Let $P_W : \mathbb{R}^4 \to W$ denote the projection map. What is the nullity of P_W?

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

2

Question Number : 26 Question Id : 640653586925 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 $P_W(0, 1, 0, 1) = (a, b, c, d)$, what is $3(a + b + c + d)$?

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

2

Statistics2

Section Id :	64065339709
Section Number :	3
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 :	64065384332
Question Shuffling Allowed :	No
Is Section Default? :	null

Question Number : 27 Question Id : 640653586928 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 :

6406531958456. ✔ YES

6406531958457. ✖ NO

Question Number : 28 Question Id : 640653586929 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) $A=\{a,a+1,\ldots,b\}$	$\frac{1}{n}, \quad x=k$ $n=b-a+1$ $k=a,a+1,\ldots,b$	$\begin{cases}0 & x<0\\ \frac{k-a+1}{n} & k\le x<k+1\\ & k=a,a+1,\ldots,b-1,b\\ 1 & x\ge n\end{cases}$	$\frac{a+b}{2}$	$\frac{n^2-1}{12}$
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,

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

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

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

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,

$$P(|\overline{X} - \mu| > \delta) \leq \frac{\sigma^2}{n\delta^2}$$

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,

$$\frac{Y - n\mu}{\sqrt{n}\sigma} \approx \text{Normal}(0, 1).$$

Useful data:

1. Use the following values of F_Z if required:
   $F_Z(1.40) = 0.9192, F_Z(1.41) = 0.9207, F_Z(1.42) = 0.9222$
2. $\int x^n dx = \frac{x^{n+1}}{n+1}$.

Options :

6406531958458. ✔ Useful Data has been mentioned above

6406531958459. ✖ This data attachment is just for a reference & not for an evaluation.

Sub-Section Number :	2
Sub-Section Id :	64065384333
Question Shuffling Allowed :	Yes
Is Section Default? :	null

Question Number : 29 Question Id : 640653586930 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 $X, Y, Z \sim$ i.i.d. Geometric $\left(\frac{1}{2}\right)$. Define a new random variable $U = \min(X, Y, Z)$.

What is the value of $\frac{1}{P(U \geq 3)}$?

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

64

Sub-Section Number :	3
Sub-Section Id :	64065384334
Question Shuffling Allowed :	Yes
Is Section Default? :	null

Question Number : 30 Question Id : 640653586931 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 $X \sim$ Bernoulli(0.4) and $(Y|X = x) \sim$ Uniform$[x - 1, x + 1]$. Find the density of Y.

Options :

6406531958461. ✖

$$f_Y(y) = \begin{cases} \frac{1}{3}, & -1 \leq y \leq 2, \\ 0, & \text{otherwise.} \end{cases}$$

6406531958462. ✔

$$f_Y(y) = \begin{cases} 0.3, & -1 \le y < 0, \\ 0.5, & 0 \le y < 1, \\ 0.2, & 1 \le y < 2, \\ 0, & \text{otherwise.} \end{cases}$$

6406531958463. ✖

$$f_Y(y) = \begin{cases} 0.2, & -1 \le y < 0, \\ 0.5, & 0 \le y < 1, \\ 0.3, & 1 \le y < 2, \\ 0, & \text{otherwise.} \end{cases}$$

6406531958464. ✖

$$f_Y(y) = \begin{cases} 0.5, & -1 \le y \le 1, \\ 0, & \text{otherwise.} \end{cases}$$

