GATE

CS & DA

PROBABILITY AND STATISTICS

DPP: 4

Q1 If X has the prob. density fx[n]

$$f(x)=\begin{cases} ke^{-3x}; & x>0 \\ 0 & ; \text{ elsewhere} \end{cases}$$

Find k and P $(0.5 \leq X \leq 1)$

Q2 Find the distribution function of the random variable X whose probability density is given by

$$f(x)=\begin{cases} x & \text{for } 0<\text{x}<1 \\ 2-x & \text{for } 1\leq x\leq 2 \\ 0 & \text{elsewhere} \end{cases}$$

Q3 If X is a random variable with density $f(x)=\frac{1}{2}e^{-\frac{|x|}{2}}, -\infty<x<\infty$. Then E(|X|) _____.

Q4 Let X be a random variable with a continuous uniform distribution on the interval (1, a), Where α>1. If E[X] =6Var [X], then α=.

(A) 2 (B) 3
(C) 4 (D) 7

Q5 Suppose the probability density function of a continuous random variable x is = $3x^2$: 0 < x < 1.
Find 'a' and 'b' satisfying the following condtion
(A) $P[x \leq a] = P[x \geq a]$
(B) P [x > b] = 0.05

Q6 Find whether the following function is a probability density function

$$f(x)=\begin{cases} \frac{x^2}{3}, -1<x<2 \\ 0, \; elseweher \end{cases}$$

Also obtain P(0 < X $\leq$1)

Q7 The probability density function f (x) of a continuous random variable x is defined by

$$f(x)=\begin{cases} \frac{A}{x^3}, & 5\leq x\leq 10 \\ 0, & otherwise \end{cases}$$

then the value of A is

(A) $\frac{100}{3}$ (B) $\frac{200}{3}$
(C) $\frac{50}{3}$ (D) $\frac{3}{200}$

Q8 Let X be a random variable denoting the hours of life in electric light bulb. Suppose X is distributed with density function

$f(x)=\frac{1}{1000}e^{-x/1000}$ for x > 0

Find the expected life time of such a bulb.

Q9 If X has exponential distribution with mean 1/2, then is P(X< 1|X<2).

(A) $\frac{(1-e^{-2})}{(1-e^{-4})}$
(B) $\frac{(1-e^{-0.5})}{(1-e^{-1})}$
(C) $\frac{(1-e^{-1})}{(1-e^{-2})}$
(D) $\frac{(1-e^{-0.5})}{(1-e^{-4})}$

Q10 Customers arrive randomly and independently at a service window, and the time between arrivals has an exponential distribution with a mean of 12 minutes. Let X equal the number of arrivals per hour. What is P[X= 10]?

(A) $\frac{10e^{-12}}{10!}$
(B) $\frac{10^{-12}e^{-10}}{10!}$
(C) $\frac{12^{-10}e^{-10}}{10!}$
(D) $\frac{5^{10}e^{-5}}{10!}$

Q11 The time (in hours) required to repair a machine is exponentially distributed with parameter $\lambda=\frac{1}{2}$. What is the probability that the repair time exceeds 2 h ?

Q12 Students arrive at a local bar and restaurant according to an approximate Poisson process at a mean rate of 30 students per hour. What is the probability that the bouncer has to wait more than 3 minutes to card the next student ?

Q13 Let X be uniformly distributed over the interval [a, b], where $0 < a < b$.
If $E(X) = 2V(X) = \frac{4}{3}$ the $P[X < 1]$ is-
(A) 3/4 (B) 1
(C) 1/2 (D) 1/4

Q14 Suppose that a large conference room for a certain company can be reserved for no more than 4 hours. However the use of the conference room is such that both long and short conferences occur quite often. In fact it can be assumed that the duration X of a conference has a uniform distribution on the interval [0, 4]. What is the probability that any given conference lasts atleast 3 hours ?
(A) 1/2 (B) 1/3
(C) 1/4 (D) 3/4

Q15 X is uniformly distributed random variable that take values between 0 and 1. The value of $E(X^3)$ will be :
(A) 0 (B) 1/8
(C) 1/4 (D) 1/2

