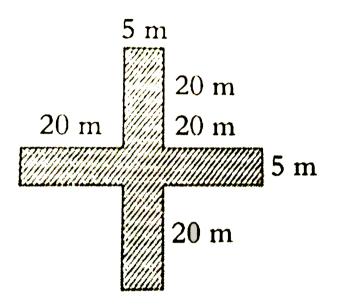# MATHS

JEE (MAIN AND ADVANCED) MATHEMATICS

RANDOM VARIABLE

Examples

1. Find the area of the figure given below.

5 m

20 m

20 m

20 m

20 m

5 m

20 m

2. Find the mean and variance of the random variable X which follows the following distribution.

$X = x$	1	2	3	4
$P(X = x)$	0.1	0.2	0.3	0.4

3. Find the mean and variance of the random variable X whose distribution is

$X = x_r$	1	2	3	- - - -	n
$P(X = x_r)$	1/n	1/n	1/n	- - - -	1/n

4. If X is a random variable with the following distribution

$X = x_r$	a	b
$P(X = x_r)$	p	q

where $p + q = 1$ then show that the variance of X is $pq(a - b)^2$.

5. Let X be a random variable such that
$$P(X = -2) = P(X - 1) = P(X = 2) = P(X = 1) = \frac{1}{6}$$
and $P(X = 0) = \frac{1}{3}$. Find the mean and variance of X.

6. Find the constant C, so that
$$F(x) = C\left(\frac{2}{3}\right)^x, \quad x = 1, 2, 3. \ldots\ldots\ldots\ldots\ldots \text{ is the p.d.f of}$$
a discrete random variable X.

7. A cubical die is thrown. Find the Mean and variance of X, giving the number on the face that shows up.

8. The probabilities of outcomes of a random experiment are given below :

Outcome	1	2	3	4	5	6
Probability	0.1	0.3	0.2	0.1	0.2	0.1

Let = {2, 4, 6}, B = {1, 2, 3, 4} and C = {1, 2}. Then find P(A), P(B), P(C), $P(A \cap B)$, $P(B \cap C)$ and $P(C \cap A)$.

9. If $X \sim B(20, 1/2)$. Find mean and variance.

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10. If $X \sim B(n, p)$, $\mu = 20$, $\sigma^2 = 10$, then find n and p.

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11. If for a Binomial distribution, $\mu = 10$ and $\sigma^2 = 5$, then find $P(X > 6)$.

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12. For the binomial distribution X with parameters $n = 12, p = \dfrac{1}{2}$, compute

i) $P(10 \leq X \leq 12)$ ii) $P(3 < X < 6)$

13. If 3 coins are tossed simultaneously and the number of heads turned up is denoted by the variable X, then find mean and variance of X.

14. When a coin is tossed n times, if the probability for getting 6 heads is equal to the probability of getting 8 heads, then the value of n is

15. The least number of times a fair coin must be tossed so that the probability of getting atleast one head is atleast 0.8 is

16. Find the probability of guessing correctly atleast 6 out of 10 questions in (i) True or false type examination (ii) multiple choice with 4 possible answers.

17. In a box containing 15 bulbs, 5 are defective. If 5 bulbs are selected at random from the box, the probability of the event that

(i) none of them is defective is $\dfrac{12}{143}$

(ii) only one of them is defective is $\dfrac{50}{143}$

(iii) atleast one of them is defective is $\dfrac{131}{143}$

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18. Five coins are tossed 320 times. Find the frequencies of the distribution of number of heads and tabulate the result.

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19. For a poisson variate X, P(X = 2) = P(X = 3) find variance of X.

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20. If X is a poisson variate such that

$P(X = 0) = P(X = 1) = K$, then show that K = 1/e

21. Suppose that a random variable X follows Poisson distribution . If P(X=1)=P(X=2)then P(X=5)=

22. The number of persons joining a cinema ticket counter in a minute has poisson distribution with parameter 6. Find the probability that (i) no one joins the queue in a particular minute (ii) two or more persons join the queue in a minute

23. Number of errors on a single page has poisson distribution with average number of errors per page is one. Find the probability that there is atleast one error on a page.

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24. Number of accidents on a national highway each day is a poisson variable with an average of three accidents per a day. Find the probability that no accidents will occur on a given day.

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25. In a large consignment of apples are rotten. What is the probability that a carton of 48 apples contain less than two rotten ones ? Answer the questions using

(i) Binomial distribution

(ii) Poisson distribution

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26. A factory produces lazor blades and 1 in 500 blades is estimated to be defective. The blades are supplied in packets of 10. In a consignment of 10,000 packets, using poisson distribution, find approximately the number of packets which contain no defective blades.

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27. Five coins are tossed 3200 times. Using the Poisson distribution , the approximate probability of getting five heads 2 times is

28. Two cards are drawn successively with replacement from a pack of cards. Taking the random variable X = the number of kings, find the probability distribution of X. Also find mean and variance of X.

29. A pair of fair dice is rolled at a time. The random variable X is the maximum of the two numbers shows on the dice.

Find the probability distribution of X and mean of X.

30. Let X be a B(2, p) and Y be an independent B(4, p). If $P(X \geq 1) = 5/9$, then find $P(Y \geq 1)$.

31. In a binomial distribution, n=5, the sum of the mean and variance is 1.8 . Then the distribution is

32. If for a binomial distribution, the mean is 10 and the variance is 5, then find the parameters and $P(X > 6)$.

33. A and B throw one die for a stake of Rs 11 which is to be won by the player who first throws 6. If A has the first throw, what are their respective expectations ?

34. A person gets dollars eqal to the square of the number which comes up when a balanced die, with faces marked 1, 2, 3, 4, 5, 6 is rooled one. If the game is repeated an indefinitely

large number of times, how much money can be expect in the long run per game ?

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35. A coin is tossed until a head appears. What is the expectation of the number of tosses required ?

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36. A player tosses 3 fair coins and wins Rs. 8 if three heads occur, Rs. 3 if 2 heads occur and Rs. 1 if one head occurs. If the game as to be fair (i.e., expected value is zero) how must should he lose, if no head occur ?

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1. X is a random variable with distribution given below

$$x: \quad\quad 0 \quad 1 \quad 2 \quad 3$$
$$P(X = x): \quad k \quad 3k \quad 3k \quad k$$

The value of k and its variance are

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2. A random variable X has the following distribution

$$X = x_1: \quad\quad -2 \quad -1 \quad 0 \quad 1 \quad 2 \quad 3$$
$$P(X = x_1): \quad 0.1 \quad k \quad\quad 0.2 \quad 2k \quad 0.3 \quad k$$

The value of k and its mean and variance are

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3. The probability distribution of a random variable X is given below.

X = x	1	2	3	4	5
P(X = x)	k	2k	3k	4k	5k

Find k, mean and variance of X

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4.

X = x	−3	−2	−1	0	1	2	3
P(X = x)	$\dfrac{1}{9}$	$\dfrac{1}{9}$	$\dfrac{1}{9}$	$\dfrac{1}{3}$	$\dfrac{1}{9}$	$\dfrac{1}{9}$	$\dfrac{1}{9}$

is the probability distribution of a random variable X. Find the variance of X.

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5. A random variable X has the following distribution

Values of X(x)	0	1	2	3	4	5	6	7
P(X = x)	0	k	2k	2k	3k	k^2	$2k^2$	$7k^2 + k$

Then $P(0<X<6)=$

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6. The range of a random variable X is {0, 1, 2}. Given that

$$P(X = 0) = 3c^3, \ P(X = 1) = 4c - 10c^2, \ P(X = 2) = 5c - 1$$

where c is constant.

