Consider the subset $S = \{(1, \alpha, 0), (0, \alpha, 1)\}$ of V_α. Which of the following options is(are) true?

Options :

6406531560420. ✔ S is linearly independent.

6406531560421. ✖ $Span(S) \neq V_\alpha$.

6406531560422. ✔ S forms a basis of V_α.

6406531560423. ✖ $dim(V_\alpha) = 3$

Sem2 Statistics2

Section Id :	64065330310
Section Number :	8
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
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 :	64065367532

Question Shuffling Allowed : No

Is Section Default? : null

Question Number : 159 Question Id : 640653469506 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 : SEMESTER 2: STATISTICS FOR DATA SCIENCE II"

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 :

6406531560424. ✔ YES

6406531560425. ✖ NO

Question Number : 160 Question Id : 640653469507 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) $A=\{a,a+1,\dots,b\}$	$\frac{1}{n},\ x=k$ $n=b-a+1$ $k=a,a+1,\dots,b$	$\begin{cases} 0 & x<0 \\ \frac{k-a+1}{n} & k\le x<k+1 \\ & k=a,a+1,\dots,b-1,b \\ 1 & x\ge n \end{cases}$	$\frac{a+b}{2}$	$\frac{n^2-1}{12}$
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)	${}^nC_k p^k(1-p)^{n-k}$, $k=0,1,\dots,n$	$\begin{cases} 0 & x<0 \\ \sum_{i=0}^{k} {}^nC_i p^i(1-p)^{n-i} & k\le x<k+1 \\ & k=0,1,\dots,n \\ 1 & x\ge n \end{cases}$	np	$np(1-p)$
Geometric(p)	$(1-p)^{k-1}p$, $k=1,\dots,\infty$	$\begin{cases} 0 & x<0 \\ 1-(1-p)^k & k\le x<k+1 \\ & k=1,\dots,\infty \end{cases}$	$\frac{1}{p}$	$\frac{1-p}{p^2}$
Poisson(λ)	$\frac{e^{-\lambda}\lambda^k}{k!}$, $k=0,1,\dots,\infty$	$\begin{cases} 0 & x<0 \\ e^{-\lambda}\sum_{i=0}^{k}\frac{\lambda^i}{i!} & k\le x<k+1 \\ & k=0,1,\dots,\infty \end{cases}$	λ	λ

Continuous random variables:

Distribution	PDF ($f_X(k)$)	CDF ($F_X(x)$)	$E[X]$	Var(X)
Uniform$[a,b]$	$\frac{1}{b-a}, a \leq x \leq b$	$\begin{cases} 0 & x \leq a \\ \frac{x-a}{b-a} & a < x < b \\ 1 & x \geq b \end{cases}$	$\frac{a+b}{2}$	$\frac{(b-a)^2}{12}$
Exp(λ)	$\lambda e^{-\lambda x}, x > 0$	$\begin{cases} 0 & x \leq 0 \\ 1-e^{-\lambda x} & x > 0 \end{cases}$	$\frac{1}{\lambda}$	$\frac{1}{\lambda^2}$
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,

$$P(X \geq c) \leq \frac{\mu}{c}$$

2. **Chebyshev's inequality:** Let X be a discrete random variable with a finite mean μ and a finite variance σ^2. Then,

$$P(\mid X - \mu \mid \geq k\sigma) \leq \frac{1}{k^2}$$

Options :

6406531560426. ✔ Useful Data has been mentioned above.

6406531560427. ✖ This data attachment is just for a reference & not for an evaluation.

Sub-Section Number : 2

Sub-Section Id : 64065367533

Question Shuffling Allowed : Yes

Is Section Default? : null

Question Number : 161 Question Id : 640653469508 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

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

$$f_{XY}(x,y) = \begin{cases} \frac{1}{27}(2x+y), & x, y \in \{0,1,2\}, \\ 0, & \text{otherwise} \end{cases}$$

What is the value of $P(0 \leq X < 1.5 | X > 0)$?

Options :

6406531560428. ✖ $\frac{1}{3}$

6406531560429. ✖ $\frac{1}{9}$

6406531560430. ✔ $\frac{3}{8}$

6406531560431. ✖ $\frac{24}{27}$

Question Number : 162 Question Id : 640653469509 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 $X \sim \text{Uniform}\{-2,-1,0,1,2\}$ and $Y \sim \text{Uniform}\{-1,1\}$ be two independent random variables. Define another random variable $Z = |X| - |Y|$. Find the PMF of Z.

