Question Number : 73 Question Id : 640653765367 Question Type : MSQ Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 4 Max. Selectable Options : 0

Question Label : Multiple Select Question

Choose the correct option(s) from the following:

Options :

6406532561857. ✔ If A and B are orthogonal matrices, then AB is also orthogonal.

6406532561858. ✔ If A is orthogonal, then A^{-1} is also an orthogonal matrix.

6406532561859. ✖ Let A be an $n \times n$ orthogonal matrix. Let R be the set of rows of A, thought of as a subset of R^n. Similarly, let C be the set of columns of A. Then exactly one of R or C is an orthogonal subset of vectors.

6406532561860. ✔ If A is an $n \times n$ orthogonal matrix, then $\|Ax\| = \|x\|$ for any $x \in \mathbb{R}^n$.

Sem2 Statistics2

Section Id :	64065353025
Section Number :	5
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	12
Number of Questions to be attempted :	12
Section Marks :	40
Display Number Panel :	Yes
Section Negative Marks :	0
Group All Questions :	No

Enable Mark as Answered Mark for Review and Clear Response :	Yes
Maximum Instruction Time :	0
Sub-Section Number :	1
Sub-Section Id :	640653111425
Question Shuffling Allowed :	No
Is Section Default? :	null

Question Number : 74 Question Id : 640653765371 Question Type : MCQ Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 0

Question Label : Multiple Choice Question

THIS IS QUESTION PAPER FOR THE SUBJECT "FOUNDATION LEVEL : SEMESTER II: STATISTICS FOR DATA SCIENCE II (COMPUTER BASED EXAM)"

ARE YOU SURE YOU HAVE TO WRITE EXAM FOR THIS SUBJECT?

CROSS CHECK YOUR HALL TICKET TO CONFIRM THE SUBJECTS TO BE WRITTEN.

(IF IT IS NOT THE CORRECT SUBJECT, PLS CHECK THE SECTION AT THE TOP FOR THE SUBJECTS REGISTERED BY YOU)

Options :

6406532561863. ✔ YES

6406532561864. ✖ NO

Question Number : 75 Question Id : 640653765372 Question Type : MCQ Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 0

Question Label : Multiple Choice Question

Discrete random variables:

Distribution	PMF ($f_X(k)$)	CDF ($F_X(x)$)	$E[X]$	$\mathrm{Var}(X)$
Uniform(A) $A=\{a,a+1,\ldots,b\}$	$\frac{1}{n}, \quad x=k$ $n=b-a+1$ $k=a,a+1,\ldots,b$	$\begin{cases} 0 & x<0 \\ \frac{k-a+1}{n} & k\le x<k+1 \\ & k=a,a+1,\ldots,b-1,b \\ 1 & x\ge n \end{cases}$	$\frac{a+b}{2}$	$\frac{n^2-1}{12}$
Bernoulli(p)	$\begin{cases} p & x=1 \\ 1-p & x=0 \end{cases}$	$\begin{cases} 0 & x<0 \\ 1-p & 0\le x<1 \\ 1 & x\ge 1 \end{cases}$	p	$p(1-p)$
Binomial(n,p)	${}^nC_k p^k(1-p)^{n-k}$, $k=0,1,\ldots,n$	$\begin{cases} 0 & x<0 \\ \sum_{i=0}^{k} {}^nC_i p^i(1-p)^{n-i} & k\le x<k+1 \\ & k=0,1,\ldots,n \\ 1 & x\ge n \end{cases}$	np	$np(1-p)$
Geometric(p)	$(1-p)^{k-1}p$, $k=1,\ldots,\infty$	$\begin{cases} 0 & x<0 \\ 1-(1-p)^k & k\le x<k+1 \\ & k=1,\ldots,\infty \end{cases}$	$\frac{1}{p}$	$\frac{1-p}{p^2}$
Poisson(λ)	$\frac{e^{-\lambda}\lambda^k}{k!}$, $k=0,1,\ldots,\infty$	$\begin{cases} 0 & x<0 \\ e^{-\lambda}\sum_{i=0}^{k}\frac{\lambda^i}{i!} & k\le x<k+1 \\ & k=0,1,\ldots,\infty \end{cases}$	λ	λ

Continuous random variables:

