RBSE BOARD

CLASS-Xth

SHARMA TUTION CLASSES

MEASURE OF CENTRAL TENDENCY [PREVIOUS YEAR 2015-20]

(1) In the following distribution calculate mean $\bar{x}$ from assumed mean : [RBSE 2015]

Class-Interval	0-20	20-40	40-60	60-80	80-100	100-120
Frequency	10	35	52	61	38	20

Sol

Class	Frequency f_i	Mid Value x_i	$u_i = \frac{(x_i - A)}{h}$	$f_i \times u_i$
10-25	2	17.5	-2	-4
25-40	3	32.5	-1	-3
40-55	7	47.5	0	0
55-70	5	62.5	1	5
70-85	6	77.5	2	12
85-100	7	92.5	3	21
	$\Sigma f_i = 30$			$\Sigma(f_i \times u_i) = 31$

Thus,

$A = 30,\ h = 15,\ \Sigma f_i = 27$ and $\Sigma (f_i \times u_i) = 31$

$$\text{Mean}(\bar{x}) = A + \left\{ h \times \frac{\Sigma (f_i \times u_i)}{\Sigma f_i} \right\}$$

$$= 45.5 + \frac{31}{30} \times 15$$

$$= 45.5 + 15.5$$

$$= 63$$

OR

Find the mode of the following distribution : [RBSE 2015]

Class-Interval	0-20	20-40	40-60	60-80	80-100	100-120
Frequency	10	35	52	61	38	20

Sol As the class 60-80 has maximum frequency, so it is the modal class.

$x_K = 60,\ h = 20,\ f_K = 61,\ f_{K-1} = 52,$ and $f_{K+1} = 38$

$$M_o = x_k + \left\{ h \times \frac{(f_k - f_{k-1})}{(2f_k - f_{k-1} - f_{k+1})} \right\}$$

$$= 60 + 20 \times \frac{(61-52)}{2\times61-52-38} = 60 + 20 \times \frac{9}{122-90}$$

$$= 60 + 20 \times \frac{9}{32}$$

$$= 60 + \frac{45}{8} = 60 + 5.625$$

$$= 65.625$$

② Per day expenses of 25 families of the frequency distribution of a Dhani of a villages is given as follows [RBSE 2016]

Per day expense	25-35	35-45	45-55	55-65	65-75
No. of families	3	7	6	6	3

Sol.

Per day exp.	Frequency (f_i)	Mid value (x_i)	$(f_i \times x_i)$
25-35	3	30	90
35-45	7	40	280
45-55	6	50	300
55-65	6	60	360
65-75	3	70	210
	$\Sigma f_i = 30$		$\Sigma(f_i \times x_i) = 1240$

Thus, $\text{Mean}(\bar{x}) = \frac{\Sigma(f_i \times x_i)}{\Sigma f_i} = \frac{1240}{25} = 49.6$

③ The following table shows the marks obtained by 50 students in Mathematics of class-X in a school. (RBSE 2016)

Sol.

Obtained Marks	20-30	30-40	40-50	50-60	60-70	70-80
No. of Students	5	9	8	12	13	3

Obtained Marks	No. of Student f_i	cf
20-30	5	5
30-40	9	14
40-50	8	22
50-60	12	34
60-70	13	47
70-80	3	50
	$\Sigma f_i = 50$	

Here, $m = \frac{N}{2} = \frac{50}{2} = 25^{th}$ term

Then, $M = l_1 + \frac{\frac{N}{2} - cf}{f} \times h$

$= 50 + \frac{25-22}{12} \times 10 = 50 + \frac{3}{12} \times 10$

$= 50 + \frac{5}{2}$

$= 52.5$

(4) Following the mean daily pocket allowance by using appropriated method. Find the Mean. [RBSE 2017]

Class interval	10-20	20-30	30-40	40-50	50-60
Frequency	3	5	4	7	6

Sol.

CI	f_i	x_i	$f_i x_i$
10-20	3	15	45
20-30	5	25	125
30-40	4	35	140
40-50	7	45	315
50-60	6	55	330
	$\Sigma f_i = 25$		$\Sigma f_i x_i = 955$

$$\text{Mean} = \frac{\Sigma (f_i \times x_i)}{\Sigma f_i} = \frac{955}{25} = 38.2$$

(5) The following data gives the information on the observed life time (in hours) of 200 electrical components. [RBSE 2017]

Life time (in hours)	40-60	60-80	80-100	100-120	120-140	140-160
frequency	25	38	65	24	31	17

Determine the modal lifetimes of components.

