Date :

Problem Statement 1:

The marks awarded for an assignment set for a year 8 class of 20 students were as follows:-

Sol:

6 7 5 7 7 8 7 6 9 7 4 10 6 8 8 9 5 6 4 8

Mean:-

$$\bar{x} = \frac{6+7+5+7+7+8+7+6+9+7+4+10+6+8+8+9+5+6+4+8}{20}$$

$$\boxed{\bar{x} = 6.74}$$

Median:- Arranging in ascending order

4, 4, 5, 5, 6, 6, 6, 6, 7, 7, 7, 7, 7, 8, 8, 8, 8, 9, 9, 10

$$\boxed{\text{median} = \frac{7+7}{2} = 7}$$

Mode → Highest Occurring number is 7

so $\boxed{\text{Mode} = 7}$

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Problem statement 2 :-

The number of calls from motorists per day for roadside service was recorded for a particular month :

28, 122, 217, 130, 120, 86, 80, 90, 140, 120, 70, 40, 145, 113, 90, 68, 174, 194, 170, 100, 75, 104, 97, 75, 123, 100, 75, 104, 97, 75, 123, 100, 89, 120, 109

Mean →

$$\bar{x} = \frac{28+122+217+130+120+86+80+90+140+120+70+40+145+113+90+68+174+194+170+100+75+104+97+75+123+100+75+104+97+75+123+100+89+120+109}{35}$$

$$\boxed{\bar{x} = 107.51}$$

Median → Arranging in ascending order

28, 40, 68, 70, 75, 75, 75, 75, 80, 86, 89, 90, 90, 97, 97, 100, 100, 100, 104, 104, 109, 113, 120, 120, 120, 122, 123, 130, 140, 145, 170, 174, 194, 217

$$\boxed{\text{median} = 100}$$

$$\boxed{\text{Mode} = 75}$$

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Problem Statement 3 :

$X = 0, 1, 2, 3, 4, 5$

$f(X) = 0.09, 0.15, 0.40, 0.25, 0.10, 0.01$

Sol :-

$\cancel{\text{Mean} :- \sum_{n=1}^{N} (\text{mean} - x_n)^2}$

$$\text{Mean} = \sum_{n=1}^{N} x_n \cdot P(x_n)$$

$$= 0 \times (.09) + 1 \times (0.15) + 2(0.40) + 3 \times (0.25) + 4 \times (0.10) + 5 \times (0.01)$$

$$= 0 + (0.15) + (0.80) + (0.75) + (0.40) + (0.05)$$

$$\boxed{\text{Mean} = 2.15}$$

$$\text{Variance} = \sum_{n=1}^{N} (\text{mean} - x_n)^2 \cdot P(x_n)$$

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$$\text{Variance} = (2.15-0)^2(0.09) + (2.15-1)^2(0.15) + (2.15-2)^2(0.40) + (2.15-3)^2(0.25) + (2.15-4)^2(0.10) + (2.15-5)^2(0.01)$$

$$= (2.15)^2 \times 0.09 + (1.15)^2 \times 0.15 + (.15)^2 \times .40 + (-.85)^2 \times .25 + (-1.85)^2 \times .10 + (-2.85)^2 \times 0.01$$

$$\cancel{= 0.193 + .173 + .06 + .213 - .185 - .0285}$$

$$\boxed{\cancel{\text{Variance} = -0.0005}}$$

$$= .380 + .198 + .009 + .18 + .342 + .08$$

$$\boxed{\text{Variance} = 1.19}$$

Date :

Problem Statement 4 :-

Given

PDF

$$\boxed{(d) = 20e^{-20(d-12.5)}, \quad d \geq 12.5}$$

Sol. If $x \geq 12.60$. Now,

$$P(X > 12.60) = \int_{12.60}^{\infty} 20e^{-20(x-12.5)}\, dx$$

$$= -e^{-20(x-12.5)}\Big|_{12.6}^{\infty} = 0.135$$

$\because$ Total Area equals 1.

