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Class : MCA - I
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SUB : Computational Statics
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Type : Assignment - I

Q1) Solve the following question.

The median & mode of the following distribution are known to be 27 & 26 respectively. find the value (a & b) ?

value	0-10	10-20	20-30	30-40	40-50
Frequency	3	a	20	12	b

Sol.

Given,
median = 27
mode = 26.

The mode for the frequency distribution. can be computed following proceduere.
1. observe the largest frequency from distribution.
2. Identify model. class corresponding to the largest frequency.
3. with reference to the modal class. observe quantities L, to, f₁, f₂, c.

with: L, f_0, f_1, f_2, c.

4. substituting these quantities in the formula mode compute the value.

where

f_0 = frequency of preceding class modal.

f_1 = frequency of the modal class

f_2 = frequency of succeeding the modal class

L = Lowest limit of modal class

c = size of the modal class.

$$M_0 = L + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} . c .$$

$M_0 = 26$.

$f_1 = 20$

$f_0 = a$

$f_2 = 12$.

$L = 20$ $(20-30)$ (ie) 20 is Lowest limit.

$C = 10$ $(20-30)$ (ie) that interval is 10.

$\Rightarrow 26 = 20 + \frac{20 - a}{2(20) - a - 12} \times 10$

$\Rightarrow 26 = 20 + \frac{20 - a}{40 - a - 12} \times 10$.

$\Rightarrow 26 - 20 = \frac{20 - a}{28 - a} \times 10$.

$\Rightarrow 6 = \frac{10(20 - a)}{28 - a}$.

$\Rightarrow 6(28 - a) = 200 - 10a$.

$\Rightarrow 168 - 6a = 200 - 10a$.

$\Rightarrow 10a - 6a = 200 - 168$.

$\Rightarrow 4a = 32$.

$\Rightarrow a = 32/4 \Rightarrow 8$ //.

$\boxed{a = 8}$

The median is computed following procoduere.
1. compute the total troquenuy ab

$(N) = t_1 + t_2 + t_3 \ldots \overset{n}{\underset{i=1}{\Sigma}} t_i$

2. Deloamine cumalative troquenceg.
3. Find the cumalative frequancies which just excoodg $N/2$.
4. The value of x corresponding to this cumalative frequeny is the median.

where.

Cf = the cumalative troquenuy just less than that corresponding median class
to = trequency of median class.
L = Lower limit of the median class.
c = Size of the median class

$$Md = L + \frac{(N/2) - Cf}{to} \cdot c$$

Value	Frequency	Cf
0 - 10	3	3
10 - 20	a	3 + a ⟵ et.
20 - 30	20 ↳ F0	
30 - 40	12	
40 - 50	b	

median.
Lower ←

$N = 3 + a + 20 + 12 + b$.
$N = 35 + a + b$ //.

$Cf = 3 + a$.
$to = 20$.
$L = 20$.
$c = 10$.
$Md (median) = 27$.
$a = 2$

$\Rightarrow 27 = 20 + \dfrac{(35+a+b)/2 - 3 + a}{20} \times 10.$

$\Rightarrow 27 = 20 + \dfrac{(35+8+b)/2 - (3+8)}{20} \times 10.$

$\Rightarrow 27 - 20 = \dfrac{(35+8+b)/2 - 11}{20_2} \times 10.$

$\Rightarrow 7 = \dfrac{(43+b)/2 - 11}{2}$

$\Rightarrow 7 = \dfrac{43+b-22}{2\times2}$

$\Rightarrow 7 = \dfrac{21+b}{4}$

$\Rightarrow 28 = 21+b.$

$\Rightarrow 28-21 = b$

$\Rightarrow 7 = b.$

$\boxed{b = 7}$

Ans //

$a = 8$

$b = 7.$

Q2) The following table shows the monthly expenditure 80 students lunch.

(Ref: with pdf page 8 3. Table)

Expenditure (Rs)	No. of students
780 - 820	2
730 - 770	6
680 - 720	7
630 - 670	12
580 - 620	18
530 - 570	18
480 - 520	9
430 - 470	7
380 - 420	4
330 - 370	2

calculate mean, standard deviation and coefficient of variation for above data.

Sol.

Calculate the Mean:

① $N = \sum\limits_{i=1}^{n} f_i$

② $\bar{x} = \frac{1}{N} \sum\limits_{i=h}^{n} f_i x_i$ (Mean formula)

③ $x = \dfrac{\text{Lower limit} + \text{upper limit}}{2}$ // mid point

$(\text{ex}) \Rightarrow \dfrac{780 + 820}{2} \Rightarrow \dfrac{1600}{2} = 800$ //

Expenditure (Rs).	No. of student (f).	midpoint (x).	f.x.
780-820	2	800	1600
730-770	6	750	4500
680-720	7	700	4900
620-670	12	650	7800
580-620	18	600	10800
530-570	13	560	7150
480-520	9	500	4500
430-470	7	450	3150
380-420	4	400	1600
330-370	2.	350	700.
	80		46700

N = 80.

$$\sum_{i=1}^{n} f_i x_i = 46700$$

$$\Rightarrow \bar{x} = \frac{1}{80} \times 46700$$

$$\Rightarrow \bar{x} = \frac{46700}{80} = 583.75 \; /\!/$$

$$\boxed{\bar{x} = 583.75} \; mean /\!/$$

Standard deviation:

① $SD = \sqrt{\frac{1}{N} \sum_{i=1}^{n} f(x-\bar{x})^2}$

f	(midpoint − 583·75) $x - \bar{x}$	$(x - \bar{x})^2$
2	216·25	46756·56
6	166·25	27637·56
7	116·25	13515·06
12	66·25	4389·06
18	16·25	264·06
13	−33·25	1139·06
9	−83·25	7013·06
7	−133·25	17823·06
4	−183·25	33763·06
2	−233·75	54643·06

f	(583·75) midpoint − mean $x - \bar{x}$	$(x - \bar{x})^2$	$f(x - \bar{x})^2$
2	216·25	46764·06	93528·12
6	166·25	27639·06	165834·38
7	116·25	13514·06	94598·44
12	66·25	4389·06	52668·75
18	16·25	264·06	4753·12
13	−33·25	1139·06	14807·81
9	−83·25	7014·06	63126·56
7	−133·25	17889·06	125223·44
4	−183·25	33764·06	135056·25
2	−233·75	54639·06	109278·12
80			858874·99

$N = 80$

$$\sum_{i=1}^{N} f(x - \bar{x})^2 = 858874·99$$

$$SD = \sqrt{\frac{1}{80} \times 858874·99}$$

$$\Rightarrow 103·6143 //$$

$$\boxed{SD = 103·61}$$

Coefficient of Variation = $\dfrac{\text{Standard deviation}}{\text{Mean}} \times 100$.

SD = 103.61

Mean = 583.75

$CV = \dfrac{103.61}{583.75} \times 100$.

= 17.749036.

$\boxed{CV = 17.75}$

Ans:

Mean : 583·75

Standard deviation = 103.61

coefficient of variation = 17.75.