STATISTICS

(A) Objective Type Questions — 1 Mark Each

Stand Alone MCQs (1 Mark Each)

1. In the formula $\bar{x} = a + \frac{\sum x_i d_i}{\sum f_i}$ for finding the mean of grouped data d_i's are the deviations from a of:

(A) lower limits of the classes

(B) upper limits of the classes

(C) mid-points of the classes

(D) frequencies of the class marks U

Ans. Option (C) is correct.

Explanation: In the given formula, a is assumed mean from class marks (x_i) and $d_i = x_i - a$
Therefore, d_i is the deviation of class mark (mid-value) from the assumed mean 'a'.

2. While computing mean of grouped data, we assume that the frequencies are:

(A) evenly distributed over all the classes

(B) centred at the class marks of the classes

(C) centred at the upper limits of the classes

(D) centred at the lower limits of the classes U

Ans. Option (B) is correct.

Explanation: In grouping the data from ungrouped data, all the observations between lower and upper limits of class marks are taken in one group then mid-value or class mark is taken for further calculation.
Therefore, frequencies or observations must be centred at the class marks of the classes.

3. If x_i's are the mid-points of the class intervals of grouped data, f_i's are the corresponding frequencies and $\bar{x}$ is the mean, then $\sum(f_i x_i - \bar{x})$ is equal to:

(A) 0 **(B)** -1

(C) 1 **(D)** 2 A

Ans. Option (A) is correct.

Explanation: $\because \bar{x} = \sum_{i=1}^{n} \frac{f_i x_i}{n}$

$\therefore \quad \sum_{i=1}^{n} f_i x_i = n\bar{x}$ ...(i)

$\sum_{i=1}^{n} \bar{x}_i = \bar{x} + \bar{x} + \bar{x} + ...n \text{ times}$

$\Rightarrow \quad \sum_{i=1}^{n} \bar{x}_i = n\bar{x}$ ...(ii)

From equations (i) and (ii), we have

$\Rightarrow \quad \sum_{i=1}^{n} f_i x_i = \sum_{i=1}^{n} \bar{x}_i$

$\Rightarrow \quad \sum_{i=1}^{n} (f_i x_i - \bar{x}) = 0$

4. For the following distribution:

Class	0 – 5	5 – 10	10 – 15	15 – 20	20 – 25
Frequency	10	15	12	20	9

the sum of lower limits of median class and modal class is:

(A) 15 **(B)** 25

(C) 30 **(D)** 35 A

Ans. Option (B) is correct.

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Explanation:

Class	Frequency	Cumulative frequency
0 – 5	10	10
5 – 10	15	25
10 – 15	12	37
15 – 20	20	57
20 – 25	9	66

The modal class is the class having the maximum frequency.
The maximum frequency 20 belongs to class (15–20).
Here, $\Sigma f_i = n = 66$
So, $\frac{n}{2} = \frac{66}{2} = 33$
33 lies in the class 10–15.
Therefore, 10–15 is the median class.
So, sum of lower limits of (15–20) and (10–15) is (15 + 10) = 25

5. Consider the following frequency distribution:

Class	0–5	6–11	12–17	18–23	24–29
Frequency	13	10	15	8	11

the upper limit of the median class is:

(A) 7 **(B)** 17.5
(C) 18 **(D)** 18.5 A

Ans. Option (B) is correct.

Explanation:

Class	Frequency	Cumulative frequency
0.5 – 5.5	13	13
5.5 – 11.5	10	23
11.5 – 17.5	15	38
17.5 – 23.5	8	46
23.5 – 29.5	11	57

The median of 57 (odd) observations $= \frac{(57+1)}{2}$

$= \frac{58}{2} = 29^{th}$ term

29th term lies in class 11.5 – 17.5.
So, upper limit is 17.5.

6. For the following distribution :

Marks	Number of students
Below 10	3
Below 20	12
Below 30	27
Below 40	57
Below 50	75
Below 60	80

the modal class is:

(A) 10 – 20 **(B)** 20 – 30
(C) 30 – 40 **(D)** 50 – 60 A

Ans. Option (C) is correct.

Explanation:

Marks	Number of students	f_i
0 – 10	3 – 0=3	3
10 – 20	12 – 3=9	9
20 – 30	27 – 12=15	15
30 – 40	57 – 27=30	30
40 – 50	75 – 57=18	18
50 – 60	80 – 75=5	5

Modal class has maximum frequency (30) in class 30 – 40.

Case-based MCQs (1 Mark Each)

Attempt any four sub-parts from each question. Each sub-part carries 1 mark.

AI **I. Read the following text and answer the questions that follow, on the basis of the same.**

COVID-19 Pandemic

The COVID-19 pandemic, also known as coronavirus pandemic, is an ongoing pandemic of corona virus disease caused by the transmission of severe acute respiratory syndrome corona virus 2 (SARS-CoV-2) among humans.

The following tables shows the age distribution of case admitted during a day in two different hospitals [CBSE QB, 2021]

Table 1

Age (in years)	5 – 15	15 – 25	25 – 35	35 – 45	45 – 55	55 – 65
No. of cases	6	11	21	23	14	5

Table 2

Age (in years)	5 – 15	15 – 25	25 – 35	35 – 45	45 – 55	55 – 65
No. of cases	8	16	10	42	24	12

Refer to table 1:

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1. The average age for which maximum cases occurred is:

(A) 32.24 **(B)** 34.36 **(C)** 36.82 **(D)** 42.24

Ans. Option (C) is correct.