$$\therefore P(12.5 < X < 12.60) = 1 - P(X > 12.60)$$

$$= 1 - .135$$

$$\boxed{P(12.5 < X < 12.60) = 0.865}$$

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If diameter is 11 mm then.

$$\boxed{PDF\ (d) = 20e^{-20(d-11)}}$$

$$= \int_{11}^{\infty} 20\, e^{-20(x-11)}\, dx.$$

$$= -e^{-20(x-11)}\Big|_{12.6}^{\infty} = e^{-1/32}$$

$$= 0 + e^{-20(1.6)}$$

$$= 1.26641654\,e^{-14}$$

$$P(11 < X < 12.60) = 1 - 1.26641655\ldots e^{-14}$$

$$\boxed{P(11 < X < 12.60) = .9999}$$

So it is showing the proportional Area will increase with the increase of diameter

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Date :

Problem Statements:-

$n = 6$

$x = 2$

faulty rate is $= 30\%$

$p = .30$

By Binomial Distribution

$$P(x) = \frac{6!}{2!\,(6-2)!}\,(.30)^2\,(1-.30)^{6-2}$$

$$\boxed{P(x) = \frac{520}{2 \times 24} \times .09 \times .24 =}$$

$= 10.84 \times .09 \times .24 = .324$

~~Mean of the process is by Poisson's Distribution~~

$$P(x) = \left(\frac{e^{-\mu}\,\mu^{x}}{x!}\right)$$

$$.234 = \frac{e^{-\mu}\,\mu^2}{2!}$$

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$e^{-\mu}\mu^2 = .468$

$-\mu \log$

~~Standard Deviation =~~

$S =$

Mean =

$$\boxed{\mu_x = n \times p = 6 \times .30 = 1.80}$$

Standard deviation

$$\sigma_x = \sqrt{n \cdot p \cdot (1-p)}$$

$$= \sqrt{6 \times .30\,(1-.30)}$$

$$= \sqrt{6 \times .30 \times .70}$$

$$\boxed{\sigma_x = 1.12}$$

Date :

Problem statement 6 :-

Given

For Gaurav

$P(x) = .75$

$n = 8$

$x = 5$

Sol.

