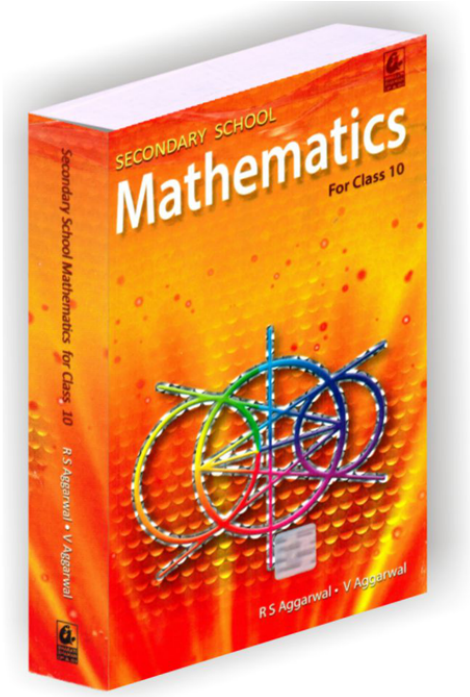
RS Aggarwal Solutions for Class 10 Maths Chapter 18–Mean, Median, Mode of Grouped Data

Class 10 - Chapter 18 Mean, Median, Mode of Grouped Data



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Exercise 18A

Question 1:

Table is as given below:

Class	Frequency f_i	Class Mark x_i	f_ix_i
0-10	3	5	15
10-20	5	15	75
20-30	9	25	225
30-40	5	35	175
40-50	3	45	135
	$\Sigma f_i = 25$		$\Sigma (f_ix_i) = 625$

$\therefore$ Mean, $\bar{x} = \frac{\Sigma (f_i \times x_i)}{\Sigma f_i} = \frac{625}{25} = 25$

Question 2:

We have

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Class	Frequency f_i	Mid Value x_i	f_ix_i
0-1010-2020-3030-4040-5050-60	7561282	51525354555	3575150420360110
	∑fi=40		∑fixi=1150

$$\bar{x} = \frac{\Sigma(f_i \times x_i)}{\Sigma f_i} = \frac{1150}{40} = 28.75$$

Question 3:

We have

Class	Frequency f_i	Class Mark x_i	f_ix_i
10 – 2020 – 3030 – 4040 – 5050 – 6060 – 70	111520301410	1525354555	16537570013507706 50
	∑fi=100		∑fixi=4010

$$\bar{x} = \frac{\Sigma(f_i \times x_i)}{\Sigma f_i} = \frac{4010}{100} = 40.10$$

Question 4:

We have

Class	Mid value f_i	Frequency x_i	f_ix_i

10 – 2020 – 3030 – 4040 – 5050 – 6060 – 7070 – 80	15253545556575	68137321	902004553151651307575
	∑fi=40		∑fixi=1430

$$\bar{x} = \frac{\Sigma(f_i \times x_i)}{\Sigma f_i} = \frac{1430}{40} = 35.75$$

Question 5:

We have

Class	**Frequency f_i**	**Mid value x_i**	**f_ix_i**
25 – 3535 – 4545 – 5555 – 6565 – 75	6108124	3040506070	180400400720280
	∑fi=40		∑fixi=1980

Mean,

$$\bar{x} = \frac{\Sigma(f_i x_i)}{\Sigma f_i} = \frac{1980}{40} = 49.5$$

Question 6:

We have

Class	**Frequency f_i**	**Mid Value x_i**	**f_ix_i**

0 – 100100 – 200200 – 300300 – 400400 – 500	6915128	501502503504 50	3001350375042003 600
	∑fi=50		∑fixi=13200

Mean,

$$\bar{x} = \frac{\Sigma(f_i x_i)}{\Sigma f_i} = \frac{13200}{40} = 264$$

Question 7:

We have

Class	**Frequency f_i**	**Mid Value x_i**	**$f_i x_i$**
0 – 1010 – 2020 – 3030 – 4040 – 50	152035p10	515253545	7530087535p4 50
	∑fi=80+p		∑fixi=1700+35 p

$$\therefore \text{Mean, } \bar{x} = \frac{\Sigma(f_i x_i)}{\Sigma f_i}$$

$$\Rightarrow \frac{(1700 + 35p)}{(80 + p)} = 24$$

$$\Rightarrow (1700 + 35p) = 1920 + 24p$$

$$\Rightarrow 11p = (1920 - 1700) = 220$$

$$\therefore \quad p = \frac{220}{11} = 20, \text{ hence } p = 20$$

Question 8:

We have

$17 + f_1 + 32 + f_2 + 19 = 120$

$\Rightarrow \quad f_2 = 52 - f_1$

Class	Frequency f_i	Mid Value x_i	f_ix_i
0 – 20	17	10	170
20 – 40	f_1	30	$30f_1$
40 – 60	32	50	1600
60 – 80	$52 - f_1$	70	$3640 - 70f_1$
80 – 100	19	90	1710
	$\sum f_i = 120$		$\sum f_ix_i = 7120 - 40f_1$

Question 9:

We have

$7 + f_1 + 12 + f_2 + 8 + 5 = 50$

$\Rightarrow f_2 = 18 - f_1$

Class	Frequency f_i	Mid Value x_i	f_ix_i
0 – 20	7	10	70
20 – 40	f_1	30	$30f_1$

40 – 60	12	50	600
60 – 80	$f_2=18-f_1$	70	$1260-70f_1$
80 – 100	8	90	720
100 – 120	5	110	550
	$\sum fi=50$		$\sum fixi=3200-40f1$

$$\therefore \text{Mean}, \bar{x} = \frac{\Sigma(f_i \times x_i)}{\Sigma f_i} = \frac{3200-40f_1}{50} = 57.6$$

$$\Rightarrow 3200-40f_1 = 2880 \Rightarrow 40f_1 = 320$$

$$\Rightarrow f_1 = 8$$

Thus, $f_1 = 8$ and $f_2 = (18-8) = 10$

Question 10:

We have, Let A = 25 be the assumed mean

Marks	**Frequency f_i**	**Mid value x_i**	**Deviation $d_i=(x_i-25)$**	**$(f_i \times d_i)$**
0 – 1010 – 2020 – 3030 – 4040 – 5050 – 60	12182720176	51525 = A354555	-20-100102030	-240-1800200340180
	$\sum fi=100$			$\sum(fi \times di)=300$

$$\bar{x} = A + \frac{\Sigma(f_i \times x_i)}{\Sigma f_i} = \left(25 + \frac{300}{100}\right) = (25+3) = 28$$

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Hence mean = 28.

Question 11:

A = 100 be the assumed mean, we have

Marks	**Frequency f_i**	**Mid value x_i**	**Deviation $d_i=(x_i-100)$**	**$(f_i \times d_i)$**
0 – 4040 – 8080 – 120120 – 160160 – 200	1220353023	2060100 = A140180	-80-4004080	-960-800012001840
	∑fi=120			∑(fi×di)=1250

$$\bar{x} = A + \frac{\Sigma(f_i \times d_i)}{\Sigma f_i} = \left(100 + \frac{1280}{120}\right) = (100 + 10.67) = 110.67$$

Hence, mean = 110.67

Question 12:

Let the assumed mean be 150, h = 20

Marks	**Frequency f_i**	**Mid value x_i**	**Deviation d_i = – 150**	**$(f_i \times d_i)$**
100 – 120120 – 140140 – 160160 – 180180 – 200	102030155	110130150=A170190	-40-2002040	-400-4000300200
	∑fi=80			∑(fi×di)=300

$$\bar{x} = A + \frac{\Sigma (f_i \times d_i)}{\Sigma f_i} = \left(150 + \frac{(-300)}{80}\right) = (150 - 3.75) = 146.25$$

Hence, Mean = 146.25

Question 13:

Let A = 50 be the assumed mean, we have

Marks	**Frequency f_i**	**Mid value x_i**	**Deviation $d_i=(x_i-50)$**	**$f_i \times d_i$**
0 – 20 – 40 – 60 – 80 – 100 – 120	203552443831	103050 = A7090110	-40-200204060	-800-700088015201860
	∑fi=200			∑(fi×di)=2760

Question 14:

Marks	**Frequency f_i**	**Mid value x_i**	**ui=(xi–Ah)**	**$f_i \times u_i$**
0 – 10 – 20 – 30 – 40 – 50 – 60	12182720176	51525 = A354555	-2-10123	-24-180203418
	∑fi=100			∑(fi×ui)=30

We have h = 10 and let assumed mean = 25.