Q16 Buses arrive at a specified stop at 15 min intervals starting at 7 A.M., that is, they arrive at 7:00, 7:15, 7:30, 7:45 and so on. If a passenger arrives at the stop at a random time that is uniformly distributed between 7 and 7:30 A.M. find the probability that he waits ?
(a) less than 5 min for a bus and
(b) at least 12 min for a bus

Q17 The mean height of 500 student is 151cm and the standard deviation is 15cm . Assuming that the heights are normally distributed, find how many students have heights between 120 and 155 cm?
Given A(z=0 to 2.07)=0.4808
and A(z=0 to 0.27)=0.1084

Q18 A manufacturer knows from experience that the resistance of resistors he produces is normal with mean μ= 100 ohms and standard deviation σ=2 ohms. What percentage of resistors will have resistance between 98 ohms and 102 ohms?

Q19 If the height of 300 student are normally distributed with mean 64.5 inches and standard deviation 3.3 inches, find the height below which 99% of the students lie.
Given A(z=0 to 2.327)=49%

Q20 The life of army shoe is normally disributed with mean 8 months and standard deviation 2 months. If 5000 pairs are issued how many pairs would be expected to need replacement after 12 months?
Given F(2)=0.9772

Q21 The mean of a normal distribution is 50, its mode will be.
(A) 25 (B) 40
(C) 50 (D) 100

Q22 For the standard normal variate, the mean and variance are.
(A) 1,0 (B) 0,0
(C) 0,1 (D) 1,1

Q23 The mode of a normal distribution is 80 with SD 10. Then, its median will be.
(A) 8 (B) 800
(C) 80 (D) None of these

Q24 If $\log_{10} X$ is normally distributed with mean 4 and variance 4, find the probability that X lies between 1.202 and 83180000.
Given that $\log_{10} 1202 = 3.08$ and $\log_{10} 8318 = 3.92$ and A(|z|<1.96)=95%
(A) 1.05 (B) 0.95
(C) 0.78 (D) None of these

Q25 In a sample of 1000 cases, the mean of a certain test is 14 and standard deviation is 2.5. Assuming the distribution to be normal then, how many students score between 12 and 15 ? Given : Area from Z = 0 to 0.4 is 0.1554 and form Z = 0 to 0.8 is0.2881.
(A) 0.443 (B) 44.3
(C) 444 (D) 82

Q26

If the actual amount of instant coffee which a filling machine puts into '6-ounce' jars is a RV having a normal distribution with SD = 0.05 ounce and if only 3% of the jars are to contain less than 6 ounces of coffee, what must be the mean fill of these jars? Given that area under f(z) from 0 to 1.808 is 47%

Q27 If the two regression lines are known, then r = ...

(A) A.M of the two regression coefficients

(B) G.M of the two regression coefficients

(C) H.M of the two regression coefficients

(D) product of the two regression coefficients

Q28 If the two lines of regression are perpendicular then the correlation coefficient r = _______.

Q29 If the two regression co-efficients are 0.8 and 0.2, what would be the value of co - efficient of correlation.

Q30 Two random variables have the regression lines with equations $3x + 2y = 26$ and $6x + y = 31$ .Find the mean values and the correlation coefficient between x and y.

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Answer Key

Q1 k=3
$e^{-1.5} - e^{-3}$

Q2 $F(x) = \begin{cases} 0, \text{for x} \leq 0 \\ \frac{x^2}{2}, 0 < x < 1 \\ 2x - \frac{x^2}{2} - 1, 1 \leq x \leq 2 \\ 1, x > 2 \end{cases}$

Q3 4

Q4 (B)

Q5 $2^{\frac{-1}{3}}$,0.9298

Q6 $\frac{1}{9}$

Q7 (B)

Q8 2000

Q9 (A)

Q10 (D)

Q11 0.3679

Q12 0.223

Q13 (D)

Q14 (C)

Q15 (C)

Q16 $\frac{1}{3} and \ \frac{1}{5}$

Q17 294

Q18 68.26%

Q19 6ft 0.18 inches

Q20 4886

Q21 (C)

Q22 (C)

Q23 (C)

Q24 (B)

Q25 (C)

Q26 μ = 6.094 ounces.

Q27 (B)

Q28 r = 0.

