1

Question Number : 14 Question Id : 640653520985 Question Type : SA Calculator : None

Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1

Question Label : Short Answer Question

If the $m \times n$ matrix B is the matrix of T with respect to some basis for W and the standard ordered basis for $\mathbb{R}^2$, then what is $m + n$?

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

3

Statistics2

Section Id :	64065333930
Section Number :	2
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	Yes

Clear Response :

Maximum Instruction Time : 0

Sub-Section Number : 1

Sub-Section Id : 64065373907

Question Shuffling Allowed : No

Is Section Default? : null

Question Number : 15 Question Id : 640653520995 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 "STATISTICS FOR DATA SCIENCE 2"

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 :

6406531736572. ✔ YES

6406531736573. ✖ NO

Question Number : 16 Question Id : 640653520996 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) $A=\{a,a+1,\ldots,b\}$	$\frac{1}{n}$, $x=k$ $n=b-a+1$ $k=a,a+1,\ldots,b$	$\begin{cases}0 & x<0\\ \frac{k-a+1}{n} & k\le x<k+1\\ & k=a,a+1,\ldots,b-1,b\\ 1 & x\ge n\end{cases}$	$\frac{a+b}{2}$	$\frac{n^2-1}{12}$
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 ($F_X(x)$)	$E[X]$	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 $E[X] = \mu, \text{Var}(X) = \sigma^2$.

   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 $E[X] = \mu, \text{Var}(X) = \sigma^2$.

   Define $Y = X_1 + X_2 + \ldots + X_n$. Then,
$$\frac{Y - n\mu}{\sqrt{n}\sigma} \approx \text{Normal}(0, 1).$$

5. Use the following values of F_Z if required:
   $F_Z(\frac{-5}{6}) = 0.20,\ F_Z(\frac{5}{6}) = 0.80,\ F_Z(2) = 0.977,\ F_Z(-2) = 0.023,\ F_Z(1) = 0.84,$
   $F_Z(\frac{2}{3}) = 0.75,\ F_Z(\frac{-2}{3}) = 0.25,\ F_Z(\frac{5}{2}) = 0.994,\ F_Z(\frac{5}{6}) = 0.797$

6. $\int x^n dx = \frac{x^{n+1}}{n+1}$.

Options :

6406531736574. ✔ Useful Data has been mentioned above.

6406531736575. ✖ This data attachment is just for a reference & not for an evaluation.

Sub-Section Number : 2

Sub-Section Id : 64065373908

Question Shuffling Allowed : Yes

Is Section Default? : null

Question Number : 17 Question Id : 640653521000 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 $(X,Y) \sim \text{Uniform}(D)$, where $D = \{(x,y) : 2 < x+y < 4, x > 0, y > 0\}$. Find $P(Y < 2)$.

Options :

6406531736584. ✖ $\frac{1}{3}$

6406531736585. ✔ $\frac{2}{3}$

6406531736586. ✖ $\frac{1}{4}$

6406531736587. ✖ $\frac{3}{4}$

Question Number : 18 Question Id : 640653521003 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 $X_1, X_2, \ldots, X_n$ be i.i.d. X with mean $\mu = 0$ and variance $\sigma^2 = 1$. Using Chebyshev's inequality, what should be the minimum value of n such that the probability that the sample mean $\frac{X_1 + X_2 + \cdots + X_n}{n}$ lies between -0.5 and 0.5 is at least 0.95?

Options :

6406531736590. ✖ 40

6406531736591. ✔ 80

6406531736592. ✖ 100

6406531736593. ✖ 95

Sub-Section Number : 3

Sub-Section Id : 64065373909

Question Shuffling Allowed : Yes

Is Section Default? : null

Question Number : 19 Question Id : 640653521001 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 probability density function of a continuous random variable X is given by

$$f(x) = \begin{cases} \frac{6x+1}{10}, & \text{if } 1 \leq x \leq 2 \\ 0, & \text{otherwise} \end{cases}$$

Find the value of $E[X]$. 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 :

1.53 to 1.57

Question Number : 20 Question Id : 640653521002 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 $X_1, X_2, X_3, X_4 \sim$ i.i.d. Bernoulli$\left(\frac{2}{3}\right)$. Define a random variable $Y = 2X_1 + 3X_2 + 4X_3 + 5X_4$. Find Var$(Y)$.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

12

Sub-Section Number :	4
Sub-Section Id :	64065373910
Question Shuffling Allowed :	No
Is Section Default? :	null

Question Id : 640653520997 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 : (21 to 22)

Question Label : Comprehension

Suppose a fair die is thrown twice independently. Let a random variable *X* denote the number obtained on the first die and a random variable Y denote the number obtained on the second die. Define *Z* =| *7* − X − Y |.

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 21 Question Id : 640653520998 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 1

Question Label : Multiple Choice Question

Find the range of *Z*.

Options :

6406531736576. ✔ $T_Z = \{0, 1, 2, 3, 4, 5\}$

6406531736577. ✖ $T_Z = \{1, 2, 3, 4, 5\}$

6406531736578. ✖ $T_Z = \{1, 2, 3, 4, 5, 6\}$

6406531736579. ✖ $T_Z = \{0, 1, 2, 3, 4, 5, 6\}$

Question Number : 22 Question Id : 640653520999 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 the value of $P(0 < Z < 3)$.

