MATHS

BOOKS - RD SHARMA MATHS (ENGLISH)

MEAN AND VARIANCE OF A RANDOM VARIABLE

Others

1. Find the mean, variance and standard deviation of the number of heads in a simultaneous toss of three coins.

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2. Find the probability distribution of the number of doublets in four throws of a pair of dice. Also find the mean and variance of this distribution.

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3. A random variable X cantake all nonnegative integral valuesand the probabililty that X takes the value r isproportionalto alpha^r (0 < alpha <1)dot Find $P(X=0)$.

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4. The random variable X has a probability distribution P(X) of the following form, where k is some number : P(X) = $\{(k, \quad \text{if} \quad x=0), (2k, \quad \text{if} \quad x=1), (3k, \quad \text{if} \quad x=2), (0otherwise)$ (a) Determine k. (b) Find P $(X<2)$, P $(X \leq 2)$, P$(X \geq 2)$

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5. Determine which of the following can be probability distributions of a random variable X: (i) X: 0 1 2 (ii) X: 0 1 2

P(X): 0.4 0.4 0.2 P(X): 0.6 0.1 0.2 (iii) X: 0 1

2 3 4 P(X): 0.1 0.5 0.2 -0.1 0.3

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6. A fair dice is thrown two times. Find the probability distribution of the number of sixes. Also determine the mean of the number of sixes

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7. Four bad oranges are mixed accidently with 16 good oranges. Find the probability distribution of the number of bad oranges in a draw of two oranges.

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8. An urn contains 4 white and 6 red balls. Four balls are drawn at random from the urn. Find the probability distribution of the number of

white balls.

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9. Three cards are drawn form a pack of 52 playing cards. Find the probability distribution of the number of aces.

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10. A discret random variable X has the following probability distribution: $X: 1234567$ $P(X): c2c2c3$ ^ $22c^{27}c^2 + c$ Find the value of · Also, find the mean of the distribution.

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11. Four balls are to be drawn without replacement from a box containing 8 red and 4 white balls. If X denotes the number of red balls drawn, find the probability distribution of X.

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12. An urn contains 4 white and 3 red balls. Find the probability distribution of the number of red balls in a random draw of three balls.

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13. A probability distribution of a variable X is given below: $X: 01234$ $P(X): 0.\ 10.\ 250.\ 30.\ 20.\ 15$ Find (i) $Var(X)$ (ii) $Var\left(\frac{X}{2}\right)$

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14. A random variable X as the following probability distribution: $x_i: -2-10123$ $p_i: 0.\ 1k0.\ 22k0.\ 3k$ Find (i) Find the value of k. (ii) Calculate the mean of X. Calculate the variance of X.

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15. Let X be a discrete random variable whose probability distribution is defined as follows:

$P(X=x)=\{k(x+1)f \text{ or } x=1,2,3,42kxf \text{ or } x=5,6,70otherwise$

, where k is a constant. Find (i) k (ii) $E(X)$ (iii) standard deviation of X.

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16. The probability distribution of a discrete random variable X is given as under: $X: 1242A3A5A \quad P(X): \frac{1}{21} / \frac{53}{25} \frac{1}{10} \frac{1}{25} \frac{1}{25}$ Calculate: The value of $A, \quad \text{if} \quad E(X)=2.94$ (ii) Variance of X.

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17. Two cards are drawn successively with replacement from a well-shuffled pack of 52 cards. Find the probability distribution of the number of kings.

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18. The probability distribution of a random variable X is given as under:

$P(X=x)=\{kx^2f \text{ or } x=1,2,32kxf \text{ or } x=4,5,60otherwise$,

where k is a constant. Find (i) $P(X \geq 4)$ (ii) $E(X)$ (iii) $E(3X^2)$

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19. In a game 3 coins are tossed. A person is paid Rs. 5, if he gets all head or all tail and be in supposed pay Rs. 3 if he gets are head or 2 heads. What can be expert to win on an arrange per game.

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20. A discrete random variable X has the probability distribution given below: $X: 0.\ 511.\ 52\ P(X): kk^{22}k^2k$ Find the value of k. (ii) Determine the mean of the distribution.