Q29 r = 0.4

Q30 7

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Hints & Solutions

Q1 Text Solution:

$\int_0^{\infty} f\left(x\right)dx = 1$

$\int_0^{\infty} ke^{-3x}dx = 1$

$Putting\ limits\ we\ get -$

$\frac{-k}{3} \times \left(e^{-\infty} - e^{-0}\right) = 1$

$\frac{-k}{3}\left[\frac{1}{\infty} - 1\right] = 1$

$k = 3$

Now solving for the second part-

$P\left(0.5 \le X \le 1\right)$

$\int_{0.5}^{1} ke^{-3x}dx$

$\int_{0.5}^{1} 3e^{-3x}dx$

$\frac{3}{-3}e^{-3x}\left(limits\ from\ 0.5\ to\ 1\right)$

$e^{-1.5} - e^{-3}$

Q2 Text Solution:

$$f(x) = \begin{cases} x & \text{for } 0 < x < 1 \\ 2 - x & \text{for } 1 \le x \le 2 \\ 0 & \text{elsewhere} \end{cases}$$

$For\ x \le 0, F(x) = \int_{-\infty}^{x} f(x)dx = \int_{-\infty}^{x} 0$

$.\,dx = 0$

$For\ 0 < x < 1, F\left(x\right) = \int_{-\infty}^{x} f\left(x\right)dx = 0$

$+ \int_0^x xdx = \frac{x^2}{2}$

$For\ 1 \le x \le 2, F(x) = \int_{-\infty}^{x} f(x)dx$

$= \int_{-\infty}^{0} 0dx + \int_0^1 xdx + \int_1^x \left(2 - x\right)dx$

$\int_{-\infty}^{x} f\left(x\right)dx = \int_{-\infty}^{0}\left(0\right)dx + \int_0^1 xdx +$

$\int_1^x \left(2 - x\right)dx$

$0 + \frac{1}{2} + \left(2x - \frac{x^2}{2}\right)_1^x = 2x - \frac{x^2}{2} - 1$

$For\ x > 2, F(x) = 1$

$Hence\ required\ distribution\ F(x)\ is$

$$F(x) = \begin{cases} 0, \text{for } x \le 0 \\ \frac{x^2}{2}, 0 < x < 1 \\ 2x - \frac{x^2}{2} - 1, 1 \le x \le 2 \\ 1, x > 2 \end{cases}$$

Q3 Text Solution:

$f(x) = \frac{1}{2}e^{-\frac{|x|}{2}}, -\infty < x < \infty.$

$E\left(|X|\right) = \int_{-\infty}^{\infty} \left|x\right| \times \frac{1}{2}e^{-\frac{|x|}{2}}dx$

$As\ it\ is\ an\ even\ function -$

$2\int_0^{\infty} \left|x\right| \times \frac{1}{2}e^{-\frac{|x|}{2}}dx$

$\int_0^{\infty} xe^{-\frac{x}{2}}dx$

$\frac{x}{2} = t, dx = 2dt$

$2\int_0^{\infty} (2t)^{2-1}e^{-t}dt$

$4 \times 1 = 4$

Q4 Text Solution:

$E\left(X\right) = \frac{b+a}{2}\ \ for\ continuous\ uniform$

$distribution$

$V\left(X\right) = \frac{(b-a)^2}{12}$

$E\left(X\right) = 6V\left(X\right)$

$\frac{\alpha+1}{2} = 6\frac{(\alpha-1)^2}{12}$

$\alpha + 1 = \alpha^2 + 1 - 2\alpha$

$\alpha^2 - 3\alpha = 0$

$\alpha = 0, 3$

$Considering\ \alpha = 3$

Q5 Text Solution:

Approach 1:

It is given that, P[x $\le$a] = P[x $\ge$a]

$\int_0^a f(x)dx = \int_a^1 f(x)dx \Rightarrow \int_0^a 3x^2dx =$

$\int_a^1 3x^2dx$

$\Rightarrow$ $a^3 = 1 - a^3$

$2a^3 = 1$

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$$a = \frac{1}{\sqrt[3]{2}} = 2^{\frac{-1}{3}}$$

