 14p is _____

8.00

Consider three sets $E_1 = \{1, 2, 3\}$, $F_1 = \{1, 3, 4\}$ and $G_1 = \{2, 3, 4, 5\}$. Two elements are chosen at random, without replacement, from the set E_1 and let S_1 denote the set of these chose elements. Let $E_2 = E_1 - S_1$ and $F_2 = F_1 \cup S_1$. Now two elements are chosen at random, without replacement, from the set F_2 and let S_2 denote the set of these chosen elements.

Let $G_2 = F_1 \cup S_2$. Finally, two elements are chosen at random, without replacement, from the set G_2 and let S_3 denote the set of these chosen elements.

Let $E_3 = E_2 \cup S_3$. Given that $E_1 = E_3$, let p be the conditional probability of the event $S_1 = \{1, 2\}$. Then the value of p is

(A) $\frac{1}{5}$ (B) $\frac{3}{5}$ (C) $\frac{1}{2}$ (D) $\frac{2}{5}$

Three numbers are chosen at random, one after another with replacement, from the set $S = \{1, 2, 3, \ldots, 100\}$. Let p_1 be the probability that the maximum of chosen numbers is at least 81 and p_2 be the probability that the minimum of chosen numbers is at most 40.

5. The value of $\frac{625}{4}p_1$ is _____

Sol. **76.25**

6. The value of $\frac{125}{4}p_2$ is _____

Sol. **24.5**

A number is chosen at random from the set $\{1, 2, 3, \ldots, 2000\}$. Let p be the probability that the chosen number is a multiple of 3 or a multiple of 7. Then the value of 500p is _____

214

Let E^c denote the complement of an event E. Let E, F, G be pairwise independent events with $P(G) > 0$ and $P(E \cap F \cap G) = 0$. Then $P(E^c \cap F^c \mid G)$ equals

(a) $P(E^c) + P(F^c)$ (b) $P(E^c) - P(F^c)$

(c) $P(E^c) - P(F)$ (d) $P(E) - P(F^c)$

An experiment has 10 equally likely outcomes. Let A and B be non-empty events of the experiment. If A consists of 4 outcomes, the number of outcomes that B must have so that A and B are independent, is

(a) 2, 4 or 8 (b) 3, 6 or 9 (c) 4 or 8 (d) 5 or 10

Let ω be a complex cube root of unity with $\omega \neq 1$. A fair die is thrown three times. If r_1, r_2 and r_3 are the numbers obtained on the die, then the probability that $\omega^{r_1} + \omega^{r_2} + \omega^{r_3} = 0$ is

(a) $\frac{1}{18}$ (b) $\frac{1}{9}$ (c) $\frac{2}{9}$ (d) $\frac{1}{36}$

A signal which can be green or red with probability $\frac{4}{5}$ and $\frac{1}{5}$ respectively, is received by station A and then transmitted to station B. The probability of each station receiving the signal correctly is $\frac{3}{4}$. If the signal received at station B is green, then the probability that the original signal was green is

(a) $\frac{3}{5}$ (b) $\frac{6}{7}$ (c) $\frac{20}{23}$ (d) $\frac{9}{20}$

One Indian and four American men and their wives are to be seated randomly around a circular table. Then the conditional probability that the Indian man is seated adjacent to his wife given that each American man is seated adjacent to his wife is

(a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{2}{5}$ (d) $\frac{1}{5}$

Four fair dice D_1, D_2, D_3 and D_4; each having six faces numbered 1, 2, 3, 4, 5 and 6 are rolled simultaneously. The probability that D_4 shows a number appearing on one of D_1, D_2 and D_3 is

(a) $\frac{91}{216}$ (b) $\frac{108}{216}$ (c) $\frac{125}{216}$ (d) $\frac{127}{216}$

Let E and F be two independent events. The probability that exactly one of them occurs is $\frac{11}{25}$ and the probability of none of them occurring is $\frac{2}{25}$. If $P(T)$ denotes the probability of occurrence of the event T, then

