

Applied Statistical Methods

# DIGITAL ASSIGNMENT – I

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Digital Assignment-1Answer any 4.

Q1:- Determine median, lower quartile and upper quartile for the following distribution:

Life time	0-20	20-40	40-60	60-80	80-100	100-120	120-140
No. of items	5	15	20	24	16	12	8

Soln:-

$Q_0$	$x$	$f$	$CF$	Median = $l_1 + (l_2 - l_1) \frac{(N/2 - CF)}{fm}$
0-20	10	5	5	
20-40	30	15	20	$\rightarrow Q_1$
40-60	50	20	40	Median class = $N/2 = 100/2 = 50$
60-80	70	24	64	$\rightarrow Q_2$ $50 < 64 \Rightarrow$ Correct $x = 60-80$
80-100	90	16	80	$\rightarrow Q_3$
100-120	110	12	92	
120-140	130	8	100	
$\Sigma f$		100		

$$= 60 + \frac{(20)(10)}{24}$$

$$= 60 + \frac{200}{24} = 60 + 8.33$$

$$\boxed{\text{Median} = 68.33}$$

$$Q_i = l_1 + \frac{(l_2 - l_1) (i^{th} N/4 - cf)}{f_1}$$

$$Q_1 = 40 + \frac{(60 - 40) (1 \times 100/4 - 20)}{20}$$

$$Q_1 = 40 + \frac{(20) (25 - 20)}{20}$$

$$Q_1 = 40 + \frac{(20) (5)}{20}$$

$$Q_1 = 40 + \frac{100}{20}$$

$$Q_1 = 45 \Rightarrow 45$$

$$Q_2 = \text{median} = 68.33$$

$$Q_3 = 80 + \frac{(100 - 80) (3 \times 100/4 - 64)}{16}$$

$$= 80 + \frac{(20) (3 \times 25 - 64)}{16}$$

$$= 80 + \frac{(20) (75 - 64)}{16}$$

$$= 80 + \frac{(20) (11)}{16} = 80 + \frac{220}{16} = 80 + 13.75$$

$$Q_3 = 93.75$$



Q.2:- The scores obtained by two batsmen A and B in 7 matches are given below: Determine who more efficient and who is more consistent.

A	30	44	66	62	60	34	80
B	34	46	70	38	55	48	60

Sol<sup>n</sup>:-

$$\bar{x}_A = \frac{\sum x_{Ai}}{N_A} = \frac{376}{7} = 53.714$$

$$\bar{x}_B = \frac{\sum x_{Bi}}{N_B} = \frac{351}{7} = 50.142$$

Since  $\bar{x}_A > \bar{x}_B$ ; A is more efficient than B.

Batsman A

$x$	$x - \bar{x}$	$x - \bar{x}^2$
30	-23.71	562.16
44	-9.71	94.28
66	12.29	151.04
62	8.29	68.72
60	6.29	39.56
34	-19.71	388.48
80	26.29	691.16
$\Sigma$	0.03	1995.4

Batsman B

$x$	$x - \bar{x}$	$x - \bar{x}^2$
34	-16.14	260.49
46	-4.14	17.13
70	19.86	394.41
38	-12.14	147.37
55	4.86	23.61
48	-2.14	4.57
60	9.86	97.21
$\Sigma$	0.02	944.79

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

$$\sigma_A = 16.88$$

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

$$\sigma_A = \sqrt{\frac{1995.4}{7}}$$

$$\sigma_B = 11.92$$

$$\sigma_B = \sqrt{\frac{944.79}{7}}$$

Calculating Coefficient of variance :-

$$CVA = \frac{\sigma_A}{\bar{x}_A} \times 100 = \frac{16.88}{53.7} \times 100 \Rightarrow CVA = 31.43$$

$$CVB = \frac{\sigma_B}{\bar{x}_B} \times 100 = \frac{11.92}{50.14} \times 100 \Rightarrow CVB = 23.77$$

Since  $CVB < CVA$  ∴ batsman B is more consistent.



Q.3:- Calculate the mean, variance & standard deviation for the following frequency distribution, and hence obtain the value of Co-efficient of variation.

$x$	20-25	25-30	30-35	35-40	40-45	45-50	50-55	55-60
$f$	35	165	215	185	145	105	75	65

60-65  
45

Sol<sup>n</sup>

$x_i$	$x_i$	$f_i$	$f_i x_i$	$x - \bar{x}$	$(x - \bar{x})^2$	$f(x - \bar{x})^2$
20-25	22.5	35	787.5	-17	289	10115
25-30	27.5	165	4537.5	-12	144	23760
30-35	32.5	215	6987.5	-7	49	10535
35-40	37.5	185	6937.5	-2	4	740
40-45	42.5	145	6162.5	3	9	1305
45-50	47.5	105	4987.5	8	64	6720
50-55	52.5	75	3937.5	13	169	12675
55-60	57.5	65	3737.5	18	324	21060
60-65	62.5	45	2812.5	23	529	23805
$\Sigma f$		1035	40887.5	$\Sigma$	1589	110715

$$\text{Mean} = \frac{\sum f_i x_i}{\sum f_i}$$

$$= \frac{40887.5}{1035} = 39.50 = \bar{x}$$

Standard deviation  $\sigma = \sqrt{\frac{\sum f(x - \bar{x})^2}{\sum f}}$

$$\sigma = \sqrt{\frac{1035(1579)^2}{1035}}$$

$$\sigma = \sqrt{\frac{110715}{1035}}$$

$$\sigma = \sqrt{\frac{109990}{1035}}$$

$$\sigma = \sqrt{106.270}$$

$$\sigma = \sqrt{106.971}$$

$$\sigma = 10.308$$

$$\sigma = 10.34$$

Variance  $= \sigma^2$

$$\sigma^2 = (10.308)^2$$

$$\sigma^2 = (10.34)^2$$

$$\sigma^2 = 106.09$$

$$\sigma^2 = 106.91$$

Coefficient of Variation

$$\frac{\sigma}{\bar{x}} \times 100$$

$$\frac{\sigma}{\bar{x}} \times 100$$

$$= \frac{10.308}{39.50} \times 100 \quad CV = \frac{10.34}{39.50} \times 100$$

$$CV = 26.09$$

$$CV = 26.17$$



Q4:- Given below is the distribution of 140 candidates obtaining marks  $x$  and cumulative frequency (C.f) of  $x$ .

$x$	10	20	30	40	50	60	70	80	90	100
C.f	140	133	118	100	75	45	25	9	2	0

Calculate mean, median, mode for this distribution.

Soln:-

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

$$= \left( \frac{140+1}{2} \right)^{\text{th}} \text{ item}$$

$$= 70.5^{\text{th}} \text{ item}$$

Corresponding  $x = 50$

$$\boxed{\text{Median} = 50}$$

$\boxed{\text{mode} = 50}$   $\because$  frequency of observation is maximum i.e., 30.

$x_i f_i$	$x$	$f$	C.f
700	10	7	140
300	20	15	133
540	30	18	118
1000	40	25	100
1500	50	30	75
1200	60	20	45
1120	70	16	25
560	80	7	9
180	90	2	2
6470	100	0	0

$$\Sigma f = 140$$

$$\text{Mean} = \bar{x} = \frac{\sum x_i f_i}{\sum f_i}$$

$$\bar{x} = \frac{6470}{140}$$

$$\boxed{\text{Mean} = 46.214}$$