GATEWAY CLASSES
Empowering learners, transforming futures

DPP-2 Maths- IV Unit-3

Topic- moments

Q-1- Calculate $\mu_1, \mu_2, \mu_3, \mu_4$ for the series: 4, 7, 10, 13, 16, 19, 22.

Sol:- $\bar{x} = \frac{\Sigma x}{n}$

$\bar{x} = \frac{91}{7}$

$\bar{x} = 13$

S.No	x	$x-\bar{x}$	$(x-\bar{x})^2$	$(x-\bar{x})^3$	$(x-\bar{x})^4$
1	4	-9	81	-729	6561
2	7	-6	36	-216	1296
3	10	-3	9	-27	81
4	13	0	0	0	0
5	16	3	9	27	81
6	19	6	36	216	1296
7	22	9	81	729	6561
	$\Sigma x = 91$	$\Sigma(x-\bar{x}) = 0$	$\Sigma(x-\bar{x})^2 = 252$	$\Sigma(x-\bar{x})^3 = 0$	$\Sigma(x-\bar{x})^4 = 15876$

Download Our App from Google PlayStore
Helpline Number : 7455961284
PDF Notes PYQs Solution Recorded Lectures

GATEWAY CLASSES
Empowering learners, transforming futures

Moments ⇒ $\boxed{\mu_1 = 0}$

$$\mu_2 = \frac{\Sigma (x-\bar{x})^2}{n}$$

$$\mu_2 = \frac{252}{7}$$

$$\boxed{\mu_2 = 31.5}$$

$$\mu_3 = \frac{\Sigma (x-\bar{x})^3}{n}$$

$$\boxed{\mu_3 = 0}$$

$$\mu_4 = \frac{\Sigma (x-\bar{x})^4}{n}$$

$$= \frac{15876}{7}$$

$$\boxed{\mu_4 = 2268}$$

Q-2: Calculate the first four moment about $x = 15$ and hence find moments about the following distribution

x	10	11	12	13	14	15	16	17	18	19	20	21
f	9	36	75	105	116	107	88	66	45	30	18	5

Gateway Classes

Download Our App from Google PlayStore
Helpline Number : 7455961284
PDF Notes
PYQs Solution
Recorded Lectures

GATEWAY CLASSES
Empowering learners, transforming futures

x	f	fx	$(x-A)$	$f(x-A)$	$f(x-A)^2$	$f(x-A)^3$	$f(x-A)^4$
10	9	90	-5	-45	225	-1125	5625
11	36	396	-4	-144	576	-2304	9216
12	75	900	-3	-225	675	-2025	6075
13	105	1365	-2	-210	420	-840	1680
14	116	1624	-1	-116	116	-116	116
15	107	1605	0	0	0	0	0
16	88	1408	1	88	88	88	88
17	66	1122	2	132	264	528	1056
18	45	810	3	135	405	1215	3645
19	30	570	4	120	480	1920	7680
20	18	360	5	90	450	2250	11250
21	5	105	6	30	180	1080	6480
	$\Sigma f =$ 700	$\Sigma fx =$ 10,355		$\Sigma f(x-A) = -145$	$\Sigma f(x-A)^2 = 3879$	$\Sigma f(x-A)^3 = 671$	$\Sigma f(x-A)^4 = 52911$

$$\mu_1' = \frac{\Sigma f(x-A)}{\Sigma f} = \frac{-145}{700} = -0.207$$

$$\mu_2' = \frac{\Sigma f(x-A)^2}{\Sigma f} = \frac{3879}{700} = 5.541$$

$$\mu_3' = \frac{\Sigma f(x-A)^3}{\Sigma f} = \frac{671}{700} = 0.958$$

$$\mu_4' = \frac{\Sigma f(x-A)^4}{\Sigma f} = \frac{52911}{700} = 75.587$$

Download Our App from Google PlayStore
Helpline Number : 7455961284
PDF Notes
PYQs Solution
Recorded Lectures