A = 25, h = 10, $\sum f_i$= 100 and $\sum(f_i \times u_i)$= 30

$$\text{Mean, } \bar{x} = A + \left[h \times \frac{\Sigma(f_i \times u_i)}{\Sigma f_i}\right]$$
$$= 25 + \left(10 \times \frac{30}{100}\right) = 25 + 3 = 28$$

Hence the mean of given frequency distribution is 28.

Question 15:

We have h = 4 and let assumed mean be A = 26. We have the table given below:

Marks	**Frequency f_i**	**Mid value x_i**	**ui=(xi −Ah)**	**$f_i \times u_i$**
4 – 88 – 1212 – 1616 – 2020 – 2424 – 2828 – 3232 – 36	2121525181213 3	61014182226 = A3034	-5-4-3-2 -1012	-10-48-45-50-1 80136
	∑fi=100			∑(fi×ui)=−152

A = 26, h = 4, $\sum f_i$= 100 and $\sum(f_i \times u_i)$= -152

$$\bar{x} = A + \left[h \times \frac{\Sigma(f_i \times u_i)}{\Sigma f_i}\right]$$
$$= 26 + \left[4 \times \frac{-152}{100}\right]$$
$$= 26 - \frac{152}{25} = (26 - 6.08) = 19.92$$

Hence the mean of given frequency distribution is 19.92.

Question 16:

We have h= 30 and let A = 75 be the assumed mean. we have the table given below:

Marks	Frequency f_i	Mid value x_i	$u_i=(x_i-Ah)$	$f_i \times u_i$
0 – 3030 – 6060 – 9090 – 120120 – 150150 – 180	122134522011	144575 = A105135165	-2-10123	-24-210524033
	∑fi=150			∑(fi×ui)=80

Thus, A = 75, h = 30, $\sum f_i$= 150 and $\sum(f_i \times u_i)$= 80

$$\text{Mean, } \bar{x} = A + \left[h \times \frac{\sum(f_i \times u_i)}{\sum f_i}\right]$$
$$= 75 + \left(30 \times \frac{80}{150}\right)$$
$$= 75 + 16 = 91$$

Hence, the mean of the given frequency distribution is 91.

Question 17:

We ahve h = 20 and let A = 70 be the assumed mean. We have the table given below:

Marks	Frequency f_i	Mid value x_i	$u_i=(x_i-Ah)$	$f_i \times u_i$
0 – 2020 – 4040 – 6060 – 8080 – 100100 – 120120 – 140	1218152526159	10305070 = A90110130	-3-2-10123	-36-36-1502 63027
	∑fi=150			∑(fi×ui)=−4

Thus, A = 70, h = 20, $\sum f_i$= 120 and $\sum(f_i \times u_i)$= -4

$$\bar{x} = A + \left[h \times \frac{\Sigma(f_i \times u_i)}{\Sigma f_i}\right]$$
$$= 70 + \left[20 \times \frac{-4}{120}\right]$$
$$= 70 - 0.67 = 69.33$$

Hence the mean of given frequency distribution is 69.33.

Question 18:

We have h = 14 and let A = 35 be the assumed mean.

For calculating the mean, we prepare the table given below:

Marks	**Frequency f_i**	**Mid value x_i**	**ui=(xi−Ah)**	**$f_i \times u_i$**
0 – 1414 – 2828 – 4242 – 5656 – 70	721351116 ∑fi=90	72135 = A4963	-2-1012	-14-2101132 ∑(fi×ui)=8

Thus, A = 35, $\sum f_i = 90$, h = 14 and $\sum(f_i \times u_i) = 8$

$$\therefore \text{Mean, } \bar{x} = A + \left[h \times \frac{\Sigma(f_i \times u_i)}{\Sigma f_i}\right]$$
$$= 35 + \left(14 \times \frac{8}{90}\right)$$
$$= 35 + \frac{14 \times 8}{90}$$
$$= 35 + 1.24$$
$$= 36.24$$

Hence, Mean = 36.24

Question 19:

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Let h = 5 and let A = 22.5 be the assumed mean.

For calculating the mean, we prepare the table given below:

Marks	**Frequency f_i**	**Mid value x_i**	**$u_i=(x_i-A)/h$**	**$f_i \times u_i$**
10 – 15 15 – 20 20 – 25 25 – 30 30 – 35 35 – 40	5 6 8 12 6 3	12.5 17.5 22.5 = A 27.5 32.5 37.5	-2 -1 0 1 2 3	-10 -6 0 12 12 9
	$\sum f_i=40$			$\sum(f_i \times u_i)=17$

Thus, A = 22.5 and h = 5

$\sum f_i = 40$ and $\sum(f_i \times u_i) = 17$

Hence the mean of given frequency distribution is 24.625.