(B) From the condtion B

Itis given as, P[x > b] = 0.05 ⇒

$\int_b^1 3x^2 dx = 0.05 \Rightarrow 3 \cdot \frac{(1-b^3)}{3} = 0.05$

$\Rightarrow b^3 = 0.95 \Rightarrow b = \left(\frac{19}{20}\right)^{\frac{1}{3}}$ = 0.9298

Q6 Text Solution:

Here, $\int_{-\infty}^{\infty} f(x)dx = \int_{-1}^{2} \frac{x^2}{3} dx$

$= \frac{x^3}{9}\Big|_{-1}^{2} = \frac{8}{9} + \frac{1}{9} = 1$

Hence, f(x) is a probability density function,

Now,

$P\left(0 < X \le 1\right) = \int_0^1 \frac{x^2}{3} dx = \frac{x^3}{9}\Big|_0^1 = \frac{1}{9}$

Q7 Text Solution:

Here,

$\mathrm{f}(\mathrm{x}) = \frac{\mathrm{A}}{\mathrm{x}^3} \qquad (5 \le \mathrm{x} \le 10)$

∵ f(x) is probability density function, so

$\int_5^{10} \frac{A}{x^3} dx = 1$

$\Rightarrow \left[\frac{-A}{2x^2}\right]_5^{10} = 1$

$\Rightarrow \frac{3A}{200} = 1$

$\Rightarrow A = \frac{200}{3}$

Q8 Text Solution:

$f\left(x\right) = \frac{1}{1000} e^{-\frac{x}{1000}}$

$here\ x > 0$

$E\left(X\right) = \int_0^{\infty} x f\left(x\right) dx$

$\int_0^{\infty} x \frac{1}{1000} e^{-\frac{x}{1000}} dx$

$Now\ u\sin g -$

$\int_0^{\infty} t^{n-1} e^{-t} dt = n!$

$Thus\ here\ t = \frac{x}{1000}, dx = 1000dt$

$1000 \int_0^{\infty} t^{2-1} e^{-t} dt = \left(2-1\right)! \times 1000$

$= 1000$

Q9 Text Solution:

$$P\left(X < 1 \middle| X < 2\right)$$

$\frac{P(X<1)}{P(X<2)}$

$f\left(x\right) = \frac{1}{\mu} e^{\frac{-x}{\mu}}$

$\frac{\int_0^1 f\left(x\right)dx}{\int_0^2 f\left(x\right)dx}$

$\frac{\int_0^1 2e^{-2x}dx}{\int_0^2 2e^{-2x}dx}$

$evaluating\ numerator\ \ in\ between\ from$
$0\ to\ 1\ and\ denominator\ from\ 0\ to\ 2 -$

$\frac{\frac{e^{-2x}}{2}}{\frac{e^{-2x}}{2}} = \frac{(1-e^{-2})}{(1-e^{-4})}$

Q10 Text Solution:

$P\left(X = r\right) = \frac{\lambda^r e^{-\lambda}}{r!}$

$U\sin g\ the\ direct\ formula -$

$Here\ \lambda = 5\ as\ \frac{60}{12} = 5$

$P\left(X = 10\right) = \frac{5^{10} e^{-5}}{10!}$

Q11 Text Solution:

If X represents the time to repair the machine, the density function of X is given by :

$\mathrm{f}(\mathrm{x}) = \lambda \mathrm{e}^{-\lambda \mathrm{x}} = \frac{1}{2}\mathrm{e}^{\frac{-\mathrm{x}}{2}}\ ,\ \mathrm{x} > 0$

$\mathrm{P}(\mathrm{X} > 2) = \int_2^{\infty} \frac{1}{2}\mathrm{e}^{\frac{-\mathrm{x}}{2}}\,\mathrm{dx}$

$= \left[-\mathrm{e}^{\frac{-\mathrm{x}}{2}}\right]_2^{\infty} = \mathrm{e}^{-1} = 0.3679$

Q12 Text Solution:

X { Number of students per minute}

λ = 30 students / hr = 30 students/ 60 mins = $\frac{1}{2}$ students / min

i.e, in every 2 min, one students is coming.

i.e Inter Arrival time of two successive students = 2 mins

and we know that inter arrival time follow Exponential Distribution.