$$P(n) = \frac{8!}{5!(8-5)!} (.75)^5 (1-.75)^{(8-5)}$$

$$= \frac{8!}{5!\,3!} (.75)^5 (1-.75)^3$$

$$\boxed{P(n) = .207} \quad 20.7\%$$

For Barakha

$p = .45$

$n = 12$

$x = 5$

$$P(n) = \frac{12!}{5!(12-5)!} (.45)^5 (1-.45)^{12-5}$$

$$\boxed{P(n) = .222} \quad 22.2\%$$

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If x is 4 then

For Gaurav

$$P(x) = \frac{8!}{4!(8-4)!} (.75)^4 (1-.75)^4$$

$$\boxed{P(n) = .0865} \quad 8.65\%$$

For Barakha

$$P(n) = \frac{12!}{4!(12-4)!} (.45)^4 (1-.45)^8$$

$$\boxed{P(n) = .17} \quad 17\%$$

If x is 6 then

For Gaurav

$$P(n) = \frac{8!}{6!(8-6)!} (.75)^6 (1-.75)^{(8-6)}$$

$$\boxed{P(n) = .311} \quad 31.1\%$$

For Barakha

$$P(n) = \frac{12!}{6!(12-6)!} (.45)^6 (1-.45)$$

$$\boxed{P(n) = .212} \quad 21.2\%$$

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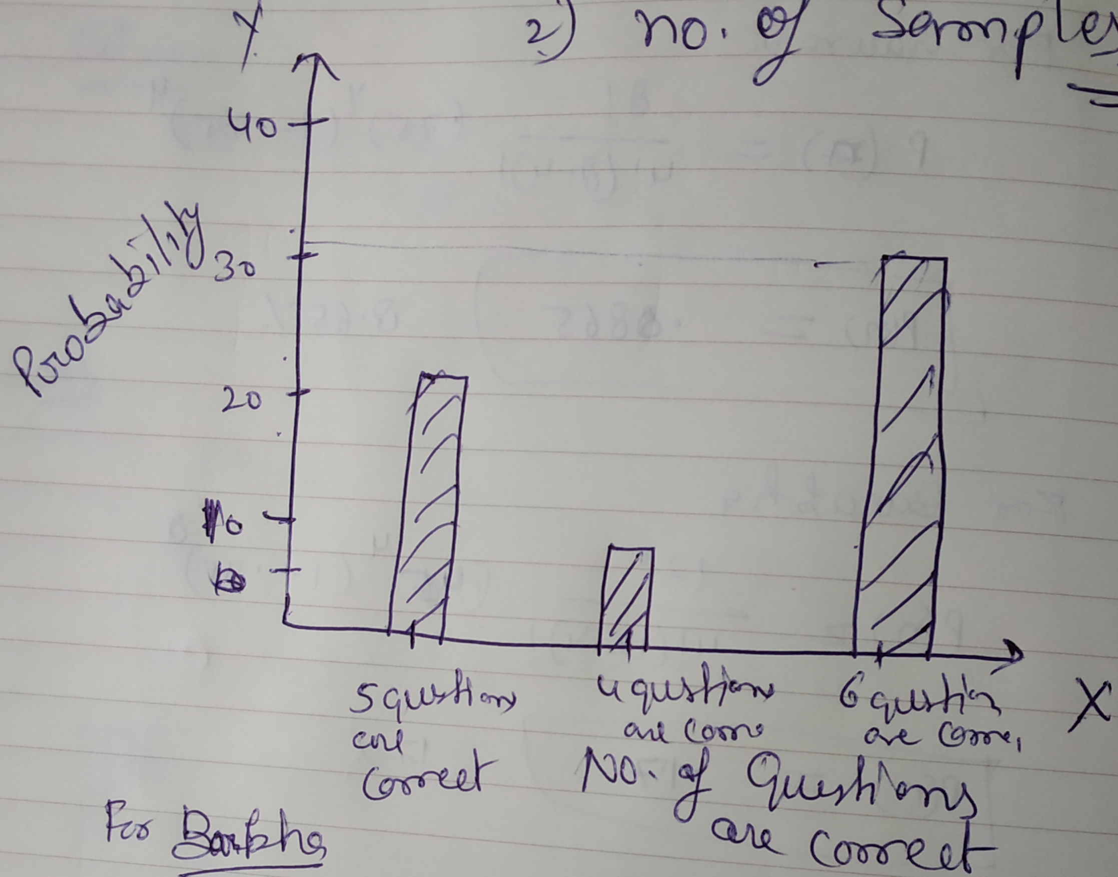
Two factors are:-