(a) $P(E)=\frac{4}{5}, P(F)=\frac{3}{5}$ (b) $P(E)=\frac{1}{5}, P(F)=\frac{2}{5}$

(c) $P(E)=\frac{2}{5}, P(F)=\frac{1}{5}$ (d) $P(E)=\frac{3}{5}, P(F)=\frac{4}{5}$

A ship is fitted with three engines E_1, E_2 and E_3. The engines function independently of each other with respective probabilities $\frac{1}{2}, \frac{1}{4}$ and $\frac{1}{4}$. For the ship to be operational at least two of its engines must function. Let X denote the event that the ship is operational and let X_1, X_2 and X_3 denote respectively the events that the engines E_1, E_2 and E_3 are functioning. Which of the following is(are) true ?

(a) $P\left[X_1^c \middle| X\right] = \frac{3}{16}$

(b) P [Exactly two engines of the ship are functioning $|X] = \frac{7}{8}$

(c) $P\left[X \middle| X_2\right] = \frac{5}{16}$ (d) $P\left[X \middle| X_1\right] = \frac{7}{16}$

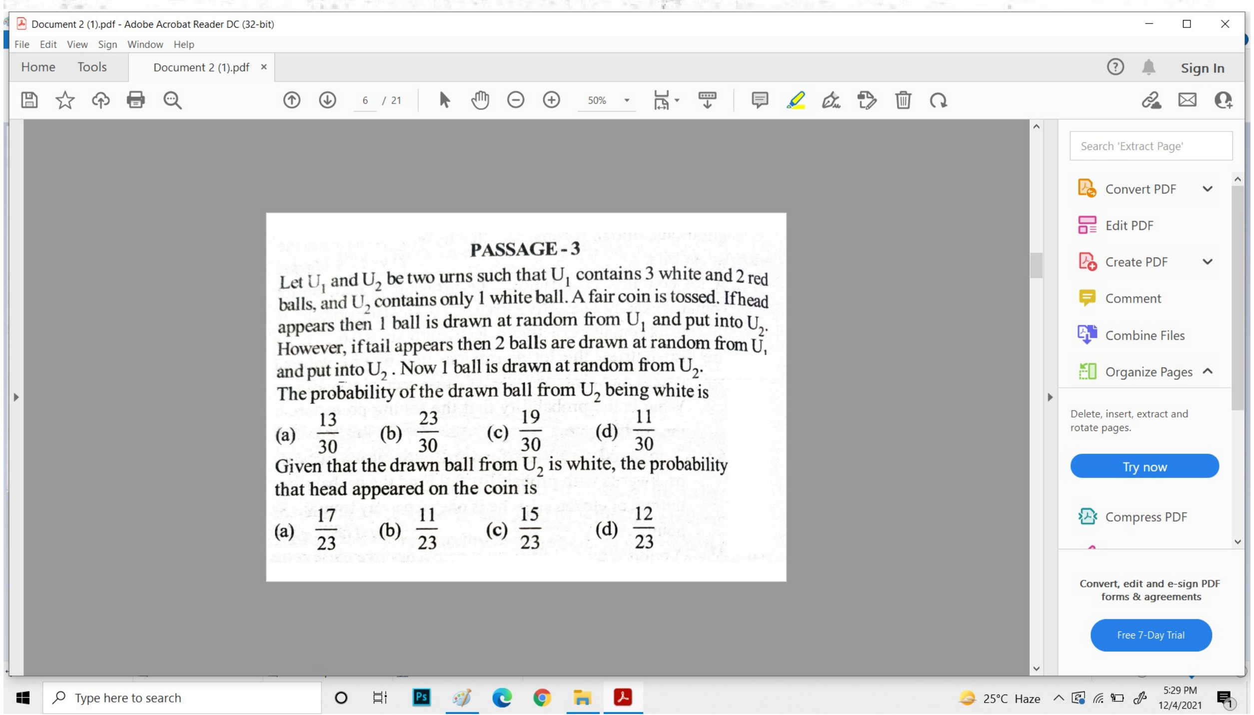
Let X and Y be two events such that $P(X|Y)=\frac{1}{2}$, $P(Y/X)=\frac{1}{3}$ and $P(X\cap Y)=\frac{1}{6}$. Which of the following is (are) correct ?