So Average waiting time for Bounce = $\frac{1}{\mu} = 2\,\mathrm{mins}.$

where t = {waiting time} and p. d. f is f (t) = $\begin{cases} \mu e^{-\mu t} & t \geq 0 \\ \text{otherwise} & t < 0 \end{cases}$

So, $P(t > 3) = \int_3^\infty f(t)dt = \int_3^\infty \mu e^{-\mu t} \cdot dt$

$= \mu\left(\frac{e^{-\mu t}}{-\mu}\right)_3^\infty$

$= -1\left[e^{-\infty} - e^{-3\mu}\right] = \frac{1}{e^{3\mu}} = \frac{1}{e^{3/2}} = 0.223$

Q13 Text Solution:

E(X)=2,V(X)=

$\frac{4}{3}\ over\ \left[a, b\right]$

$We\ have\ to\ find\ P\left(X < 1\right)\ so,$

$u\sin g\ the\ formula\ for\ expectation$

$\frac{a+b}{2} = 2$

$a + b = 4$

$u\sin g\ the\ formula\ for\ variance$

$\frac{(b-a)^2}{12} = \frac{4}{3}$

$b - a = 4, b - a = -4$

$solving\ the\ equations$

$a + b = 4$

$b - a = 4$

$we\ get\ a = 0, b = 4$

$solving\ the\ equations$

$a + b = 4$

$b - a = -4$

$we\ get\ a = 4, b = 0$

$Considering\ a = 0, b = 4$

$Now\ P\left(X < 1\right)\ will\ be\ equal\ to -$

$\int_0^1 \frac{1}{b-a}dx$

$\int_0^1 \frac{1}{4}dx$

$1/4$

Q14 Text Solution:

As it is mentioned that it is an uniform distribution thus considerig the values

$f(x) = \frac{1}{4-0} = \frac{1}{4}$

We require $P(x \geq 3) = \int_3^4 f(x)\ dx$

$= \int_3^4 \frac{1}{4}dx = \frac{1}{4}\left[x\right]_3^4 = \frac{1}{4}$

Q15 Text Solution:

$E(x^3) = \int_{-\infty}^{\infty} x^3 f(x)\, dx = \int_0^1 x^3 (1)\, dx$

As it is mentioned that the variable will take the values between 0 and 1 only thus we are taking the limit in between 0 and 1.

$= \left(\frac{x^4}{4}\right)_0^1 = \frac{1}{4}$

Q16 Text Solution:

Let X denote the time in minute past 7 A.M when the passenger arrives at the stop.

Then X is uniformly distributed over (0,30)

i.e., $f(x) = \frac{1}{30}$, $0 < x < 30$.

(a) The passenger will have to wait less than 5 min if he arrives at the stop between 7: 10 and 7 : 15 or 7 : 25 and 7 : 30.

∴ Required Probability

$= P(10 < x < 15) + P(25 < x < 30)$

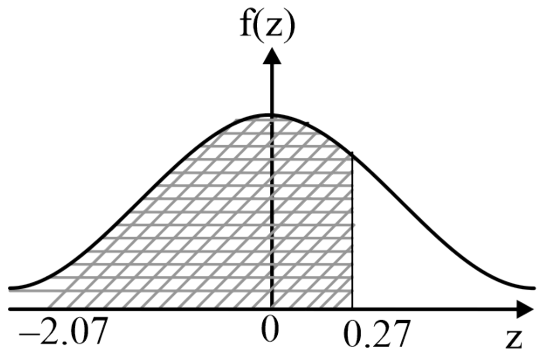
$= \int_{10}^{15} \frac{1}{30}dx + \int_{25}^{30} \frac{1}{30}dx = \frac{1}{3}$

(b) The passenger will have to wait at least 12 min if he arrives at the stop between 7:00 and 7:03 or 7:15 and 7:18.