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21. There are 5 cards numbered 1 to 5, one number on one card. Two cards are drawn at random without replacement. Let X denote the sum of the numbers on two cards drawn. Find the mean and variance.

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22. A box contains 13 bulbs out of which 5 are defective. 3 bulbs are randomly drawn, one by one without replacement, from the box. Find the probability distribution of the number of defective bulbs.

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23. Two cards are drawn without replacement from a well-shuffled deck of 52 cards. Determine the probability distribution of the number of face cards (i.e. Jack, Queen, King and Ace).

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24. Find the probability distribution of the number of green balls drawn when 3 balls are drawn , one by one, without replacement from a bag containing 3 green and 5 white balls.

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25. Find $\frac{dy}{dx}$ if $x^2 = \tan y$

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26. We take 8 identical slips of paper, write the number 0 on one of them, the number 1 on three of the slips, the number 2 on three of the slips and the number 3 on one the ships. These slips are folded, put in a box and thoroughly mixed. One slip is drawn at random from the box. If X is the random variable denoting the number written on the drawn slip, find the probability distribution of X.

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27. A die is loaded in such a way that an even number is twice likely to occur as an odd number. If the die is tossed twice, find the probability distribution of the random variable X representing the perfect squares in the two tosses.

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28. Two baised dice are thrown together. For the first die $P(6) = \frac{1}{2}$, other scores being equally likely while for the second die, $P(1) = \frac{2}{5}$ and other scores are equally likely. Find the probability distribution of the number of ones seen.

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29. The probability distribution function of a random variable X is given by $x_i : 012$ $p_i : 3c^{34}c - 10c^{25}c - 1$ Where $c > 0$. Find : (i) c (ii) $P(X < 2)$ (iii) $P(1 <_X \leq 2)$.

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30. Two cards are drawn successively without replacement from a well shuffled pack of 52cards. Find the probability distribution of the number of aces.

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31. Three cards are drawn successively with replacement from a well-shuffled deck of 52 cards. A random variable X denotes the number of hearts in the three cards drawn. determine the probability distribution of X.

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32. A fair die is tossed twice. If the number appearing on the top is less than 3, it is a success. Find the probability distribution of number of successes.

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33. A baised die is such that $P(4) = \frac{1}{10}$ and other scores being equally likely. The die is tossed twice if X is the number of fours seens, find the variance of the random variable X .

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34. Find the probability distribution of the maximum of two scores obtained when a die is thrown twice. Determine also the mean of the distribution.

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35. Find the mean and variance of the number of heads in the two tosses of a coin.

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36. A random variable X as the following probability distribution: $x_i: -2 - 10123$ $p_i: 0.1k0.22k0.3k$ Find (i) Find the value of k. (ii) Calculate the mean of X. Calculate the variance of X.

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37. Find the mean number of heads in three tosses of a fair coin.

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38. A coin weighted so that $P(H) = \frac{3}{4} and P(T) = \frac{1}{4}$ is tossed three times. Let X be the random variable which denotes the longer string of heads which occurs. Find the probability distribution, mean and variance of X.

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39. In roulette, fig the wheel has 13 numbers 0,1,2,...,12 marked on equally spaced slots. A player sets Rs. 10 on a given number. He receives Rs. 100 from the organiser of the game if the ball comes to rest in this slot, otherwise he gets nothing. If X denotes the players net gain/loss, find $E(X)$.

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40. There are 5 cards numbered 1 to 5, one number on one card. Two cards are drawn at random without replacement. Let X denote the sum of the numbers on two cards drawn. Find the mean and variance.

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41. A die is tossed twice. A "success" is "getting an odd number" on a random toss. Find the variance of the number of successes.