Options :

6406531560432. ✖

z	-1	0	1
$f(z)$	$2/5$	$1/5$	$2/5$

6406531560433. ✖

z	-1	0	1
$f(z)$	$1/10$	$2/5$	$3/10$

6406531560434. ✖

z	-3	-2	-1	0	1	2	3
$f(z)$	1/10	1/10	1/5	1/5	1/5	1/10	1/10

6406531560435. ✔

z	-1	0	1
$f(z)$	$1/5$	$2/5$	$2/5$

Question Number : 163 Question Id : 640653469512 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

Consider a function $f : \mathbb{R} \longrightarrow \mathbb{R}$ such that

$$f(x) = \begin{cases} e^{(1-ax)}, & 0 < x < \infty, \\ 0, & \text{otherwise,} \end{cases}$$

where a is any real constant. Find a such that the function f is a valid density function.

Hint: $\int e^{kx}\, dx = \dfrac{e^{kx}}{k}$

Options :

6406531560438. ✖ $\dfrac{1}{e}$

6406531560439. ✖ $1 - e$

6406531560440. ✖ $\dfrac{2}{e} - \dfrac{1}{e^2}$

6406531560441. ✔ e

Sub-Section Number : 3

Sub-Section Id : 64065367534

Question Shuffling Allowed : Yes

Is Section Default? : null

Question Number : 164 Question Id : 640653469510 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

The joint PMF of two discrete random variables X and Y is given in the following table:

$Y \backslash X$	-1	0
-1	$\frac{1}{12}$	$\frac{1}{\alpha}$
0	$\frac{1}{6}$	$\frac{1}{3}$
1	$\frac{1}{4} - \frac{1}{\alpha}$	$\frac{1}{6}$

In the table, α is any positive real number. Find the value of α such that $\text{Cov}(X, Y) = 0$.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

6

Question Number : 165 Question Id : 640653469511 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

Suppose an unbiased coin is tossed n times. Let Y denote the ratio of the number of heads to the number of tosses. Using Chebyshev's inequality, find the minimum value of n such that the probability that Y lies between 0.4 and 0.6 is at least 0.9.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

250

Sub-Section Number :	4
Sub-Section Id :	64065367535
Question Shuffling Allowed :	No
Is Section Default? :	null

Question Id : 640653469513 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 : (166 to 167)

Question Label : Comprehension

An unbiased coin is tossed three times independently. Let

X represent the number of heads,

Y represent the number of tails after the first toss.

Define another random variable $U = XY$.

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 166 Question Id : 640653469514 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 PMF of U.

Options :

6406531560442. ✖

u	0	1	2
$f(u)$	1/4	1/4	1/2

6406531560443. ✖

u	0	1	2	3
$f(u)$	1/8	1/4	1/2	1/8

6406531560444. ✔

u	0	1	2
$f(u)$	3/8	1/4	3/8

6406531560445. ✖

u	0	2
$f(u)$	1/4	3/4

Question Number : 167 Question Id : 640653469515 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

If $P(U = a | U \geq 1) = \frac{3}{5}$,

then find the value of a.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

2

Question Id : 640653469516 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 : (168 to 169)

Question Label : Comprehension

Urn I contains three balls numbered 0, 1, and 2, and Urn II contains three balls numbered 1 , 2, and 3. One ball from each of the urns is drawn randomly and independently. Let

X_1 denote the number on the ball drawn from Urn I,

X_2 denote the number on the ball drawn from Urn-II.

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 168 Question Id : 640653469517 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

Suppose $Y = X_1 - X_2$. Find the value of $P(Y \geq 0)$. 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 :

0.31 to 0.35

Question Number : 169 Question Id : 640653469518 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

Suppose $Z = \max(X_1, X_2)$.

Find the value of $P(Z \leq 1)$.

Options :

6406531560448. ✖ $\frac{2}{3}$

6406531560449. ✖ $\frac{1}{9}$

6406531560450. ✔ $\frac{2}{9}$

6406531560451. ✖ $\frac{4}{9}$

Question Id : 640653469519 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 : (170 to 171)

Question Label : Comprehension

Two matches are played between John and Walter. The probability that John wins the first match against Walter is 0.75. The probability that John wins the second match given that he won the first is 0.9, and the probability that John wins the second match given that he lost the first is 0.5. No match ends in a draw. Let X_1, X_2 be two random variables defined as

$$X_i = \begin{cases} 1 & \text{if John wins the } i^{th} \text{ match} \\ 0 & \text{if Walter wins the } i^{th} \text{ match} \end{cases}$$

for $i \in \{1, 2\}$.