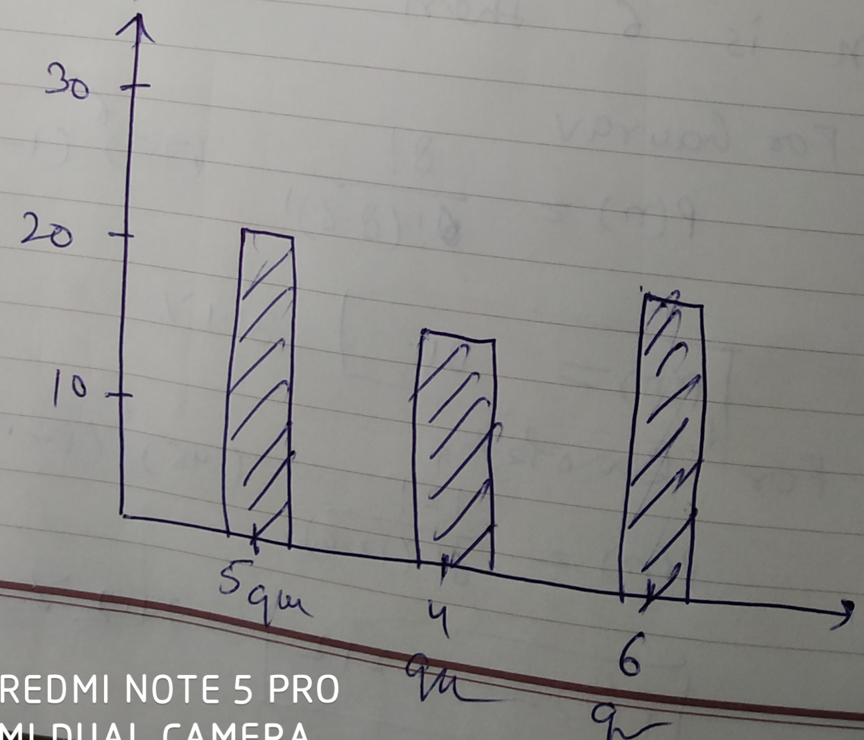
For Gaurav

1) Correction rate

2) no. of samples



For Barkha



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Problem Statement 7 :-

~~Proo~~

72 Custometers in 60 minutes

so

$$p = \frac{72}{60} = 1.2$$

$$\mu = 4 \times 1.2 = 4.8$$

$$P(x) = \frac{e^{-4.8}(4.8)^5}{5!}$$

$$= .174 = 17.4\%$$

$$P(x \le 3) = \frac{e^{-4.8}(4.8)^1}{1!} + \frac{e^{-4.8}(4.8)^2}{2!} + \frac{e^{-4.8}(4.8)^3}{3!}$$

$$= .294 = 29.4\%$$

$$P(x \geq 3) = 1 - P(x \le 3)$$

$$= 1 - .294 = .706$$

$$= 70.6$$

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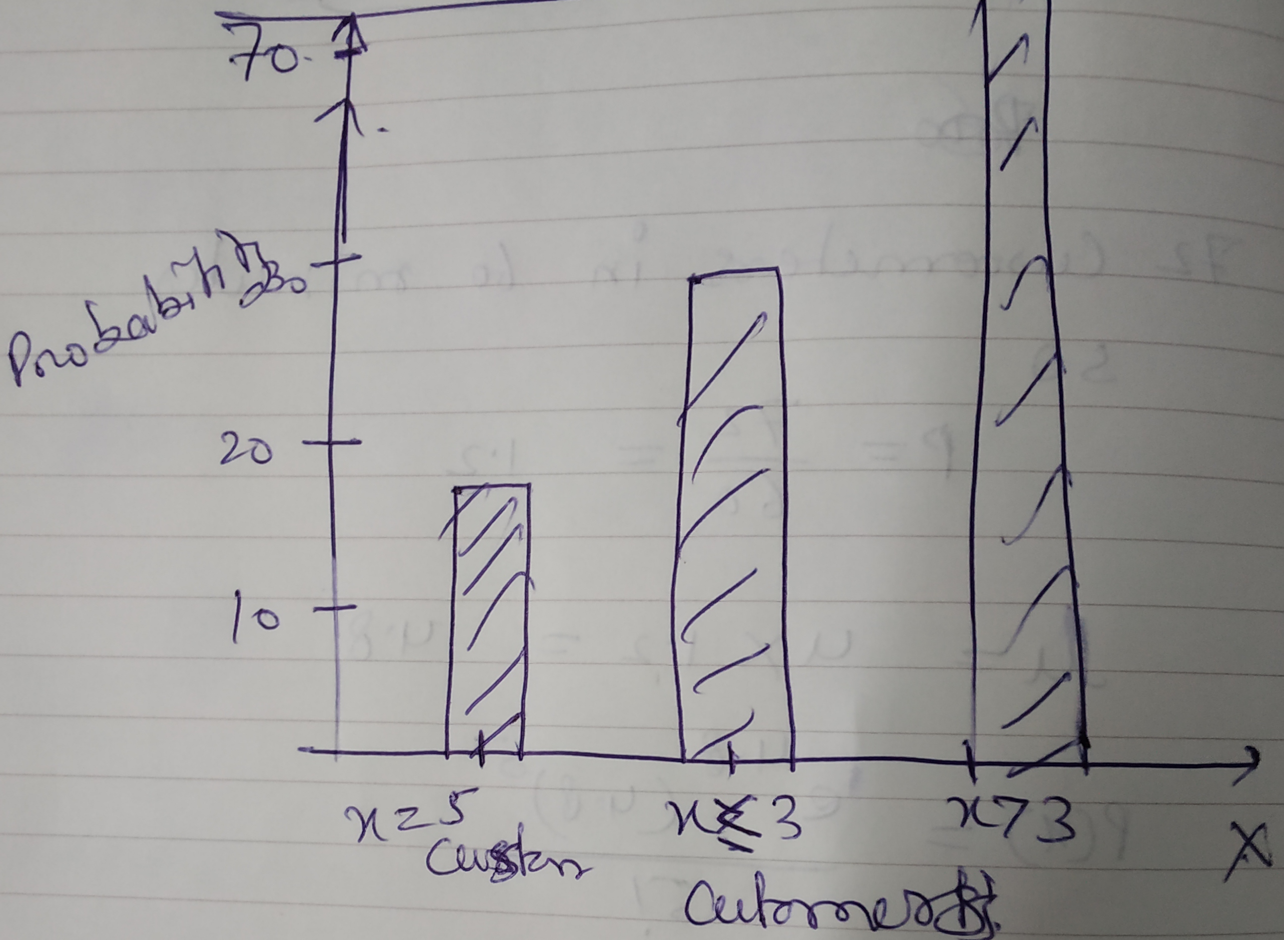
Pictorial Representation :-