(a) $P(X\cup Y)=\frac{2}{3}$

(b) X and Y are independent

(c) X and Y are not independent

(d) $P\left(X^c\cap Y\right)=\frac{1}{3}$



PASSAGE - 3

Let U_1 and U_2 be two urns such that U_1 contains 3 white and 2 red balls, and U_2 contains only 1 white ball. A fair coin is tossed. If head appears then 1 ball is drawn at random from U_1 and put into U_2. However, if tail appears then 2 balls are drawn at random from U_1 and put into U_2. Now 1 ball is drawn at random from U_2.

The probability of the drawn ball from U_2 being white is

(a) $\frac{13}{30}$ (b) $\frac{23}{30}$ (c) $\frac{19}{30}$ (d) $\frac{11}{30}$

Given that the drawn ball from U_2 is white, the probability that head appeared on the coin is

(a) $\frac{17}{23}$ (b) $\frac{11}{23}$ (c) $\frac{15}{23}$ (d) $\frac{12}{23}$

Let $H_1, H_2, \ldots, H_n$ be mutually exclusive and exhaustive events with $P(H_i) > 0$, $i = 1, 2, \ldots, n$. Let E be any other event with $0 < P(E) < 1$.

STATEMENT-1 :
$P(H_i \mid E) > P(E \mid H_i) . P(H_i)$ for $i = 1, 2, \ldots, n$ **because**

STATEMENT-2 : $\sum_{i=1}^{n} P(H_i) = 1$.

Consider the system of equations $ax + by = 0$; $cx + dy = 0$, where $a, b, c, d \in \{0, 1\}$

STATEMENT - 1 : The probability that the system of equations has a unique solution is $\frac{3}{8}$.

and

STATEMENT - 2 : The probability that the system of equations has a solution is 1.

Let A and B be two events such that $P(\overline{A \cup B}) = \frac{1}{6}$,

$P(A \cap B) = \frac{1}{4}$ and $P(\bar{A}) = \frac{1}{4}$, where $\bar{A}$ stands for complement of event A. Then events A and B are

(a) equally likely and mutually exclusive
(b) equally likely but not independent
(c) independent but not equally likely
(d) mutually exclusive and independent

At a telephone enquiry system the number of phone cells regarding relevant enquiry follow Poisson distribution with an average of 5 phone calls during 10 minute time intervals. The probability that there is at the most one phone call during a 10-minute time period is

(a) $\frac{6}{5^e}$ (b) $\frac{5}{6}$ (c) $\frac{6}{55}$ (d) $\frac{6}{e^5}$

A multiple choice examination has 5 questions. Each question has three alternative answers of which exactly one is correct. The probability that a student will get 4 or more correct answers just by guessing is:

(a) $\frac{17}{3^5}$ (b) $\frac{13}{3^5}$

(c) $\frac{11}{3^5}$ (d) $\frac{10}{3^5}$

Let A and B be two events such that $P(\overline{A \cup B}) = \frac{1}{6}$, $P(\overline{A \cap B}) = \frac{1}{4}$ and $P(\overline{A}) = \frac{1}{4}$, where $\overline{A}$ stands for the complement of the event A. Then the events A and B are

(a) independent but not equally likely.
(b) independent and equally likely.
(c) mutually exclusive and independent.
(d) equally likely but not independent.