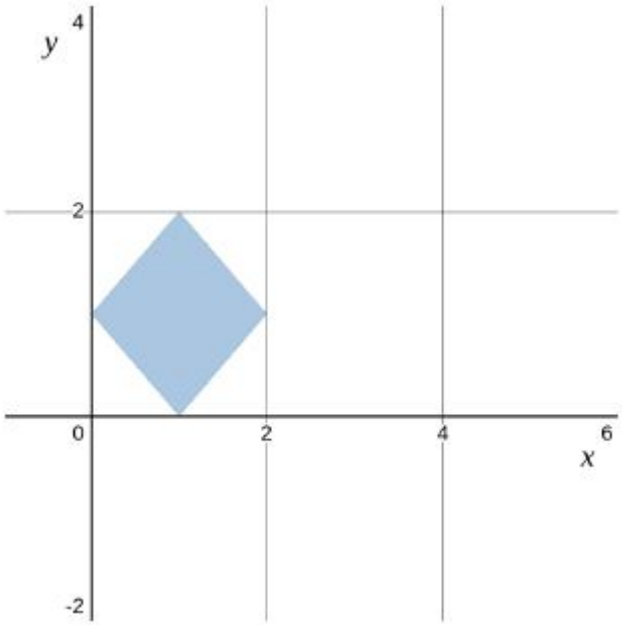
Question Number : 31 Question Id : 640653586932 Question Type : MCQ Is Question Mandatory : No Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 3

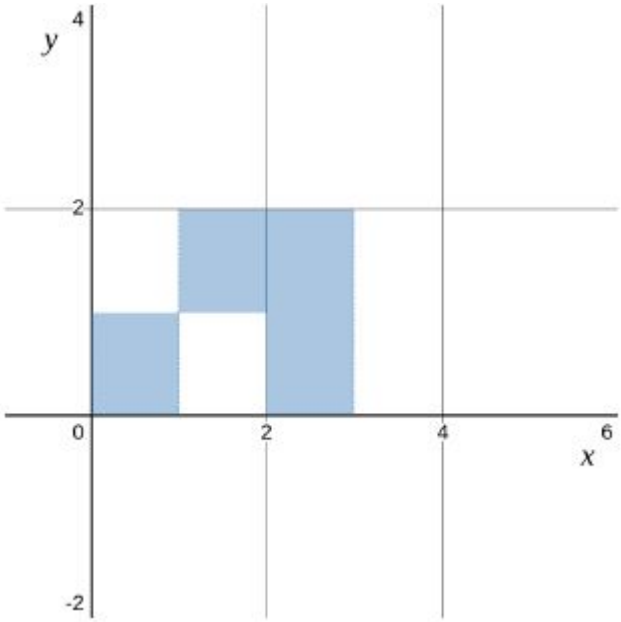
Question Label : Multiple Choice Question

Let $(X, Y) \sim \text{Uniform}(D)$. Which of the following may represent a region D such that X and Y are independent?

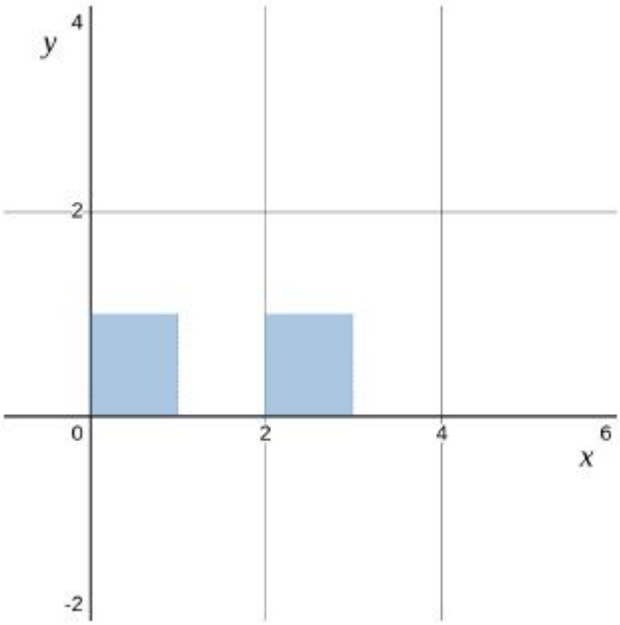
Options :



