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State	Finished
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Time taken	1 hour 47 mins
Marks	21.00/25.00
Grade	**8.40** out of 10.00 (**84**%)

Question 1

Incorrect

Mark 0.00 out of 1.00

Let the random variable X have a discrete ***uniform distribution*** on the set of integers {3, 6, 9, 12, 15, 18, 21}.
Find the ***mean*** and ***variance*** of X.

- a. E(X) = 2, V(X) = 6
- b. E(X) = 4, V(X) = 4
- c. E(X) = 12, V(X) = 36
- d. E(X) = 12, V(X) = 12
- e. None of others

If X ~ Unif() and values are in {a, a+1, ..., b}, then

- The *mean* of X is $\mu = E(X) = \dfrac{a+b}{2}$
- The *variance* of X is $\sigma^2 = V(X) = \dfrac{(b-a+1)^2 - 1}{12}$

Given a discrete ***uniform distribution*** X whose values are integers in {3, 6, 9, 12, 15, 18, 21}.

Let Y = X/3, then Y has a discrete ***uniform distribution*** on the set of integers {1, 2, 3, 4, 5, 6, 7}.

E(Y) = (1+7)/2 = 4 => E(X) = 3E(Y) = 12.

V(Y) = $[(7 - 1 + 1)^2 - 1]/12 = 4$ => V(X) = 36.

The correct answer is: E(X) = 12, V(X) = 36

$\mu = \frac{8}{0,4} = 20$

Question **2**

Incorrect

Mark 0.00 out of 1.00

Consider a sequence of independent Bernoulli trials with p = 0.4. After the seventh success occurs, what is the expected number of trials to obtain the eighth success?

$\frac{1}{0,4} = \frac{10}{4} = 2,5$

- a. None of the others
- b. 4
- c. 3
- d. 20
- e. 2.5

Lack of Memory Property of Geometric distribution

After the sixth success, the expected number of trials to obtain the eighth success = The expected number of trials to obtain the first success = E(X) = 1/p = 1/0.4 = 2.5

The correct answer is: 2.5

Question 3

Correct

Mark 1.00 out of 1.00

Let <= be "less than or equal". Let the random variable X have a discrete uniform distribution on the intergers 1<=x<=35. Determine the mean and variance of X.

- a. 17 and 102
- b. None of the others
- c. 17.5 and 102
- d. 18 and 102

The correct answer is: 18 and 102

Question 4

Incorrect

Mark 0.00 out of 1.00

A dangerous computer virus attacks a folder consisting of 50 files. Files are affected by the virus independently of one another. Each file is affected with the probability 0.02. What is the probability that more than 3 files are affected by this virus?

- a. 0.06
- b. None of the others
- c. 0.814
- d. 0.018
- e. 0.078

Let X be the number of files affected by the virus.

Then X ~ Binom(n = 50, p = 0.02).

We wish to find P(X > 3).

P(X > 3) = 1 - P(X <= 3) = 0.018

The correct answer is: 0.018

Question 5

Correct

Mark 1.00 out of 1.00

A store receives a shipment of 1000 phones. Suppose the probability that a phone is defective is 0.1%. Let X be the number of defective phones in the shipment.

What kind of distribution does X have?

- a. Poisson
- b. Negative Binomial
- c. Geometric
- d. Binomial
- e. Hypergeometric

The correct answer is: Binomial

Question 6

Correct

Mark 1.00 out of 1.00

The probability that an individual is left-handed is 0.11. In a class of 40 students, what is the probability of finding five left-handers?

- a. None of the other choices is correct
- b. 0.179
- c. 0.000
- d. 0.125
- e. 0.11

The correct answer is: 0.179

Question 7

Correct

Mark 1.00 out of 1.00

An array of 30 LED bulbs is used in an automotive light. The probability that a bulb is defective is 0.001 and defective bulbs occur independently.

Determine the probability that an automotive light has **no** defective bulb.

- a. 0.970
- b. 0.030
- c. 1/30
- d. 0.029
- e. None of the others

Let X be the number of defective bulbs in an automotive light. Then X~Binom(n = 30, p = 0.001).

We wish to find P(X = 0) = 0.970

The correct answer is: 0.970

Question 8

Correct

Mark 1.00 out of 1.00

Given the probability distribution of a discrete random variable X.

X	3	4	7	9
P(X)	0.1	0.2	0.4	0.3

Find E(X) and V(X)

- a. 6.6, 5.9
- b. 5.9, 5.4
- c. None of these
- d. 6.6, 4.44
- e. 5.75, 4

Your answer is correct.