Explanation: Since, highest frequency is 23.

So, modal class is 35 – 45.

Now, $\text{Mode} = l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$

Here, $l = 35, h = 10, f_1 = 23, f_0 = 21, f_2 = 14,$

$\Rightarrow \quad \text{Mode} = 35 + \frac{23 - 21}{46 - 21 - 14} \times 10$

$= 35 + \frac{2}{11} \times 10$

$= 35 + \frac{20}{11}$

$= 35 + 1.81$

$= 36.818 \approx 36.82$

2. The upper limit of modal class is:

(A) 15 **(B)** 25 **(C)** 35 **(D)** 45

Ans. Option (D) is correct.

3. The mean of the given data is:

(A) 26.2 **(B)** 32.4 **(C)** 33.5 **(D)** 35.4

Ans. Option (D) is correct.

Explanation:

Age (in years)	Class marks (x_i)	Frequency (f_i)	Deviation $d_i = (x_i - a)$	$f_i d_i$
5 – 15	10	6	–20	–120
15 – 25	$20 \rightarrow a$	11	–10	–110
25 – 35	30	21	0	0
35 – 45	40	23	10	230
45 – 55	50	14	20	280
55 – 65	60	5	30	150
		$\Sigma f_i = n = 80$		$\Sigma f_i d_i = 430$

Now, $\text{Mean } (\bar{x}) = a + \frac{\Sigma f_i d_i}{\Sigma f_i}$

$= 30 + \frac{430}{80}$

$= 30 + 5.375$

$= 35.375$

$= 35.4$

Refer to table 2:

4. The mode of the given data is:

(A) 41.4 **(B)** 48.2 **(C)** 55.3 **(D)** 64.6

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Ans. Option (A) is correct.

Explanation:

Here, Modal class is 35 - 45. (As highest frequency is 42)

Now, $$\text{Mode} = l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$$

Here, $l = 30,\ f_1 = 42, f_0 = 10, f_2 = 24, h = 10$

$$\text{Mode} = 35 + \frac{42 - 10}{2 \times 42 - 10 - 24} \times 10$$

$$= 35 + \frac{32}{50} \times 10$$

$$= 35 + 6.4$$

$$= 41.4$$

5. The median of the given data is:

(A) 32.7 **(B)** 40.2 **(C)** 42.3 **(D)** 48.6

Ans. Option (B) is correct.

Explanation:

Age (in years)	Frequency (f_i) (No. of cases)	Cumulative frequency (*c.f.*)
5 – 15	8	8
15 – 25	16	24
25 – 35	10	34
35 – 45	42 (frequency)	76 (Nearest to $\frac{n}{2}$)
45 – 55	24	100
55 – 65	12	112
	$\Sigma f_i = n = 112$	

Now, $$\frac{n}{2} = \frac{112}{2} = 56.$$

$l = 35$ (lower limit of median class)

c.f. = 34 (Preceding to median class)

Here, $$\text{Median} = l + \left(\frac{\frac{n}{2} - c.f.}{f}\right) \times h$$

$$= 35 + \left(\frac{56 - 34}{42}\right) \times 10$$

$$= 35 + \left(\frac{22}{42}\right) \times 10$$

$$= 35 + \left(\frac{11}{21}\right) \times 10$$

$$= 35 + \frac{110}{21}$$

$$= 40.24 \simeq 40.2$$

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II. Read the following text and answer the following question on the basis of the same. U

Electricity Energy Consumption

Electricity energy consumption is the form of energy consumption that uses electric energy. Global electricity consumption continues to increase faster than world population, leading to an increase in the average amount of electricity consumed per person (per capita electricity consumption).

Tariff	: LT - Residential	Bill Number	: 384756
Type of Supply	: Single Passes	Connected lead	: 3 kW
Meter Reading Date	: 31-11-21	Mater Reading	: 65700
Previous Reading Date	: 31-10-21	Previous Meter Reading	: 65500
		Units consumed	: 289

A survey is conducted for 56 families of colony A and 80 families of colony B. The following tables gives the weekly consumption of electricity of these families.

Colony A: **Table 2**

Weekly consumption (in units)	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
No. of families	16	12	18	6	4	0

Colony B: **Table 2**

Weekly consumption (in units)	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60
No. of families	1	5	10	20	40	5

Refer to data received from Colony A (Table 1):

1. The median weekly consumption is:

(A) 12 units **(B)** 16 units **(C)** 20 units **(D)** None of these

Ans. Option (C) is correct.

Explanation:

Weekly consumption (in units)	**Frequency (f_i) (No. of families)**	**Cumulative frequency (*c.f.*)**
0 – 10	16	16
10 – 20 (Median class)	12 (frequency)	28 (Nearest to $\frac{n}{2}$)
20 – 30	18	46
30 – 40	6	52
40 – 50	4	56
50 – 60	0	56
	$\Sigma f_i = n = 56$	

Now, $\frac{n}{2} = \frac{56}{2} = 28$

$l = 10,\ c.f. = 16, f = 12, h = 10$

Here, $\text{Median} = l + \left(\frac{\frac{n}{2} - c.f.}{f}\right) \times h$

$= 10 + \left(\frac{28 - 16}{12}\right) \times 10$

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$$= 10 + \left(\frac{12}{12}\right) \times 10$$

$$= 10 + 10$$

$$= 20$$

Hence, median weekly consumption = 20 units.