Find (i) the value of c (ii) $P(X < 1)$

(iii) $P(1 < X \leq 2)$ (iv) $P(0 < X \leq 3)$

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7. The range of a random variable X is {1, 2, 3, ...} and $P(X = k) = \dfrac{C^k}{\lfloor k}$ where k = 1, 2, 3,.... Find the value of C

8. If X is a random variable with probability distribution $P(X = k) = \dfrac{(k + 1)C}{2^k}$, $K = 0, 1, 2, \ldots$ then find C.

9. Two dice are rolled and the probability distribution of the sum of the numbers on the dice is formed. Find mean of the sum.

1. If $X \sim B(10, 0.6)$ then, find mean and variance of X.

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2. In a binomial distribution n=400, $p = 1/5$, It's standard deviation is

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3. $X \sim B(n, p)$ and mean and variance of X are $\dfrac{15}{2}$ and $\dfrac{15}{4}$. Find n and p.

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4. For a binomial distribution with mean 6 and variance 2, find the first tow terms of t6he distirubiton.

5. In a binomial distribution, the parameter $n = 6$. If $9P(X = 4) = P(X = 2)$, then p=

6. The mean and variance of a Binomial variate are 2.4 and 1.44 respectively. Find the parameters, $P(X = 2)$ and $P(1 < X \leq 4)$.

7. The mean and variance of a binomial distribution are 4 and 3 respectively. Fix the distribution and find $P(X \geq 1)$.

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8. If the difference between the mean and variance of a Binomial variate is 5/9 then find the probability for the event of 2 success when the experiment is conducted 5 times.

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9. A fair coin is tossed a fixed number times . If the probability of getting seven heads is equal to that of getting nine heads

then the probability of getting two heads is

10. 8 coins are tossed simultaneously. Find the probablity of getting at least 6 heads.

11. In the experiment of tossing a coin n times, if the variable X denotes the number of heads and $P(X = 4), P(X = 5), P(X = 6)$ are in arithmetic progression then find n.

12. In an average , rain falls on 12 days in every 30 days. The probability that , rain will fall on just 3 days of a given week is

13. The probability that a person chosen at random is left handed (in hand writing) is 0.1 what is the probability that in a group of ten people there is one and only one who is left handed.

14. It is given that 10% of the electric bulbs manufactured by a company are defective. In a sample of 20 bulbs, find the probability that more than 2 are defective.

15. One in 9 ships is likely to be wrecked when they are set on

a sail. When 6 ships are on sail, find the probability for

i) atleast one will arrive safely

ii) exactly three will arrive safely.

16. The probability of a bomb hitting a bridge is $1/2$ and two

direct hits are needed to destroy it . The least number of

bombs required so that the probability of the bridge being

destroyed is greater then 0.9 is

1. The mean of a Poisson distribution is 2.25. The standard deviation is

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2. If a random variable X has a Poisson distribution with parameter $1/2$, then P(X=2)=

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3. If X is a Poisson variate such that $P(X = 2) = 9P(X = 4) + 90P(X = 6)$, then mean of X is

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4. In a Poisson distribution P(X=0) =2P(X=1) then the standard

deviation =

5. If X is a Poisson variate with

$P(X = 2) = \dfrac{2}{3}P(X = 1),$ find $P(X = 0)$ and $P(X = 3)$

6. A random variable X has Poisson distribution with mean 2.

Then $P(X > 1.5) =$

7. If 2% of a given lot of manufactured parts are defective , then the probability that in a sample of 100 items has no defective is

8. In a book of 450 pages, there are 400 typographical eroors. Assuming that the number of errors per page follow the Poisson law, find the probability that a random sample of 5 pages will contain no typographical error.

9. Deficiency by examining a specimen of blood under microscope. Suppose a small fixed volume contains on an average 20 red cells for normal persons. Using the Poission distribution, find the probability that a specimen of blood taken from a normal person will contain less than 15 red cells.

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10. In a city 10 accident take place in a span of 50 days. Assuming that the number of accidents follow the Poisson distribution, the probability that three or more accident occure in a day , is

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1. The probability function of a random variable X is given by

$$p(x) = \frac{1}{3}, \text{ if x = -1, 0, 1}$$

=0, otherwise.

Find the distribution function of X.

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

X=x	0	1	2	3	4	5	6
P(x)	a	3a	5a	7a	9a	11a	12a

(i) determine the value of a

(ii) find $P(X < 3), P(X > 3)$

X = x	0	1	2	3	4
P(X = x)	0.4	0.3	0.1	0.1	0.1

3.

is the probability distribution of a random variable X. Find

the variance of X.

4. Compute the variance of X whose distribution is given by

X = x_r	0	1	2	3
P(X = x_r)	$\dfrac{1}{3}$	$\dfrac{1}{3}$	$\dfrac{1}{6}$	$\dfrac{1}{6}$

5. State whether the following probability distribution is admissible or not.

X	-1	0	+1
P(x)	0.4	0.4	0.3

6. State whether the following probability distribution is admissible or not.

X	-2	-1	0	1	2
P(X = x)	0.3	0.4	-0.2	0.2	0.3

7. Four bad apples are mixed accidentally with 20 good apples. Probability distribution of the number of bad apples in a draw of 2 apples with replacement is formed. The mean is

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8. A business man gets a profit of Rs. 2800 with probability 0.5, loss of Rs. 5000 with probability 0.3. and neither profit nor loss with probability 0.2. Find mean of his income.

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9. A pair of fair dice is rolled 2 times. Find the mean of the number of doublets on the dice. Find also variance of the number of doublets on the dice.

10. A coin is loaded such that $P(H) = 3P(T)$. It is tossed 3 times. Let X be the random variable which indicates the number of heads which occur. Find the mean of X, variance of X.

11. In a binomial distribution the sum and difference of mean and variance are 1.8 and 0.2 respectively. Find the parameters.

12. If X is a binomial variate with mean 10 and variance 5 then find $P(X \leq 1)$.

13. A man takes a step forward with probability 0.4 and backward with probability 0.6. The probability that at the end of eleven steps, he is just one step away from the starting point is

14. On an average 1 in 100 razor blades manufactured by a firm are defective.If blades are supplied in packets of 5 each, find the probability that a packet has atleast one defective blade. If 1000 packets are tested, in how many packets would you expect defective blades.

15. The following data is related to the number of mistakes in each page of a book containing 180 pages :

No. of mistakes per page	0	1	2	3	4	5 or more
No. of pages	156	16	5	2	1	0

Fit a Poisson distribution to the data. Obtain the theoretical frequencies.

16. Every one out of 15 telephone calls between 2.00 p.m and 4.00 p.m. in a week is busy. Find the probability that out of 6 randomly chosen telephone numbers,

(i) exactly two are busy

(ii) atleast three of them are busy.

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17. If a person gains or loses an amount equal to the number appearing when an unbiased die is rolled once, according to wether the number is even or odd, how much money can he expect per game in the long run ?

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18. A person gets Rs. 2 if head comes and loses Rs. 5 when a tail comes then how much money can he expect in the long run per game, when an unbiased coin in tossed twice.

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19. A person gets Rs. $(2X + 3)$ where X denotes the number appearing when a balaced die is rolled once, how much money can be expect in the long run per game ?

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20. A coin is tossed until a tail appears what is the expectation of the number of tosses ?

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21. Suppose that X is a ramdom variable for which $E(X) = 10$ and Var (X) = 25. Find the values of a and b such that Y = ax - b has expectation 0 and variance 1.

22. Given the following table

X = x	− 3	− 2	− 1	0	1	2	3
P(X=x)	0.05	0.10	0.30	0	0.30	0.15	0.10

Computer i) $E(4X + 5)$ ii) $E(X^2)$

iii) V(X) iv) $V(2X \pm 3)$

23. A ramdom variable X can assume any positive integral value of n with a probability proportional to n with a probability proportional to $\dfrac{1}{3^n}$. Find the expectation of X?