E(X) = 3*0.1 + 4*0.2 + 7*0.4 + 9*0.3 = 6.6

E(X^2) = 3^2*0.1 + 4^2*0.2 + 7^2*0.4 + 9^2*0.3 = 48

V(X) = E(X^2) - E(X)^2 = 48 - 6.6^2 = 4.44

The correct answer is:
6.6, 4.44

$$\sum_{x=0}^{2} \frac{C_3^x \cdot C_7^{5-x}}{C_{10}^5}$$

N

10

K N-K

3 7

Question **9**

Correct

Mark 1.00 out of 1.00

Suppose that X has a hypergeometric distribution with N = 10, n = 5, and K = 3. Determine P(X < 2).

- a. None of the others
- b. 0.5
- c. 0.92
- d. 0.08
- e. 0.64

$$P(X<2) = P(X=0) + P(X=1)$$

$$= \frac{C_7^5}{C_{10}^5} + \frac{3 \cdot C_7^4}{C_{10}^5}$$

The correct answer is: 0.5

Question **10**

Correct

Mark 1.00 out of 1.00

Let the random variable X be a ***Poisson distribution*** with *mean* of 0.8. Find the probability that X > 1.

- a. 0.550
- b. 0.191
- c. 0.809
- d. 0.640
- e. None of the other choices is correct

$$P(X>1) = 1 - P(X \le 1)$$

$$= 1 - \sum_{x=0}^{1} \frac{e^{-0.8} \cdot 0.8^{x}}{x!}$$

X ~ Poisson(lambda = 0.8)

P(X>1) = 1-P(X <=1) = 1- P(X = 0) - P(X = 1) = 0.191

The correct answer is: 0.191

Question **11**

Correct

Mark 1.00 out of 1.00

$p = 20\% =$

An exciting computer game is released. Twenty percent of players will buy an ***advanced version*** of the game. Among 20 users, what is the expected number of people who will buy the ***advanced version***?

mean

- a. 20
- b. 4
- c. 5
- d. 10
- e. None of the others

$\mu = np = 20 \cdot 20\%$

Let X be the number of players who will buy the advanced version among 20 players.

Then X has a binomial distribution with parameter n = 20, p = 0.2

==> E(X) = np = 20*0.2 = 4

The correct answer is: 4

Question 12

Correct

Mark 1.00 out of 1.00

Given the cumulative distribution function

$$F(x)=\begin{cases} 0 & x<1 \\ 0.7 & 1\le x<4 \\ 0.9 & 4\le x<7 \\ 1 & 7\le x \end{cases}$$

Find $P(X \le 2)$ and $P(X > 4)$

- a. 0.3, 0.1
- b. 0.7, 0.9
- c. None of the other choices is correct
- d. 0.3, 0.9
- e. 0.7, 0.1

P(X <= 2) = F(2) = 0.7

P(X > 4) = 1 - P(X <+ 4) = 1 - F(x) = 1 - 0.9 = 0.1

The correct answer is: 0.7, 0.1

Question 13

Correct

Mark 1.00 out of 1.00

Give $f(x)=0,75 \, . \, 0,25^x$, $x = 0,1,2\ldots$ is the probability mass function. Which the following statement is NOT TRUE?

- a. $P(X = 2) = 3/64$
- b. All of the others
- c. $P(X \geq 1) = 48/64$
- d. $P(X \leq 2) = 63/64$

The correct answer is: $P(X \geq 1) = 48/64$

$$P(X \geq 1) = \sum_{x=1}^{20} C_{20}^{x} \cdot 0{,}1^{x} \cdot (1-0{,}1)^{20-x}$$

Question **14**

Correct

Mark 1.00 out of 1.00

$p = 0{,}1$

Suppose the probability that item produced by a certain machine will be defective is 0.1. Find the probability that 20 items will contain **at least one** defective item. Assume that the quality of successive items is independent.

$n = 20$

x

- a. 0.270
- b. 0.122
- c. None of these
- d. 0.878
- e. 0.730

$$P(X \geq 1) = 1 - P(X < 1)$$
$$= 1 - P(X = 0) = 1 - C_{20}^{0} \cdot 0{,}1^{0} \cdot 0{,}9^{20}$$

Let X be the number of defective items then X has binomial distribution with parameter n = 20, p = 0.1.

The desired probability is P(X > 0) = 1 - P(X = 0) = 0.878

The correct answer is: 0.878

Question 15

Correct

Mark 1.00 out of 1.00

A multiple choice test contains 25 questions, each with four answers. Assume a student just guesses on each question. What is the probability that the student answers more than 22 questions correctly?

- a. $2.46558.10^{-12}$
- b. $1.15463x10^{-14}$
- c. None of these
- d. 0.096770

The correct answer is: $2.46558.10^{-12}$

Question **16**

Correct

Mark 1.00 out of 1.00

The number of 113-calls in HCM city, has a Poisson distribution with a mean of 7 calls per day. The probability that there are 4 calls tomorrow is ___

- a. None of the other choices is correct
- b. 0.195
- c. 0.091
- d. 0.060
- e. 0.149

Let X be the number of 113-calls in a day.