Sol. Simplify the modal lifetimes of the components

As the life time (in hours) 80-100 has max. frequency, so it is the modal time in hours.

$x_k = 80$, $h = 20$, $f_k = 38$, and $f_{k+1} = 24$

$$\text{Mode}, M_0 = x_k + \left\{ \frac{h \times (f_k - f_{k-1})}{(2f_k - f_{k-1} - f_{k+1})} \right\}$$

$$= 80 + \left(\frac{20 \times (65 - 38)}{(2 \times 65 - 38 - 24)} \right)$$

$$= 80 + \left(\frac{20 \times 27}{130 - 62} \right) = 80 + \frac{20 \times 27}{68}$$

$$= 80 + 7.94$$

$$= 87.94 \quad \text{Ans}$$

⑥ Find the mean and mode of the following frequency distribution. [RBSE 2018]

Score	20-30	30-40	40-50	50-60	60-70
No. of Students	4	28	42	20	6

Sol

Score	No. of Student f_i	Mid value x_i	$u_i = \frac{(x_i - A)}{h} = \frac{x_i - 100}{h}$	$f_i \times u_i$
20-30	4	25	-7.5	-30
30-40	28	35	-6.5	-182
40-50	42	45	-5.5	-231
50-60	20	55	-4.5	-90
60-70	6	65	-3.5	-21
	$\Sigma f_i = 100$			$\Sigma(f_i \times u_i) = -554$

Mean

$A = 45$, $h = 10$, $\Sigma f_i = 100$, $\Sigma f_i \times u_i$

$$\bar{x} = \left\{ h + \frac{\Sigma(f_i \times x_i)}{\Sigma f_i} \right\} \Rightarrow \bar{x} = 45 + \left\{ 10 \times \frac{554}{100} \right\}$$

$$= 45 + 55.4 = 100.4$$

Hence, the mean is 100.4.

Now, for mode,

the 40-50 has max. frequency, so, it is the modal life time in hours.

$x_k = 40$, $h = 10$, $f_k = 42$, $f_{k-1} = 28$, $f_{k+1} = 20$

Mode, $M_o = x_k + \left\{ \dfrac{h \times (f_k - f_{k-1})}{(2f_k - f_{k-1} - f_{k+1})} \right\}$

$= 40 + \left\{ \dfrac{10 \times (42-28)}{(2\times 42 - 28 - 20)} \right\}$

$= 40 + \left\{ 10 \times \dfrac{14}{84-48} \right\}$

$= 40 + \left\{ 20 \times \dfrac{14}{36} \right\}$

$= 40 + 7.77$

$= 47.77$

Hence, the mode is 47.77

⑦ Find the median and mode of the following frequency distribution. [RBSE 2019]

Class	10-25	25-40	40-55	55-70	70-85	85-100
f_i	6	20	44	26	3	1

Sol

Class	frequency (f_i)	c.f
10-25	6	6
25-40	20	26
40-55	44	70
55-70	26	96
70-85	3	99
85-100	1	100
	$\Sigma f_i = 100$	

Now, for Mean $N = 100 \Rightarrow \frac{N}{2} = \frac{100}{2} = 50$

The cumulative frequency just greater than 44 is 70, the corresponding class is 40-55

Thus, $l = 40$, $h = 15$, $f_1 = 44$, $f_0 = 20$

$$\text{Mode}(z) = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$$

$$= 40 + \left(\frac{44 - 20}{88 - 20 - 26}\right) \times 15$$

$$= 40 + \left(\frac{24}{88 - 46}\right) \times 15 = 40 + \frac{24}{42} \times 15$$

$$= 40 + \frac{24 \times 5}{14}$$

$$= 40 + 8.57$$

$$= 48.57 \quad \text{Ans}$$

Now, Median, $l = 40$, $h = 15$, $cf = 26$

$$\text{Median}(m) = l + \left(\frac{\frac{N}{2} - cf}{f}\right) \times h$$

$$= 40 + \left(\frac{50 - 26}{44}\right) \times 15 = 40 + \frac{24}{44} \times 15 = 40 + \frac{90}{11}$$

$$= 40 + 8.18 = 48.18$$