MATHS

BOOKS - VK JAISWAL ENGLISH

PROBABILITY

Exercise 1 Single Choice Problems

1. The boy comes from a family of two children, What is the probability that the other child is his sister ? :

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

B. $\frac{1}{3}$

C. $\frac{2}{3}$

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

Answer: A

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2. If A be any event in sample space then the maximum value of $3\sqrt{P(A)} + 4\sqrt{P(\overline{A})}$ is :

A. 4

B. 2

C. 5

D. Can not determined

Answer: C

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3. 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 $P\overline{A} = \frac{1}{4}$

,where $\overline{A}$ 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

Answer: C

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4. Let n ordinary fair dice are rolled once. The probability that at least one of the dice shows an odd number is $\left(\frac{31}{32}\right)$ than 'n' is equal to :

A. 3

B. 4

C. 5

D. 6

Answer: C

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5. Three a's, three b's and three c's are placed randomly in 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

Answer: C

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

A. $2/7$

B. $1/7$

C. $1/9$

D. $2/9$

Answer: D

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7. Three different numbers are selected at random from the set $A = \{1, 2, 3, \ldots\ldots\ldots, 10\}$. Then the probability that the product of two numbers equal to the third number is $\frac{p}{q}$, where p and q

are relatively prime positive integers then the value of $(p+q)$ is :

A. 39

B. 40

C. 41

D. 42

Answer: C

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8. Poor Dolly's T.V. has only 4 channels, all of them quite boring. Hence it is not surprising that she desires to switch (change) channel after every one minute. Then find the number of ways in which she can change the channels so that she is back to her original channel for the first time after 4 min.

A. 27

B. 31

C. 23

D. 33

Answer: B

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9. Letters of the word TITANIC are arranged to form all possible words. What is the probability that a word formed starts either with a T or a vowel ?

A. $\frac{2}{7}$

B. $\frac{4}{7}$

C. $\frac{3}{7}$

D. $\frac{5}{7}$

Answer: D

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10. One mapping is selected at random from all mappings of the set $S = \{1, 2, 3, ... n\}$ into itself. If the probability that the mapping

is one-one is 3/32, then the value of n is 2 b. 3

c. 4 d. none of these

A. 3

B. 4

C. 8

D. 16

Answer: B

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11. A 4 digit ios randomly picked from all the 4 digit numbers, then the probability that the product of its digit is divisible by 3 is :

A. $\frac{107}{125}$

B. $\frac{109}{125}$

C. $\frac{111}{125}$

D. None of these

Answer: A

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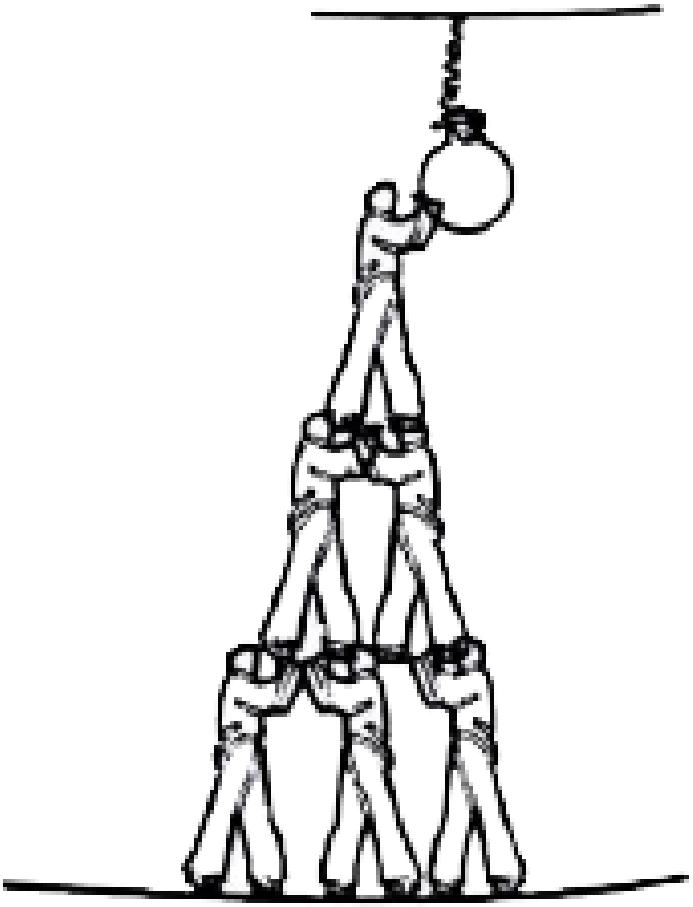
12. To obtain a gold coin, 6 men, all of different weight, are trying to build a human pyramid as shown in the figure. Human pyramid is called "stable" if some one not is the bottom row is "supported by" each of the two closest people beneath him and no body can be supported by anybody of lower weight. Formation of 'stable' pyramid is the only condition to get a gold coin. What is the probability that they will get

gold coin ?