A random variable X has Poisson distribution with mean 2. Then $P(X > 1.5)$ equals

(a) $\frac{2}{e^2}$ (b) 0 (c) $1 - \frac{3}{e^2}$ (d) $\frac{3}{e^2}$

If 12 identical balls are to be placed in 3 identical boxes, then the probability that one of the boxes contains exactly 3 balls is :

(a) $220\left(\frac{1}{3}\right)^{12}$ (b) $22\left(\frac{1}{3}\right)^{11}$

(c) $\frac{55}{3}\left(\frac{2}{3}\right)^{11}$ (d) $55\left(\frac{2}{3}\right)^{10}$

Let E,F and G be pairwise independent events with $P(G)>0$ ***and*** $P(E\cap F\cap G)=0.$

then $P\left(\frac{\bar{E}\cap\bar{F}}{G}\right)=$

From (2n+1) consecutive positive integers 3 are selected at random. The probability that they are in A.P.$=\frac{3n}{4n^2-1}$

From 2n consecutive positive integers 3 are selected at random. The probability that the numbers on them are in A.P is $\frac{3}{2(2n-1)}$

64 players play in a knockout tournament. Assuming that all the players are of equal strength, the probability that P_1 loses to P_2 and P_3 becomes the eventual winner is $\frac{1}{abc}$, where abc is a three digited number, then $\frac{a+b+c}{3}$ is

a) 4 b) 5 c) 6 d)7

Let P_n be the probability that n throws of a fair die, contain an odd number of "sixes" then

(a) $6P_n - 4P_{n-1} - 1 = 0$ (b) $6P_n - 5P_{n-1} - 1 = 0$

(c) $4P_n - 3P_{n-1} - 1 = 0$ (d) $P_n = 2P_{n-1} - 1$

Consider $f(x) = x^3 + ax^2 + bx + c$. Parameters a, b, c are chosen, respectively, by throwing a die three times. Then the probability that $f(x)$ is an increasing funciton is

(A) 5/36 (B) 8/36 (C) 4/9 (D) 1/3

Mr. A lives at origin on the Cartesian plane and has his office at (4, 5). His friend lives at (2, 3) on the same plane. Mr. A can go to his office travelling one block at a time either in the +y or +x direction. If all possible paths are equally likely then the probability that Mr. A passed his friends house is (shortest path for any event must be considereD)

(A) 1/2 (B) 10/21 (C) 1/4 (D) 11/21

A five-digit number is written down at random. The probability that the number is divisible by 5 and no two consecutive digits are identical, is

(A) $\frac{1}{5}$ (B) $\frac{1}{5}\cdot\left(\frac{9}{10}\right)^3$ (C) $\left(\frac{3}{5}\right)^4$ (D) $\frac{3}{5}$.

$A_1, A_2, A_3, \ldots\ldots, A_{21}$ be the 21 – vertices of a regular polygon of 21 – sides inscribed in a circle with centre O. Triangles are formed by joining the vertices of this regular polygon. From these traingles, if a triangle is chosen at random.

Probability that chosen triangle is equilateral traingle

(A) $\frac{1}{1330}$ (B) $\frac{5}{1330}$ (C) $\frac{1}{190}$ (D) $\frac{9}{1330}$

Probability that chosen triangle is right angled traingle

(A) $\frac{196}{1330}$ (B) $\frac{2}{1330}$ (C) $\frac{945}{1330}$ (D) 0

Probability that chosen triangle is acute angled traingle

(A) $\frac{11}{38}$ (B) $\frac{21}{38}$ (C) $\frac{196}{1330}$ (D) $\frac{945}{1330}$

Three a's, three b's and three c's are placed randomly in a 3×3 matrix. The probability that no row or column contain two identical letters can be expressed as $\frac{p}{q}$, where p and q are coprime then $(p + q)$ equals to :

(a) 151 (b) 161 (c) 141 (d) 131

A set contains $3n$ members. Let P_n be the probability that S is partitioned into 3 disjoint subsets with n members in each subset such that the three largest members of S are in different subsets. Then $\lim_{n \to \infty} P_n =$

(a) 2/7 (b) 1/7 (c) 1/9 (d) 2/9

A bag contains four tickets marked with 112, 121, 211, 222 one ticket is drawn at random from the bag. let E_i $(i = 1,2,3)$ denote the event that i^{th} digit on the ticket is 2. Then :

(a) E_1 and E_2 are independent (b) E_2 and E_3 are independent

(c) E_3 and E_1 are independent (d) E_1, E_2, E_3 are independent

For two events A and B let, $P(A) = \frac{3}{5}$, $P(B) = \frac{2}{3}$, then which of the following is/are correct ?