.. Required probability = $P(0 < x < 3) + P(15 < x < 18)$

$\int_0^3 \frac{1}{30}dx + \int_{15}^{18} \frac{1}{30}dx = \frac{1}{5}$

Q17 Text Solution:



No. of student = 500

$\therefore$ N = 500; Mean, μ=151cm

When x_1 = 120cm

Standard normal variable

$z_1 = \frac{x_1-\mu}{\sigma} = \frac{120-151}{15} = \frac{-31}{15} = -2.07$

When x_2 = 155 cm

Standard normal variable $z_2 = \frac{x_2-\mu}{\sigma} = \frac{155-151}{15} = 0.27$

$\therefore$ P (120 < x < 155) = P (–2.07 < z < 0.27)

= P(–2.07 $\leq$z$\leq$0) + P(0 $\leq$ z$\leq$0.27)

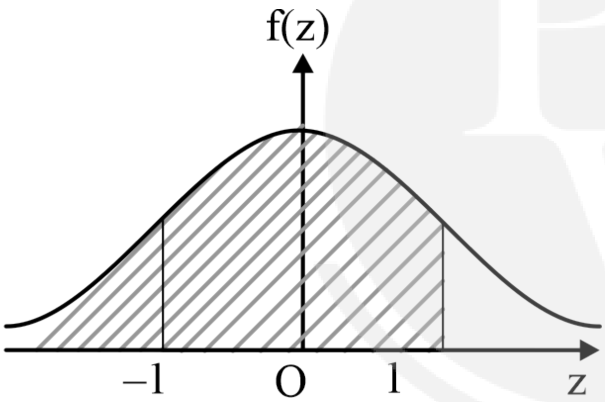
As the graph is symmetric thus-

= P(0$\leq$z$\leq$2.07) + P(0 $\leq$z $\leq$0.27)

= 0.4808 + 0.1084 = 0.5892

$\therefore$ The required number of student = 0.5892 ×500 = 294 (Appx.)

Q18 Text Solution:



$\mu = 100\Omega, \quad \sigma = 2\Omega$

$x_1 = 98\Omega, \quad x_2 = 102\Omega$

$\therefore \quad z_1 = \frac{x_1-\mu}{\sigma} = \frac{98-100}{2} = -1$

and $z_2 = \frac{x_2-\mu}{\sigma} = \frac{102-100}{2} = 1$

Now, P(98 <x < 102) = P(–1 < z < 1)

= P(–1$\leq$z$\leq$0) + P(0$\leq$z$\leq$1)

= P(0$\leq$z$\leq$1) + P(0$\leq$z $\leq$1)

= 0.3413 + 0.3413 = 0.6826

$\therefore$ Percentage of resistors having resistance between 98 ohms and 102ohms = 68.26%

Q19 Text Solution:

Mean μ = 64.5 inches , S.D. σ = 3.3 inches

Area between 0 and $\frac{x-64.5}{3.3} = 0.99 - 0.5 = 0.49$

From the table, for the area 0.49 , z = 2.327

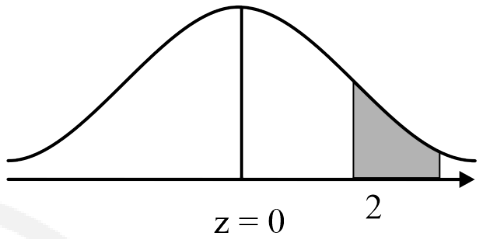
The corresponding value of x is given by $\frac{x-64.5}{3.3} = 2.327$

$\Rightarrow$ x – 64.5 = 7.68

$\Rightarrow$ x = 7.68 + 64.5 = 72.18 inches

Hence 99% student are of height less than 6ft 0.18 inches.

Q20 Text Solution:



Mean (μ) = 8

Standard deviation (σ) =2

Number of pairs of shose = 5000

Total months (x) = 12

When $z = \frac{x-\mu}{\sigma} = \frac{12-8}{2} = 2$

Area when (z$\geq$ 2) = 1-P(Z<2)=1-0.9772= 0.0228

Number of pairs whose life is more than 12 months (z >2) = 5000 × 0.0228 = 114

Replacement after 12 months = 5000 – 114 = 4886 pairs of shoes

Q21 Text Solution:

The mean of a normal distribution is 50, its mode will be 50 as both are same in this case.

Q22 Text Solution:

The standard normal distribution is the normal distribution with mean **0** and variance 1

Q23 Text Solution:

The mode of a normal distribution is 80 ,then the median will also be 80, as in this type of distribution they all are same.