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42. From a lot of 10 items containing 3 defectives, a sample of 4 items id drawn at random. Let the random variable X denote the number of defective items in the sample. If the sample is drawn randomly, find (i) the probability distribution of X (ii) $P(X \leq 1)$ (iii) $P(X < 1)$ (iv) `P(0

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43. Determine which of the following can be probability distributions of a random variable $X \rightarrow X: 0\,1\,2\; P(X): 0.4\;\; 0.4\, 0.2$

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44. Determine which of the following can be probability distributions of a random variable $X: X: 0\,1\,2\; P(X): 0.6\;\; 0.1\, 0.2$

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45. Determine which of the following can be probability distributions of a random variable X: X: $0\,1\,2\,3\;\;4\;P(X)$: $0.1\;\;0.5\;0.2\;\;-0.1\;\;0.3$

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46. Let X denote the number of hours you study during a randomly selected school day The probability that X can take the values x. has the following form, where k is some unknown constant. `P(X=x)={0. 1 if x=0,k x if x=1 , 2k(5-x) if x=3 or 4, 0 otherwise

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47. A random, variable X has the following probability distribution: X: $0\,1\,2\;\;3\;\;4\,5\;\;6\,7\;\;P(X):0\;\;k\,2k\;\;2k\,3k\;\;k^2\;\;2k^2\;\;7k^2+k$ Find each of the following: i. k ii. $P(X<6)$ iii. $P(X\geq 6)$ iv. $P(0<X<5)$

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48. Find the probability distribution of X; the number of heads in two tosses of a coin (or a simultaneous toss of two coins).

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49. A coin is tossed until a head appears or the tail appears 4 times in succession. Find the probability distribution of the number of tosses.

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50. A coin is biased so that the head is 3 times as likely to occur as tail. If the coin is tossed twice, find the probability distribution of number of tails.

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51. State which of the following are not the probability distributions of a random variable. Give reasons for your answer.

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52. Check the following distributions of probability of random variable X is the probability distributions?

$X: \ 0 \ 1 \ 2$

$P(X): 0.6 \ 0.4 \ 0.2$

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53. Prove that the following distributions of probability of random variable X are the probability distributions? $X: \ 0 \ 1 \ 2 \ 3 \ 4$

$P(X): 0.1 \ 0.5 \ 0.2 \ 0.1 \ 0.1$

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54. Which of the following distributions of probability of random variable X are the probability distributions?

$X: \ 0\,1 \ 2\,3$

$P(X): 0.3\ 0.2\ 0.4\ 0.1$

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55. A random variable X has the following probability distribution:

$X: \ -2 \ -1 \ 0\,1\,2\,3$

$P(X): 0.1\,k \ \ 0.2 \ \ 2k\ 0.3\,k$, find value of k

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56. A random variable X has the following probability distribution: Values of $X: 0\,1 \ 2\,3 \ 4\,5 \ 6 \ 7\,8 \quad P(x): a\ 3a\ 5a\ 7a \ \ 9a\ 11a\ 13a\ 15a\ 17a$ Determine: (i). The value of a (ii) $P(X<3),\ P(X \geq 3),\ P(0<X<5)$

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57. Let X be a random variable which assumes values $x_1, x_2, x_3, \ x_4$ such that $2P(X = x_1) = 3P(X = x_2) = P(X = x_3) = 5P(X = x_4)$. Find the probability distribution of X.

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58. Two cards are drawn from a well shuffled pack of 52 cards. Find the probability distribution of the number of aces.

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59. Find the probability distribution of the number of heads when three coins are tossed.

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60. Four cards are drawn simultaneously from a well shuffled pack of 52 playing cards. Find the probability distribution of the number of aces.

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61. A bag contains 4 red and 6 black balls. Three balls are drawn at random. Find the probability distribution o the number of red balls.

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62. Five defective mangoes are accidentally mixed with 15 good ones. Four mangoes are drawn at random from this lot. Find the probability distribution of the number of defective mangoes.

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63. Two dice are thrown together and the number appearing on them noted. X denotes the sum of the two numbers. Assuming that all the 36 outcomes are equally likely, what is the probability distribution of X?

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64. A class has 15 students whose ages are 14, 17, 15, 14, 21, 17, 19, 20, 16, 18, 20, 17, 16, 19 and 20 years. One student is selected in such a manner that each has the same chance of being chosen and the age X of the selected student is recorded. What is the probability distribution of the random variable X? Find mean, variance and standard deviation of X.

