Q.5] (a) Normal Distribution.

- $N = 400$ companies
- $U = 150$ lakhs

$\sigma = 20$ lakhs.

(i)

(i) For 100 lakhs

z variate. $x = 100$

using formula $\boxed{z = \frac{x - U}{\sigma}}$

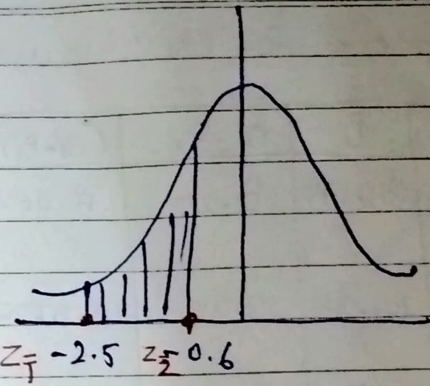
$$z_1 = \frac{100 - 150}{20}$$

$$= \frac{5\cancel{0}}{2\cancel{0}} -$$

$$\boxed{z_1 = -2.5}$$

i) For 138 latchs

$x = 138$



using $Z_2 = \frac{x-\mu}{\sigma}$

$= \frac{138-150}{20}$

$z_2 = \boxed{-0.6}$

Now

area b/w $-2.5 < z < 0$

$= 0.4938$ —(I)

area b/w $-0.6 < z < 0$ —(II)

$= 0.2251$.

Subtracting

(1) − (2)

$0.4938 - 0.2251$

$= \boxed{0.2687}$ area

b/w $-2.5 < x < -0.6$

No of Companies

400×0.2687

$= 107.48$

$\approx \boxed{107 \text{ Components}}$

Correspondence for Chi x^2 is used.

Q.4] (a)

	Oi	Ei	Oi - Ei	$(Oi - Ei)^2$	$\frac{(Oi - Ei)^2}{Ei}$
R & Y	315	312.75	2.25	5.0625	0.0161
W & Y	101	104.25	3.25	10.5625	0.1013
R & G	108	104.25	3.75	14.0625	0.1348
W & G	32	34.75	2.75	7.5625	0.2176
Total	556				$\Sigma = 0.4698$

- H_0 = There is no diff b/w Oi & Ei frequency
- H_1 = There is diff b/w $O_i \neq E_i$
- Significance level = 5%. 7.815
- Test static.

E_i = 9 : 3 : 3 : 1

Total = 16

For expected frequencies Ei :

- For R & Y = $\frac{9}{16} \times 556 = 312.75$
- For W & Y = $\frac{3}{16} \times 556 = 104.25$
- For R & G = $\frac{3}{16} \times 556 = 104.25$
- For W & G = $\frac{1}{16} \times 556 = 34.75$

Chi sq formula

$$\chi_2 = \frac{\Sigma (O_i - E_i)^2}{E_i}$$

$= 0.4698$

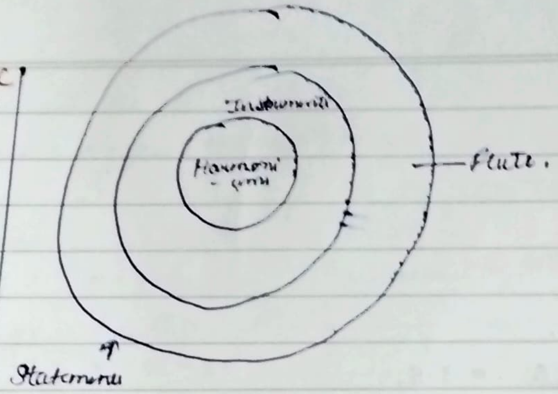
Conclusion

$\chi_2 (Cal) < \chi_2 (tab)$; $0.4698 < 7.815$

Ho is accepted.

Section - B

Ans 3 C)
Ans 5.



Conclusions: 1. ~~True~~ False. (because the above figure conclude that All flute are not instruments)
2. True.

3.b N = . $n = 5$
$p = 1/2$ $q = 1/2$

(1) P(2 boy & 3 girl) $= {}^nC_r\, p^r\, q^{n-r}$

$= {}^5C_2\, p^2 q^3$

$= \frac{5!}{2!\,3!} \times (1/2)^2 \times (1/2)^3$

$= \frac{5!}{2!\,3!} \times 1/4 \times 1/8 = 5/16$

No. of families with 2 boy & 3 girl $= \frac{5}{16} \times 320 = 100$

% of families with 2 boys & 3 girls $= \frac{100}{320} \times 100 = 31.25\,\%$

(2)

