Text Areas : PlainText

Possible Answers :

-5

Statistics 2

Section Id :	64065322132
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 Clear Response :	Yes
Maximum Instruction Time :	0
Sub-Section Number :	1
Sub-Section Id :	64065350362
Question Shuffling Allowed :	No

Question Number : 23 Question Id : 640653351236 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 :

6406531165775. ✔ Yes

6406531165776. ✖ No

Question Number : 24 Question Id : 640653351237 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 ($F_X(x)$)	$E[X]$	$\mathrm{Var}(X)$
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,
$$\frac{Y - n\mu}{\sqrt{n}\sigma} \approx \text{Normal}(0,1).$$

Options :

6406531165777. ✔ Useful Data has been mentioned above.

6406531165778. ✖ This data attachment is just for a reference & not for an evaluation.

Sub-Section Number : 2

Sub-Section Id : 64065350363

Question Shuffling Allowed : Yes

Question Number : 25 Question Id : 640653351249 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

Consider a random variable X with the following PMF:

X	0	1	2	3
$p_X(x)$	1/8	1/4	1/8	1/2

Find the moment generating function of X.

Options :

6406531165793. ✖ $M_X(\lambda) = \frac{1}{4}e^{-\lambda} + \frac{1}{8}e^{-2\lambda} + \frac{1}{2}e^{-3\lambda}$

6406531165794. ✖ $M_X(\lambda) = \frac{1}{8} + \frac{1}{4}e^{\lambda} + \frac{1}{8}e^{2\lambda} + \frac{1}{2}e^{3\lambda}$

6406531165795. ✔ $M_X(\lambda) = \frac{1}{8} + \frac{1}{4}e^{-\lambda} + \frac{1}{8}e^{-2\lambda} + \frac{1}{2}e^{-3\lambda}$

6406531165796. ✖ $M_X(\lambda) = \frac{1}{4}e^{\lambda} + \frac{1}{8}e^{2\lambda} + \frac{1}{2}e^{3\lambda}$

Sub-Section Number : 3

Sub-Section Id : 64065350364

Question Shuffling Allowed : Yes

Question Number : 26 Question Id : 640653351264 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 $X_1, X_2, \ldots, X_{50} \sim$ i.i.d. Poisson(2) and let $Y = \sum_{i=1}^{50} X_i$. Using Central Limit theorem, find the value of $P(Y > 50)$.

Options :

6406531165820. ✔ $1 - F_z(-5)$

6406531165821. ✖ $1 - F_z(5)$

6406531165822. ✖ $F_z(-0.5)$

6406531165823. ✖ $1 - F_z(-0.5)$

Sub-Section Number :	4
Sub-Section Id :	64065350365
Question Shuffling Allowed :	Yes

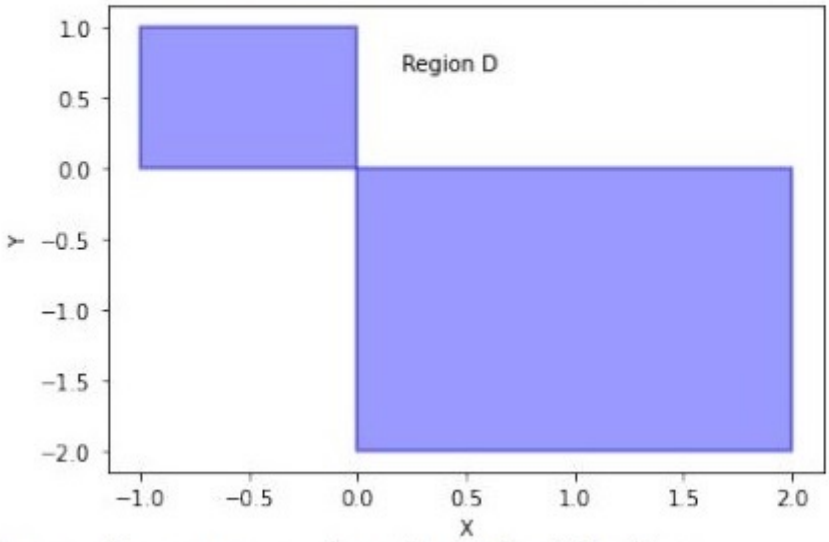
Question Number : 27 Question Id : 640653351250 Question Type : MSQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

Question Label : Multiple Select Question

Suppose random variables X and Y are uniformly distributed over the region D, where

$$D = \{(x, y) : [0, 2] \times [0, -2] \cup [-1, 0] \times [0, 1]\}$$



Choose the correct options from the following:

Options :