2. The mean weekly consumption is:

(A) 19.64 units **(B)** 22.5 units **(C)** 26 units **(D)** None of these

Ans. Option (A) is correct.

Explanation:

Weekly consumption (in units)	x_i	f_i	$f_i x_i$
0-10	5	16	80
10-20	15	12	180
20-30	25	18	450
30-40	35	6	210
40-50	45	4	180
50-60	55	0	0
Total		$\Sigma f_i = 56$	$\Sigma f_i x_i = 1100$

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

$$= \frac{1100}{56}$$

$$= 19.64$$

3. The modal class of the above data is:

(A) 0 – 10 **(B)** 10 – 20 **(C)** 20 – 30 **(D)** 30 – 40

Ans. Option (C) is correct.

Explanation: Modal class is the class with highest frequency *i.e.*, 20 – 30

Refer to data received from Colony B (Table 2):

4. The modal weekly consumption is:

(A) 38.2 units **(B)** 43.6 units **(C)** 26 units **(D)** 32 units

Ans. Option (B) is correct.

Explanation:

Here, modal class is 40 - 50 as highest frequency is 40.

$$\text{Mode} = l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$$

Here, $l = 40$, $f_1 = 40$, $f_0 = 20$, $f_2 = 5$, $h = 10$

$$\text{Mode} = 40 + \frac{40 - 20}{2 \times 40 - 20 - 5} \times 10$$

$$= 40 + \frac{200}{55}$$

$$= 40 + 3.63$$

$$= 43.63$$

$$\approx 43.6 \text{ units}$$

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5. The mean weekly consumption is:

(A) 15.65 units **(B)** 32.8 units **(C)** 38.75 units **(D)** 48 units

Ans. Option (C) is correct.

Explanation:

Weekly consumption (in units)	x_i	f_i	f_ix_i
0-10	5	1	0
10-20	15	5	75
20-30	25	10	250
30-40	35	20	700
40-50	45	40	1800
50-60	55	5	275
Total		$\Sigma f_i = 80$	$\Sigma f_ix_i = 3105$

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

$$= \frac{3105}{80}$$

$$= 38.81$$

$$\approx 38.8 \text{ units}$$

AI III. Read the following text and answer the questions that follow, on the basis of the same.

The maximum bowling speeds, in km per hour of 33 players at a cricket coaching centre are given as follows.

Speed (in km/h)	85 – 100	100 – 115	115 – 130	130 – 145
Number of players	11	9	8	5

1. What is the modal class of the given data?

(A) 85 – 100 **(B)** 100 – 115 **(C)** 115 – 130 **(D)** 130 – 145

Ans. Option (A) is correct.

Explanation: Modal class is the class with highest frequency *i.e.*, 85 – 100

2. What is the value of class interval for the given data set?

(A) 10 **(B)** 15 **(C)** 5 **(D)** 20

Ans. Option (B) is correct.

Explanation: The value of class interval = 100 – 85 = 15

again 115 – 100 = 15

and 130 – 115 = 15

145 – 130 = 15

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3. What is the median class of the given data?

(A) 85 – 100 **(B)** 100 – 115 **(C)** 115 – 130 **(D)** 130 – 145

Ans. Option (B) is correct.

Explanation: n = Number of observations = 33
Median of 33 observations = 16.5 observation, which lies in class 100 – 115.

4. What is the median of bowling speed?

(A) 109.17 km/hr (Approx.) **(B)**109.71 km/hr (Approx.)
(C) 107.17 km/hr (Approx.) **(D)**109.19 km/hr (Approx.)

Ans. Option (A) is correct.

Explanation:

$$\text{Median} = l + \frac{\left(\frac{n}{2} - c.f.\right)}{f} \times h$$

$l = 100, f = 9, c.f. = 11, h = 100 - 85 = 15$

$$\text{Median} = l + \frac{\left(\frac{n}{2} - c.f.\right)}{f} \times h$$

$$= 100 + \frac{\left(\frac{33}{2} - 11\right)}{9} \times 15$$

$$= 100 + \left(\frac{16.5 - 11}{9}\right) \times 15$$

$$= 100 + \frac{5.5 \times 15}{9}$$

$$= 100 + \frac{82.5}{9}$$

$$= 100 + 9.166$$

$$= 109.17 \text{ km/h (Approx.)}$$

Hence, the median bowling speed is 109.17 km/h (Approx.)

5. What is the sum of lower limit of modal class and upper limit of median class?

(A) 100 **(B)** 200 **(C)** 300 **(D)** 400

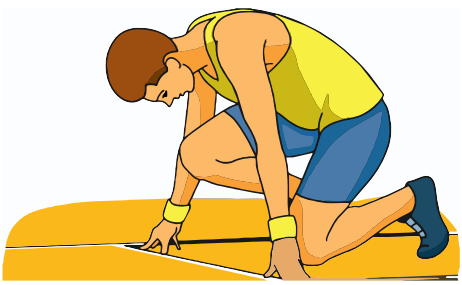
Ans. Option (B) is correct.

Explanation: Lower limit of modal class = 85
and upper limit of median class =115
$\therefore$ sum = 85 + 115 = 200

AI IV. Read the following text and answer the questions that follows, on the basis of the same:

100 m RACE

A stopwatch was used to find the time that it took a group of students to run 100 m.