$P(X = 1,2,3,4,5) = 1 - P(X=0)$

$= 1 - {}^5C_0\, p^0 q^5$

$= 1 - (1/2)^5$

$= 1 - \frac{1}{32} = \frac{31}{32}$

No. of families with at least one boy $= 320 \times \frac{31}{32} = 310$

% of families with at least one boy $= \frac{310}{320} \times 100 = 96.88\,\%$

Section- B

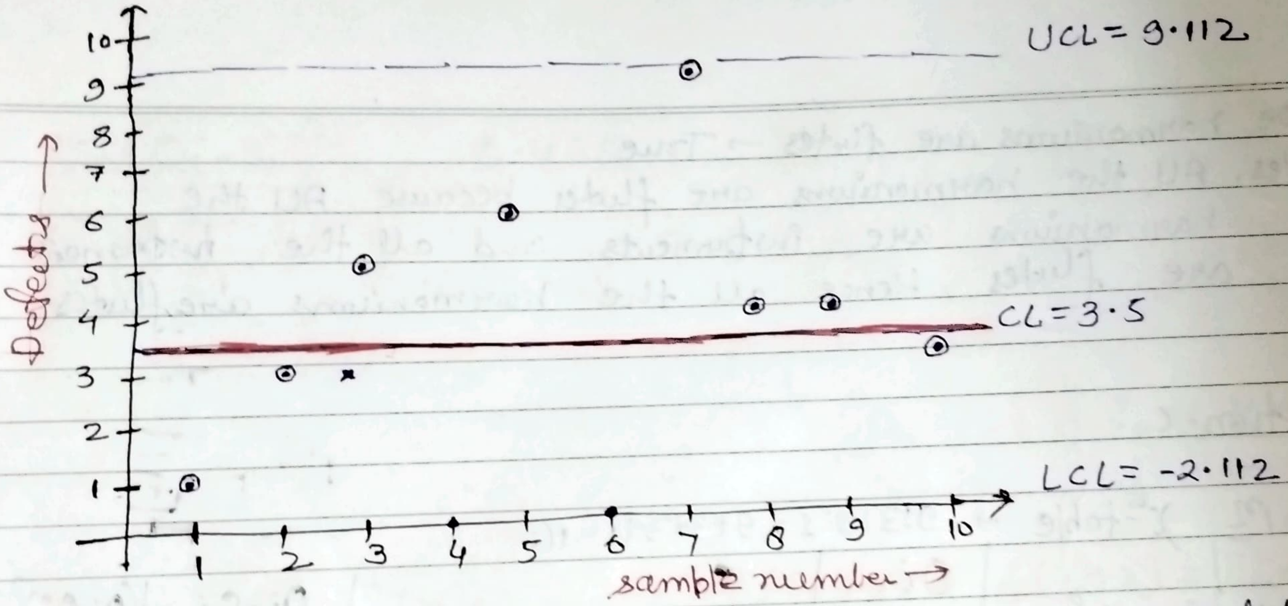
Sol^n ⇒ 3a) defects → 1, 3, 5, 0, 6, 0, 9, 4, 4, 3

$\bar{c} = \frac{\text{Total no. of defects}}{\text{Total No. of Sample}} = \frac{35}{10} = 3.5$

$CL = \bar{c} = 3.5$

$UCL = \bar{c} + 3\sqrt{\bar{c}} \rightarrow 3.5 + 3\sqrt{3.5} = 9.112$

$LCL = \bar{c} - 3\sqrt{\bar{c}} \Rightarrow 3.5 - 3\sqrt{3.5} = -2.112$



Conclusion :- All the points lie into under the Control limit. Hence it is ~~no~~ not out of ~~or~~ bound.

Harmoniums

Ans 3b

$N = 320$
$n = 5$
p (prob of being boy) $= \frac{1}{2}$
q (being girl) $= \frac{1}{2}$

(i) 2 boys & 3 girls

P(2 boys & 3 girls) $= N \cdot {}^{n}C_{r}\, p^{r} \cdot q^{n-r}$

here $r = 2$

$= 320 \times {}^{5}C_{2} \left(\frac{1}{2}\right)^2 \left(\frac{1}{2}\right)^3$

$= 320 \times \frac{5!}{2!\,3!} \cdot \frac{1}{(2)^5}$

$= 320 \times \frac{\cancel{4}^{2} \times 5}{\cancel{2}} \cdot \frac{1}{2^5}$

$= \overset{10}{\cancel{320}} \times 10 \times \frac{1}{\cancel{32}} = 100$

out of 320 families only 100 families having 2 boys & 3 girls.

Required percentage $= \frac{100}{32\cancel{0}} \times 10\cancel{0} = \frac{1000}{32}$

$= 31.2\%$

(ii) for at least one boy means $r = 1, 2, 3, 4, 5$

$P(r = 1, 2, 3, 4, 5) = 1 - P(r = 0)$

$= 1 - {}^{n}C_{r} \cdot p^{r} \cdot q^{n-r} = 1 - {}^{5}C_{0} \cdot \left(\frac{1}{2}\right)^{0} \left(\frac{1}{2}\right)^{5}$

$= 1 - 1 \times \frac{1}{32}$

$= 1 - \frac{1}{32} = \frac{31}{32}$

~~% of~~ percentage of the families having at least one boy $= \frac{31}{32} \times 100 = \frac{3100}{32} = 96.875\%$

~~work has same~~ workbook Q-94 same

Ans 2b Two properties of M.G.F

Let M.G.F of a R.V X is

$$M_X(t) = E(e^{Xt}), \quad t \in R$$

property 1 : $M_X\{c(t)\} = M_X\{ct\}$, c is any constant

this property is called Translation property

property 2 : If X_1 & X_2 are two independent random variable then

$$M_{X_1+X_2}(t) = M_{X_1}(t) \cdot M_{X_2}(t)$$

property 3 :

The M.G.F. of a distribution, if it exists, uniquely determines the distribution

Ans 2b   Two properties of M.G.F

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