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65. Five defective bolts are accidently mixed with twenty good ones. If four bolts are drawn at random from this lot, find the probability distribution of the number of defective bolts.

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66. Tow cards are drawn successively with replacement from a well-shuffled pack of 52 cards. Find the probability distribution of the number of kings.

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67. Find the probability distribution of the number of white balls drawn in a random draw of 3 balls without replacement from a bag containing 4 white and 6 red balls.

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68. From a lot containing 25 items, 5 of which are defective, 4 are, chosen at

random. Let X be the number of defectives found. Obtain the

probability

distribution of X if the items are chosen without replacement.

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69. Find the probability distribution of Y in two throws of two dice, where Y represents the number of times a total of 9 appears.

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70. An urn contains 4 white and 3 red balls. Find the probability distribution of the number of red balls in a random draw of three balls.

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71. Two cards are drawn from a pack of well shuffled 52 cards one by one withreplacement. Getting an ace or a spade is considered a success. Findthe probability distribution for the number of successes.

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72. Let X represent the difference between the number of heads and the number of tails obtained when a coin is tossed 6 times. What are possible values of X?

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73. From a lot of 10 bulbs, which includes 3 defectives, a sample of 2 bulbs is drawn at random. Find the probability distribution of the number of defective bulbs.

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74. The probability distribution of a random variable X is given below: $X: \ 0 \ 1 \ 2 \ 3 \ \ P(X): k \ \frac{k}{2} \ \frac{k}{4} \ \frac{k}{8}$ (i) Determine the value of k (ii) Determine $P(X \leq 2) and \ P(X > 2)$ (iii) Find $P(X \leq 2) + P(X > 2)$

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75. Let a pair of dice be thrown and the random variable X be the sum of the numbers that appear on the two dice. Find the mean or expectation of X.

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76. In a single throw of a dice; if X denotes the number on its upper face. Find the mean of X.

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77. A dealer in refrigerators estimates from his past experience the probabilities of his selling refrigerators in a day. These are as follows: No of refrigerators sold in a day: 0 1 2 3 4 5 6 Probability 0.03 0.20 0.23 0.25 0.12 0.10 0.07 Find the mean number of refrigerators sold in a day.

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78. A salesman wants to know the average number of units he sells per sales call. He checks his past sales records and comes up with the following probabilities:: Sales (in units): 0 1 2 3 4 5 Probability 0.15 0.20 0.10 0.05 0.30 0.20 . What is the average number of units he sells per sale call?

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79. Evaluate the following definite integral: $\int_{\pi/3}^{\pi/4} (tanx + \cot x)^2 dx$

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80. The random variable X can take only the values $0, 1, 2$. Given that $P(X = 0) = P(X = 1) = p$ and that $E(X^2) = E(X)$; find the value of p.

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81. Two dice are thrown simultaneously. If X denotes the number of sixes, find the expectation of X.

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82. Two numbers are selected at random(without replacement) from the first five positive integers. Let X denote the larger of the two numbers obtained. Find the mean and variance of X

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83. In a meeting, 70% of the members favour and 30% oppose a certain proposal. A member is selected at random and we take X = 0 if he opposed, and X = 1 if he is in favour. Find E(X) and Var (X).

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84. A class has 15 students whose ages are 14, 17, 15, 14, 21, 17, 19, 20, 16, 18, 20, 17, 16, 19 and 20 years. One student is selected in such a manner that each has the same chance of being chosen and the age X of the selected student is recorded. What is the probability distribution of the random variable X? Find mean, variance and standard deviation of X.

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85. Find the probability distribution of the number of success in two tosses of a die, where a success is defined as "getting a number greater than 4". Also, find the mean and variance of the distribution.

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86. Two cards are drawn successively with replacement from a well shuffled deck of 52 cards. Find the mean and standard deviation of the number of aces.

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87. A fair coin is tossed until a head or five tails occur. If X denotes the number of tosses of the coin, find mean of X.

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88. In a game, a man wins a rupee for a six and loses a rupee for any other number when a fair die is thrown. The man decided to throw a die thrice but to quit as and when he gets a six. Find the expected value of the amount he wins / loses.