6406531165797. ✖ $$f_{XY}(x, y) = \begin{cases} 4, & 0 < x < 2, -2 < y < 0 \\ 1, & -1 < x < 0, 0 < y < 1 \\ 0, & \text{otherwise} \end{cases}$$

6406531165798. ✔ $$f_{XY}(x, y) = \begin{cases} \frac{1}{5}, & x, y \in D \\ 0, & \text{otherwise} \end{cases}$$

6406531165799. ✔ $f_{Y|X=1}(-1) = 0.5$

6406531165800. ✖ $f_{Y|X=1}(-1) = 0$

6406531165801. ✖ $f_{Y|X=1}(-1) = 0.625$

Sub-Section Number : 5

Sub-Section Id : 64065350366

Question Shuffling Allowed : No

Question Id : 640653351242 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Calculator : None Response Time : N.A

Think Time : N.A Minimum Instruction Time : 0

Question Numbers : (28 to 30)

Question Label : Comprehension

Consider a sample 0, 1, 0, 1, 1, 1, 0, 1, 0, 1 from Bernoulli(0.5) distribution.

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 28 Question Id : 640653351243 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

Compute empirical distribution of the sample.

Options :

6406531165782. ✖ $p(0) = 0.3, p(1) = 0.7$

6406531165783. ✔ $p(0) = 0.4, p(1) = 0.6$

6406531165784. ✖ $p(0) = 0.6, p(1) = 0.4$

6406531165785. ✖ $p(0) = 0.7, p(1) = 0.3$

Question Number : 29 Question Id : 640653351244 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

Compute distribution mean. 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 Number : 30 Question Id : 640653351245 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

Compute sample mean. 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 :

0.6

Question Id : 640653351246 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No 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 continuous random variable with PDF

$$f_X(x) = \begin{cases} 2/3, & 0 < x < 1 \\ 1/3, & 2 < x < 3 \\ 0, & \text{otherwise} \end{cases}$$

Based on the above data, answer the given subquestions.

Sub questions

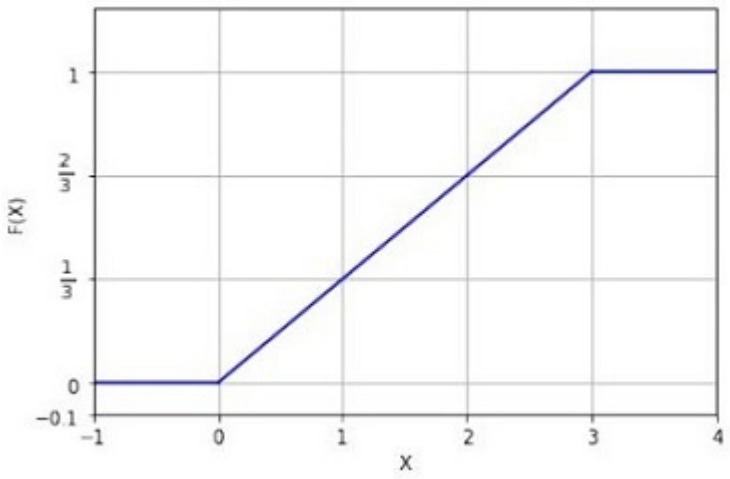
Question Number : 31 Question Id : 640653351247 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 2

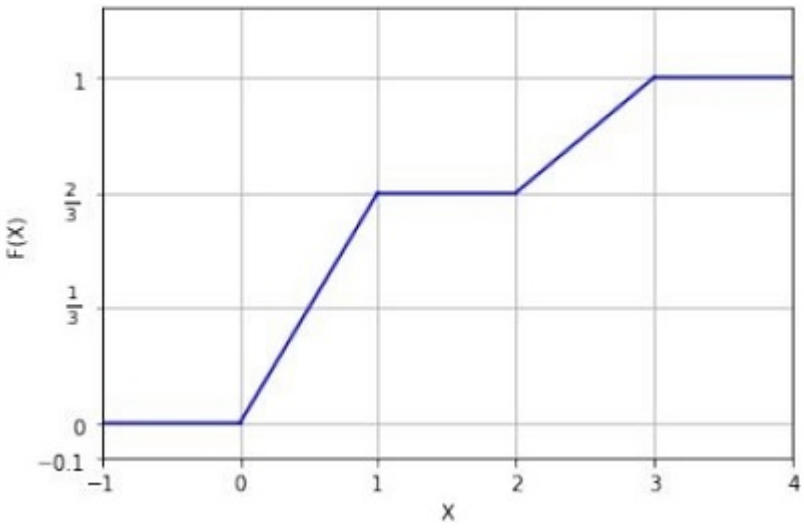
Question Label : Multiple Choice Question

Which among the following represent the cumulative distribution function (CDF) of X?