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24. Find the probability of guessing at least 6 out of 10 answers in

i) True false type examination

ii) Multiple choice with 4 possible answers

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25. Thee number of persons joining a cinema ticket counter is a minute has Poisson distribution with parameter 6. Find the

probability that

i) no one joins the queue in a particular minute

ii) two or more persons join the queue is a minute.

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Exercise I

1. A random variable X has the following distribution

$x:$ 1   2   3   4
$P(X = x):$ k^2 $3k^2$ $5k^2$ $7k^2$

The value of k is

     A. $= \pm \dfrac{1}{2}$

     B. $\pm \dfrac{1}{8}$

     C. $\pm \dfrac{1}{2}$

D. $+ \dfrac{1}{10}$

Answer: A

2. The distribution of a random variable X is given below:

$X = x$	-2	-1	0	1	2	3
$P(X = x)$	$\frac{1}{10}$	k	$\frac{1}{5}$	$2k$	$\frac{3}{10}$	k

The value of k is

A. $\dfrac{1}{10}$

B. $\dfrac{2}{10}$

C. $\dfrac{3}{10}$

D. $\dfrac{7}{10}$

Answer: A

3. If m and σ^2 are the mean and variance of the random variable X, whose distribution is given by:

$$X = x: \quad 0 \quad 1 \quad 2 \quad 3$$
$$P(X = x): \quad \tfrac{1}{3} \quad \tfrac{1}{2} \quad 0 \quad \tfrac{1}{6}$$

A. $m = \sigma^2 = 2$

B. $m = 1, \sigma^2 = 2$

C. $m = \sigma^2 = 1$

D. $m = 2, \sigma^2 = 1$

Answer: C

4. A randomm variable X takes the value -1,0,1. It's mean is 0.6.

If (X=0)=0.2 then P(X=1)=

A. 0.3

B. 0.5

C. 0.7

D. 0.8

Answer: C

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5. If 4 coins are tossed then the mean and variance of X where X is the number of head

A. 2,4

B. 2,1

C. 1,2

D. 1,1

Answer: B

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6. Which of the following is variance of random variable $x = x_i$ and $P(x = x_i) = p_i$

A. $\sum (x_i \cdot P_i)$

B. $\sum (x_i \cdot p_i) - \mu^2$

C. $\left(\sum X_i \cdot P_i \right) - \mu^2$

D. $2\sum (x_i - \mu)^2 . P_i$

Answer: B

7. The mean of the 'Sixes' in two tosses of an unbiased die is

A. $\dfrac{1}{3}$

B. $\dfrac{1}{6}$

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

D. $\dfrac{5}{18}$

Answer: A

8. A die is rolled twice. Getting a number greater than 4 is called a 'Success'. Let the random variable X is equal to the number of successes then mean of X is

A. $\dfrac{1}{3}$

B. $\dfrac{2}{3}$

C. $\dfrac{3}{4}$

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

Answer: B

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9. A bag contains 4 white balls and 3 black balls. If two balls are drawn at random, then mean of number of white balls is

A. $\dfrac{8}{7}$

B. $\dfrac{7}{8}$

C. $\dfrac{1}{4}$

D. $\dfrac{1}{5}$

Answer: A

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10. Four bad apples are mixed accidentally with 20 good apples. If 3 apples are drawn one by one with replacement then mean of number of good apples is

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

B. $\dfrac{5}{2}$

C. $\dfrac{5}{4}$

D. $\dfrac{5}{6}$

Answer: B

11. If two dice are rolled thrice, then the mean of X where X denotes the number of times even numbers obtained on both dice is

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

B. $\dfrac{3}{4}$

C. $\dfrac{1}{2}$

D. $\dfrac{1}{5}$

Answer: B

---

12. In a binomial distribution $n = 20$, $q = 0.75$. Then mean =

A. 5

B. 15

C. 10

D. 7.5

Answer: A

13. In a binomial distribution the mean is 20, standard deviation is $\sqrt{15}$ and p =

A. $\dfrac{3}{4}$

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

C. $\dfrac{1}{2}$

D. $\dfrac{1}{3}$

Answer: B

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14. If the mean of a binomial distribution with 9 trials is 6, then its variance is

A. 2

B. 3

C. 4

D. $\sqrt{2}$

Answer: A

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15. For binomial distribution $n = 10, q = 0.4$, then mean is

A. 6

B. -4

C. 1

D. 10

Answer: A

16. Six coins are tossed simultaneously . The probability of getting at least 4 heads is

A. $\dfrac{21}{64}$

B. $\dfrac{11}{32}$

C. $\dfrac{7}{64}$

D. $\dfrac{1}{2}$

Answer: B

17. If a binomial distribution have parameters $9, 1/3$ then $P(X=4)=$

A. $\dfrac{448}{2187}$

B. $\dfrac{224}{1186}$

C. $\dfrac{112}{1046}$

D. $\dfrac{94}{886}$

Answer: A

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18. If the mean and variance of a binomial distribution are $15/4$ and $15/16$ then the number of trials is

A. 5

B. 2

C. 4

D. 6

Answer: A

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19. Let X be a binomially distributed variate with mean 10 and variance 5. Then $P(X > 10) =$

A. $\dfrac{1}{2^{20}} \displaystyle\sum_{11}^{20} 20_{C_K}$

B. $\dfrac{1}{2^{20}} \displaystyle\sum_{1}^{20} - 20_{C_K}$

C. $\dfrac{1}{2^{20}} \displaystyle\sum_{1}^{20} 10_{C_K}$

D. $\displaystyle\sum_{11}^{20} 20_{C_K} \dfrac{1}{2^K} \left(\dfrac{2}{3}\right)$

Answer: A

---

20. The mean and standard deviation of a binomial variate X are 4 and $\sqrt{3}$ respectively. Then $P(X = \geq 1) =$

A. $1 - \left(\dfrac{1}{4}\right)^{16}$

B. $1 - \left(\dfrac{3}{4}\right)^{16}$

C. $1 - \left(\dfrac{2}{3}\right)^{16}$

D. $1 - \left(\dfrac{1}{3}\right)^{16}$

Answer: B

21. The mean and the variance of a binomial distribution are 4 and 2 respectively. Then the probability of 2 successes is

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

B. $\dfrac{219}{256}$

C. $\dfrac{37}{256}$

D. $\dfrac{7}{64}$

Answer: A

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22. X is a binomial variate with parameters $n = 6$ and p. If $4P(X = 4) = P(X = 2)$, then p is s

A. $1/3$

B. $1/2$

C. $2/3$

D. $3/4$

Answer: A

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23. The probability that a student is not swimmer is $1/4.$ Then the probability that out of five students atleast four are swimmers is

A. $\dfrac{18}{31}$

B. $\dfrac{1}{88}$

C. $\dfrac{81}{128}$

D. $\dfrac{18}{181}$

Answer: C

24. From a pack of 52 cards, 3 cards are drawn successively with replacement each time. The probability of getting atleast one king is

A. $1 - \dfrac{12^3}{13^3}$

B. $\dfrac{12^3}{13^3}$

C. $1 - \dfrac{1}{13^3}$

D. $1 - \dfrac{1}{(13^3)}$

Answer: A

25. A pair of dice is rolled 4 times. The probability of getting

doublet exactly 2 times is

A. $\dfrac{25}{216}$

B. $\dfrac{15}{216}$

C. $\dfrac{1}{216}$

D. $\dfrac{5}{216}$

Answer: A

26. Out of 10,000 families with 4 children each , the probability number of families all of whose children are daughters is

    A. 625

    B. 1250

    C. 2500

    D. 9375

Answer: A

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27. If X is a Poisson variate such that $P(X = 0) = P(X = 1)$, then the parameter $\lambda =$

A. 1

B. 2

C. 3

D. 1/2

Answer: A

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28. In a Poisson distribution if $P(X = 0) = P(X = 1) = k$,

the value of k is

A. 1

B. $1/e$

C. e

D. $\sqrt{e}$

Answer: B

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29. If X is a poisson distribution such that

P(X=1)=P(X=2)then,P(X=4)=

A. $\dfrac{1}{2e^2}$

B. $\dfrac{1}{3e^2}$

C. $\dfrac{2}{3e^2}$

D. $\dfrac{1}{e^2}$

Answer: C

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30. If X is a Poisson variate and P(X=1)=2P(X=2) them P(X=3)=

A. $\dfrac{e^{-1}}{6}$

B. $\dfrac{e^{-2}}{2}$

C. $\dfrac{e^{-1}}{2}$

D. $\dfrac{e^{-1}}{3}$

Answer: A

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31. A random variable X has poisson distribution with mean 2.