A. $\frac{1}{45}$

B. $\frac{2}{45}$

C. $\frac{4}{45}$

D. $\frac{1}{\lfloor 5}$

Answer: A

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13. From a pack of 52 playing cards, half of the cards are randomly removed without looking at them. From the remaining cards, 3 cards(without replacement) are drawn randomly. The probability that all are queen.

A. $\frac{1}{(25)(17)(13)}$

B. $\frac{1}{(25)(15)(13)}$

C. $\frac{1}{(52)(17)(13)}$

D. $\frac{1}{(13)(51)(17)}$

Answer: A

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14. A bag contains 10 white and 3 black balls. Balls are drawn one by one without replacement till all the black ball are drawn.

The probability that the procedure of drawing balls will come to an end at the seventh drawn is :

A. $\frac{15}{286}$

B. $\frac{105}{286}$

C. $\frac{35}{286}$

D. $\frac{7}{286}$

Answer: A

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15. Let S be the set of all function from the set {1, 2, ..., 10} to itself. One function is selected from S, the probability that the selected function is one-one onto is :

A. $(9!)^{10^9}$

B. $\frac{1}{10}$

C. $\frac{100}{10!}$

D. $\frac{9!}{10^{10}}$

Answer: A

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16. Two friends visit a restaurant randomly during 5 pm to 6 pm . Among the two, whoever comes first waits for 15 min and then leaves. The probability that they meet is :

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

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

C. $\frac{7}{16}$

D. $\frac{9}{16}$

Answer: C

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17. Three numbers are randomly selected from the set {10, 11, 12, ..., 100}. Probability that they form a Geometric progression with integral common ratio greater than 1 is :

A. $\frac{15}{{}^{91}C_3}$

B. $\frac{16}{{}^{91}C_3}$

C. $\frac{17}{{}^{91}C_3}$

D. $\frac{18}{{}^{91}C_3}$

Answer: D

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Exercise 2 One Or More Than One Answer Is Are Correct

1. A consignment of 15 record players contain 4 defectives. The record players are selected at random, one by one and examined. The one examined is not put back. Then : Find the

Probability that 9^{th} one examined is the last defective is $\frac{8}{195}$.

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2. If $A_1, A_2, A_3, \ldots\ldots . A_{1006}$ be independent events such that $P(A) = \frac{1}{2i}(i = 1, 2, 3, \ldots . .1006)$ and probability that none of the events occur be $\frac{\alpha!}{2^{\alpha}(\beta!)^2}$. then

A. β is of form $4k + 2, k \in I$

B. $\alpha = 2\beta$

C. β is a composite number

D. α is of form $4k, k \in I$

Answer: A::B::C::D

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3. A bag contains four tickets marked with numbers $112, 121, 211,$ and 222. One ticket is drawn at random from the bag. Let

$E_i(i = 1, 2, 3)$ denote the event that ith 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

Answer: A::B::C

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

A. $P\left(A \cap \overline{B}\right) \leq \frac{1}{3}$

B. $P(A \cup B) \geq \frac{2}{3}$

C. $\frac{4}{15} \leq P(A \cap B) \leq \frac{3}{5}$

D. $\frac{1}{10} \leq P\left(\overline{A}/B\right) \leq \frac{3}{5}$

Answer: A::B::C::D

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Exercise 3 Comprehension Type Problems

1. There are four boxes B_1, B_2, B_3 and B_4. Box B_i has i cards and on each card a number is printed, the numbers are from 1 to i. A box is selected randomly, the probability of selecting box B_i is $\frac{i}{10}$ and then a card is drawn.

Let E_i respresent the event that a card with number 'i' is drawn, Then :

Q. $P(E_1)$ is Equal to :

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

B. $\frac{1}{10}$

C. $\frac{2}{5}$

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

Answer: C

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2. There are four boxes B_1, B_2, B_3 and B_4. Box B_i has i cards and on each card a number is printed, the numbers are from 1 to i. A box is selected randomly, the probability of

selecting box B_i is $\frac{i}{10}$ and then a card is drawn.

Let E_i respresent the event that a card with number 'i' is drawn, Then :

Q. $P(B_3 \mid E_2)$ is equal to :

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

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

C. $\frac{1}{3}$

D. $\frac{2}{3}$

Answer: C

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3. 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.

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

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

B. $\frac{1}{3}$

C. $\frac{2}{3}$

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

Answer: B

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4. 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.

Q. 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. $\frac{1}{72}$

Answer: C

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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.

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

A. $\frac{37}{56}$

B. $\frac{39}{56}$

C. $\frac{31}{56}$

D. none of these

Answer: A

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6. In an experiment a coin is tossed 10 times.

Q. Probability that no two heads are consecutive is :

A. $\frac{143}{2^{10}}$

B. $\frac{9}{2^6}$

C. $\frac{2^7-1}{2^{10}}$

D. $\frac{2^6-1}{2^6}$

Answer: B

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7. In an experiment a coin is tossed 10 times.