Distribution	PDF ($f_X(k)$)	CDF ($F_X(x)$)	$E[X]$	$\mathrm{Var}(X)$
Uniform$[a,b]$	$\frac{1}{b-a}$, $a \le x \le b$	$\begin{cases} 0 & x \le a \\ \frac{x-a}{b-a} & a < x < b \\ 1 & x \ge b \end{cases}$	$\frac{a+b}{2}$	$\frac{(b-a)^2}{12}$
Exp(λ)	$\lambda e^{-\lambda x}$, $x > 0$	$\begin{cases} 0 & x \le 0 \\ 1-e^{-\lambda x} & x > 0 \end{cases}$	$\frac{1}{\lambda}$	$\frac{1}{\lambda^2}$
Normal(μ, σ^2)	$\frac{1}{\sigma\sqrt{2\pi}} \exp\left(\frac{-(x-\mu)^2}{2\sigma^2}\right)$, $-\infty < x < \infty$	No closed form	μ	σ^2
Gamma(α, β)	$\frac{\beta^\alpha}{\Gamma(\alpha)} x^{\alpha-1} e^{-\beta x}$, $x > 0$		$\frac{\alpha}{\beta}$	$\frac{\alpha}{\beta^2}$
Beta(α, β)	$\frac{\Gamma(\alpha+\beta)}{\Gamma(\alpha)\Gamma(\beta)} x^{\alpha-1}(1-x)^{\beta-1}$ $0 < x < 1$		$\frac{\alpha}{\alpha+\beta}$	$\frac{\alpha\beta}{(\alpha+\beta)^2(\alpha+\beta+1)}$

1. **Markov's inequality:** Let X be a discrete random variable taking non-negative values with a finite mean μ. Then,
$$P(X \ge c) \le \frac{\mu}{c}$$
2. **Chebyshev's inequality:** Let X be a discrete random variable with a finite mean μ and a finite variance σ^2. Then,
$$P(|\, X - \mu \,| \ge k\sigma) \le \frac{1}{k^2}$$
3. **Weak Law of Large numbers:** Let $X_1, X_2, \ldots, X_n \sim$ iid X with $E[X] = \mu, \mathrm{Var}(X) = \sigma^2$.
Define sample mean $\overline{X} = \frac{X_1 + X_2 + \ldots + X_n}{n}$. Then,
$$P(|\overline{X} - \mu| > \delta) \le \frac{\sigma^2}{n\delta^2}$$
4. **Using CLT to approximate probability:** Let $X_1, X_2, \ldots, X_n \sim$ iid X with $E[X] = \mu, \mathrm{Var}(X) = \sigma^2$.
Define $Y = X_1 + X_2 + \ldots + X_n$. Then,
$$\frac{Y - n\mu}{\sqrt{n}\sigma} \approx \text{Normal}(0,1).$$

Useful data:

1. Use the following values of F_Z if required:
$F_Z(1) = 0.84,\ F_Z(1.92) = 0.97,\ F_Z(0) = 0.5$
2. $\int x^n dx = \frac{x^{n+1}}{n+1}$.

Options :

6406532561865. ✔ Useful Data has been mentioned above.

6406532561866. ✖ This data attachment is just for a reference & not for an evaluation.

Sub-Section Number : 2

Sub-Section Id : 640653111426

Question Shuffling Allowed : Yes

Is Section Default? : null

Question Number : 76 Question Id : 640653765373 Question Type : SA Display Question Number : Yes Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Short Answer Question

Let $X_1, X_2, \ldots, X_{36} \sim$ i.i.d. Bernoulli(0.5). Define a new random variable

$$Y = X_1 + X_2 + \ldots + X_{36}.$$

Using the Central limit theorem, find the approximate value of $P(Y \leq 21)$. Enter the answer correct to two decimal places.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

0.81 to 0.87

Question Number : 77 Question Id : 640653765374 Question Type : SA Display Question Number : Yes Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Short Answer Question

Let X and Y be two continuous random variables with joint PDF

$$f_{XY}(x,y) = \begin{cases} x + cy^2, & \text{if } 0 \leq x \leq 1 \text{ and } 0 \leq y \leq 1, \\ 0, & \text{otherwise.} \end{cases}$$

Find the value of c. Enter the answer corret to one decimal place.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1.5

Sub-Section Number :	3
Sub-Section Id :	640653111427
Question Shuffling Allowed :	Yes
Is Section Default? :	null

Question Number : 78 Question Id : 640653765376 Question Type : MCQ Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Multiple Choice Question

Suppose X and Y are two independent random variables with probability density functions as

$$g(x) = \begin{cases} \frac{8}{x^3}, & x > 2, \\ 0, & \text{otherwise.} \end{cases}$$

and

$$h(y) = \begin{cases} 2y, & 0 < y < 1, \\ 0, & \text{otherwise.} \end{cases}$$

Calculate the value of $E[XY]$.