Time (in sec)	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100
No. of students	8	10	13	6	3

C + AE [CBSE SQP, 2020-21]

1. Estimate the mean time taken by a student to finish the race.

(A) 54 **(B)** 63 **(C)** 43 **(D)** 50

Ans. Option (C) is correct.

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Explanation:

Time (in sec)	x	f	fx
0-20	10	8	80
20-40	30	10	300
40-60	50	13	650
60-80	70	6	420
80-100	90	3	270
Total		**40**	**1720**

$$\text{Mean} = \frac{1720}{40} = 43$$

2. What will be the upper limit of the modal class ?

(A) 20 **(B)** 40 **(C)** 60 **(D)** 80

Ans. Option (C) is correct.

Explanation: Modal class = 40 – 60
Upper limit = 60

3. The construction of cumulative frequency table is useful in determining the:

(A) Mean **(B)** Median **(C)** Mode **(D)** All of the above

Ans. Option (B) is correct.

Explanation: The construction of *c.f.* table is useful in determining the median.

4. The sum of lower limits of median class and modal class is:

(A) 60 **(B)** 100 **(C)** 80 **(D)** 140

Ans. Option (C) is correct.

Explanation: Median class = 40 – 60
Modal class = 40 – 60
Therefore, the sum of the lower limits of median and modal class = 40 + 40 = 80

5. How many students finished the race within 1 minute?

(A) 18 **(B)** 37 **(C)** 31 **(D)** 8

Ans. Option (C) is correct.

Explanation: Number of students who finished the race within 1 minute = 8 + 10 + 13 = 31

(B) Subjective Questions

Very Short Answer Type Questions
(1 Mark Each)

AI **1. Find the class-marks of the classes 10 – 25 and 35 – 55.** A [CBSE OD Set-I, 2020]

Sol. Class mark of $10 - 25 = \frac{10 + 25}{2}$

$= \frac{35}{2} = 17.5$

and Class mark of $35 - 55 = \frac{35 + 55}{2}$

$= \frac{90}{2} = 45$

2. Find the class marks of the classes 20 – 50 and 35 – 60. A [CBSE OD Set-III, 2020]

Sol. Class mark of $20 - 50 = \frac{20 + 50}{2}$

$= \frac{70}{2} = 35$

and Class mark of $35 - 60 = \frac{35 + 60}{2}$

$= \frac{95}{2} = 47.5$

3. Consider the following frequency distribution of the heights of 60 students of a class.

Heights (in cm)	No. of students
150 – 155	15
155 – 160	13
160 – 165	10
165 – 170	8
170 – 175	9
175 – 180	5

Find the upper limit of the median class in the given data. A [CBSE SQP, 2020-21]

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Sol.

Heights (in cm)	No. of students	Cumulative frequency
150 – 155	15	15
155 – 160	13	15 + 13 = 28
160 – 165	10	28 + 10 = 38
165 – 170	8	38 + 8 = 46
170 – 175	9	46 + 9 = 55
175 – 180	5	55 + 5 = 60

Since total frequency is 60.

$$\frac{n}{2} = 30$$

And cumulative frequency greater than or equal to 30 lies in class 160 - 165.

So, median class is 160 - 165.

$\therefore$ Upper limit of median class is 165.

4. Following distribution gives cumulative frequencies of 'more than type' :

Marks obtained	More than or equal to 5	More than or equal to 10	More than or equal to 15	More than or equal to 20
Number of students (cumulative frequency)	30	23	8	2

Change the above data to a continuous grouped frequency distribution. U [CBSE Term-I, 2015]

Sol.

C.I.	5 – 10	10–15	15–20	More than 20
f	7	15	6	2

[CBSE Marking Scheme, 2015] 1

5. In the following frequency distribution, find the median class.

Height (in cm)	140 – 145	145 – 150	150 – 155	155 – 160	160 – 165	165 – 170
Frequency	5	15	25	30	15	10

U [CBSE Term-I, 2015]

Sol.

Height	Frequency	*c.f.*
140 – 145	5	5
145 – 150	15	20
150 – 155	25	45
155 – 160	30	75
160 – 165	15	90
165 – 170	10	100
	$N = \Sigma f = 100$	

$$N = 100$$

$$\Rightarrow \quad \frac{N}{2} = \frac{100}{2} = 50$$

The cumulative frequency just greater than 50 is 75 and the corresponding class is 155 – 160.

Hence, median class is 155 – 160.

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Short Answer Type Questions-I

(2 Marks Each)

AI 1. Find the mean of the following distribution :

Class	3 – 5	5 – 7	7 – 9	9 – 11	11 – 13
Frequency	5	10	10	7	8

A [CBSE Delhi Set-I, 2020]

Sol.