(a) $P(A \cap \bar{B}) \leq \frac{1}{3}$ (b) $P(A \cup B) \geq \frac{2}{3}$

(c) $\frac{4}{15} \leq P(A \cap B) \leq \frac{3}{5}$ (d) $\frac{1}{10} \leq P(\bar{A}/B) \leq \frac{3}{5}$

Mr. A randomly picks 3 distinct numbers from the set $\{1, 2, 3, 4, 5, 6, 7, 8, 9\}$ and arranges them in descending order to form a three digit number. Mr. B randomly picks 3 distinct numbers from the set $\{1, 2, 3, 4, 5, 6, 7, 8\}$ and also arranges them in descending order to form a 3 digit number.

The probability that Mr. A's 3 digit number is always greater than Mr. B's 3 digit number is :

(a) $\frac{1}{9}$ (b) $\frac{1}{3}$ (c) $\frac{2}{3}$ (d) $\frac{1}{4}$

The probability that A and B has the same 3 digit number is :

(a) $\frac{7}{9}$ (b) $\frac{4}{9}$ (c) $\frac{1}{84}$ (d) $\frac{1}{72}$

The probability that Mr. A's number is larger than Mr. B's number, is :

(a) $\frac{37}{56}$ (b) $\frac{39}{56}$ (c) $\frac{31}{56}$ (d) none of these

A is a set containing n elements, A subset P (may be void also) is selected at random from set A and the set A is then reconstructed by replacing the elements of P. A subset Q (may be void also) of A is again chosen at random. The probability that

	Column-I		Column-II
(A)	Number of elements in P is equal to the number of elements in Q is	**(P)**	$\frac{^{2n}C_n}{4^n}$
(B)	The number of elements in P is more than that in Q is	**(Q)**	$\frac{(2^{2n} - {}^{2n}C_n)}{2^{2n+1}}$
(C)	$P \cap Q = \phi$ is	**(R)**	$\frac{^{2n}C_{n+1}}{4^n}$
(D)	Q is a subset of P is	**(S)**	$\left(\frac{3}{4}\right)^n$
		(T)	$\frac{^{2n}C_n}{4^{n-1}}$

If $a, b, c \in N$, the probability that $a^2 + b^2 + c^2$ is divisible by 7 is $\frac{m}{n}$ where m, n are relatively prime natural numbers, then $m + n$ is equal to :

There are 3 different pairs (*i.e.*, 6 units say a, a, b, b, c, c) of shoes in a lot. Now three person come and pick the shoes randomly (each gets 2 units). Let p be the probability that no one is able to wear shoes (*i.e.*, no one gets a correct pair), then the value of $\frac{13p}{4-p}$, is :

X and Y are two weak students in mathematics and their chances of solving a problem correctly are 1/8 and 1/12 respectively. They are given a question and they obtain the same answer. If the probability of common mistake is $\frac{1}{1001}$, then probability that the answer was correct is a / b (a and b are coprimes). Then $|a-b| =$

Seven digit numbers are formed using digits 1, 2, 3, 4, 5, 6, 7, 8, 9 without repetition. The probability of selecting a number such that product of any 5 consecutive digits is divisible by either 5 or 7 is P. Then $12P$ is equal to

Assume that for every person the probability that he has exactly one child, excactly 2 children and exactly 3 children are $\frac{1}{4}, \frac{1}{2}$ and $\frac{1}{4}$ respectively. The probability that a person will have 4 grand children can be expressed as $\frac{p}{q}$ where p and q are relatively prime positive integers. Find the value of $5p-q$.

Mr. B has two fair 6-sided dice, one whose faces are numbered 1 to 6 and the second whose faces are numbered 3 to 8. Twice, he randomly picks one of dice (each dice equally likely) and rolls it. Given the sum of the resulting two rolls is 9. The probability he rolled same dice twice is $\frac{m}{n}$ where m and n are relatively prime positive integers. Find $(m+n)$.

