| | |
|---|---|
| **Is Section Default? :** | null |

**Question Number : 73 Question Id : 640653770478 Question Type : MSQ 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 :**

6406532577307. ✔ If $A$ and $B$ are orthogonal matrices, then $AB$ is also orthogonal.

6406532577308. ✔ If $A$ is orthogonal, then $A^{-1}$ is also an orthogonal matrix.

6406532577309. ✖ 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.

6406532577310. ✔ If $A$ is an $n \times n$ orthogonal matrix, then $\|Ax\| = \|x\|$ for any $x \in \mathbb{R}^n$.

# Statistics2

| | |
|---|---|
| **Section Id :** | 64065353261 |
| **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 :** | 640653112582 |
| **Question Shuffling Allowed :** | No |
| **Is Section Default? :** | null |

**Question Number : 74 Question Id : 640653770482 Question Type : MCQ 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 : 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 :**

6406532577313. ✔ YES

6406532577314. ✖ NO

**Question Number : 75 Question Id : 640653770483 Question Type : MCQ 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($A$)<br>$A=\{a,a+1,\ldots,b\}$ | $\frac{1}{n}, \quad x=k$<br>$n=b-a+1$<br>$k=a,a+1,\ldots,b$ | $\begin{cases} 0 & x<0 \\ \frac{k-a+1}{n} & k\le x<k+1 \\ & k=a,a+1,\ldots,b-1,b \\ 1 & x\ge n \end{cases}$ | $\frac{a+b}{2}$ | $\frac{n^2-1}{12}$ |
| 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($n,p$) | ${}^nC_k p^k(1-p)^{n-k}$,<br>$k=0,1,\ldots,n$ | $\begin{cases} 0 & x<0 \\ \sum_{i=0}^{k} {}^nC_i p^i(1-p)^{n-i} & k\le x<k+1 \\ & k=0,1,\ldots,n \\ 1 & x\ge n \end{cases}$ | $np$ | $np(1-p)$ |
| Geometric($p$) | $(1-p)^{k-1}p$,<br>$k=1,\ldots,\infty$ | $\begin{cases} 0 & x<0 \\ 1-(1-p)^k & k\le x<k+1 \\ & k=1,\ldots,\infty \end{cases}$ | $\frac{1}{p}$ | $\frac{1-p}{p^2}$ |
| Poisson($\lambda$) | $\frac{e^{-\lambda}\lambda^k}{k!}$,<br>$k=0,1,\ldots,\infty$ | $\begin{cases} 0 & x<0 \\ e^{-\lambda}\sum_{i=0}^{k}\frac{\lambda^i}{i!} & k\le x<k+1 \\ & k=0,1,\ldots,\infty \end{cases}$ | $\lambda$ | $\lambda$ |

**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($\lambda$) | $\lambda e^{-\lambda x}$, $x > 0$ | $\begin{cases} 0 & x \le 0 \\ 1-e^{-\lambda x} & x > 0 \end{cases}$ | $\frac{1}{\lambda}$ | $\frac{1}{\lambda^2}$ |
| Normal$(\mu, \sigma^2)$ | $\frac{1}{\sigma\sqrt{2\pi}} \exp\left(\frac{-(x-\mu)^2}{2\sigma^2}\right)$, $-\infty < x < \infty$ | No closed form | $\mu$ | $\sigma^2$ |
| Gamma$(\alpha, \beta)$ | $\frac{\beta^\alpha}{\Gamma(\alpha)} x^{\alpha-1} e^{-\beta x}$, $x > 0$ | | $\frac{\alpha}{\beta}$ | $\frac{\alpha}{\beta^2}$ |
| Beta$(\alpha, \beta)$ | $\frac{\Gamma(\alpha+\beta)}{\Gamma(\alpha)\Gamma(\beta)} x^{\alpha-1}(1-x)^{\beta-1}$ $0 < x < 1$ | | $\frac{\alpha}{\alpha+\beta}$ | $\frac{\alpha\beta}{(\alpha+\beta)^2(\alpha+\beta+1)}$ |

1. **Markov's inequality:** Let $X$ be a discrete random variable taking non-negative values with a finite mean $\mu$. Then,
$$P(X \ge c) \le \frac{\mu}{c}$$
2. **Chebyshev's inequality:** Let $X$ be a discrete random variable with a finite mean $\mu$ and a finite variance $\sigma^2$. 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 :**

6406532577315. ✔ Useful Data has been mentioned above.

6406532577316. ✖ This data attachment is just for a reference & not for an evaluation.

