ASSIGNMENT - 1

Q.1.i] 4, 7, 9, 9, 11, 15, 18, 18, 18, 25.

a) Mean:

$\Rightarrow$ $n = 10$

$$\bar{x} = \frac{4+7+9+9+11+15+18+18+18+25}{10}$$

$$= \frac{134}{10}$$

$$\bar{x} = 13.4.$$ //

b) Median:

$\Rightarrow$ $n = 10.$

$$\text{Median} = \frac{\left(\frac{n}{2}\right)^{th} + \left(\frac{n}{2}+1\right)^{th} \text{ term}}{2}$$

$$= \frac{11+15}{2}$$

$$= \frac{26}{2}$$

$$\text{Median} = 13$$ //

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c) Mode:

$\Rightarrow$ $\because$ '18' is occuring three times, the mode of data is 18.

$\therefore$ Mode = 18 //

d) Standard deviation:

x	4	7	9	9	11	15	18	18	18	25
$(x-\bar{x})^2$	88.36	40.96	19.36	19.36	5.76	2.56	21.16	21.16	21.16	57.76

$$\Sigma(x-\bar{x})^2 = 297.60$$

$$n = 10$$

$$\sigma = \sqrt{\frac{\Sigma(x-\bar{x})^2}{n}}$$

$$= \sqrt{\frac{297.60}{10}}$$

$$= \frac{2\sqrt{186}}{5}$$

$$\sigma = 5.45527 \text{ //}$$

e) Inter quartile range:

$Q_3 - Q_1$

$$Q_1 = \frac{n+1}{4}$$

$$= \frac{10+1}{4}$$

$$= \frac{11}{4}$$

$$= 2.75^{th} \text{ term.}$$

$=$

1. ii]

No. of household	0	1	2	3	4
No. of People	5	11	26	15	3

a) Mean :- $n = \cancel{8}$

$\bar{x} =$

x_i	f_i	~~(CF)~~ $x_i f_i$	~~CF~~
0	5	0	~~0~~
1	11	11	~~11~~
2	26	52	~~37~~
3	15	45	~~52~~
4	3	12	~~55~~
	$\Sigma f_i = 60$	$\Sigma x_i f_i = 109$	

$\cancel{\bar{x} = \frac{109}{}}$

$$\bar{x} = \frac{\Sigma x_i f_i}{\Sigma f_i}$$

$$= \frac{109}{60}$$

$$\boxed{\bar{x} = 1.8167}$$

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b) Median: $\frac{(n+1)}{2}^{th}$ term.

x_i	f_i	CF
0	5	5
1	11	16
2	26	42
3	15	57
4	3	60

$$\text{Median} = \frac{n+1}{2}$$

$$= \frac{5+1}{2}$$

$$= \frac{6}{2}$$

$$= 3^{rd} \text{ term}$$

$\boxed{\text{Median} = 26}$

c) $\boxed{\text{Mode : 26.}}$

1 d. Standard deviation:

$$\sigma = \sqrt{\frac{\Sigma (x-\bar{x})^2}{n}}$$

$$= \sqrt{\frac{4383.02}{60}}$$

$$= \sqrt{73.0504}$$

$$\boxed{\sigma = 8.546}$$

Q.2. i. Possion = (0.5)

$$X \sim P(0.5) = e^{-\lambda} \cdot \frac{\lambda^x}{x!}$$

$$= e^{-0.5} \cdot \frac{(0.5)^0}{0}$$

$$P = 0.6065$$

ii) $P(V=1)$

$\therefore$ V = no. of years.

P = Probability of no. of claims.

$$q = 1 - p.$$

$$= 1 - 0.6065$$

$$q = 0.39350$$

$\therefore P(V=1) = 3(0.39350) \times (0.6065)^2$
$= 0.43423$ //

~~iii)~~
Q.3. Given: $\alpha = 2$
$\lambda = \frac{1}{2}$

i. Mean $= (\bar{x}) = \frac{\alpha}{\lambda}$

$= \frac{2}{1/2}$

$= 2 \times 2$
$\bar{x} = 4$ //

$\sigma = \sqrt{\frac{(x-\bar{x})^2}{n}}$

~~$x =$~~ $V(x) = \frac{\alpha}{\lambda^2}$

$= \frac{2}{(1/2)^2}$

$= \frac{2}{1/4}$

$= 8$

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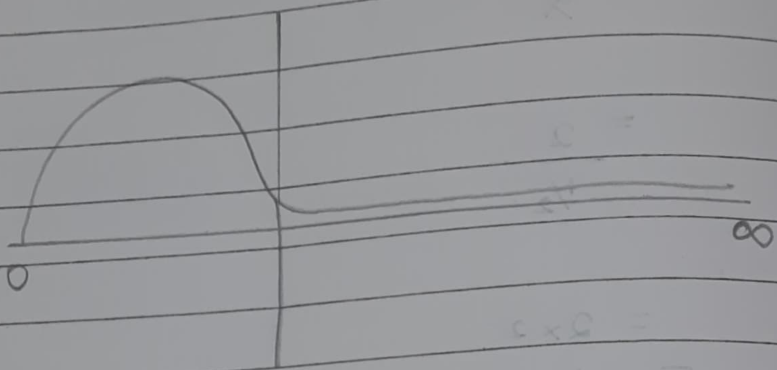
$\sigma = \sqrt{V(x)}$

$= \sqrt{8}$

$\sigma = 2\sqrt{2}$

$\boxed{\sigma = 2.8284}$ //

ii. Shape :



Q.4

x	Male	Female
$P(X=x)$	10	8
Qualified	6	7

Let F be atleast one female qualified
Let M be two females qualified

$$P(M/F) = \frac{P(F \cap M)}{P(F)}$$

$$\boxed{P(M/F) = \frac{7}{8}}$$ //

Q.7.