Then $P(x < 1.5)=$

A. $1 - \dfrac{3}{e^2}$

B. $\dfrac{3}{e^2}$

C. $\dfrac{2}{e^2}$

D. 0

Answer: B

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32. If 3% of electric bulbs manufactured by a company are

defective , then the probability that a sample of 100 bulbs

has no defective is

A. 0

B. e^{-3}

C. $1 - e^{-3}$

D. $3 - e^{-3}$

Answer: B

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33. In a Poission X, If P(X=0)=0.2 then the variance of the distribution is

A. 2

B. 1

C. e

D. $\log 5$

Answer: D

Exercise Ii

1. A person who tosses an unbiased coin gains two points for turning up a head and loses one point for a tail. If three coins are tossed and the total score X is observed, then the range of X is

A. {0, 3, 6}

B. {-3, 0, 3}

C. {-3, 0, 3, 6}

D. {-3, 3, 6}

Answer: C

---

2. A random variable X has the following distribution

$X = x_1:$ 1   2   3   4

$P(X = x_1):$ k $2k$ $3k$ $4k$

The value of k and $P(X < 3)$ are equal to

A. $k = \dfrac{1}{10}, P(x < 3) = \dfrac{3}{5}$

B. $k = \dfrac{1}{10}, P(x < 3) = \dfrac{3}{10}$

C. $k = \dfrac{3}{10}, P(x < 3) = \dfrac{1}{10}$

D. $k = \dfrac{1}{10}, P(x < 3) = \dfrac{5}{12}$

Answer: B

3. The probability distribution of a random variable is given below:

$X = x$	0	1	2	3	4	5	6	7
$P(X = x)$	0	k	$2k$	$2k$	$3k$	k^2	$2k^2$	$7k^2 + k$

Then $P(0 < X < 5) = $

A. $\dfrac{1}{10}$

B. $\dfrac{3}{10}$

C. $\dfrac{8}{10}$

D. $\dfrac{7}{10}$

Answer: C

4. A random variable x had its range {0, 1, 2} and the probabilities are given by $P(x = 0) = 3k^3$, $P(x = 1) = 4k - 10k^2$, $P(x = 2) = 5kk - 1$ where k is constant then k =

A. 1

B. -1

C. $1/3$

D. $2/3$

Answer: C

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5. The value of c for which $P(x = k) = ck^2$ can serve as the probability distribution function of a random variable X that takes values 0, 1, 2, 3, 4 is

A. $\dfrac{1}{10}$

B. $\dfrac{1}{15}$

C. $\dfrac{1}{20}$

D. $\dfrac{1}{30}$

Answer: D

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6. The range of random vairable $x = \{1, 2, 3. \ldots\}$ and the probabilities are given by $P(x = k) = \dfrac{c^k}{k!}$ then c =

A. $\log_e^2$

B. $\log_e^3$

C. $\log_3^2$

D. $\log_2^3$

Answer: A

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7. The range of random variable $x = \{1, 2, 3. \ldots \}$ and the

probabilities are given by $P(x = k) = \dfrac{3^{CK}}{K!}$ (k = 1, 2, 3, ...)

and C is a constant. Then C =

A. $\log_3 (\log 2)$

B. $\dfrac{1}{2}\log(\log 2)$

C. $\dfrac{\log_e(\log 2)}{\log_3^e}$

D. $\log_2(\log 3)$

Answer: A

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8. If the range of a random variable X is {0,1,2,3,4,..........} with $P(X = k) = \dfrac{(k+1)}{3^k}$ for $k \geq 0$, then u=

A. $\dfrac{2}{3}$

B. $\dfrac{4}{9}$

C. $\dfrac{8}{27}$

D. $\dfrac{16}{81}$

Answer: B

9. A random variable x takes the values 0, 1, 2, 3 and its mean is 1.3. If P(x=3)=2 P(x=1) and P(x=2)=0.3, then P(x=0)=

A. 0.1

B. 0.2

C. 0.3

D. 0.4

Answer: D

10. If X is a random variable with the following probability distribution

X = x	-3	6	9
P(X = x)	$\dfrac{1}{6}$	$\dfrac{1}{2}$	$\dfrac{1}{3}$

then the variance of X is

A. $\dfrac{65}{4}$

B. $\dfrac{65}{2}$

C. $\dfrac{65}{3}$

D. 65

Answer: A

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11. A die a rolled and let x denote twice the number appearing on its face. Mean of x is

A. 6

B. 7

C. 4

D. 5

Answer: B

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12. A pair of dice is thrown at a time. X is the maximum of the two numbers shown on the dice. Then mean of X is

A. $\dfrac{151}{36}$

B. $\dfrac{161}{36}$

C. $\dfrac{141}{36}$

D. $\dfrac{131}{36}$

Answer: B

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13. A sample of 2 itmes is selected at random from a bag containing 5 items of which 2 are defective. Then mean of number of defective items is

A. $\dfrac{4}{5}$

B. $\dfrac{1}{5}$

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

D. $\dfrac{3}{5}$

Answer: A

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14. A player tosses two coins. He wins Rs. 1 if 1 head appears, Rs 2 if 2 heads appear. But he lose Rs 5 if no head appears. The mean of the prized money is

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

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

C. $-\dfrac{1}{4}$

D. $\dfrac{1}{5}$

Answer: C

15. Let X denote the profit of a business man. The probability of getting profit $Rs. 3000$ is 0.6. The probability of getting loss $Rs4000$ is 0.3. The probability of getting neither profit nor loss is 0.1 . The mean and variance of X are

    A. 100, 182000000

    B. 4,00, 4560000

    C. 400, 12300

    D. 600, 984 0000

Answer: D

16. The random variable takes the values 1,2,3,.......m. If $P(X = n) = \dfrac{1}{m}$ to each n, then the variance of X is

A. $\dfrac{(m+1)(2m+1)}{6}$

B. $\dfrac{m^2 - 1}{12}$

C. $\dfrac{m+1}{2}$

D. $\dfrac{m^2 + 1}{12}$

Answer: B

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17. Two cards are drawn successively one by one with out replacement from a pack of cards. The mean of number of kings is

A. $\dfrac{1}{13}$

B. $\dfrac{2}{13}$

C. $\dfrac{3}{13}$

D. $\dfrac{4}{13}$

Answer: B

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18. A : If the difference between the mean and variance of a

binomial distribution for 5 trials is $5/9$ then the distribution

o is $(2/3 + 1/3)^5$

R : The binomial distribution with parameters n, p is $(q + p)^n$

A. $\left(\dfrac{2}{5} + \dfrac{3}{5}\right)^5$

B. $\left(\dfrac{2}{3} + \dfrac{1}{3}\right)^5$

C. $\left(\dfrac{1}{3} + \dfrac{2}{3}\right)^5$

D. $\left(\dfrac{3}{4} + \dfrac{1}{4}\right)^5$

Answer: B

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19. If the standerd deviation of the binomial distribution $(q + p)^{16}$ is 2, then mean is