**Sub-Section Number :** 2

**Sub-Section Id :** 640653112583

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 76 Question Id : 640653770484 Question Type : SA 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 : 640653770485 Question Type : SA 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 :** 640653112584

**Question Shuffling Allowed :** Yes

**Is Section Default? :** null

**Question Number : 78 Question Id : 640653770487 Question Type : MCQ 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 :**

6406532577323. ✖ $2$

6406532577324. ✖ $\frac{2}{3}$

6406532577325. ✔ $\frac{8}{3}$

6406532577326. ✖ Insufficient information

**Question Number : 79 Question Id : 640653770488 Question Type : MCQ 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 :**

6406532577327. ✖ $E[\overline{X}] = 150, \text{Var}(\overline{X}) = 100$

6406532577328. ✖ $E[\overline{X}] = 150, \text{Var}(\overline{X}) = 10$

6406532577329. ✔ $E[\overline{X}] = 150, \text{Var}(\overline{X}) = 1$

6406532577330. ✖ $E[\overline{X}] = 1500, \text{Var}(\overline{X}) = 10$

| | |
|---|---|
| **Sub-Section Number :** | 4 |
| **Sub-Section Id :** | 640653112585 |
| **Question Shuffling Allowed :** | Yes |
| **Is Section Default? :** | null |

**Question Number : 80 Question Id : 640653770486 Question Type : MSQ 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 :**

6406532577319. ✔ $f_{X_1}(2) = f_{X_2}(2)$

6406532577320. ✖ $f_{X_1}(1) \neq f_{X_2}(1)$

6406532577321. ✖ $X_1$ and $X_2$ are independent.

6406532577322. ✔ $X_1$ and $X_2$ are not independent.

| | |
|---|---|
| **Sub-Section Number :** | 5 |
| **Sub-Section Id :** | 640653112586 |
| **Question Shuffling Allowed :** | No |
| **Is Section Default? :** | null |

**Question Id : 640653770489 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 : 640653770490 Question Type : MCQ 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 :**

6406532577331. ✖ $$f_X(x) = \begin{cases} 4x, & 0 \le x \le 1, \\ 0, & \text{otherwise.} \end{cases}$$

6406532577332. ✖ $$f_X(x) = \begin{cases} 4x, & y \le x \le 1, \\ 0, & \text{otherwise.} \end{cases}$$

6406532577333. ✔ $$f_X(x) = \begin{cases} 4x^3, & 0 \le x \le 1, \\ 0, & \text{otherwise.} \end{cases}$$

6406532577334. ✖ $$f_X(x) = \begin{cases} 4x^3, & y \le x \le 1, \\ 0, & \text{otherwise.} \end{cases}$$

**Question Number : 82 Question Id : 640653770491 Question Type : SA 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 : 640653770492 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 : 640653770493 Question Type : MCQ 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 :**

6406532577336. ✖ X ~ Bernoulli(0.5)

6406532577337. ✖ X ~ Bernoulli(0.2)

6406532577338. ✔ X ~ Binomial(400, 0.8)

6406532577339. ✖ X ~ Binomial(400, 0.2)

**Question Number : 84 Question Id : 640653770494 Question Type : SA 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 : 640653770495 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 $\mu$ 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 : 640653770496 Question Type : MSQ 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 :**

6406532577341. ✔ $P\left(|\overline{X}-\mu| \leq 5\right) \geq 1-\frac{25}{n}$

6406532577342. ✖ $P\left(|\overline{X}-\mu| \leq 5\right) \geq 1-\frac{1}{n}$

6406532577343. ✔ $P\left(|\overline{X}-\mu| \geq 5\right) \leq \frac{25}{n}$

6406532577344. ✖ $P\left(|\overline{X}-\mu| \geq 5\right) \leq \frac{1}{n}$

**Question Number : 86 Question Id : 640653770497 Question Type : SA 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 : 640653770498 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 : 640653770499 Question Type : SA 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 : 640653770500 Question Type : MCQ 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 :**

6406532577347. ✖ $\frac{1}{16}$

6406532577348. ✔ $\frac{1}{8}$

6406532577349. ✖ $\frac{1}{2}$

6406532577350. ✖ $\frac{1}{4}$

**Question Id : 640653770501 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 : 640653770502 Question Type : SA 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 : 640653770503 Question Type : MCQ 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 :**

6406532577352. ✖ There is a positive linear relationship between the variables *X* and *Y* .

6406532577353. ✖ There is a negative linear relationship between the variables *X* and *Y* .

6406532577354. ✔ There is no linear relationship between the variables *X* and *Y*.

6406532577355. ✖ We cannot conclude anything.

# DBMS

| | |
|---|---|
| **Section Id :** | 64065353262 |
| **Section Number :** | 6 |
| **Section type :** | Online |
| **Mandatory or Optional :** | Mandatory |
| **Number of Questions :** | 14 |
| **Number of Questions to be attempted :** | 14 |
| **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 :** | 640653112587 |
| **Question Shuffling Allowed :** | No |
| **Is Section Default? :** | null |

**Question Number : 91 Question Id : 640653770504 Question Type : MCQ Is Question**