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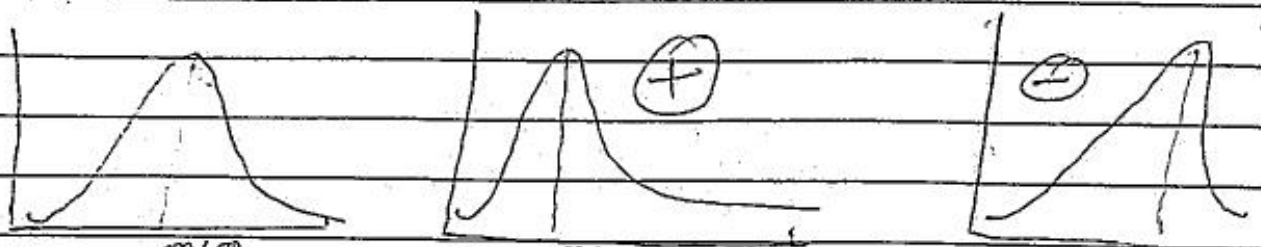
Skewness — lack of Symmetry
- measure of dispersion only gives the amt of variation in a series rather than its direction.
→ skewness denotes the degree of departure of a distribution from symmetry & gives direction of variation of items

$\gamma_1 = 0$ $\gamma_1 > 0$ $\gamma_1 < 0$



normal curve positive skew

$\gamma_1 = \sqrt{\beta_1} = \frac{\mu_3}{(\mu_2)^{3/2}}$ $\beta_1 = \frac{\mu_2^2}{\mu_2^3}$ = always +ve

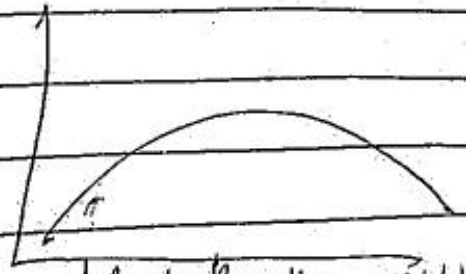
$\beta_1 = 0$ Symmetric distribution

$\beta_1 \neq 0$ skewed dist^n

Kurtosis :- A measure of Kurtosis indicates the the degree of flatness or peakedness of the frequency curve.

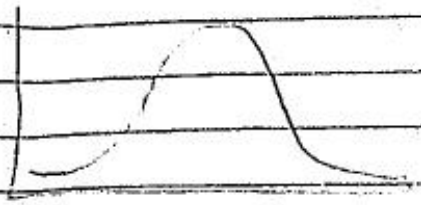
→ Platy Kurtic distribution :- has lower and wider peak around mean

$\gamma_2 < 0$



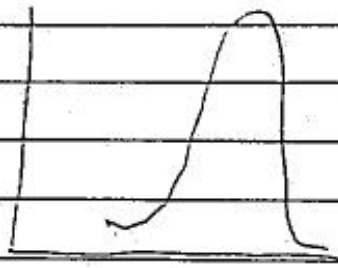
platykurtic curve

→ mesokurtic :- flat topped distribution ($\gamma_2 = 0$)



mesokurtic

→ Leptokurtic distribution :- has a more accurate peak around the mean ($\gamma_2 > 0$)



$$\beta_2 = \frac{\mu_4}{\mu_2^2}$$

$$\gamma_1 = \beta_2 - 3$$

Q]

x	f
2	1
3	3
4	7
5	2
6	5

① Find first 4 moments about origin
② Find first 4 moments about mean
③ Find $\beta_1, \beta_2, \gamma_1$ and γ_2
④ Find nature and shape of distribution

Sol

x	f	fx	x^2	fx^2	fx^3	fx^4
2	1	2	4	4	8	16
3	3	9	9	27	81	243
4	7	28	16	112	448	1792
5	2	10	25	50	250	1250
6	5	30	36	180	1080	6480
	18	79		373	1867	9781

① $\mu_1' = \frac{\sum fx}{N} = \frac{79}{18} = 4.389$

$$\mu_2' = \frac{\Sigma f x^2}{N} = \frac{373}{79} = 20.722$$

$$\mu_3' = \frac{\Sigma f x^3}{N} = \frac{1867}{18} = 103.722$$

$$\mu_4' = \frac{\Sigma f x^4}{N} = \frac{9781}{18} = 543.389$$

(2) moments about mean

$\mu_1 = 0$

$$\mu_2 = \mu_2' - (\mu_1')^2 = 20.722 - (4.389)^2 = 1.46$$

$$\mu_3 = \mu_3' - 3\mu_2'\mu_1' + 2(\mu_1')^3 = -0.031$$

$$\mu_4 = \mu_4' - 4\mu_3'\mu_1' + 6\mu_2'(\mu_1')^2 - 3(\mu_1')^4 = 4.27$$

$$\beta_1 = \frac{\mu_3^2}{\mu_2^3} = \frac{(-0.031)^2}{(1.46)^3} = 0.000308$$

$$\beta_2 = \frac{\mu_4}{\mu_2^2} = \frac{4.27}{(1.46)^2} = 2.0021$$

$$\gamma_1 = \frac{\mu_3}{(\mu_2)^{3/2}} = -0.01757$$

$$\gamma_2 = \beta_2 - 3 = -0.9969$$

nature:- $\gamma_1 < 0$ negatively skewed

$\gamma_2 < 0$ platykurtic