Out of 3n consecutive numbers, 3 are selected at random. Find the chance that their sum is divisible by 3.

Five balls are randomly chosen, without replacement, from an urn that contains 5 red, 6 white, and 7 blue balls. Find the probability that atleast one ball of each colour is chosen.

If F is the set of all onto functions from $A = \{a_1, a_2, \ldots\ldots, a_n\}$ to $B = \{x, y, z\}$ and $f \in F$ is chosen randomly what is the probability that (a) $f^{-1}(x)$ has 2 elements in it? (b) $f^{-1}(x)$ is a singleton?

If n integers taken at random are multiplied together, show that the chance that the last digit of the product is 1, 3, 9 is $\frac{2^n}{5^n}$, the chance of its being 2, 4, 6 or 8 is $\frac{4^n - 2^n}{5^n}$, of its being 5 is $\frac{5^n - 4^n}{10^n}$ and that of its being 0 is $\frac{10^n - 8^n - 5^n + 4^n}{10^n}$.

Sixteen players S_1, S_2, ..., S_{16} play in a tournament. They are divided into eight pairs at random. From each pair a winner is decided on the basis of a game played between the two players of the pair. Assume that all the players are of equal strength.

(i) Find the probability that the player S_1 is among the eight winners.

(ii) Find the probability that exactly one of the two players S_1 and S_2 is among the eight winners.

A sportsman's chance of shooting an animal at a distance r (> a) is a^2/r^2. He fires when r = 2a and if he misses, he reloads and fires when r = 3a, 4a, ... If he misses at distance na, the animal escapes. Find the odds against the sportsman.

Three six-faced fair dice are thrown together. The probability that the sum of the numbers appearing on the dice is k $(3 \leq k \leq 8)$ is

(a) $\dfrac{(k-1)(k-2)}{432}$ (b) $\dfrac{k(k-1)}{432}$

(c) $\dfrac{k^2}{432}$ (d) none of these.

Ans. (a)

For the three events A, B and C, P (exactly one of the events A or B occurs) = P(exactly one of the events B or C occurs) = P(exactly one of the events C or A occurs) = p and P(all the three events occur simultaneously) = p^2, where $0 < p < 1/2$. Then the probability of at least one of the three events A, B and C occurring is

(a) $\dfrac{3p+2p^2}{2}$ (b) $\dfrac{p+3p^2}{4}$

(c) $\dfrac{p+3p^2}{2}$ (d) $\dfrac{3p+2p^2}{4}$

Ans. (a)

If two events A and B such that $P(A') =$ 0.3, $P(B) = 0.5$ and $P(A \cap B) = 0.3$, then $P(B|A \cup B')$ is

(a) 3/8 (b) 2/3 (c) 5/6 (d) 1/4

Ans. (a)

If A and B are two independent events such that $P(A) = 1/2$ and $P(B) = 1/5$, then

(a) $P(A \cup B) = 3/5$

(b) $P(A \mid B) = 1/2$

(c) $P(A \mid A \cup B) = 5/6$

(d) $P(A \cap B \mid A' \cup B')] = 0$.

Ans. (a), (b), (c), (d)

If A and B are two events such that $P(A) = 1/2$ and $P(B) = 2/3$, then

(a) $P(A \cup B) \geq 2/3$

(b) $P(A \cap B') \leq 1/3$

(c) $1/6 \leq P(A \cap B) \leq 1/2$

(d) $1/6 \leq P(A' \cap B) \leq 1/2$.

Ans. (a), (b), (c), (d)

For two events A and B, if $P(A) = P(A \mid B) = 1/4$ and $P(B \mid A) = 1/2$, then

(a) A and B are independent

(b) A and B are mutually exclusive

(c) $P(A' \mid B) = 3/4$

(d) $P(B' \mid A') = 1/2$.

Ans. (a), (c), (d)

If A and B are two independent events such that $P(A' \cap B) = 2/15$ and $P(A \cap B') = 1/6$, then $P(B)$ is

(a) 1/5 (b) 1/6 (c) 4/5 (d) 5/6.