Moment about mean -

$\boxed{\mu_1 = 0}$

$\mu_2 = \mu_2' - \mu_1'^2$

$= 5.541 - (-0.207)^2$

$= 5.541 - 0.042$

$\boxed{\mu_2 = 5.499}$

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

$= 0.958 - 3 \times 5.541 \times (-0.207) + 2 \times (-0.207)^3$

$= 0.958 + 3.44 - 0.0177$

$\boxed{\mu_3 = 4.3023}$

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

$= 75.587 - 4 \times 0.958 \times (-0.207) + 6 \times 5.541 \times (-0.207)^2 - 3 \times (-0.207)^4$

$\boxed{\mu_4 = 77.76}$

Download Our App from Google PlayStore
Helpline Number : 7455961284
PDF Notes | PYQs Solution | Recorded Lectures

GATEWAY CLASSES
Empowering learners, transforming futures

Q-3- Find the first four moments about origin for the following data.

Marks	0-10	10-20	20-30	30-40	40-50
No. of student	5	10	40	20	25

Marks	f	x	fx	$(x-\bar{x})$	$f(x-\bar{x})$	$f(x-\bar{x})^2$	$f(x-\bar{x})^3$	$f(x-\bar{x})^4$
0-10	5	5	25	-25	-125	3125	-78125	1953125
10-20	10	15	150	-15	-150	2250	-33750	506250
20-30	40	25	1000	-5	-200	1000	-5000	25000
30-40	20	35	700	5	100	500	2500	12500
40-50	25	45	1125	15	375	5625	84375	1265625
	$\Sigma f = 100$		$\Sigma fx = 3000$		$\Sigma f(x-\bar{x}) = 0$	$\Sigma f(x-\bar{x})^2 = 12,500$	$\Sigma f(x-\bar{x})^3 = 30,000$	$\Sigma f(x-\bar{x})^4 = 3762500$

$$\text{Mean } (\bar{x}) = \frac{\Sigma fx}{\Sigma f}$$

$$= \frac{3000}{100}$$

$$\boxed{\bar{x} = 30}$$

Download Our App from Google PlayStore
Helpline Number : 7455961284
PDF Notes
PYQs Solution
Recorded Lectures

GATEWAY CLASSES
Empowering learners, transforming futures

Moment about mean:-

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

$$\mu_2 = \frac{\Sigma f (x - \bar{x})^2}{N}$$

$$= \frac{12500}{100}$$

$$\boxed{\mu_2 = 125}$$

$$\mu_3 = \frac{\Sigma f (x - \bar{x})^3}{N}$$

$$= -\frac{30,000}{100}$$

$$\boxed{\mu_3 = -300}$$

$$\mu_4 = \frac{\Sigma f (x - \bar{x})^4}{N}$$

$$= \frac{3762500}{100}$$

$$\boxed{\mu_4 = 37625}$$

Moment about origin:-

$$\boxed{\nu_1 = \bar{x} = 30}$$

$$\nu_2 = \mu_2 + \bar{x}^2$$

$$= 125 + 30 \times 30$$

$$\boxed{\nu_2 = 1025}$$

Download Our App from Google PlayStore
Helpline Number : 7455961284
PDF Notes | PYQs Solution | Recorded Lectures

GATEWAY CLASSES
Empowering learners, transforming futures

$$v_3 = \mu_3 + 3\mu_2\bar{x} + \bar{x}^3$$

$$v_3 = -300 + 3 \times 125 \times 30 + 30 \times 30 \times 30$$

$$v_3 = -300 + 11250 + 27000$$

$$\boxed{v_3 = 37950}$$

$$v_4 = \mu_4 + 4\mu_3\bar{x} + 6\mu_2\bar{x}^2 + \bar{x}^4$$

$$v_4 = 37625 + 4 \times (-300) \times 30 + 6 \times 125 \times 30 \times 30 + 810000$$

$$v_4 = 37625 - 36000 + 675000 + 810000$$

$$\boxed{v_4 = 1486625}$$

Download Our App from Google PlayStore
Helpline Number : 7455961284
PDF Notes
PYQs Solution
Recorded Lectures