Options :

6406532561873. ✖ 2

6406532561874. ✖ $\frac{2}{3}$

6406532561875. ✔ $\frac{8}{3}$

6406532561876. ✖ Insufficient information

Question Number : 79 Question Id : 640653765377 Question Type : MCQ Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Multiple Choice Question

Let $X_1, X_2, \ldots, X_{100}$ be i.i.d. samples with mean 150 and variance 100. Find the mean and variance of $\overline{X}$, where $\overline{X} = \frac{X_1 + X_2 + \ldots + X_{100}}{100}$ is the sample mean.

Options :

6406532561877. ✖ $E[\overline{X}] = 150, \text{Var}(\overline{X}) = 100$

6406532561878. ✖ $E[\overline{X}] = 150, \text{Var}(\overline{X}) = 10$

6406532561879. ✔ $E[\overline{X}] = 150, \text{Var}(\overline{X}) = 1$

6406532561880. ✖ $E[\overline{X}] = 1500, \text{Var}(\overline{X}) = 10$

Sub-Section Number :	4
Sub-Section Id :	640653111428
Question Shuffling Allowed :	Yes
Is Section Default? :	null

Question Number : 80 Question Id : 640653765375 Question Type : MSQ Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3 Max. Selectable Options : 0

Question Label : Multiple Select Question

The joint PMF table of two discrete random variable X_1 and X_2 is given as

X_2 \ X_1	1	2
1	$\frac{1}{3}$	$\frac{1}{6}$
2	$\frac{1}{6}$	k

Which of the following option(s) is(are) true?

Options :

6406532561869. ✔ $f_{X_1}(2) = f_{X_2}(2)$

6406532561870. ✖ $f_{X_1}(1) \neq f_{X_2}(1)$

6406532561871. ✖ X_1 and X_2 are independent.

6406532561872. ✔ X_1 and X_2 are not independent.

Sub-Section Number :	5
Sub-Section Id :	640653111429
Question Shuffling Allowed :	No
Is Section Default? :	null

Question Id : 640653765378 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Question Numbers : (81 to 82)

Question Label : Comprehension

The joint probability density function of two continuous random variables X and Y is given as,

$$f(x,y)=\begin{cases}8xy, & 0\le y\le x\le 1,\\ 0, & \text{otherwise}\end{cases}$$

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 81 Question Id : 640653765379 Question Type : MCQ Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Multiple Choice Question

Find the marginal density of X.

Options :

6406532561881. ✖ $$f_X(x)=\begin{cases}4x, & 0\le x\le 1,\\ 0, & \text{otherwise.}\end{cases}$$

6406532561882. ✖ $$f_X(x)=\begin{cases}4x, & y\le x\le 1,\\ 0, & \text{otherwise.}\end{cases}$$

6406532561883. ✔ $$f_X(x)=\begin{cases}4x^3, & 0\le x\le 1,\\ 0, & \text{otherwise.}\end{cases}$$

6406532561884. ✖ $$f_X(x)=\begin{cases}4x^3, & y\le x\le 1,\\ 0, & \text{otherwise.}\end{cases}$$

Question Number : 82 Question Id : 640653765380 Question Type : SA Display Question Number : Yes Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction

Time : 0

Correct Marks : 2

Question Label : Short Answer Question

What is the value of E[X]? Enter the answer correct to one decimal place.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

0.8

Question Id : 640653765381 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Question Numbers : (83 to 84)

Question Label : Comprehension

In a large town, it is estimated that 20% of students own a laptop. A random sample of 400 students is selected from the town.

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 83 Question Id : 640653765382 Question Type : MCQ Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 2

Question Label : Multiple Choice Question

Let a random variable X denote the total number of students without laptops in the selected sample. Which of the following options is a good model for X?