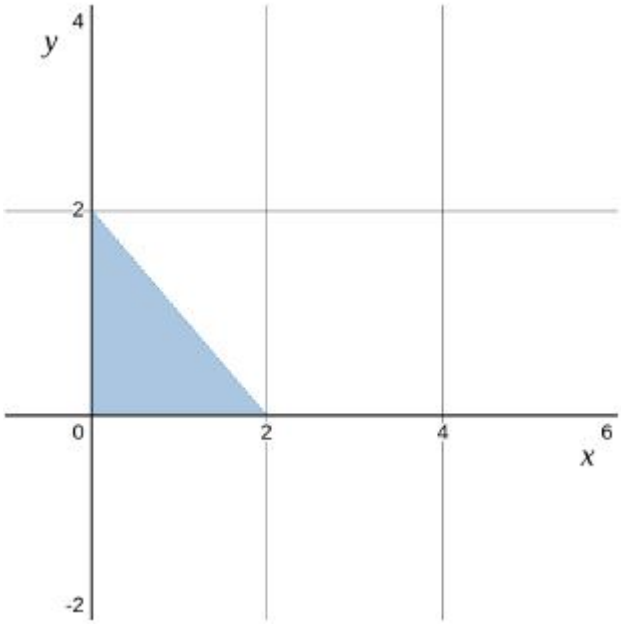
6406531958465. ✖



6406531958466. ✖



6406531958467. ✔



6406531958468. ✖

Question Number : 32 Question Id : 640653586934 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 is a discrete random variable and has moment generating function

$$M_X(\lambda) = \frac{1}{7} + \frac{3}{7}e^{2\lambda} + \frac{2}{7}e^{4\lambda} + \frac{1}{7}e^{6\lambda}.$$

What is the PMF of X?

Options :

x	1	2	4	6
$f_X(x)$	1/7	3/7	2/7	1/7

6406531958473. ✖

x	0	2	4	6
$f_X(x)$	1/7	3/7	2/7	1/7

6406531958474. ✔

6406531958475. ✖

x	0	2	4	6
$f_X(x)$	1/7	3/7	1/7	2/7

6406531958476. ✖

x	1	2	4	6
$f_X(x)$	1/7	3/7	1/7	2/7

Sub-Section Number : 4

Sub-Section Id : 64065384335

Question Shuffling Allowed : Yes

Is Section Default? : null

Question Number : 33 Question Id : 640653586933 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

Suppose $X_1, X_2, X_3, X_4 \sim$ i.i.d X such that $E[X] = 10$ and $\text{Var}[X] = 4$. Define a random variable $S = 3X_1 - 2X_2 - X_3 + 2X_4$. Choose the correct option(s) from below:

Options :

6406531958469. ✔ $E[S] = 20$

6406531958470. ✖ $\text{Var}[S] = 32$

6406531958471. ✔ $\text{Var}[S] = 72$

6406531958472. ✖ $E[S] = 180$

Sub-Section Number : 5

Sub-Section Id : 64065384336

Question Shuffling Allowed : No

Is Section Default? : null

Question Id : 640653586935 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 : (34 to 35)

Question Label : Comprehension

A weather forecaster wants to predict the rainfall in a local area in the month of July. Suppose a random variable X represents the amount of rainfall (in inches) in the local area and the PDF of X is

$$f(x) = \begin{cases} ke^{-x/20}, & 0 < x < \infty, \\ 0, & \text{otherwise.} \end{cases}$$

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 34 Question Id : 640653586936 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 k such that $f(x)$ is a valid PDF.
Hint: $\int e^{ax}\,dx = \dfrac{e^{ax}}{a}$

Options :

6406531958477. ✖ 20

6406531958478. ✔ $\frac{1}{20}$

6406531958479. ✖ 1

6406531958480. ✖ Cannot be determined.

