Section-3

Q2

Ans →

Range	f	x	(x-A)	f(x-A)	$(x-A)^2$	$f(x-A)^2$	$(x-A)^3$	$f(x-A)^3$	$(x-A)^4$	$f(x-A)^4$	Cumulative frequency
2-4	38	3	-4	-152	16	608	-64	-2432	256	9728	38
4-6	292	5	-2	-584	4	1168	-8	-2336	16	4672	330
6-8	389	7(A)	0	0	0	0	0	0	0	0	719
8-10	212	9	2	424	4	848	8	1696	16	3392	931
10-12	69	11	4	276	16	1104	64	4416	256	17664	1000
	$\Sigma f = 1000$			$\Sigma f(x-A) = -36$		$\Sigma f(x-A)^2 = 3728$		$\Sigma f(x-A)^3 = 1344$		$\Sigma f(x-A)^4 = 35456$	

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$$\Rightarrow \mu_1' = \frac{\Sigma f(x-A)}{\Sigma f} = \frac{-36}{100} = -0.036$$

$$\Rightarrow \mu_2' = \frac{\Sigma f(x-A)^2}{\Sigma f} = \frac{3728}{1000} = 3.728$$

$$\Rightarrow \mu_3' = \frac{\Sigma f(x-A)^3}{\Sigma f} = \frac{1344}{1000} = 1.344$$

$$\Rightarrow \mu_4' = \frac{\Sigma f(x-A)^4}{\Sigma f} = \frac{35456}{1000} = 35.456$$

⇒ Central moment are given by,

$$\boxed{\mu_1 = 0}$$

$$\mu_2 = \mu_2' - \mu_1'^2 = 3.728 - (-0.036)^2$$

$$\boxed{\mu_2 = 3.7267}$$

$$\mu_3 = \mu_3' - 3\mu_2'\mu_1' + 2\mu_1'^3$$
$$= 1.344 - 3(3.728)(-0.036) + 2(-0.036)^3$$
$$= 1.344 + 0.402624 - 0.000093312$$

$$\boxed{\mu_3 = 1.7465}$$

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$$\mu_4 = \mu_4' - 4\mu_3'\mu_1' + 6\mu_2'\mu_1'^2 - 3\mu_1'^4$$

$$= 35.456 - 4(1.344)(-0.036) + 6(3.728)(-0.036)^2 - 3(-0.036)^4$$

$$= 35.456 + 0.193536 + 0.028988 + 5.0388 \times 10^{-6}$$

$$\boxed{\mu_4 = 35.6785}$$

$\Rightarrow$ Co-efficient of skewness, $\beta_1 = \dfrac{\mu_3^2}{\mu_2^3}$

$$\beta_1 = \frac{(1.7465)^2}{(3.7267)^3}$$

$$\boxed{\beta_1 = 0.0589} \text{ (positive)}$$

- The curve is positive skewed.
- Co-efficient of kurtosis, $\beta_2 = \dfrac{\mu_4}{\mu_2^2} = \dfrac{35.6785}{(3.7267)^2}$

$$\beta_2 = 2.569 \ (<3)$$ i.e. curve is platykurtic.

- Measure of Karl Pearson's skewness is given by

$$\boxed{\text{Mean} = A + \frac{\Sigma f(x-A)}{\Sigma f}}$$

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$= 7 + \frac{(-36)}{1000}$

Mean = 6.964

- **Median** $= l + \frac{N/2 - C.f}{f} \cdot i$

$= 6 + \frac{\frac{1000}{2} - 330}{389} \times 2$

$= 6 + 0.437 \times 2 = 6.874$

Median = 6.874

- **Standard Deviation (S.D.)** $= \sqrt{\frac{\Sigma f(x-A)^2}{\Sigma f} - \left(\frac{\Sigma f(x-A)^2}{\Sigma f}\right)}$

$= \sqrt{\frac{3728}{1000} - \left(\frac{-36}{1000}\right)^2}$

$= \sqrt{3.728 - 0.001296}$

$= \sqrt{3.726}$

S.D = 1.930

- Karl Pearson's Co-efficient of skewness $= \frac{3(\text{Mean} - \text{Median})}{\text{S.D.}}$

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$$S_K = \frac{3(6.964 - 6.874)}{1.930}$$

$$S_K = \frac{0.27}{1.930} = 0.1398$$

Since $S_K > 0$

∴ Distribution is positively skewed. Ans.