Class	Frequency (f)	Mid-Value (x)	$f \times x$
3 – 5	5	4	20
5 – 7	10	6	60
7 – 9	10	8	80
9 – 11	7	10	70
11 – 13	8	12	96
	$\Sigma f = 40$		$\Sigma fx = 326$

$$\therefore \quad \text{Mean} = \frac{\Sigma fx}{\Sigma f}$$

$$= \frac{326}{40} = 8.15.$$

AI 2. Find the mode of the following data:

Class	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100	100 – 120	120 – 140
Frequency	6	8	10	12	6	5	3

A [CBSE Delhi Set-I, 2020]

Sol. Since the modal class is the class having the maximum frequency.

$$\therefore \quad \text{Modal class} = 60 - 80$$

$$\therefore \quad \text{Mode} = l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$$

Hence, $l = 60, f_1 = 12, f_0 = 10, f_2 = 6$ and $h = 20$

$$\text{Mode} = 60 + \frac{12 - 10}{2 \times 12 - 10 - 6} \times 20$$

$$= 60 + \frac{2 \times 20}{24 - 16}$$

$$= 60 + \frac{40}{8}$$

$$= 60 + 5$$

$$= 65$$

3. Compute the mode for the following frequency distribution :

Size of items (in cm)	0 – 4	4 – 8	8 – 12	12 – 16	16 – 20	20 – 24	24 – 28
Frequency	5	7	9	17	12	10	6

A [CBSE OD Set-I, 2020]

Sol. Here, $\text{Modal class} = 12 - 16$

$\therefore l = 12, f_1 = 17, f_0 = 9, f_2 = 12$ and $h = 4$

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

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$$= 12 + \left(\frac{17-9}{2\times17-9-12}\right) \times 4$$

$$= 12 + \frac{8\times4}{13}$$

$$= 12 + 2.46$$

$$= 14.46. \text{ (Approx.)}$$

4. Find the mode of the following frequency distribution :

Class	15 – 20	20 – 25	25 – 30	30 – 35	35 – 40	40 – 45
Frequency	3	8	9	10	3	2

Sol. Here, modal class $= 30 - 35$

$\therefore l = 30, f_0 = 9, f_1 = 10, f_2 = 3$ and $h = 5$

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

$$= 30 + \left(\frac{10-9}{2\times10-9-3}\right) \times 5$$

$$= 30 + \frac{5}{8}$$

$$= 30 + 0.625$$

$$= 30.625.$$

5. Find the mode of the following distribution :

Class	25 – 30	30 – 35	35 – 40	40 – 45	45 – 50	50 – 55
Frequency	25	34	50	42	38	14

U [CBSE OD Set-I, 2019]

Sol. Maximum frequency $= 50$, class (modal) $= 35 - 40$. ½

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

$$= 35 + \frac{50-34}{100-34-42} \times 5 \quad \text{1}$$

$$= 35 + \frac{16}{24} \times 5$$

$$= 38.33 \text{ (Approx.)}$$ [CBSE Marking Scheme, 2019] ½

6. Find the unknown values in the following table: U [CBSE Term-I, 2016]

Class Interval	Frequency	Cumulative Frequency
0 – 10	5	5
10 – 20	7	x_1
20 – 30	x_2	18
30 – 40	5	x_3
40 – 50	x_4	30

Sol. $x_1 = 5 + 7 = 12$

$x_2 = 18 - x_1 = 18 - 12 = 6$

$x_3 = 18 + 5 = 23$

and $x_4 = 30 - x_3 = 30 - 23 = 7$ [CBSE Marking Scheme, 2016] ½ × 4 = 2

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7. The mean and median of 100 observations are 50 and 52 respectively. The value of the largest observation is 100. It was later found that it is 110 not 100. Find the true mean and median. A [CBSE Term-I, 2016]

Sol. $\text{Mean} = \frac{\Sigma fx}{\Sigma f}$

$\Rightarrow \quad 50 = \frac{\Sigma fx}{100}$

$\Rightarrow \quad \Sigma fx = 5000$

$\text{Correct, } \Sigma fx' = 5000 - 100 + 110 = 5010$ **1**

$\therefore \quad \text{Correct Mean} = \frac{5010}{100}$

$= 50.1$ **1**

Median will remain same *i.e.*, median = 52 [CBSE Marking Scheme, 2016]

8. The data regarding marks obtained by 48 students of a class in a class test is given below:

Marks obtained	0 – 5	5 – 10	10 – 15	15 – 20	20 – 25	25 – 30	30 – 35	35 – 40	40 – 45	45 – 50
Number of students	1	0	2	0	0	10	25	7	2	1

Calculate the modal marks of students. A [CBSE Term-I, 2015]

Sol. Modal class is 30 – 35, $l = 30, f_1 = 25, f_0 = 10, f_2 = 7$ and $h = 5$

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

$\Rightarrow \quad \text{Mode} = 30 + \frac{25 - 10}{50 - 10 - 7} \times 5$

$= 30 + 2.27 \text{ or } 32.27 \text{ approx.}$ [CBSE Marking Scheme, 2015] **2**

AI **9. Given below is the distribution of weekly pocket money received by students of a class. Calculate the pocket money that is received by most of the students.**

Pocket money (in ₹)	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100	100 – 120	120 – 140
Number of students	2	2	3	12	18	5	2

A [CBSE Term-I, 2015]

Sol.

Class Interval	Frequency
0 – 20	2
20 – 40	2
40 – 60	3
60 – 80	12
80 – 100	18
100 – 120	5
120 – 140	2
Total	**44**

Here, Modal Class = 80 – 100

$\therefore \quad l = 80, f_1 = 18, f_2 = 5, f_0 = 12$ and $h = 20$

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

$= 80 + \left(\frac{18 - 12}{36 - 12 - 5}\right) \times 20$

$= 80 + \frac{6}{19} \times 20$

$= 80 + 6.31$

$= 86.31 \text{ (approx.)}$

Hence, mode = 86.31.

10. The mean of the following frequency distribution is 25. Find the value of p.

Class interval	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
Frequency	4	6	10	6	p

U [CBSE Term-I, 2015]

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Sol.