Options :

6406531736580. ✖ $\frac{5}{18}$

6406531736581. ✖ $\frac{5}{6}$

6406531736582. ✔ $\frac{1}{2}$

6406531736583. ✖ $\frac{2}{3}$

Sub-Section Number :	5
Sub-Section Id :	64065373911
Question Shuffling Allowed :	No
Is Section Default? :	null

Question Id : 640653521004 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 : (23 to 24)

Question Label : Comprehension

Kunal throws a dart onto a circular board. Let a random variable *X* denote the distance from the center to the point where the dart hits the board. Suppose the PDF of *X* is

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

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 23 Question Id : 640653521005 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 :

6

Question Number : 24 Question Id : 640653521006 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 $P(|X - 0.5| \leq 0.25)$. 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 :

0.66 to 0.72

Question Id : 640653521007 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 : (25 to 26)

Question Label : Comprehension

30% of the total candidates in a competitive exam were boys and 70% were girls. The distribution of the marks of the boys is Normal(60,36) and the distribution of the marks of the girls is Normal(55,49).

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 25 Question Id : 640653521008 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 PDF of the marks of a candidate chosen uniformly at random.

Options :

6406531736596. ✔

$$\frac{1}{20\sqrt{2\pi}}\left(\exp\left(\frac{-(y-60)^2}{72}\right)+2\exp\left(\frac{-(y-55)^2}{98}\right)\right)$$

6406531736597. ✖ $$\frac{1}{20\sqrt{2\pi}}\left(2\exp\left(\frac{-(y-60)^2}{36}\right)+\exp\left(\frac{-(y-55)^2}{49}\right)\right)$$

6406531736598. ✖ $$\frac{7}{60\sqrt{2\pi}}\exp\left(\frac{-(y-60)^2}{72}\right)+\frac{3}{70\sqrt{2\pi}}\exp\left(\frac{-(y-55)^2}{98}\right)$$

6406531736599. ✖ $$\frac{1}{2\sqrt{2\pi}}\left(\frac{1}{6}\exp\left(\frac{-(y-60)^2}{72}\right)+\frac{1}{7}\exp\left(\frac{-(y-55)^2}{98}\right)\right)$$

Question Number : 26 Question Id : 640653521009 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

If a randomly selected candidate got 60 marks, what is the probability that the selected candidate is a boy?

Options :

6406531736600. ✖ $$\frac{2}{2+\exp\left(\frac{-25}{49}\right)}$$

6406531736601. ✖ $$\frac{2}{2+\exp\left(\frac{-25}{98}\right)}$$

6406531736602. ✖ $$\frac{1}{20\sqrt{2\pi}}$$

6406531736603. ✔

$$\frac{1}{1+2\exp\left(\frac{-25}{98}\right)}$$

Question Id : 640653521010 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 : (27 to 28)

Question Label : Comprehension

At a particular petrol pump, petrol is stocked in a bulk tank each week. Let a random variable *X* denote the proportion of the tank's capacity that is stocked in a given week, and let *Y* denote the proportion of the tank's capacity that is sold in the same week. The petrol pump cannot sell more than what was stocked in a given week. Assume the joint density function of *X* and *Y* is given by

$$f_{XY}(x,y)=\begin{cases}cxy, & \text{if } 0\le y\le x\le 2,\\ 0, & \text{otherwise.}\end{cases}$$

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 27 Question Id : 640653521011 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 *c*. 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 :

0.48 to 0.52

Question Number : 28 Question Id : 640653521012 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 probability that the amount of petrol sold in a given week is less than half the amount stocked in that week. 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

Question Id : 640653521013 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 : (29 to 30)

Question Label : Comprehension

In a manufacturing company, each machine produces 600 bottles daily. If a bottle is selected uniformly at random, then the probability that the bottle is of good quality is 60%.

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 29 Question Id : 640653521014 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 a sample of 20 bottles is selected for a quality inspection. Let a random variable *X* denote the total number of bottles that are of bad quality in the selected sample. Which of the following is true?

Options :

6406531736606. ✖ $X \sim \text{Binomial}(600, 0.6)$

6406531736607. ✖ $X \sim \text{Binomial}(20, 0.6)$

6406531736608. ✔ $X \sim \text{Binomial}(20, 0.4)$

6406531736609. ✖ $X \sim \text{Binomial}(600, 0.4)$

Question Number : 30 Question Id : 640653521015 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 the approximate probability that a machine will produce more than 370 bottles that are of good quality on a particular day. 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 :

0.17 to 0.23

Question Id : 640653521016 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 : (31 to 32)

Question Label : Comprehension

Let X be a random variable with PMF as follows:

x	0	1	2
$f_X(x)$	1/4	1/2	1/4

Suppose $X_1, X_2 \sim$ i.i.d. X. Define a random variable $Y = X_1 + X_2$.

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 31 Question Id : 640653521017 Question Type : MSQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3 Selectable Option : 0

Question Label : Multiple Select Question

Which of the following option*(s)* is (are) true about the moment generating function of the random variable *Y* ?

Options :

6406531736611. ✔ $M_Y(\lambda) = M_{X_1}(\lambda) \times M_{X_2}(\lambda)$

6406531736612. ✖ $M_Y(\lambda) = M_{X_1}(\lambda) + M_{X_2}(\lambda)$

6406531736613. ✖ $M_Y(\lambda) = \frac{1}{2} + e^{\lambda} + \frac{1}{2}e^{2\lambda}$

6406531736614. ✖ $M_Y(\lambda) = \frac{1}{16} + \frac{1}{8}e^{\lambda} + \frac{3}{8}e^{2\lambda} + \frac{3}{8}e^{3\lambda} + \frac{1}{16}e^{4\lambda}$

6406531736615. ✔ $$M_Y(\lambda) = \frac{1}{16} + \frac{1}{4}e^{\lambda} + \frac{3}{8}e^{2\lambda} + \frac{1}{4}e^{3\lambda} + \frac{1}{16}e^{4\lambda}$$

Question Number : 32 Question Id : 640653521018 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 expected value of Y .

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

2

CT

Section Id :	64065333931
Section Number :	3
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
Group All Questions :	No
Enable Mark as Answered Mark for Review and	Yes