x	1	2	3	4	5
$P(X=x)$	0.05	0.15	0.35	0.4	0.05

i. $F(3)$

$\Rightarrow = P(X=1) + P(X=2) + P(X=3)$

$= 0.05 + 0.15 + 0.35$

$= 0.55$ //

ii. $E(x)$

$\Rightarrow = \sum x \cdot P(X=x)$

$= (1 \times 0.05) + (2 \times 0.15) + (3 \times 0.35) + (4 \times 0.4) + 5(0.05)$

$= \frac{181}{100}$

#

$\boxed{E(x) = 1.81}$ //

iii) $V(x) = E(x)^2 - [E(x)]^2$

$= \frac{569}{100} - \left(\frac{181}{100}\right)^2$

$= 5.69 - 3.2761$

$V(x) = 5065.72$ //

iv) Coefficient of Skewness.

$$= \left[\frac{\text{Mean} - \text{Mode}}{\sigma}\right]$$

$$= \left[\frac{0.2 - 0.35}{71.173}\right]$$

$$= 0.0021075 //$$

8. $X \sim Bin(15, 0.2)$

$$P(X=3) = P(X=0) + P(X=1) + P(X=2)$$

$$= {}^{15}C_0 (0.2)^0 . (0.8)^{15} + {}^{15}C_1 (0.2)^1 . (0.8)^{14} + {}^{15}C_2 (0.2)^2 (0.8)^{13}$$

$$= \left(\frac{1}{5}\right)^0 . \left(\frac{4}{5}\right)^{15} + 15\left(\frac{1}{5}\right)\left(\frac{4}{5}\right)^{14} + \frac{15\times14}{2} . \left(\frac{1}{5}\right)^2 . \left(\frac{4}{5}\right)^{13}$$

$$= \left(\frac{4}{15}\right)^{13}\left[(0.8)^2 + 3\times\frac{4}{5} + \frac{15\times14}{2}\times\frac{1}{5}\times\frac{1}{5}\right]$$

$$= (0.8)^{13} (0.04 + 2.4 + 4.2)$$

$$= (0.8)^{13} (7.24)$$

$$= 0.398023 //$$

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Q.12. $X \sim P(10)$

$$P(X < 0.1) = 1 - e^{-\lambda x}$$
$$= 1 - e^{-10 \times 0.1}$$
$$= 1 - e^{-1}$$
$$= 1 - 0.3678$$
$$= 0.6322$$ //

15. $\dfrac{k}{(x+5)^4}$; $x > 0$

i) Calculate 'k':

$$= \int_0^\infty \frac{k}{(x+5)^4}$$

$$= k \int_0^\infty \frac{1}{(x+5)^4} \cdot dx$$

$$= k \int_0^\infty (x+5)^{-4} \cdot dx$$

\# ~~Applying limits.~~

$\cancel{= k \left[\infty \right.}$

$$= k \int_0^\infty \frac{(x+5)^{-3}}{-3} \cdot 1 \qquad \left[\because \int (ax+b)^n dx = \frac{(ax+b)^{n+1}}{n+1} \cdot \frac{1}{a} + c \right]$$

\# Applying limits.

$$= k \left[\frac{(\infty+5)^3}{-3} - \frac{(0+5)^{-3}}{-3} \right]$$

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$$= k\left[0 - \frac{(5)^{-3}}{-3}\right]$$

$$= k\left[\frac{0+1}{(5)^3} \times \frac{1}{3}\right]$$

$$= k\left[\frac{0+1}{125} \times \frac{1}{3}\right]$$

$$= k\left[\frac{1}{375}\right]$$

$$\boxed{k = 375}$$

ii. Calculate F (10)

$$= \int_0^{10} \frac{k}{(x+5)^4} \cdot dx$$

$$= k\int_0^{10} \frac{1}{(x+5)^4} \cdot dx$$

$$= 375\int_0^{10} (x+5)^{-4}\, dx$$

$$= 375\int_0^{10} \frac{(x+5)^{-3}}{-3} \cdot dx$$

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= Applying limits.

$$= 375\left[\frac{(10+5)^{-3}}{-3} - \frac{(0+5)^{-3}}{-3}\right]$$

$$= 375\left[\frac{(15)^{-3}}{-3} - \frac{(5)^{-3}}{-3}\right]$$

$$= 375\left[\frac{\frac{1}{3375}}{-3} - \frac{\frac{1}{125}}{-3}\right]$$

$$= 375\left[\frac{-1}{10125} - \frac{(-1)}{375}\right]$$

$$= 375\left[\frac{26}{10125}\right]$$

$$= \frac{26}{27}$$

$$\boxed{F(10) = 0.962962963}$$

iii. $E(x) =$

$$\Rightarrow \quad = \int_0^\infty \frac{k}{(x+5)^4} \cdot dx$$

$$= k \cdot \int_0^\infty \frac{1}{(x+5)^4}\, dx.$$

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$$= k \cdot \int_0^{\infty} (x+5)^{-4} \cdot dx.$$

$$= k \cdot \left[\frac{(x+5)^{-3}}{-3} \right]_0^{\infty}$$

$$= 375 \cdot \left[\frac{(\infty+5)^{-3}}{-3} - \frac{(0+5)^{-3}}{-3} \right]$$

$$= 375 \cdot \left[0 + \frac{(5)^{-3}}{-3} \right]$$

$$= 375 \cdot \left[\frac{1}{(5)^{-3}} \times \frac{1}{3} \right]$$

$$\boxed{E(X) = 1} //$$