Class-Interval	Mid-Point x_i	f_i	f_ix_i
0 – 10	5	4	20
10 – 20	15	6	90
20 – 30	25	10	250
30 – 40	35	6	210
40 – 50	45	p	$45p$
		$\Sigma f_i = 26 + p$	$\Sigma f_ix_i = 570 + 45p$

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

$$\Rightarrow \quad 25 = \frac{570 + 45p}{26 + p}$$

$$\Rightarrow \quad 650 + 25p = 570 + 45p$$

$$\Rightarrow \quad 650 - 570 = 45p - 25p$$

$$\therefore \quad p = 4 \text{ (Approx.)}$$

[CBSE Marking Scheme, 2015] 2

AI **11. Given below is a frequency distribution table showing daily income of 100 workers of a factory:**

Daily income of workers (in ₹)	200 – 300	300 – 400	400 – 500	500 – 600	600 – 700
Number of workers	12	18	35	20	15

Convert this table to a cumulative frequency distribution table of 'more than type'.

C + U [CBSE Term-I, 2016]

Sol. Cumulative frequency distribution table (more than type):

Daily income of workers (in ₹)	Number of workers
More than 200	100
More than 300	88
More than 400	70
More than 500	35
More than 600	15
More than 700	0

[CBSE Marking Scheme, 2016] 2

AI **12. The following are the ages of 300 patients getting medical treatment in a hospital on a particular day:**

Age (in years)	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70
Number of patients	60	42	55	70	53	20

Form the "less than type" cumulative frequency distribution table. U

Sol.

Age (in years)	Number of Patients
Less than 20	60
Less than 30	102
Less than 40	157
Less than 50	227
Less than 60	280
Less than 70	300

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Short Answer Type Questions-II

(3 Marks Each)

1. The median of the following data is 16. Find the missing frequencies a and b, if the total of the frequencies is 70.

Class	0 – 5	5 – 10	10 – 15	15 – 20	20 – 25	25 – 30	30 – 35	35 – 40
Frequency	12	a	12	15	b	6	6	4

A [CBSE SQP, 2020-21]

Sol.

Class	Frequency (f)	Cumulative frequency ($c.f.$)
0 – 5	12	12
5 – 10	a	$12 + a$
10 – 15	12	$24 + a$
15 – 20	15	$39 + a$
20 – 25	b	$39 + a + b$
25 – 30	6	$45 + a + b$
30 – 35	6	$51 + a + b$
35 – 40	4	$55 + a + b$
Total	**70**	

According to question, $55 + a + b = 70$

$$a + b = 15 \quad \text{...(i)}$$

$\because$ $$\text{Median} = l + \frac{\frac{n}{2} - c.f.}{f} \times h$$

$\therefore$ $$16 = 15 + \frac{35 - 24 - a}{15} \times 5$$

$$1 = \frac{11 - a}{3}$$

$$a = 8$$

Substituting the value of a in equation (i), we get

$$8 + b = 15$$

$\Rightarrow$ $$b = 15 - 8$$

$\Rightarrow$ $$b = 7$$

2. The mode of the following data is 67. Find the missing frequency x.

Class	40 – 50	50 – 60	60 – 70	70 – 80	80 – 90
Frequency	5	x	15	12	7

Sol. From the table of given question, the modal class is the class having the maximum frequency,

i.e., Modal class $= 60 - 70$

Then, $l = 60, f_1 = 15, f_0 = x, f_2 = 12$ and $h = 10$

$\therefore$ $$\text{Mode} = l + \frac{f_1 - f_0}{2f_1 - f_2 - f_0} \times h$$

$$67 = 60 + \frac{15 - x}{30 - 12 - x} \times 10$$

$$7 = \frac{15 - x}{18 - x} \times 10$$

$$7 \times (18 - x) = 10(15 - x)$$

$$126 - 7x = 150 - 10x$$

$$3x = 150 - 126$$

$$3x = 24$$

$$x = 8$$

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AI **3. Find the mode of the following frequency distribution.**

Class	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70
Frequency	8	10	10	16	12	6	7

A **[CBSE Delhi Set- I, 2019] [CBSE Term-I, 2016]**

Sol. Modal class is 30 – 40 ½

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

$$= 30 + \left(\frac{16 - 10}{32 - 10 - 12}\right) \times 10 \quad \textbf{2}$$

$$= 36 \quad \textbf{[CBSE Marking Scheme, 2019]} \ ½$$

Detailed Solution:

Class	Frequency
0 – 10	8
10 – 20	10
20 – 30	10
30 – 40	16
40 – 50	12
50 – 60	6
60 – 70	7

Modal-class = 30 – 40

$\therefore \quad l = 30, f_0 = 10, f_1 = 16, f_2 = 12, h = 10$

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

$$= 30 + \left(\frac{16 - 10}{2 \times 16 - 10 - 12}\right) \times 10$$

$$= 30 + \left(\frac{6}{32 - 22}\right) \times 10$$

$$= 30 + \left(\frac{6}{10}\right) \times 10$$

$$= 30 + 6 = 36$$

4. The mean of the following distribution is 53. Find the missing frequency k ?

Class	0 – 20	20 – 40	40 – 60	60 – 80	80 – 100
Frequency	12	15	32	k	13

U **[CBSE Delhi Set-II, 2019]**

Sol.