A. f16

B. 8

C. 4

D. 6

20. If a binomial distribution has mean 2.4 and variance is 1.44, then n=

   A. 10

   B. 6

   C. 16

   D. 20

Answer: B

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21. If the mean of a binomial distribution with 9 trials is 6, then its variance is

  A. 2

  B. 3

  C. 4

  D. $\sqrt{2}$

Answer: D

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22. If the mean of the binomial distribution is 100. Then standard deviation lies in the interval

  A. $[0, 7)$

B. [1, 7)

C. [0, 10)

D. [1, 11)

Answer: C

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23. Four bad apples are mixed accidentally with 20 good apples. Probability distribution of the number of bad apples in a draw of 2 apples with replacement is formed. The mean is

A. $\dfrac{1}{3}$

B. $\dfrac{2}{3}$

C. $\dfrac{3}{4}$

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

Answer: A

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24. Two cards are drawn successively with replacement . The mean of number of Aces is

A. $\dfrac{5}{3}$

B. $\dfrac{113}{69}$

C. $\dfrac{17}{69}$

D. $\dfrac{11}{69}$

Answer: A

25. The mean and variance of a random variable X having binomial distribution are 4 and 2 respectively. Then $P(x > 6) =$

A. $\dfrac{1}{32}$

B. $\dfrac{37}{256}$

C. $\dfrac{9}{256}$

D. $\dfrac{1}{256}$

Answer: C

26. The least number of times a fair coin must be tossed so that the probability of getting atleast one head is atleast 0.8 is

A. 6

B. 5

C. 4

D. 3

Answer: D

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27. The probabilty of hitting a target is 1/3. The least number of times to fire so that the probability of hitting the larget atleast once is more than 90% is

A. 4

B. 5

C. 6

D. 7

Answer: C

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28. The mean and variance of a random variable X having a binomial distribution are 4 and 2 respectively, then P(X=1) is

Theoretical Distributions

A. $\dfrac{1}{16}$

B. $\dfrac{1}{8}$

C. $\dfrac{1}{4}$

D. $\dfrac{1}{32}$

Answer: D

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29. In a binomial distribution, mean = 25, variance = 20 then

$P(X \leq 100) =$

A. $\displaystyle\sum_{r=0}^{100} {}^{125}C_r \left(\dfrac{1}{5}\right)^r \left(\dfrac{4}{5}\right)^{125-r}$

B. $\displaystyle\sum_{r=1}^{100} {}^{125}C_r \left(\dfrac{1}{2}\right)^r \left(\dfrac{2}{5}\right)^{125-r}$

C. $\displaystyle\sum_{r=0}^{100} {}^{25}C_r \left(\frac{1}{3}\right)^r \left(\frac{2}{5}\right)^{125-r}$

D. $\displaystyle\sum_{r=0}^{100} {}^{225}C_r \left(\frac{1}{5}\right)^r \left(\frac{3}{5}\right)^{125+r}$

Answer: A

30. If the mean and variance of a binomial variable X are 2 and 1 respectively, then $P(X \geq 1) =$

A. $\dfrac{1}{16}$

B. $\dfrac{5}{16}$

C. $\dfrac{11}{16}$

D. $\dfrac{15}{16}$

Answer: C

31. X is a binomial variate with parameters $n = 6$ and p. If $4P(X = 4) = P(X = 2)$, then p is s

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

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

C. $\dfrac{1}{6}$

D. $\dfrac{1}{3}$

Answer: D

32. For a binomial variate X if $n = 5$, and P(X=1)=8P(X=3),

thenp=

A. $\dfrac{4}{5}$

B. $\dfrac{1}{5}$

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

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

Answer: B

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33. X follows a binomial distribution with parameters n and p

where $0 < p < 1$.

If $\dfrac{P(X = r)}{P(X = n - r)}$ is independent of n and r then p=

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

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

C. $\dfrac{1}{4}$

D. 1

Answer: A

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34. Suppose X is binomial distribution with parameters n =

100 and p = 1/2 then P(X=r) is maximum when r =

A. 50

B. 32

C. 33

D. 67

Answer: A

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35. Suppose X is a binomial distribution with parameters n = 100 and $p = \dfrac{1}{3}$ then P(x=r) is maximum when r =

A. 50

B. 32

C. 33

D. 67

Answer: C

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36. A coin is tossed any number of times until a head appears. If x donotes the number of tosses till head uappear then $P(x \geq 3) =$

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

B. 1

C. $\dfrac{1}{4}$

D. $\dfrac{3}{4}$

Answer: C

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37. A fair coin is tossed n times. Let x be random variable denoting the number of heads tossed. If $P(x = 4), P(x = 5), P(x = 6)$ are in A.P. then n =
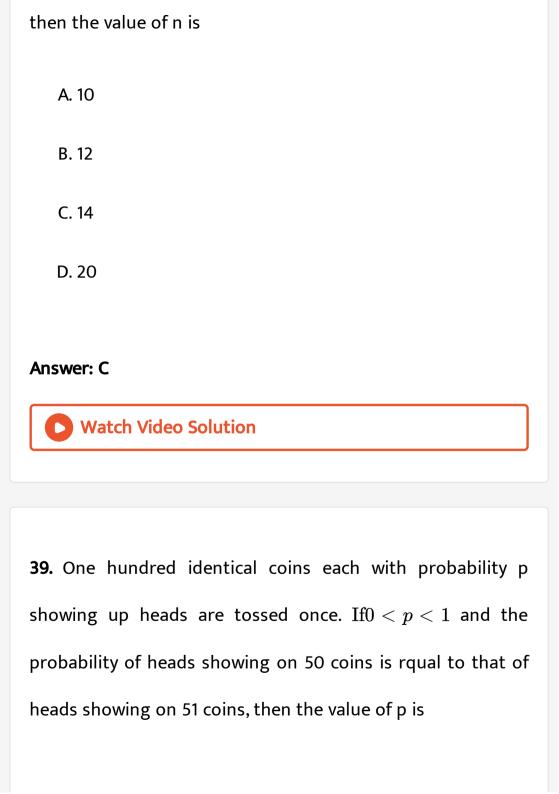
A. 7

B. 10

C. 14

D. 7 or 14

Answer: D

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38. When a coin is tossed n times, if the probability for getting 6 heads is equal to the probability of getting 8 heads,

then the value of n is

A. 10

B. 12

C. 14

D. 20

Answer: C

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39. One hundred identical coins each with probability p showing up heads are tossed once. If $0 < p < 1$ and the probability of heads showing on 50 coins is rqual to that of heads showing on 51 coins, then the value of p is

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

B. $\dfrac{49}{101}$

C. $\dfrac{50}{101}$

D. $\dfrac{51}{101}$

Answer: D

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40. A die is rolled 3 times. If getting a one is considered as a

success, then the probability of 2 successes is

A. $\dfrac{5}{72}$

B. $\dfrac{2}{27}$

C. $\dfrac{5}{27}$

D. $\dfrac{7}{72}$

Answer: B

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41. An unbiased die is tossed 6 times. The mean of number odd numbers is

A. 3

B. 4

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

D. 2

Answer: A

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42. In a binomial distribution $B\left(n, p = \dfrac{1}{4}\right)$, if the probability of at least one success is greater than or equal to $9/10$, then n is greater than

A. $\dfrac{1}{\log_{10}^4 + \log_{10}^3}$

B. $\dfrac{9}{\log_{10^4} - \log_{10}^3}$

C. $\dfrac{4}{\log_{10^4} - \log_{10}^3}$

D. $\dfrac{1}{\log_{10^4} - \log_{10}^3}$

Answer: D

43. A die is thrown (2n + 1) times. The probability of getting 1 or 3 or 4 atmost n times is

A. $\dfrac{1}{n}$

B. $\dfrac{1}{2n + 1}$

C. $\dfrac{n}{2n + 4}$

D. $\dfrac{1}{2}$

Answer: D

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44. If X is a binomial variate with n = 7 and $P(X = 3) = P(X = 4)$ then $P(X = 5) =$