Options :

6406532561886. ✖ X ~ Bernoulli(0.5)

6406532561887. ✖ X ~ Bernoulli(0.2)

6406532561888. ✔ X ~ Binomial(400, 0.8)

6406532561889. ✖ X ~ Binomial(400, 0.2)

Question Number : 84 Question Id : 640653765383 Question Type : SA Display Question Number : Yes Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Short Answer Question

Using the Central Limit Theorem, find an approximate probability that at least 80 students in the selected random sample own a laptop. Enter the answer correct to one decimal place.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

0.5

Question Id : 640653765384 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Question Numbers : (85 to 86)

Question Label : Comprehension

A random sample of size n is taken from a population with mean μ and standard deviation 25.

The sample mean is $\overline{X} = \dfrac{X_1 + X_2 + \cdots + X_n}{n}$.

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 85 Question Id : 640653765385 Question Type : MSQ Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3 Max. Selectable Options : 0

Question Label : Multiple Select Question

Which of the following inequalities result from Chebyshev's inequality?

Options :

6406532561891. ✔ $P\left(|\overline{X}-\mu| \leq 5\right) \geq 1-\frac{25}{n}$

6406532561892. ✖ $P\left(|\overline{X}-\mu| \leq 5\right) \geq 1-\frac{1}{n}$

6406532561893. ✔ $P\left(|\overline{X}-\mu| \geq 5\right) \leq \frac{25}{n}$

6406532561894. ✖ $P\left(|\overline{X}-\mu| \geq 5\right) \leq \frac{1}{n}$

Question Number : 86 Question Id : 640653765386 Question Type : SA Display Question Number : Yes Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 2

Question Label : Short Answer Question

Find the minimum value of n such that the sample mean lies in $[\mu-5, \mu+5]$ with probability more than 0.95 using Chebyshev's inequaliy.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

498 to 502

Question Id : 640653765387 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Question Numbers : (87 to 88)

Question Label : Comprehension

The joint density of two continuous random variables X and Y is given by

$$f_{XY}(x,y) = \begin{cases} \frac{x+y}{k}, & 0<x<1, 0<y<1, \\ 0, & \text{otherwise.} \end{cases}$$

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 87 Question Id : 640653765388 Question Type : SA Display Question Number : Yes Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 2

Question Label : Short Answer Question

Find the value of k.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

1

Question Number : 88 Question Id : 640653765389 Question Type : MCQ Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Multiple Choice Question

What is the value of

$$P\left(X < \frac{1}{2}, Y < \frac{1}{2}\right)?$$

Options :

6406532561897. ✖ $\frac{1}{16}$

6406532561898. ✔ $\frac{1}{8}$

6406532561899. ✖ $\frac{1}{2}$

6406532561900. ✖ $\frac{1}{4}$

Question Id : 640653765390 Question Type : COMPREHENSION Sub Question Shuffling

Allowed : No Group Comprehension Questions : No Question Pattern Type : NonMatrix Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Question Numbers : (89 to 90)

Question Label : Comprehension

The joint PMF table of two discrete random variables X and Y is given as

Y \ X	0	1
0	$\frac{1}{12}$	$\frac{1}{6}$
1	$\frac{1}{6}$	$\frac{1}{3}$
2	$\frac{1}{12}$	$\frac{1}{6}$

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 89 Question Id : 640653765391 Question Type : SA Display Question Number : Yes Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Short Answer Question

Find the value of Cov(*X, Y*).

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

0

Question Number : 90 Question Id : 640653765392 Question Type : MCQ Display Question Number : Yes Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 2

Question Label : Multiple Choice Question

What conclusion will you make based on the obtained value in the given part?

Options :

6406532561902. ✖ There is a positive linear relationship between the variables *X* and *Y* .

6406532561903. ✖ There is a negative linear relationship between the variables *X* and *Y* .

6406532561904. ✔ There is no linear relationship between the variables *X* and *Y*.

6406532561905. ✖ We cannot conclude anything.

Sem1 English1

Section Id :	64065353026
Section Number :	6
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	27
Number of Questions to be attempted :	27
Section Marks :	50
Display Number Panel :	Yes
Section Negative Marks :	0
Group All Questions :	No
Enable Mark as Answered Mark for Review and Clear Response :	Yes
Maximum Instruction Time :	0
Sub-Section Number :	1
Sub-Section Id :	640653111430