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 170 Question Id : 640653469520 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 joint PMF of X_1 and X_2.

Options :

6406531560452. ✖

X_2 \ X_1	0	1
0	$\frac{1}{8}$	$\frac{1}{8}$
1	$\frac{3}{40}$	$\frac{27}{40}$

6406531560453. ✖

X_2 \ X_1	0	1
0	$\frac{1}{8}$	$\frac{27}{40}$
1	$\frac{1}{8}$	$\frac{3}{40}$

6406531560454. ✔

$X_2 \backslash X_1$	0	1
0	$\frac{1}{8}$	$\frac{3}{40}$
1	$\frac{1}{8}$	$\frac{27}{40}$

6406531560455. ✖

$X_2 \backslash X_1$	0	1
0	$\frac{1}{8}$	$\frac{1}{8}$
1	$\frac{27}{40}$	$\frac{3}{40}$

Question Number : 171 Question Id : 640653469521 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 probability that John loses the second match. Enter the answer correct to one decimal place.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

0.19 to 0.21

Question Id : 640653469522 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 : (172 to 173)

Question Label : Comprehension

From a well-shuffled deck of 52 cards, one card is drawn randomly. Let X and Y be defined as

$$X = \begin{cases} 0, & \text{if the drawn card is a red color card(Hearts or Diamonds)}, \\ 1, & \text{otherwise} \end{cases}$$

$$Y = \begin{cases} 0, & \text{if the drawn card is a face card(J or Q or K)}, \\ 1, & \text{otherwise} \end{cases}$$

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 172 Question Id : 640653469523 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 $E[X^2Y^2]$. Enter the answer correct to three decimal places.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

0.36 to 0.41

Question Number : 173 Question Id : 640653469524 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

Find $\text{Var}(XY)$.

Options :

6406531560458. ✖ $\frac{69}{676}$

6406531560459. ✔ $\frac{40}{169}$

6406531560460. ✖ 0

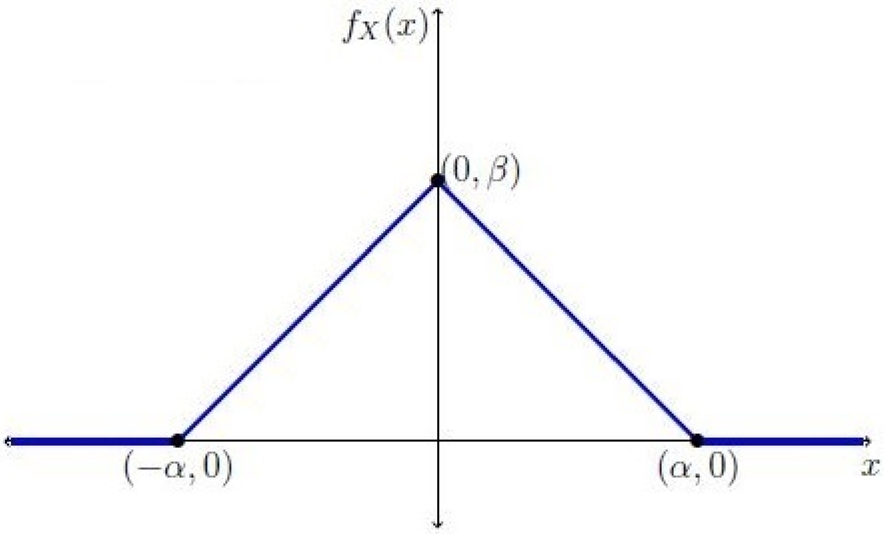
6406531560461. ✖ $\frac{1}{2704}$

Question Id : 640653469525 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 : (174 to 175)

Question Label : Comprehension

The graph of a probability density function ($f_X(x)$) of a continuous random variable (X) is shown below:



5.1: Graph of a pdf of X

where $\alpha, \beta \in \mathbb{R}$.

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 174 Question Id : 640653469526 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

Which of the following is true?

Options :

6406531560462. ✖ $\alpha\beta = \frac{1}{2}$

6406531560463. ✔ $\alpha\beta = 1$

6406531560464. ✖ $\alpha\beta = 2$

6406531560465. ✖ $\frac{1}{\alpha} + \frac{1}{\beta} = 1$

Question Number : 175 Question Id : 640653469527 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 $P\left(|X| > \frac{\alpha}{2}\right)$. 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 :

0.23 to 0.27