A. 21. $\dfrac{3^2}{4^7}$

B. 21. $\dfrac{3^5}{4^7}$

C. 7. $\dfrac{2^5}{3^6}$

D. $\dfrac{21}{2^7}$

Answer: D

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45. For a binomial variate X with $n = 6$, if $P(X = 2) = 9P(X = 4)$, then its variance is

A. $8/9$

B. $1/4$

C. $9/8$

D. 4

Answer: C

46. The probability that a candidate seeure a seat in Engineering through EAMCET is $1/10$. Seven candidates are selected at random from a centre. The probability that exactly two will get seats is

A. $15(0.1)^2(09)^5$

B. $20(0.1)^2(0.9)^5$

C. $21(0.1)^2(0.9)^5$

D. $(0.1)^2(0.9)^5$

Answer: C

47. The probability that a bomb dropped from a plane strikes

the target is $1/5$. The probability that out of six bombs

dropped at least 2 bombs stricke the target is

A. 0.345

B. 0.246

C. 0.543

D. 0.426

Answer: A

48. An experiment succeeds twice as often as it fails. The probability of at least 5 successes in the six trials of this experiment is

A. $\dfrac{496}{729}$

B. $\dfrac{192}{729}$

C. $\dfrac{240}{729}$

D. $\dfrac{256}{729}$

Answer: D

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49. In an average , rain falls on 12 days in every 30 days. The probability that , rain will fall on just 3 days of a given week is

A. $35\left(\dfrac{1}{5}\right)^{3}\left(\dfrac{3}{5}\right)^{4}$

B. $35\left(\dfrac{2}{5}\right)^{3}\left(\dfrac{3}{5}\right)^{4}$

C. $35\left(\dfrac{1}{5}\right)^{3}\left(\dfrac{2}{5}\right)^{4}$

D. $35\left(\dfrac{1}{5}\right)^{2}\left(\dfrac{3}{5}\right)^{4}$

Answer: B

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50. Suppose A and B are two equally strong table tennis players . The probability that A beats B in exactly 3 games out of 4 is

A. $1/2$

B. $1/4$

C. $1/8$

D. $3/4$

Answer: B

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51. The probability that a man can hit a target is $3/4$. He makes 5 trials. The probability that he will hit the target every time he hits is

A. $\dfrac{243}{1024}$

B. $\dfrac{81}{1024}$

C. $\dfrac{243}{256}$

D. $\dfrac{241}{256}$

Answer: A

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52. A box contains tickets numbered from 1 to 20. If 3 tickets are drawn one by one with replacement then the probability of getting prime number exactly 2 times is

A. $\dfrac{36}{125}$

B. $\dfrac{12}{125}$

C. $\dfrac{1}{125}$

D. $\dfrac{4}{125}$

Answer: A

---

53. If on an average 1 vessel in every 10 is wrecked, the chance that out of 5 vessels expected 4 at least will arrive sefely is

A. $3\left(9^4 / 10^5\right)$

B. $4\left(9^4 / 10^5\right)$

C. $\left(9^4 / 10^5\right)$

D. $14\left(9^4 / 10^5\right)$

Answer: D

54. One in 9 ships is likely to be wrecked , when they are set on sail. When 6 ships set on sail, the probability for exactly, 3 will arrive safely is

A. $\dfrac{25 \times 8^3}{9^6}$

B. $1 - \dfrac{1}{9^6}$

C. $^6C_3 \left(\dfrac{8^3}{9^6} \right)$

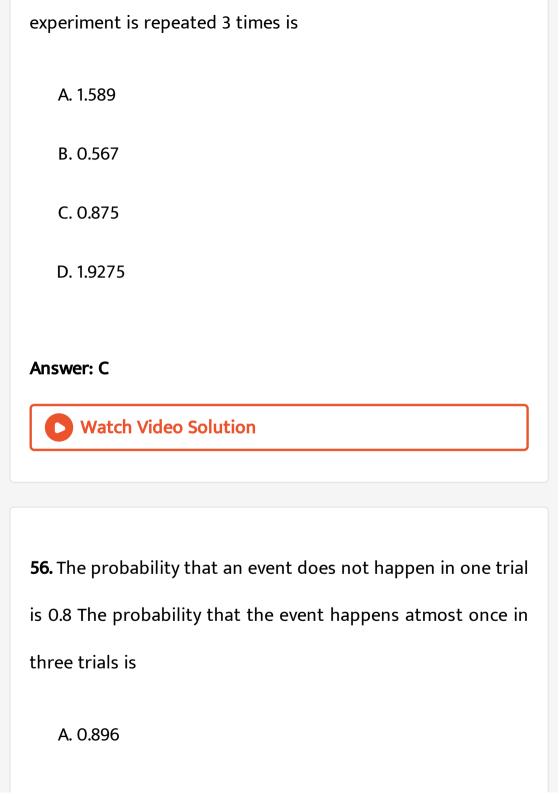D. $^6C_3 \left(\dfrac{8^6}{9^3} \right)$

Answer: C

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55. The probability of happening of an event in a trial is 0.5. The probability of happening of the event atlest once if the

experiment is repeated 3 times is

A. 1.589

B. 0.567

C. 0.875

D. 1.9275

Answer: C

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56. The probability that an event does not happen in one trial

is 0.8 The probability that the event happens atmost once in

three trials is

A. 0.896

B. 0.791

C. 0.642

D. 0.592

Answer: A

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57. 12 coins are tossed 4096 times. The number of times that

one can get atleast 2 heads is

A. 4080

B. 4081

C. 4082

D. 4083

Answer: D

58. Five coins are tossed 3200 times. The number of times getting exactly two heads is

    A. 600

    B. 1000

    C. 2000

    D. 1500

Answer: B

59. A poisson variate x is such that $P(x = 2) = 9P(x = 4) + 90. P(x = 6)$ then mean and standard deviation are

A. 1, 1

B. 1, 2

C. 2, 2

D. 2, $\sqrt{2}$

Answer: A

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60. Suppose on an average 1 house in 1000 in a certain district has a fire during a year . If there are 2000 houses in

the district , then the probability that exactly 5 houses will have a fire during the year is

A. $\dfrac{1}{15e^2}$

B. $\dfrac{14}{15e^2}$

C. $\dfrac{4}{15e^2}$

D. e^{-2}

Answer: C

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61. A manufacturing concern emplyoing a large number of workers over a period of time and the average absentee rate is 2 workers per shift then probability that exactly two workers will be absent is

A. $\dfrac{1}{e^2}$

B. $\dfrac{2}{e^2}$

C. $\dfrac{4}{e^2}$

D. $2e^2$

Answer: B

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62. If the number of telephone calls an operator receives between 10.00 pm to 10.10 pm follow poisson distribution with mean 3. The probability that the operator receives one call during that interval the next day is

A. $\dfrac{e^3}{3}$

B. e^{-3}

C. $\dfrac{e^{-3}}{3}$

D. $3e^{-3}$

Answer: D

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63. The probability that an individual suffers a bad reaction from an injection is 0.001. The probability that out of 2000 individuals more than 2 suffer a bad reaction is

A. $\dfrac{5}{e^2}$

B. $1 - \dfrac{5}{e^2}$

C. $1 - \dfrac{4}{e^2}$

D. $\dfrac{4}{e^2}$

Answer: B

64. Suppose there are 500 misprints in a book of 750 pages. Assuming that the number of misprints per page is a poisson random variate. The probability that a page selected at random has more than one mis print is