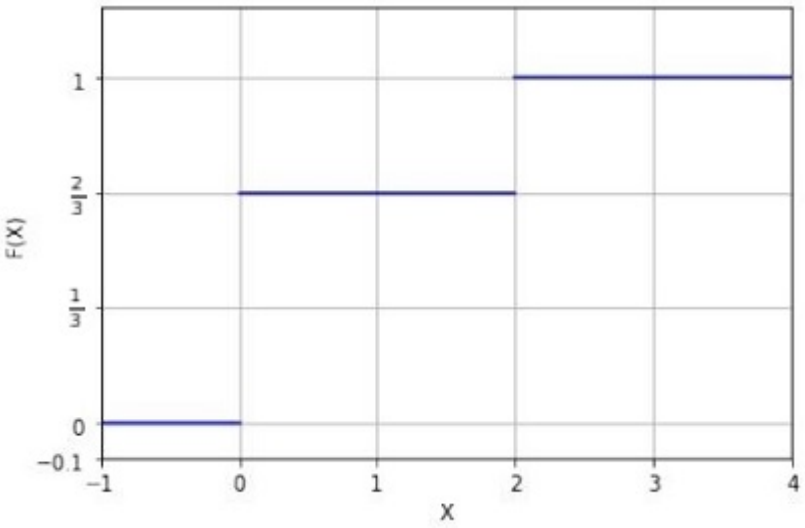
Options :



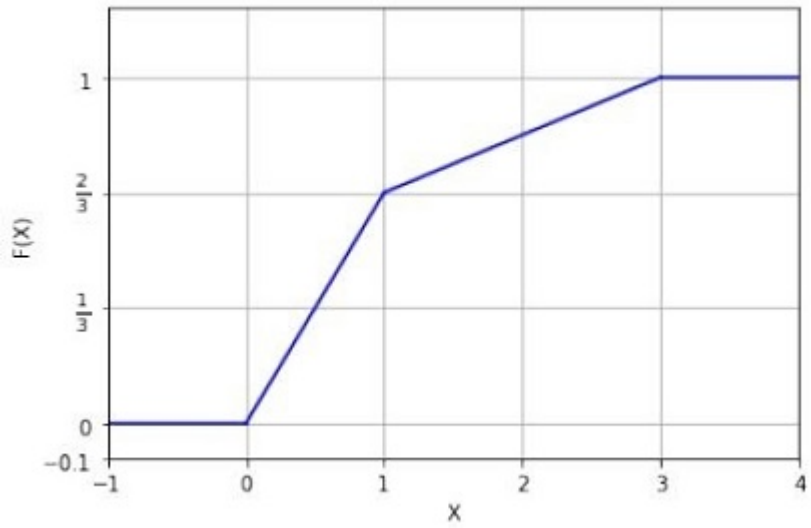
6406531165788. ✖



6406531165789. ✔



6406531165790. ✖



6406531165791.

Question Number : 32 Question Id : 640653351248 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

Find the value of P(X ≤ 2.5). 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 0.85

Sub-Section Number :	6
Sub-Section Id :	64065350367
Question Shuffling Allowed :	No

Question Id : 640653351238 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Question Numbers : (33 to 35)

Question Label : Comprehension

Let the random variables X and Y have the following joint density function:

$$f_{XY}(x,y) = \begin{cases} 1 & \text{for } 0 \le x < 1\ ,\ 0 \le y < 1 \\ 0 & \text{otherwise} \end{cases}$$

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 33 Question Id : 640653351239 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

Calculate $P\left(0 < X < \frac{1}{2}, \frac{1}{4} < Y < \frac{1}{2}\right)$.

Enter the answer correct to three decimal places.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

0.125

Question Number : 34 Question Id : 640653351240 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

Find $P\left(0 < X < \frac{1}{2}\right)$. 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 Number : 35 Question Id : 640653351241 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 $P(X < 2Y)$. Enter the answer correct to two decimal places.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

0.75

Sub-Section Number :	7
Sub-Section Id :	64065350368
Question Shuffling Allowed :	No

Question Id : 640653351258 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Question Numbers : (36 to 37)

Question Label : Comprehension

Consider a sample of i.i.d. random variables ($X_1, X_2, \ldots, X_n$), where each of the X_i's follows Uniform(−0.5, 0.5) distribution.

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 36 Question Id : 640653351259 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

Compute the expected value and variance of sample mean, $\overline{X} = \frac{X_1 + \ldots + X_n}{n}$.