Question 20:

We have h = 6 and let assume mean A = 33. For calculating the mean we prepare the table.

Age	**Frequency f_i**	**Mid value x_i**	**$u_i=(x_i-A)/h$**	**$f_i \times u_i$**
18 – 24 24 – 30 30 – 36 36 – 42 42 – 48 48 – 54	6 8 12 8 4 2	21 27 33 = A 39 45 51	-2 -1 0 1 2 3	-12 -8 0 8 8 6
	$\sum f_i=40$			$\sum(f_i \times u_i)=2$

Thus, A = 33, h = 6, $\sum f_i = 40$ and $\sum(f_i \times u_i)=2$

Hence, Mean = 33.3 years

Question 21:

We have h = 6 and let assumed mean A = 99. For calculating the mean we prepare the table:

Class	**f_i**	**x_i**	**ui=(xi −Ah)**	**$f_i \times u_i$**
84 – 9090 – 9696 – 102102 – 108108 – 114114 – 120	152220182025	879399=A1051111117	-2-10123	-30-220184075
	∑fi=120			∑(fi×ui)=81

Thus, A = 99, h = 6 and $\sum f_i = 120$, $\sum(f_i \times u_i)=2$

$$\therefore \text{Mean}, \bar{x} = A + \left[h \times \frac{\sum(f_i \times u_i)}{\sum f_i}\right]$$
$$= 99 + \left(6 \times \frac{81}{120}\right) = 103.05$$

Hence, Mean = 103.05.

Question 22:

Let h = 20 and assume mean = 550, we prepare the table given below:

Age	**Frequency f_i**	**Mid value x_i**	**ui=(xi−5**	**$f_i \times u_i$**

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			5020)	
500 – 520520 – 540540 – 560560 – 580580 – 600600 – 620	1495435	510530550 = A570590610	-2-10123	-27-904615
	∑fi=40			∑(fi×ui)=−12

Thus, A = 550, h = 20, and $\sum f_i = 40$, $\sum(f_i \times u_i) = -12$

Hence the mean of the frequency distribution is 544.

Question 23:

The given series is an inclusive series, making it an exclusive series, we have

Class	**Frequency f_i**	**Mid value x_i**	**ui=(xi−425)**	**$f_i \times u_i$**
24.5 – 29.529.5 – 34.534.5 – 39.539.5 – 44.544.5 – 49.549.5 – 54.554.5 – 59.5	4142216653	27323742 = A475257	-3-2-10123	-12-28-2206109
	∑fi=70			∑(fi×ui)=−37

Thus, A = 42, h = 5, $\sum f_i = 70$ and $\sum(f_i \times u_i) = -37$

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

$$= 42 + \left(5 \times \frac{-37}{70}\right)$$

$$= 42 - 2.64$$

$$= 39.36 \text{ years}$$

Hence, Mean = 39.36 years.

Question 24:

The given series is an inclusive series making it an exclusive series, we get

class	**Frequency f_i**	**Mid value x_i**	**$u_i=(x_i-29.510)$**	**$f_i \times u_i$**
4.5 – 14.514.5 – 24.524.5 – 34.534.5 – 44.544.5 – 54.554.5 – 64.5	6112123145	9.519.529.5=A39.549.559.5	-2-10123	-12-110232815
	∑fi=80			∑(fi×ui)=43

Thus, A = 29.5, h = 10, $\sum f_i = 80$ and $\sum(f_i \times u_i)=43$

Hence, Mean = 34.87 years.

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He was born on January 2, 1946 in a village of Delhi. He graduated from Kirori Mal College, University of Delhi. After completing his M.Sc. in Mathematics in 1969, he joined N.A.S. College, Meerut, as a lecturer. In 1976, he was awarded a fellowship for 3 years and joined the University of Delhi for his Ph.D. Thereafter, he was promoted as a reader in N.A.S. College, Meerut. In 1999, he joined M.M.H. College, Ghaziabad, as a reader and took voluntary retirement in 2003. He has authored more than 75 titles ranging from Nursery to M. Sc. He has also written books for competitive examinations right from the clerical grade to the I.A.S. level.

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