Question Number : 35 Question Id : 640653586937 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

What is the probability that rainfall in the local area will be at most 10 inches? (Enter the answer correct to 3 decimal places)

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

0.388 to 0.398

Question Id : 640653586938 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 : (36 to 37)

Question Label : Comprehension

Let $(X, Y) \sim \text{Uniform}(D)$, where $D := [1, 2] \times [1, 3]$.

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 36 Question Id : 640653586939 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 joint density function $f_{XY}(x, y)$.

Options :

6406531958482. ✖ $$f_{XY}(x,y) = \begin{cases} 2, & 1 < x < 2, 1 < y < 3, \\ 0, & \text{otherwise.} \end{cases}$$

6406531958483. ✔ $$f_{XY}(x,y) = \begin{cases} \frac{1}{2}, & 1 < x < 2, 1 < y < 3, \\ 0, & \text{otherwise.} \end{cases}$$

6406531958484. ✖ $$f_{XY}(x,y) = \begin{cases} 6, & 1 < x < 2, 1 < y < 3, \\ 0, & \text{otherwise.} \end{cases}$$

6406531958485. ✖ $$f_{XY}(x,y) = \begin{cases} \frac{1}{6}, & 1 < x < 2, 1 < y < 3, \\ 0, & \text{otherwise.} \end{cases}$$

Question Number : 37 Question Id : 640653586940 Question Type : SA Calculator : None Response Time : N.A Think Time : N.A Minimum Instruction Time : 0

Correct Marks : 4

Question Label : Short Answer Question

Find $P(|X - Y| < 1)$. 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

Question Id : 640653586941 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 : (38 to 39)

Question Label : Comprehension

Let a random variable X represent the temperature change and let Y represent the pressure change during a chemical process. The joint density for X and Y is given by

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

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 38 Question Id : 640653586942 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 two decimal places.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

0.25

Question Number : 39 Question Id : 640653586943 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

What is the probability that the pressure change during the chemical process is more than 0.5, given that the temperature change is equal to 0.5? 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 :

0.92 to 0.96

Question Id : 640653586944 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 : (40 to 41)

Question Label : Comprehension

Let $X_1, X_2, \ldots, X_{20} \sim$ i.i.d. Uniform$[8, 12]$.

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 40 Question Id : 640653586945 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
$Y = \sum_{i=1}^{10} X_i + \sum_{i=11}^{20} 2X_i$.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

300

Question Number : 41 Question Id : 640653586946 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 Chebyshev's inequality, find an upper bound for $P(|\overline{X} - 10| > 2)$, where $\overline{X} = \frac{X_1 + X_2 + \ldots + X_{20}}{20}$ is the sample mean. Enter the answer correct to 3 decimal places.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Range

Text Areas : PlainText

Possible Answers :

0.014 to 0.02

Question Id : 640653586947 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 : (42 to 43)

Question Label : Comprehension

In a large city, it is expected that 10% of children have defective eye-sight. Suppose a random sample of 300 children is selected from the city.

Based on the above data, answer the given subquestions.

Sub questions

Question Number : 42 Question Id : 640653586948 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 children who have normal eye-sight in the selected sample. Which of the following is true?

Options :

6406531958491. ✖ $X \sim \text{Binomial}(300, 0.1)$

6406531958492. ✔ $X \sim \text{Binomial}(300, 0.9)$

6406531958493. ✖ $X \sim \text{Binomial}(300, 0.5)$

6406531958494. ✖ $X \sim \text{Binomial}(300, 0.01)$

Question Number : 43 Question Id : 640653586949 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 in a random sample of 300 selected children at least 30 will have defective eye-sight. Enter the answer correct to 1 decimal place.

Response Type : Numeric

Evaluation Required For SA : Yes

Show Word Count : Yes

Answers Type : Equal

Text Areas : PlainText

Possible Answers :

0.5

CT

Section Id :	64065339710
Section Number :	4
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 Clear Response :	Yes
Maximum Instruction Time :	0
Sub-Section Number :	1
Sub-Section Id :	64065384337
Question Shuffling Allowed :	No