Q24 Text Solution:

As log X is a non - decreasing function of X, we have P(1.202 < X < 83180000)

= P ($\log_{10}$ 1.202 < $\log_{10}$ X < $\log_{10}$ 83180000)

= P (0.08 < $\log_{10}$ X < 7.92)

= P (0.8 < Y < 7.92)

Given,

$Y = \log_{10} X \sim N(4, 4)$

Now, when Y = 0.08, $Z = \frac{0.08-4}{2} = -1.96$

and when Y = 7.92, $Z = \frac{7.92-4}{2} = 1.96$

Required probability = 2P $(-1.96 < Z < 1.96)$

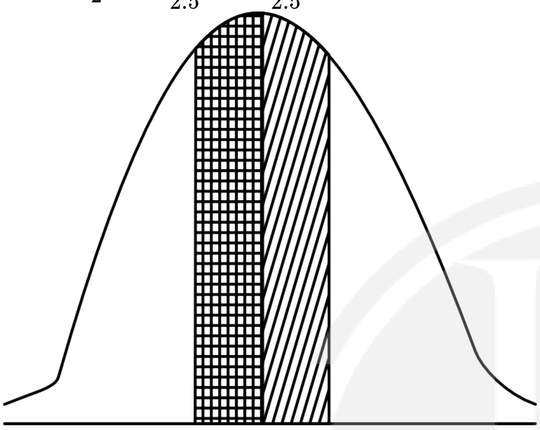
$= 2 \times 0.475 = 0.95$

Q25 Text Solution:

n = 1000, μ = 14, σ = 2.5

Here, $z_1 = \frac{x_1-\mu}{\sigma} = \frac{12-14}{2.5} = -0.8$

and $z_2 = \frac{15-14}{2.5} = \frac{1}{2.5} = 0.4$



Thus, the area lying between z = −0.8 to z = 0.4

= [Area from (z = 0) to (z = 0.8)] + [Area (z = 0) to (z = 0.4)]

Hence, the required number of students

$= 1000 \times 0.4435 = 443.5 = 444$

Q26 Text Solution:

Let X be the actual amount of coffee put into the jars.

Then X follows N (μ, 0.05)

P(X < 6) = 0.03

$\therefore P\left\{-\infty < \frac{X-\mu}{0.05} < \frac{6-\mu}{0.05}\right\} = 0.03$

i.e $\therefore P\left\{-\infty < Z < \frac{\mu-6}{0.05}\right\} = 0.47$ (by symmetry)

From the table of areas, we have

P(0 < Z < 1.808) = 0.47

$\therefore \frac{\mu-6}{0.05} = 1.808$

$\therefore \mu = 6.094$ ounces.

Q27 Text Solution:

Correlation coefficient 'r' is the geometric mean (GM) of two regression coefficients.

$r = \sqrt{byxbxy}$

Q28 Text Solution:

Angle between two regression lines

$\tan\theta = \frac{1-r^2}{r}\left[\frac{\sigma_x \cdot \sigma_y}{\sigma_x^2+\sigma_y^2}\right]$

two regression lines are perpendicular

$\theta = \frac{\pi}{2}$; only when r = 0.

Q29 Text Solution:

If the two regression co-efficients are positive correlation coefficients is also positive.

$r = \sqrt{byx \times bxy} = \sqrt{0.8 \times 0.2} = \sqrt{0.16}$

r = 0.4.

Q30 Text Solution:

Two regression equation are

3x + 2y = 26 →(1) and 6x + y = 31 →(2)

Equation (1) is regression line of y or x and re - written as

$y = \frac{-3x}{2} + 13 \rightarrow (3)$

Equation (2) is regression line of x on y and re - written as

$x = -\frac{1}{6}y + \frac{31}{6} \rightarrow (4)$

Hence byx = $-\frac{3}{2}$ and bxy = $-\frac{1}{6}$

$r = -\sqrt{byx \times bxy}$

(∴ both byx and bxy are negative)

$r = -\sqrt{\frac{3}{12}} = -\frac{1}{2}$

$r = -\frac{1}{2}$

Both regression lines pass through $(\bar{x}, \bar{y})$

$3\bar{x} + 2\bar{y} = 26$

$6\bar{x} + \bar{y} = 31$ we get

$\bar{x} = 4$ and $\bar{y} = 7$