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89. In a group of 30 scientists working on an experiments 20 never commit error in their work and are reporting results elaborately. Two scientists are selected at random from the group. Find the probability distribution of the number of selected scientists who never commit

error in the work and reporting. Also, find the mean of the distribution. What values are described in the question?

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90. Find the mean and standard deviation of the following probability distribution: $x_i: 2\ \ 3\ \ 4\ p_i: 0.2\ \ 0.5\ 0.3$

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91. Find the mean and standard deviation of each of the following probability distribution: $x_i: 1\ \ 3\ 4\ 5\ p_i: 0.4\ 0.1\ 0.2\ \ 0.3$

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92. Find the mean and standard deviation of the following probability distribution: $x_i: -5\ \ -4\ \ 1\ \ 2\ p_i: \frac{1}{4}\ \ \frac{1}{8}\ \ \frac{1}{2}\ \ \frac{1}{8}$

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93. Find the mean and standard deviation of the following probability distribution: $x_i: \ -1 \ 0 \ 1 \ 2 \ 3 \ p_i: \ 0.3 \ 0.1 \ 0.1 \ 0.3 \ 0.2$

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94. Find the mean and standard deviation of the following probability distribution: $x_i: \ 1 \ 2 \ 3 \ 4 \ p_i: \ 0.4 \ 0.3 \ 0.2 \ 0.1$

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95. Find the mean and standard deviation of the following probability distribution: $x_i: \ -2 \ -1 \ 0 \ 1 \ 2 \ p_i: \ 0.1 \ 0.2 \ 0.4 \ 0.2 \ 0.1$

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96. Find the mean and standard deviation of the following probability distribution:

$x_i: -3 \quad -1\ 0\ 1\ 3$

$p_i: \ 0.05\ 0.45\ 0.20\ 0.25\ 0.05$

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97. Find the mean and standard deviation of the following probability distribution: $x_i: 0\ 1\ 2\ 3\ 4\ 5\ p_i: \frac{1}{6}\ \frac{5}{18}\ \frac{2}{9}\ \frac{1}{6}\ \frac{1}{9}\ \frac{1}{18}$

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98. A discrete random variable X has the probability distribution given below: $X: \ 0.5\ 1\ 1.5\ 2\ P(X): \ k\ k^2\ 2k^2\ k$ then, Find the value of k.

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99. Find the mean variance and standard deviation of the following probability distribution $x_i : a \;\; b \; p_i : p \; q$ Where $p + q = 1$.

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100. Two cards are drawn simultaneously (or successively without replacement) from a well shuffled pack of 52 cards. Find the mean, variance and standard deviation of the number of kings.

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101. Two bad eggs are accidently mixed up with ten good ones. Three eggs are drawn at random with replacement from this lot. compute the mean for the number of bad eggs drawn.

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102. Pair of fair dice is thrown. Let X be the random variable which denotes the minimum of the two numbers which appear. Find the probability distribution, mean and variance of X.

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103. A fair coin is tossed four times. Let X denote the number of heads occurring. Find the probability distribution, mean and variance of X.

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104. A fair die is tossed. Let X denote twice the number appearing. Find the probability distribution, mean and variance of X.

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105. A fair die is tossed. Let X denote 1 or 3 according as an odd or an even number appears. Find the probability distribution, means variance of X.

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106. A die is tossed twice. A success is getting an odd number on a random toss. Find the variance of the number of successes.

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107. Three cards are drawn at random (without replacement) from a well shuffled pack of 52 cards. Find the probability distribution of number of red cards. Hence find the mean of the distribution.

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108. An urn contains 5 red 2 black balls. Two balls are randomly drawn, without replacement. Let X represent the number of black balls drawn. What are the possible values of X? Is X a random variable ? if yes, find the mean and variance of X.

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109. Two numbers are selected are random (without replacement) from positive integers 2, 3, 4, 5, 6 and 7. Let X denote the larger of the two numbers obtained. Find the mean and variance of the probability distribution of X.