Ans. (b), (c)

A chess match between two grandmasters X and Y is won by whoever first wins a total of two games. X's chances of winning, drawing or losing any particular game are a, b, c respectively. The games are independent and $a + b + c = 1$.

The probability that X wins the match after $(n + 1)$ games $(n \geq 1)$ is

(a) $na^2 b^{n-1}$

(b) $a^2(nb^{n-1}+n(n - 1)b^{n-2} c)$

(c) $na^2 bc^{n-1}$

(d) none of these

The probability that Y wins the match after the 4th game is

(a) $3bc^2 (b + 2a)$ (b) $bc^2 (3b + a)$

(c) $2ac^2 (b + c)$ (d) $abc (2a + 3b)$

The probability that X wins the match is

(a) $\dfrac{a^3 + a^2c}{(a+c)^3}$ (b) $\dfrac{a^3 + 3a^2c}{(a+c)^3}$

(c) $\dfrac{a^3}{(a+c)^3}$ (d) none of these

The probability that Y wins the match is

(a) $\dfrac{b^3 + b^2c}{(b+c)^3}$ (b) $\dfrac{c^3 + 3c^2a}{(a+c)^3}$

(c) $\dfrac{c^3}{(b+c)^3}$ (d) none of these

The probability that there is no winner is

(a) $(1 - a)(1 - c)$ (b) $(1 - a)\,b(1 - c)$

(c) b (d) 0

Ans. 76. (b), 77. (a), 78. (b), 79. (b), 80. (d)

Two numbers are selected at random from the numbers $1, 2, \cdots, n$. Let p denote the probability that the difference between the first and second is not less than m (where $0 < m < n$). If $n = 25$ and $m = 10$ find $5p$.

Ans. 1.

If A, B, C are events such that

$P(A) = 0.3$, $P(B) = 0.4$, $P(C) = 0.8$

$P(A \cap B) = 0.08$, $P(A \cap C) = 0.28$,

$P(A \cap B \cap C) = 0.09$

If $P(A \cup B \cup C) \geq 0.75$, then show that $P(B \cap C)$ lies in the interval $0.23 \leq x \leq 0.48$.

Fifteen coupons are numbered 1, 2, ..., 15, respectively. Seven coupons are selected at random one at a time with replacement. The probability that the largest number appearing on a selected coupon as 9, is

(a) $\left(\frac{9}{16}\right)^6$ (b) $\left(\frac{8}{15}\right)^7$

(c) $\left(\frac{3}{5}\right)^7$ (d) None of these

In a test, an examine guesses, copies or knows the answer to a multiple choice question with four choices. The probability that he makes a guess is 1/3 and the probability that he copies the answer is 1/6. The probability that his answer is correct given that he copied it is 1/8. Find the probability that he knew the answer to the question, given that he answered it correctly.

If two events A and B such that $P(A') = 0.3$, $P(B) = 0.4$ and $P(A \cap B) = 0.5$, then $P(B|(A \cup B))$ = ________.

A box contains 24 identical balls of which 12 are white and 12 are black. The balls are drawn at random from the box one at a time with replacement. The probability that a white ball is drawn for the 4th time on the 7th draw is

(a) $\frac{5}{64}$ (b) $\frac{27}{32}$

(c) $\frac{5}{32}$ (d) $\frac{1}{2}$

For the three events A, B and C, P (exactly one of the events A or B occurs) = P(exactly one of the events B or C occurs) = P (exactly one of the events C or A occurs) = p and P (all the three events occur simultaneously) = p^2, where $0 < p < 1/2$. Then the probability of at least one of the three events A, B and C occurring is

(a) $\frac{3p + 2p^2}{2}$ (b) $\frac{p + 3p^2}{4}$

(c) $\frac{p + 3p^2}{2}$ (d) $\frac{3p + 2p^2}{4}$

Three numbers are chosen at random without replacement from $\{1, 2, ..., 10\}$. The probability that the minimum of the chosen numbers is 3, or their maximum is 7, is ________.