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Problem Statement 8 :-

Given

77 words per minute

Per hour = 77 X 60

=

Errors per hour = 6 ~~wor~~

Errors per words is $= \frac{6}{77 \times 60}$

$P = \frac{1}{770}$

$n = 455 \qquad x = 2$

Sol.

$$P(n) = \frac{455!}{2!(455-2)!} \times \left(\frac{1}{770}\right)^2 \left(1 - \frac{1}{770}\right)^{453}$$

$\boxed{P(n) = .097}$ 9.7 %

If $n = 1000$

$\boxed{P(n) = .230}$ 23 %

If $n = 255$

$\boxed{P(n) = .039}$ 3.9 %

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$\lambda = n \cdot p$

So when $n = 455$

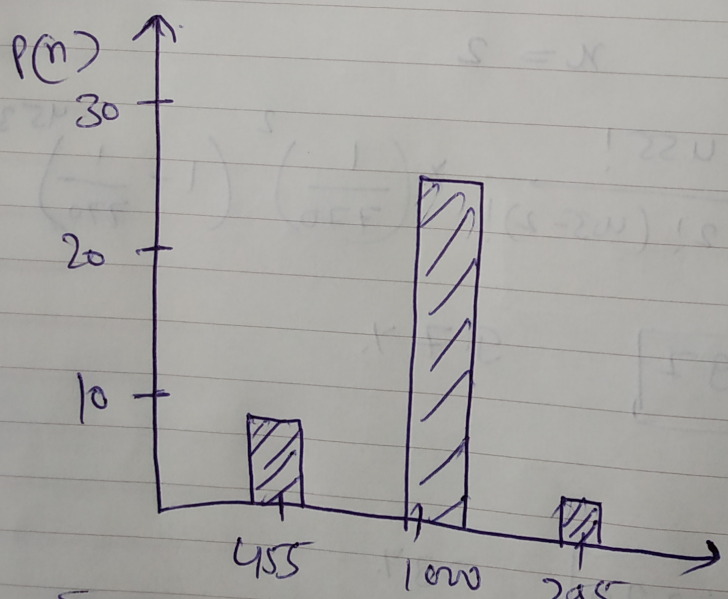
$\lambda = 455 \times \frac{1}{770} = .590$