A. $e^{-2/3}$

B. $\dfrac{5}{3}e^{-2/3}$

C. $1 - e^{-2/3}4\big)$

D. $1 - \dfrac{5}{3}e^{-2/3}$

Answer: D

---

65. In a book of 500 pages , it is found that there are 250 typing errors . Assume that Poisson law holds for the number of errors per page . Then, the probability that a random sample of 2 pages will contains no error is

A. $e^{-0.3}$

B. $e^{-0.5}$

C. e^{-1}

D. e^{-2}

Answer: C

66. A firm hires out 3 cars every day. The demand for a car on each day is distributed as a poisson distribution with mean 2.0. The probability that some demand is refused on a day is $\left(e^{-2} = 0.135\right)$

A. 0.2177

B. 0.1912

C. 0.1455

D. 0.0192

Answer: C

67. Six coins are tossed 6400 times. The probability of getting 6 heads x times using poisson distribution is

A. $6400e^{-x}$

B. $\dfrac{6400e^{-x}}{\angle x}$

C. $\dfrac{e^{-100}100^x}{x!}$

D. e^{-100}

Answer: C

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68. Six coins are tossed 9600 times. The probability of getting 5 heads 2 times, by using poisson distribution, is

A. $\dfrac{300^2 . e^{-300}}{2}$

B. $\dfrac{300. \, e^{-300}}{2}$

C. $300^2 . \, e^{-300}$

D. $300e^{-2}$

Answer: A

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69. Cycle tyres are supplied in lots of 10 and there is a chance of 1 in 500 tyres to be defective. Using Poisson's distribution the approximate number of lots containing no defective tyres in a consignment of 10,000 lots is e^-0.02=0.9802

A. 9980

B. 9998

C. 9802

D. 9982

Answer: C

70. In a poisson distribution, the variance is m. The sum of terms in odd places in the distribution is

A. e^{-m}

B. $e^{-m} \cos h(m)$

C. $e^{-m} \sin h(m)$

D. $e^{-m} \cot h(m)$

Answer: B

71. A random variable x follows binomial distribution with mean a and variance b then observe the following statements.

Statement-I : $a > b > 0$

Statement-II : $\dfrac{a^2}{a - b}$ is a positive integer

Statement-III : $a + b = 1$

which of the above statments are true.

    A. only I, II

    B. only II, III

    C. only I, III

D. all the I, II, III

Answer: A

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72. A fair coin is tossed n times and x be the number of heads. If P(x=4), P(x=5), P(x=6) are in A.P. then which of the following are correct.

Statement-I : n = 7 Statement-II : n = 9

Statement-III : n = 2 Statement-IV : n = 14

correct statements are

A. only I

B. both I and III

C. both III and IV

D. both I and IV

Answer: D

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73. A random variable has the following distribution.

$x = x_i$	-3	-2	-1	0	1	2
$P(x = x_i)$	0.1	$2K$	$3K$	$7K$	0.2	0.1

Then for the values, A = K, B = Mean, C = Variance, the ascending order is

A. A, B, C

B. B, A, C

C. C, B, A

D. C, A, B

Answer: B

74. One hundred indentical coins are thrown as each coin has the probability of head as p. Let x = number of coins showing heads then match the following conditions with p value.

(A) $P(x = 49) = P(x = 50)$ $1)$ $P = \dfrac{1}{2}$

(B) $P(x = 48) = P(x = 52)$ $2)$ $\dfrac{51}{101}$

(C) $P(x = r) = P(x = n - r)$ $3)$ $\dfrac{50}{101}$

$4)$ $\dfrac{57}{100}$

The correct matching is

A.
A	B	C
2	3	1

B.
A	B	C
4	2	3

$$\begin{array}{ccc} A & B & C \\ 1 & 2 & 3 \end{array}$$

C.

$$\begin{array}{ccc} A & B & C \\ 3 & 1 & 1 \end{array}$$

D.

Answer: D

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75. Observe the following statements

Assertion (A) : X is binomial variate with parameters $2n + 1$

and p = 1/2 then P(x = odd values) = 1/2

Reason (R) : If $^nC_p = C_p$ then

$C_1 + C_3 + C_5 + \ldots\ldots = 2^{n-1}$. Then

A. A is false, R is true

B. A is true, R is true but $R \not\Rightarrow A$

C. A is true, R is true and R $\Rightarrow$ A

D. A is true, R is false

Answer: C

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76. X is a poisson variate with parameter λ. Then match the following.

A) $P(x = 0)$ 1) $e^{-\lambda}.\sinh \lambda$
B) $P(x \geq 1)$ 2) $e^{-\lambda}.\cosh \lambda$
C) $P(x = 1, 3, 5,.....)$ 3) $e^{-\lambda}.\tanh \lambda$
D) $P(x = 0, 2, 4, ...)$ 4) $1 - e^{-\lambda}$
                          5) $e^{-\lambda}$

The correct matching is

A.
$\begin{array}{cccc} A & B & C & D \\ 5 & 4 & 2 & 1 \end{array}$

B. $\begin{array}{cccc} A & B & C & D \\ 4 & 5 & 2 & 1 \end{array}$

C. $\begin{array}{cccc} A & B & C & D \\ 5 & 4 & 1 & 2 \end{array}$

D. $\begin{array}{cccc} A & B & C & D \\ 2 & 5 & 1 & 2 \end{array}$

Answer: C

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Practice Exercise

1. A random variable X ahs the following distribution

x	1	2	3	4
$P(X = x)$	c	$2c$	$3c$	$4c$

The value of c is

A. 1

B. 10

C. $\dfrac{1}{10}$

D. $\dfrac{1}{5}$

Answer: C

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2. X is a random variable with distribution given below

$$x: \qquad\qquad 0 \quad 1 \quad 2 \quad 3$$
$$P(X=x): \quad k \quad 3k \quad 3k \quad k$$

The value of k and its variance are

A. $\dfrac{1}{8}, \dfrac{22}{27}$

B. $\dfrac{1}{8}, \dfrac{23}{27}$

C. $\dfrac{1}{8}, \dfrac{24}{27}$

D. $\dfrac{1}{8}, \dfrac{3}{4}$

Answer: D

3. Given below is the distribution of a random variable X

$X = x$	0	1	2	3
$P(X = x)$	λ	2λ	3λ	4λ

If $\alpha = P(X < 3)$ and $\beta = P(X > 2)$, then $\alpha, \beta =$

4. A random variable X has the following distribution .

$X : x_i$	0	1	2	3
$P(X : x_i)$	$\dfrac{2}{6}$	$\dfrac{3}{6}$	$\dfrac{0}{6}$	$\dfrac{1}{6}$

The mean and variance of x are

A. 1, 1

B. 1, 2

C. 2 , 1

D. 2 , 3

Answer: A

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5. In a probability distribution of a random variable X , the sum of probabilities is always

A. 0

B. 1

C. 2

D. a non-negative integer

Answer: B

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6. A random variable X has the following distribution .