Eight players P_1, P_2, ... P_8 play a knock-out tournament. It is known that whenever the players P_i and P_j play, the player P_i will win if $i < j$. Assuming that the players are paired at random in each round, what is the probability that the player P_4 reaches the final?

If A, B and C are three events such that $P(B) = \frac{3}{4}$,

$P(A \cap B \cap C') = \frac{1}{3}$ and $P(A' \cap B \cap C') = \frac{1}{3}$, then $P(B \cap C)$ is equal to

(a) $\frac{1}{12}$ (b) $\frac{1}{6}$

(c) $\frac{1}{15}$ (d) $\frac{1}{9}$

Let E' denote the complement of an event E. Let E, F, G be pairwise independent events such that $P(G) > 0$ and $P(E \cap F \cap G) = 0$. Then $P(E' \cap F'|G)$ equals

(a) $P(E') + P(F')$ (b) $P(E') - P(F')$

(c) $P(E') - P(F)$ (d) $P(E) - P(F')$

[Reasoning Type]

Consider the system of equations

$ax + by = 0$, $cx + dy = 0$, where $a, b, c, d \in \{0, 1\}$.

Statement-1: The probability that the system of equations has a unique solution is $\frac{3}{8}$.

Statement-2: The probability that the system of equations has a solution is 1.

A person throws two fair dice. He wins ₹ 15 for throwing a doublet (same numbers on the two dice), wins ₹ 12 when the throw results in the sum of 9, and loses ₹ 6 for any other outcome on the throw. Then, the expected gain/loss (in ₹) of the person is

(a) $\frac{1}{2}$ gain (b) $\frac{1}{4}$ loss (c) $\frac{1}{2}$ loss (d) 2 gain

Let $S = \{1, 2, \ldots, 20\}$. A subset B of S is said to be "nice", if the sum of the elements of B is 203. Then, the probability that a randomly chosen subset of S is "nice", is

(a) $\frac{6}{2^{20}}$ (b) $\frac{4}{2^{20}}$ (c) $\frac{7}{2^{20}}$ (d) $\frac{5}{2^{20}}$

If two different numbers are taken from the set {0, 1, 2, 3, ..., 10}, then the probability that their sum as well as absolute difference are both multiple of 4, is

(a) $\frac{6}{55}$ (b) $\frac{12}{55}$ (c) $\frac{14}{45}$ (d) $\frac{7}{55}$

A pot contain 5 red and 2 green balls. At random a ball is drawn from this pot. If a drawn ball is green then put a red ball in the pot and if a drawn ball is red, then put a green ball in the pot, while drawn ball is not replace in the pot. Now we draw another ball randomnly, the probability of second ball to be red is

(a) $\frac{27}{49}$ (b) $\frac{26}{49}$ (c) $\frac{21}{49}$ (d) $\frac{32}{49}$

In a game, a man wins ₹100 if he gets 5 or 6 on a throw of a fair die and loses ₹50 for getting any other number on the die. If he decides to throw the die either till he gets a five or a six or to a maximum of three throws, then his expected gain/loss (in rupees) is

(a) $\frac{400}{3}$ loss (b) $\frac{400}{9}$ loss (c) 0 (d) $\frac{400}{3}$ gain

A box contains 15 green and 10 yellow balls. If 10 balls are randomly drawn one-by-one with replacement, then the variance of the number of green balls drawn is

(a) $\frac{12}{5}$ (b) 6 (c) 4 (d) $\frac{6}{25}$

A fair die is tossed repeatedly until a six is obtained. Let X denote the number of tosses required.

86. The probability that $X = 3$ equals
    (a) 25/216 (b) 25/36
    (c) 5/36 (d) 125/216
87. The probability that $X \geq 3$ equals
    (a) 125/216 (b) 25/36
    (c) 5/36 (d) 25/216
88. The conditional probability that $X \geq 6$ given $X > 3$ equals
    (a) 125/216 (b) 25/216
    (c) 5/36 (d) 25/36