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110. Write the values of a for which the following distribution of probabilities becomes a probability distribution:

$X = x_i: \ -2 \ \ -1 \ 0 \ 1$

$P(X = x_i): \frac{1-a}{4} \ \frac{1+2a}{4} \ \frac{1-2a}{4} \ \frac{1+a}{4}$

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111. Find the mean of the following probability distribution:

$X = x_i: \ 1\,2\,3 \ P(X = x_i): \frac{1}{4} \ \frac{1}{8} \ \frac{5}{8}$

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112. In a single throw of a dice; if X denotes the number on its upper face. Find the mean of X.

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113. If the probability distribution of a random variable X is given by

$X = x_i: \ 1 \ 2 \ 3 \ 4 \, P(X = x_i): \ 2k \ 4k \ 3k \ k$ Write the value of k .

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114. Find the mean of the following probability distribution: $X = x_i: \ 1 \ 2 \ 3 \ P(X = x_i): \frac{1}{4} \ \frac{1}{8} \ \frac{5}{8}$.

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115. If the probability distribution of a random variable X is as given below: $X = x_i: 1 \ 2 \ 3 \ 4 \ P(X = x_i): c \ 2c \ 3c \ 4c$ Write the value of $P(X \leq 2)$.

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116. A random variable X has the following probability distribution: $X = x_i: 1 \ 2 \ 3 \ 4 \quad P(X = x_i): \ k \ 2k \ 3k \ 4k$ Write the value of $P(X \geq 3)$.

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117. A random variable X has the following probability distribution: Values of $X: 0\ 1\ 2\ 3\ 4\ 5\ 6\ 7\ 8$ $P(x): a\ 3a\ 5a\ 7a\ 9a\ 11a\ 13a\ 15a\ 17a$ Determine: The value of a

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118. A random variable has the following probability distribution: 1 2 3 4 5 6 7 8 For the events $E = [X: X$ is a prime number $]$, $F = \{X: X < 4\}$, the probability $P(E \cup F)$ is 0.50 b. 0.77 c. 0.35 d. 0.87

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119. A random variate X takes the values 0, 1, 2, 3 and its mean is 1.3. If $P(X = 3) = 2P(X = 1)$ and $P(X = 2) = 0.3$, then $P(X = 0)$ is equal to

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120. A random variable has the following probability distribution:

$X = x_i: \ 0 \ 1 \ 2 \ 3 \ 4 \ 5 \ 6 \ 7$

$P(X = x_i): 0 \ 2p \ 2p \ 3p \ p^2 \ 2p^2 \ 7p^2 \ 2p$

The value of p is

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

b. -1

c. $-\frac{1}{10}$

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

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121. If X is a random variable with probability distribution as given below: $X = x_i: \ 0 \ 1 \ 2 \ 3 \ P(X = x_i): k \ 3k \ 3k \ k$ The value of k and its variance are (A) $\frac{1}{8}, \frac{22}{27}$ (B) $\frac{1}{8}, \frac{23}{27}$ (C) $\frac{1}{8}, \frac{24}{27}$ (D) $\frac{1}{8}, \frac{3}{4}$

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122. The probability distribution of a discrete random variable X is given below: $X: \ 2 \ 3 \ 4 \ 5 \ P(X): \frac{5}{k} \ \frac{7}{k} \ \frac{9}{k} \ \frac{11}{k}$ The value of $E(X)$ is

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123. For the following probability distribution:

$X: \ -4 \ -3 \ -2 \ -1 \ 0$

$P(X): \ 0.1 \ 0.2 \ 0.3 \ 0.2 \ 0.2$

The value of $E(X)$ is

a .0

b. -1

c. -2

d. -1.8

A. 0

B. -1

C. -2

D. -1.8

Answer: null

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124. For the following probability distribution: $X: 1\ 2\ 3\ 4$ $P(X): \frac{1}{10}\ \frac{1}{5}\ \frac{3}{10}\ \frac{2}{5}$ The value of $E(X^2)$ is 3 b. 5 c. 7 d. 10

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125. Let X be the discrete random variable. Then the variance of X is (a). $E(X^2)$ (b). $E(X^2) + (E(X))^2$ (c). $E(X^2) - (E(X))^2$ (d). $\sqrt{E(X^2) - (E(X))^2}$

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