Class Interval	Frequency (f_i)	Class Marks (x_i)	$f_i x_i$
0 – 20	12	10	120
20 – 40	15	30	450
40 – 60	32	50	1600
60 – 80	k	70	$70k$
80 – 100	13	90	1170
	$\Sigma f_i = 72 + k$		$\Sigma f_i x_i = 3340 + 70k$

1½

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Given, Mean $= 53$

But $\text{Mean} = \dfrac{\Sigma f_i x_i}{\Sigma f_i}$

$\Rightarrow \quad 53 = \dfrac{3340 + 70k}{72 + k}$ **1**

$\Rightarrow \quad 53(72 + k) = 3340 + 70k$

$= \quad 3816 + 53k = 3340 + 70k$

$\Rightarrow \quad 70k - 53k = 3816 - 3340$

$\Rightarrow \quad 17k = 476$

$\Rightarrow \quad k = 28$ ½

Hence, value of k is 28. **[CBSE Marking Scheme, 2019]**

5. The table below show the salaries of 280 persons:

Salary (in thousand ₹)	5 – 10	10 – 15	15 – 20	20 – 25	25 – 30	30 – 35	35 – 40	40 – 45	45 – 50
No. of Persons	49	133	63	15	6	7	4	2	1

Calculate the median salary of the data. U **[CBSE Delhi/OD, 2018]**

Sol.

Salary (in thousand ₹)	No. of Persons	*c.f.*
5 – 10	49	49
10 – 15	$133 = f$	182
15 – 20	63	245
20 – 25	15	260
25 – 30	6	266
30 – 35	7	273
35 – 40	4	277
40 – 45	2	279
45 – 50	1	280

$$\frac{n}{2} = \frac{280}{2} = 140.$$ **1**

Median class $= 10 - 15.$

$$\text{Median} = l + \left(\frac{\frac{n}{2} - c.f.}{f}\right) \times h$$

$$= 10 + \left(\frac{140 - 49}{133}\right) \times 5$$ **1**

$$= 10 + \frac{5 \times 91}{133}$$

$$= 13.42$$

Hence, median salary is ₹ 13.42 thousand or ₹ 13420 (approx). **[CBSE Marking Scheme, 2018]** **1**

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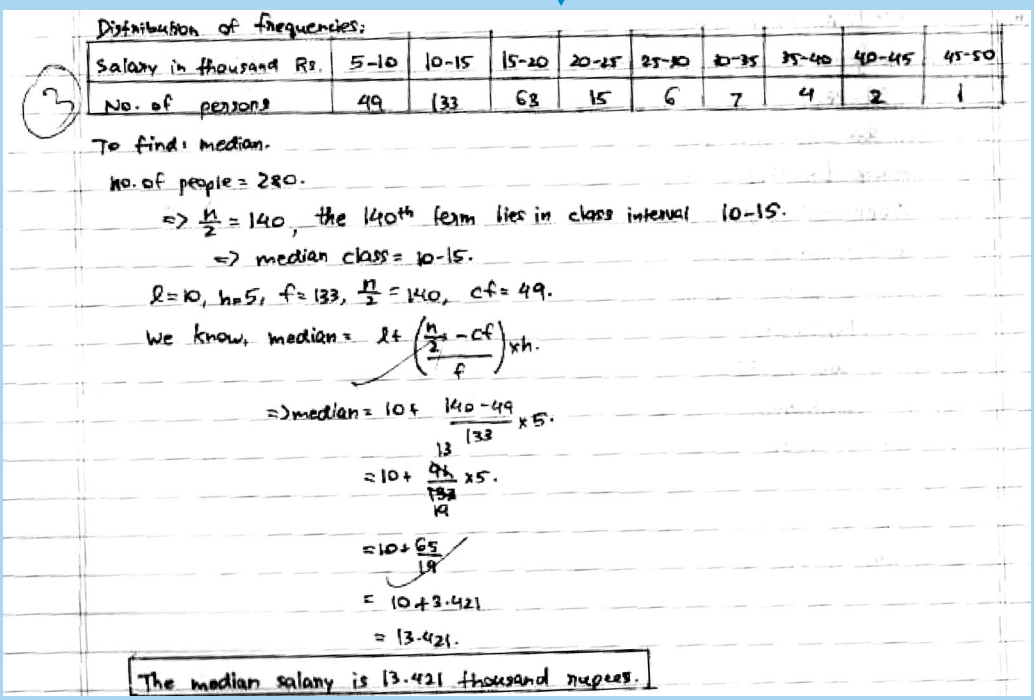
Detailed Solution:

Topper Answer, 2018



Distribution of frequencies:

Salary in thousand Rs.	5–10	10–15	15–20	20–25	25–30	30–35	35–40	40–45	45–50
No. of persons	49	133	63	15	6	7	4	2	1

To find: median.

No. of people = 280.

$\Rightarrow \frac{n}{2} = 140$, the 140th term lies in class interval 10–15.

$\Rightarrow$ median class = 10–15.

$l = 10, h = 5, f = 133, \frac{n}{2} = 140, cf = 49.$

We know, median = $l + \left(\frac{\frac{n}{2} - cf}{f}\right) \times h$.

$\Rightarrow$ median = $10 + \frac{140 - 49}{133} \times 5$.

$= 10 + \frac{91}{133} \times 5$.

$= 10 + \frac{65}{19}$

$= 10 + 3.421$

$= 13.421$.

The median salary is 13.421 thousand rupees.