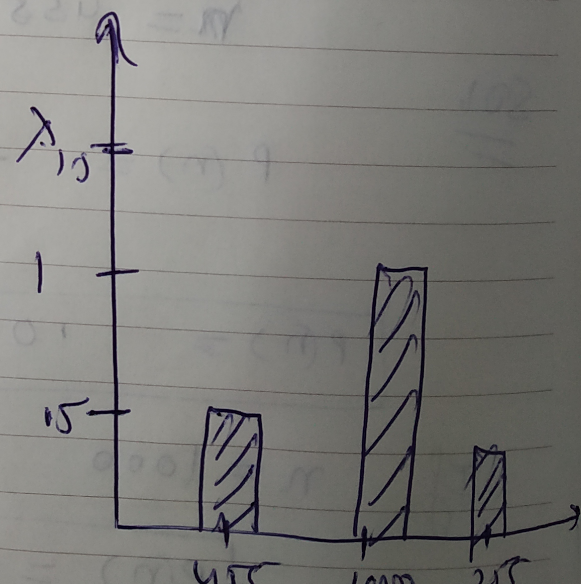
when $n = 1000$

$\lambda = 1000 \times \frac{1}{770} = 1.29$

when $n = 255$

$\lambda = \cancel{1000}\ 255 \times \frac{1}{770} = .331$





$\boxed{\text{With the increase of } n \text{ \& both } P(n) \text{ \& } \lambda \text{ is increasing}}$

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Problem statement 10 :-

a) $P(z > 1.26) = 1 - P(z < 1.26)$

$= 1 - .89617 = .1038$

$P(z < -0.86) =$

$P(z > -1.37) = 1 - P(z < -1.37)$

$= 1 - .08534$

$= .91466$

here $P(-1.25 < z < 0.37)$

$P(z > -1.25) = P(z < -1.25)$

$= .10749$

$P(z < .37) = .64431$

so.

$P(-1.25 < z < 0.37) = .64431 - .10749$

$= .5368$

$$\boxed{\begin{aligned} P(z \leq -4.6) &= .0003 \\ &\simeq .00 \end{aligned}}$$

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b) $P(Z > z) \Rightarrow 1 - P(Z < z) = 0.05$

$P(Z < z) = 1 - 0.05$

$P(Z < z) = .95$

$\cancel{P(Z > z) =}$

$P(Z < 1.65) = .95$

$\boxed{z = 1.65}$

c) $P(-z < Z < z) = 0.99$

$P(-z < Z < 2.33) = .99$

$\cancel{P(-3.9 < Z < 2.34) = .99}$

$1 - .99 = .01$

$\frac{.01}{2} = .005$

$\boxed{P(-2.57 < Z < 2.57) = .99}$

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Problem statement 11

$$P(X \geq 13) = P\left(\frac{X-10}{3} > \frac{13-10}{3}\right) = P(z > 1)$$

$$= 1 - P(z \leq 1)$$

$$= 1 - .84134$$

$$\boxed{P(X > 13) = .1586}$$

$$P(9 < X < 11)$$

$$= P\left(\frac{9-10}{3} < \frac{X-10}{3} < \frac{11-10}{3}\right) = \left(-\frac{1}{3} < z < \frac{1}{3}\right)$$

$$= (-.33 < z < .33)$$

$$= .37070 < z < .6293$$

$$= .6293 - .3707$$

$$\boxed{P(9 < X < 11) = .2586}$$

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$$P(X) = .98$$

$$P(X < x) = P\left(\frac{X-10}{3} < \frac{x-10}{3}\right)$$

$$= P\left(Z < \frac{x-10}{3}\right) = 0.98$$

from Z table

$$= P(Z < 2.06) = 0.98$$

<u>So</u>:

$$\frac{x-10}{3} = 2.06$$

$$x - 10 = 6.18$$

$$\boxed{x = 10.18\,mA}$$

Date:

Problem Statement 12:-

$\mu = .2508$

$\sigma = .0005$

Specifications $.2500 \pm .0015$

$(.2500 - .0015)$ & $(.2500 + .0015)$

$.2485$ & $.2515$

Sol:

$P(.2485 < X < .2515) = P(0.2485 - 0.2508$

$< Z < (.2515 - .2508)$

$= .92$

$\boxed{92\% \text{ of diameters conforms}}$

Second if mean is $.2500$ then

$P(.2485 < X < .2515) = P(.2485 - .2500 <$

$Z < .2515 - .2500)$

$= .9973$

$\boxed{\text{It is increased now to } 99.73\%}$