$X = x_i$:	1	2	3	4
$P(X=x_i)$:	k	$2k$	$3k$	$4k$

The value of k and $P(X < 4)$ are equal to

A. $k = \dfrac{1}{10}, P(X < 4) = \dfrac{3}{7}$

B. $k = \dfrac{1}{10}, P(X < 4) = \dfrac{3}{5}$

C. $k = \dfrac{3}{10}, P(X < 4) = \dfrac{2}{7}$

D. $k = \dfrac{1}{24}, P(X < 4) = \dfrac{2}{9}$

Answer: B

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7. If X is the sum of the number when two dice are rolled , then mean variance are

A. 10

B. 7

C. 6

D. 5

Answer: B

8. A random variable X has its range $\{0,1,2,3,.........\}$. If $P(X = r) = \dfrac{c(r + 1)}{2^r}$ for r=0,1,2,.......... Then c=

A. $1/2$

B. $1/3$

C. $1/4$

D. $1/5$

Answer: C

9. If it rains a dealer in rain coats can earn Rs . 500 Rs a day . If it is fair , he can loose Rs.40/- per day . His mean profit if the probability of a fair day is 0.6 is

A. 170

B. 172

C. 274

D. 176

Answer: D

10. A box contains 6 tickets. Two of the tickets carry a price of $Rs. 5/-$ each , the other 4 the price of $Rs.1$. If one ticket is drawn, the mean value of the price is

A. $14/3$

B. $7/6$

C. 1

D. $7/3$

Answer: D

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11. For a dealer in a consignment of umbrellas , the probabilty of getting a profit of $Rs.\ 1500$ is 0.6, the probability of getting a loss of $Rs.\ 1000$ is 0.3 and the probability of getting no profit or no loss is 0.1. The mean profit of the dealer is

A. 500

B. 900

C. 300

D. 600

Answer: D

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12. In a binomial distribution $n = 12, p = 1/3$. Then mean and variance are

A. $4, \dfrac{8}{3}$

B. $2, \dfrac{6}{3}$

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

D. $4, \dfrac{2}{3}$

Answer: A

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13. In a binomial distribution, mean is 5 and the variance is 4 .

The number of trials is

A. 9

B. 20

C. 25

D. 125

Answer: C

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14. If the mean and variance of a binomial variate X are $\dfrac{4}{3}, \dfrac{8}{9}$

respectively , then P(X = 2) =

A. $\dfrac{4}{27}$

B. $\dfrac{8}{81}$

C. $\dfrac{16}{81}$

D. $\dfrac{8}{27}$

Answer: D

15. If for a binomial distribution the mean is 6 and the standdard deviation is $\sqrt{2}$, then P(X=r)=

A. $^{9}C_r\left(\dfrac{2}{3}\right)^{r}\left(\dfrac{1}{3}\right)^{9-r}$

B. $^{9}C_r\left(\dfrac{1}{3}\right)^{r}\left(\dfrac{2}{3}\right)^{9-r}$

C. $^{12}C_r\left(\dfrac{2}{3}\right)^{r}\left(\dfrac{1}{3}\right)^{12-r}$

D. $^{12}C_r\left(\dfrac{1}{3}\right)^{r}\left(\dfrac{2}{3}\right)^{9-r}$

Answer: A

16. A box contains 4 red and 8 white balls . If 4 balls are drawn one by one with replacement then the probability of getting 3 white balls is

A. $\dfrac{16}{81}$

B. $\dfrac{8}{81}$

C. $\dfrac{32}{81}$

D. $\dfrac{1}{32}$

Answer: A

17. Probability of happening of an event in an experiment is 0.4 . The probability of happening of the event atleast once , if the experiment is repeated 3 times under similar condition is

A. $\dfrac{1}{16}$

B. $\dfrac{13}{16}$

C. $\dfrac{98}{125}$

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

Answer: C

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18. In a binomial distribution the mean is 12 and the standard deviation is $\sqrt{3}$. Then the distribution is

A. $\left(\dfrac{1}{4} + \dfrac{3}{4}\right)^{16}$

B. $\left(\dfrac{1}{4} + \dfrac{1}{4}\right)^{16}$

C. $\left(\dfrac{1}{2} + \dfrac{1}{4}\right)^{16}$

D. $\left(\dfrac{3}{4} - \dfrac{1}{(4)^{16}}\right)$

Answer: A

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19. A fair coin is tossed a fixed number times . If the probability of getting seven heads is equal to that of getting nine heads then the probability of getting two heads is

A. $\dfrac{15}{2^8}$

B. $\dfrac{2}{15}$

C. $\dfrac{15}{2^{13}}$

D. $\dfrac{4}{15}$

Answer: C

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20. A coin is biased so that the probability of falling head when tossed is $\dfrac{1}{4}$. If the coin is tossed 5 times , the probability of obtaining 2 heads and 3 tails is

A. $\dfrac{135}{512}$

B. $\dfrac{75}{512}$

C. $\dfrac{1}{512}$

D. $\dfrac{1}{256}$

Answer: A

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21. If 10 coins are tossed then mean and variance of x and x denotes the number of heads is

A. $5, \dfrac{5}{2}$

B. $5, 5$

C. $10, 5$

D. $5, 10$

Answer: A

22. A die is thrown twice. If getting a number greater than four on the die is considered a succes. Then the variance of the probability distribution of the number of successes is

A. $\dfrac{2}{9}$

B. $\dfrac{3}{9}$

C. $\dfrac{4}{9}$

D. $\dfrac{5}{9}$

Answer: C

23. Three dice are rolled 4 times . The probability of getting sum 17 exactly 3 times is

A. $\dfrac{4 \times 71}{72^4}$

B. $\dfrac{71}{72^4}$

C. $\dfrac{71}{72^4}$

D. $\dfrac{1}{72^4}$

Answer: A

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24. Two cards are drawn successively with replacement . The mean of number of Aces is

A. $\dfrac{1}{13}$

B. $\dfrac{2}{13}$

C. $\dfrac{3}{13}$

D. $\dfrac{4}{13}$

Answer: B

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25. The standard deviation of a poisson distribution is 4 then its mean is

A. 4

B. 16

C. 2

D. 8

Answer: B

26. If a random variable X has a Poisson distribution such that P(X=1)=P(X=2) then

I: its mean is 2 II: its variance is 1

A. 1, 1

B. 2 ,2

C. $2, \sqrt{3}$

D. $2, 4$

Answer: B

27. In a Poisson distribution P(X=0) =2P(X=1) then the standard deviation =

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

B. $\dfrac{1}{\sqrt{2}}$

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

D. $\dfrac{1}{\sqrt{3}}$

Answer: B

28. In a Poission X, If P(X=0)=0.2 then the variance of the distribution is

A. 2

B. 1

C. e

D. log 5

Answer: D

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29. In a factory manufacturing certain spare parts 2% of the output is found defective . If spares are packed in 200 units , the probability that there are 4 defective spares in a pack is

A. $64e^{-4}$

B. $32e^{-4}$

C. $\dfrac{64}{3}e^{-4}$

D. $\dfrac{32}{3}e^{-4}$

Answer: D

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30. The incidence of an occupation disease to the workers of a factory is found to be $1/5000$. If there are 10000 workers in a factory then the probability that none of them will get the disease is

A. e

B. e^{-2}

C. e^{-3}

D. e^4

Answer: B

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31. If 2% of a given lot of manufactured parts are defective ,

then the probability that in a sample of 100 items has no

defective is

A. $\dfrac{1}{e^2}$

B. $\dfrac{2}{e^2}$

C. $\dfrac{1}{e}$

D. e^2

Answer: A

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32. Statement I : A fair coin is tossed 100 times .

The probability of getting tails an odd number of times is 1/2

.

Statement II : A fair coin is tossed 99 times .

The probability of getting tails an odd number of times is 1/2

Then which of the above statements are true .

A. only I

B. only II

C. both I and II

D. neither I nor II

Answer: C

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33. For the binomial distribution

$$(a + p)^n = \left(\frac{1}{2} + \frac{1}{2} \right)^{10}$$

if A = P (x = 3) , B = P (x = 6) , C = P (x = 9) then the ascending

order of A , B , C is

    A. C , A , B

    B. A , B , C

    C. A , C , B

    D. B , C , A

Answer: A

34. Assertion (A) : X is a binomial distribution with parameters n = 100 and p .

If P (x = 50) = P (x = 49) then p = $\dfrac{1}{2}$

Reason (R) : For the binomial distribution $(q + p)^n$, $P(x = k) = {}^nc_k \cdot q^{n-k} \cdot p^k$

A. A is false , R is true

B. A is true , R is fals

C. A , R are true but R $\Rightarrow$ A

D. A , R are true , and $R \not\Rightarrow A$

Answer: A

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