Options :

6406531165810. ✖ $E[\overline{X}] = 0$ and $\text{Var}[\overline{X}] = 0$

6406531165811. ✖ $E[\overline{X}] = 0$ and $\text{Var}[\overline{X}] = \frac{1}{12}$

6406531165812. ✖ $E[\overline{X}] = \frac{1}{2}$ and $\text{Var}[\overline{X}] = \frac{1}{n}$

6406531165813. ✔ $E[\overline{X}] = 0$ and $\text{Var}[\overline{X}] = \frac{1}{12\,n}$

Question Number : 37 Question Id : 640653351260 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 minimum value of n such that probability that the sample mean, $\overline{X}$ is within 0.2 of the distribution mean is at least 0.9 using Weak Law of Large numbers.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

21

Question Id : 640653351261 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Question Numbers : (38 to 39)

Question Label : Comprehension

Let X be a continuous uniform random variable on $[0, 1]$ and $Y = \frac{1}{X}$.

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 38 Question Id : 640653351262 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 probability density function of Y.

Options :

6406531165815. ✖ $f_Y(y) = 1 - \frac{1}{y}$, for $0 \leq y < \infty$

6406531165816. ✖ $f_Y(y) = 1 - \frac{1}{y}, \text{ for } 1 \leq y < \infty$

6406531165817. ✖ $f_Y(y) = \frac{1}{y^2}, \text{ for } 0 \leq y < \infty$

6406531165818. ✔ $f_Y(y) = \frac{1}{y^2}, \text{ for } 1 \leq y < \infty$

Question Number : 39 Question Id : 640653351263 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 P($Y \leq 2$). 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

Sub-Section Number :	8
Sub-Section Id :	64065350369
Question Shuffling Allowed :	No

Question Id : 640653351251 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Question Numbers : (40 to 41)

Question Label : Comprehension

30% of the total players in IPL 2022 are uncapped (i.e., they have not played any international games) and 70% are capped (i.e., they have played at least 1 international game). Suppose the runs scored by the capped players is Normal(60, 25) and the runs scored by the uncapped players is Normal(55,36).

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 40 Question Id : 640653351252 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 distribution of runs of a randomly chosen player.

Options :

6406531165802. ✖ $\frac{3}{25\sqrt{2\pi}}\exp\left(\frac{-(y-60)^2}{50}\right)+\frac{1}{15\sqrt{2\pi}}\exp\left(\frac{-(y-55)^2}{72}\right)$

6406531165803. ✔ $\frac{7}{50\sqrt{2\pi}}\exp\left(\frac{-(y-60)^2}{50}\right)+\frac{1}{20\sqrt{2\pi}}\exp\left(\frac{-(y-55)^2}{72}\right)$

6406531165804. ✖ $\frac{3}{25\sqrt{2\pi}}\exp\left(\frac{-(y-60)^2}{50}\right)+\frac{7}{15\sqrt{2\pi}}\exp\left(\frac{-(y-55)^2}{72}\right)$

6406531165805. ✖ $\frac{7}{25\sqrt{2\pi}}\exp\left(\frac{-(y-60)^2}{50}\right)+\frac{1}{15\sqrt{2\pi}}\exp\left(\frac{-(y-55)^2}{72}\right)$

Question Number : 41 Question Id : 640653351253 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

If a randomly selected player scored 60 runs, what is the probability that the selected candidate is a capped player? 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 :

0.77 to 0.82

Question Id : 640653351254 Question Type : COMPREHENSION Sub Question Shuffling Allowed : No Group Comprehension Questions : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Question Numbers : (42 to 44)

Question Label : Comprehension

Suppose the time to failure of device *A* is exponentially distributed with parameter α. Suppose the time to failure of device *B* is exponentially distributed with parameter β. Let *X* and *Y* denote the time to failure of Devices *A* and *B*, respectively. The joint pdf of *X* and *Y* is given by

$$f_{XY}(x,y) = \begin{cases} ke^{-(4x+5y)} & \text{if } x > 0, y > 0 \\ 0 & \text{otherwise} \end{cases}$$

Sub questions

Question Number : 42 Question Id : 640653351255 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 :

20

Question Number : 43 Question Id : 640653351256 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

Find the value of $\alpha + \beta$.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

9

Question Number : 44 Question Id : 640653351257 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 Device *B* will last longer when compared to Device *A*.

Enter the answer correct to two decimal places.

$$\underline{\text{Hint:}}\ \text{Use}\ \int_a^b e^{nx}\,dx = \left.\frac{e^{nx}}{n}\right|_a^b$$

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

0.42 to 0.46

CT

Section Id :	64065322133
Section Number :	3
Section type :	Online
Mandatory or Optional :	Mandatory
Number of Questions :	16
Number of Questions to be attempted :	16
Section Marks :	50
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 :	64065350370
Question Shuffling Allowed :	No

Question Number : 45 Question Id : 640653351265 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 0