Q. The probability of the event that "exactly four heads occur and occur alternately" is :

A. $1 - \frac{4}{2^{10}}$

B. $1 - \frac{7}{2^{10}}$

C. $\frac{4}{2^{10}}$

D. $\frac{5}{2^{10}}$

Answer: C

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8. The rule of an "obstacle course" specifies that at the n^{th} obstacle a person has to tos a fair 6 sided die n times. If the sum of points in

these n tosses is bigger than 2^n, the person is said to have crossed the obstacle.

Q. The probability that a person crosses the first two obstacles but fails to cross the third obstacle.

A. $\frac{36}{243}$

B. $\frac{116}{216}$

C. $\frac{35}{243}$

D. $\frac{143}{243}$

Answer: A

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9. The rule of an "obstacle course" specifies that at the n^{th} obstacle a person has to tos a fair 6 sided die n times. If the sum of points in these n tosses is bigger than 2^n, the person is said to have crossed the obstacle.

Q. The probability that a person crosses the first three obstacles :

A. $\frac{143}{216}$

B. $\frac{100}{243}$

C. $\frac{216}{243}$

D. $\frac{100}{216}$

Answer: B

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10. The rule of an "obstacle course" specifies that at the n^{th} obstacle a person has to tos a fair 6 sided die n times. If the sum of points in these n tosses is bigger than 2^n, the person is said to have crossed the obstacle.

Q. The probability that a person crosses the first two obstacles but fails to cross the third obstacle.

A. $\frac{36}{243}$

B. $\frac{116}{216}$

C. $\frac{35}{243}$

D. $\frac{143}{243}$

Answer: C

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11. In an objective paper, there are two sections of 10 questions each. For "section 1" , ech question has 5 options and only one option is correct and "sectin 2" has 4 option with multiple answer an marks for a question in this section is awarded only if he ticks all correct answers. Marks for each question in "section 1" is 1 and in "section 2" is 3. (therefore is no negativve marking.)

If a candidate attempts only two questions by guessing, one from "section 1" and one from

"section 2", the probability that he score in both questions is

A. $\frac{74}{75}$

B. $\frac{1}{25}$

C. $\frac{1}{15}$

D. $\frac{1}{75}$

Answer: D

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12. In an objective paper, there are two sections of 10 questions each. For "section 1" , ech question has 5 options and only one option is correct and "sectin 2" has 4 option with multiple answer an marks for a question in this section is awarded only if he ticks all correct answers. Marks for each question in "section 1" is 1 and in "section 2" is 3. (therefore is no negativve marking.)

If a candidate attempts only two questions by guessing, one from "section 1" and one from

"section 2", the probability that he score in both questions is

A. $\frac{1}{15}\left(\frac{1}{15}\right)^2$

B. $\frac{4}{5}\left(\frac{1}{15}\right)^3$

C. $\frac{1}{5}\left(\frac{14}{15}\right)^3$

D. none of these

Answer: D

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Exercise 4 Matching Type Problems

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

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Exercise 5 Subjective Type Problems

1. Mr. A writes an article. The article originally is error free. Each day Mr. B introduces one new error into the article. At the end of the day, Mr. A checks the article and has $\frac{2}{3}$ chance of catching each individual error still in the article. After 3 days, the probability that the article is error free can be expressed as $\frac{p}{q}$ where p and q are relatively prime positive integers. Let $\lambda = q - p$, then find the sum of the digits of λ.

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2. India and Australia play a series of 7 one-day matches. Each team has equal probability of winning a match. No match ends in a draw. If the probability that India wins atleast three consecutive matches can be expressed as $\frac{p}{q}$ where p and q are relatively prime positive integers. Find the unit digit of p.

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3. 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 :

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4. A fair coin is tossed 10 times. If the probability that heads never occur on consecutive tosses be $\frac{m}{n}$ (where m, n are

coprime and m, $n \in N$), then the value of $(n - 7m)$ equals to :

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5. A bag contains 2 red, 3 green and 4 black balls. 3 balls are drawn randomly and exactly 2 of them are found to be red. If p denotes the chance that one of the three balls drawn is green, find the value of 7p.

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6. 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 :

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7. A fair coin is tossed 12 times. Find the probability that two heads do not occur consectively.

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8. The probabilities of solving a problem correctly by A and B are $\frac{1}{8}$ and $\frac{1}{12}$ respectively. Given that they obtain the same answer after solving a problem and the probability of a common mistake by them is $\frac{1}{1001}$, then probability that their solution is correct is (Assuming that if they commit different mistake, then their answers will differ)

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9. 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

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10. Assume that for every person the probability that he has exactly one child,

exactly 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 $5p - q$.

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11. 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 tolls is 9. The probability he rolled same dice twice is $\frac{m}{n}$ where m and n are relatively prime positive integers. Find $(m+n)$.

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