X ~ Poisson(lambda) and E(X) = lambda = 7 (= mean of 7 calls/day)

$$f(x) = \frac{e^{-\lambda}\lambda^{x}}{x!}$$

$P(X = 8) = e^{-7}(7^{4})/4! = 0.091$

The correct answer is: 0.091

Question 17

Correct

Mark 1.00 out of 1.00

A computer user tries to recall her password. She knows it can be one of 6 possible passwords. She tries her passwords until she finds the right one.

Find the expected number of passwords she uses.

mean

$$\mu = \frac{1}{p} = \frac{1}{\frac{1}{6}} = 6$$

- a. 5
- b. 3
- c. 4
- d. 6
- e. None of the others

Let X be the number of passwords she uses until she finds the right one.

Then X ~ Geometric(p = 1/6)

E(X) = 1/p = 6.

The correct answer is: 6

Question **18**

Correct

Mark 1.00 out of 1.00

Consider the time to recharge the flash in a camera. The probability that a camera passes the test is 0.9, and the cameras perform independently. What is the probability that the second failure is obtained at the fifth test?

- a. 0.003
- b. None of the others
- c. 0.047
- d. 0.035
- e. 0.029

Let X be the number of tests until the second failure.

Then X has a negative binomial distribution with parameter p = 0.1 and r = 2.

We wish to find P(X = 5).

$$P(X=5)=\binom{4}{1}0.1^2(0.9)^3=0.029$$

The correct answer is: 0.029

Question 19

Incorrect

Mark 0.00 out of 1.00

Network breakdowns are unexpected rare events that occur every 3 weeks, on the average. Compute the probability of more than one breakdown during a 12-week period.

- a. None of the others
- b. 0.908
- c. 0.982
- d. 0.092
- e. 0.927

Let X be the number of network breakdowns during a 12-week period. Then X has a Poisson distribution with mean of 4 (breakdowns per 12 weeks).

We wish to find $P(X > 1)$

$= 1 - P(X = 0) - P(X = 1) = 0.908$

The correct answer is: 0.908

Question **20**

Correct

Mark 1.00 out of 1.00

Let X be a binomial random variable with p=0.1 and n=10. Calculate the following probability: P(X>2) and P(X`<= `8).

- a. 0.0702 and 0
- b. 0.702 and 0.999
- c. 0.702 and 1
- d. None of others.
- e. 0.9892 and 1

$P(X > 2) = P(X \geq 3)$

$=$

The correct answer is: None of others.

Question 21

Correct

Mark 1.00 out of 1.00

Assume that each of your calls to a popular radio station has a probability of 0.04 of connecting, that is, of not obtaining a busy signal. Assume that your calls are independent.

What is the probability that your first call that connects is your 8th call?

- a. 0.020
- b. 0.040
- c. 0.025
- d. 0.030
- e. None of the others

Let X be the number of calls until the first connect. Then X ~ Geometric(p=0.04). We wish to compute P(X=8).

P(X=8) = (0.96)^7*(0.04) = 0.030

The correct answer is: 0.030

Question 22

Correct

Mark 1.00 out of 1.00

You roll a **fair die** until it shows a six. What is the expected number of times of rolling?

- a. 3
- b. 4
- c. None of these
- d. 6
- e. 12

Your answer is correct.

Let X be the number of times of rolling until a six comes up. Then X~Geometric(p=1/6).

E(X) = 1/p = 6.

The correct answer is:
6

Question 23

Correct

Mark 1.00 out of 1.00

Suppose that the random variable X has a geometric distribution with parameter $p = 0.3$. Find $P(X > 2)$.

a. 0.49

b. 0.21

c. None of the others

d. 0.79

e. 0.7

$P(X > 2) = 1 - P(X = 1) - P(X = 2)$

$= 1 - 0.3 - 0.7*0.3 = 0.49$

The correct answer is: 0.49

Question **24**

Correct

Mark 1.00 out of 1.00

Messages arrive at a switchboard in a Poisson manner at an average rate of five per hour. Find the probability for each of the following event: "No message arrives within one hour"

$\lambda = 5 \rightarrow 1 \text{ hour}$

$P(x=0) = \frac{e^{-\lambda} \cdot \lambda^{x}}{x!} = \frac{e^{-5} \cdot 5^{0}}{0!}$

- a. 0.4046
- b. None of the other choices is correct
- c. 0.0067
- d. 0.4406
- e. 0.4460

The correct answer is: 0.0067

Question **25**

Correct

Mark 1.00 out of 1.00

Given the probability distribution of X.

X	0	1	2	3	Otherwise
P(X)	a	0.1	2a	0.3	0

Find E(X).

- a. 1.8
- b. None of the others
- c. 2
- d. 1.5
- e. 2.2

First, determine a such that a + 0.1 + 2a + 0.3 = 1.

==> a = 0.2

E(X) = 0*0.2 + 1*0.1 + 2*0.4 + 3*0.3 = 1.8

The correct answer is: 1.8