3

6. If the mean of the following data is 14.7, find the values of p and q.

Class	0 – 6	6 – 12	12 – 18	18 – 24	24 – 30	30 – 36	36 – 42	Total
Frequency	10	p	4	7	q	4	1	40

U [CBSE Term-I, 2016]

Sol.

Class	x_i	f_i	$x_i f_i$
0 – 6	3	10	30
6 – 12	9	p	$9p$
12 – 18	15	4	60
18 – 24	21	7	147
24 – 30	27	q	$27q$
30 – 36	33	4	132
36 – 42	39	1	39
Total		$\Sigma f_i = 26 + p + q = 40$	$\Sigma x_i f_i = 408 + 9p + 27q$

Given, $\Sigma f_i = 40$

$\Rightarrow$ $26 + p + q = 40$

$\Rightarrow$ $p + q = 14$ ...(i)

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

$\Rightarrow$ $14.7 = \frac{408 + 9p + 27q}{40}$

$\Rightarrow$ $p + 3q = 20$ ...(ii)

Subtracting e(i) from e(ii),

$2q = 6$

or, $q = 3$

Putting the value of q in e(i),

$p = 14 - q = 14 - 3 = 11$

Hence, $p = 11, q = 3$

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7. Find the median of the following data :

Height (in cm)	Less than 120	Less than 140	Less than 160	Less than 180	Less than 200
Number of students	12	26	34	40	50

U [CBSE Term-I, 2015]

Sol.

Height (in cm)	Frequency	*c.f.*
less than 120	12	12
120 – 140	14	26
140 – 160	8	34
160 – 180	6	40
180 – 200	10	50
Total	$n = 50$	

Here, $n = 50$

$\Rightarrow$ Median $= \frac{n}{2}$

$= \frac{50}{2} = 25$

So, Median Class $= 120 - 140$

$$\text{Median} = l + \left(\frac{\frac{n}{2} - c.f.}{f}\right) \times h$$

$$= 120 + \left(\frac{25 - 12}{14}\right) \times 20$$

$$= 120 + \frac{260}{14}$$

$$= 120 + 18.57$$

$\therefore$ Median $= 138.57$

[CBSE Marking Scheme, 2015] 3

8. Form the frequency distribution table from the following data:

C + A

Marks (out of 90)	Number of students (*c.f.*)
More than or equal to 80	**4**
More than or equal to 70	**6**
More than or equal to 60	**11**
More than or equal to 50	**17**
More than or equal to 40	**23**
More than or equal to 30	**27**
More than or equal to 20	**30**
More than or equal to 10	**32**
More than or equal to 0	**34**

Sol.

Marks (out of 90)	Number of students (*c.f.*)	C.I.	Number of students (f_i)
More than or equal to 0	34	0 – 10	34 – 32 = 2
More than or equal to 10	32	10 – 20	32 – 30 = 2
More than or equal to 20	30	20 – 30	30 – 27 = 3
More than or equal to 30	27	30 – 40	27 – 23 = 4
More than or equal to 40	23	40 – 50	23 – 17 = 6
More than or equal to 50	17	50 – 60	17 – 11 = 6
More than or equal to 60	11	60 – 70	11 – 6 =5
More than or equal to 70	6	70 – 80	6 – 4 = 2
More than or equal to 80	4	80 – 90	4 – 0 = 4

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Long Answer Type Questions

(5 Marks Each)

1. The median of the following data is 525. Find the values of x and y, if total frequency is 100.

Class	Frequency
0 – 100	2
100 – 200	5
200 – 300	x
300 – 400	12
400 – 500	17
500 – 600	20
600 – 700	y
700 – 800	9
800 – 900	7
900 – 1000	4

A [CBSE Delhi Set-I, 2020]

Sol.

Class Interval	Frequency	Cumulative frequency
0 – 100	2	2
100 – 200	5	7
200 – 300	x	$7 + x$
300 – 400	12	$19 + x$
400 – 500	17	$36 + x$
500 – 600	20	$56 + x$
600 – 700	y	$56 + x + y$
700 – 800	9	$65 + x + y$
800 – 900	7	$72 + x + y$
900 – 1000	4	$76 + x + y$
Total	$n = 100$	

Also, $76 + x + y = 100$

$\Rightarrow$ $x + y = 100 - 76 = 24$ ...(i)

Given, Median $= 525$, which lies between class 500 – 600.

$\Rightarrow$ Median class $= 500 - 600$

Now, $$\text{Median} = l + \frac{\frac{n}{2} - c.f.}{f} \times h$$

$\Rightarrow$ $$525 = 500 + \left[\frac{\frac{100}{2} - (36 + x)}{20}\right] \times 100$$

$\Rightarrow$ $25 = (50 - 36 - x)\,5$

$\Rightarrow$ $14 - x = \frac{25}{5} = 5$

$\Rightarrow$ $x = 14 - 5 = 9$

Putting the value of x in e(i), we get

$y = 24 - 9 = 15$

Hence, $x = 9$ and $y = 15$.

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AI **2. The mean of the following distribution is 18. Find the frequency f of the class 19 – 21.**

Class	11 – 13	13 – 15	15 – 17	17 – 19	19 – 21	21 – 23	23 – 25
Frequency	3	6	9	13	f	5	4

U **[CBSE OD Set-I, 2020] [CBSE Delhi/OD 2018]**

Sol.

Class	Class mark (x)	Frequency (f)	fx
11 – 13	12	3	36
13 – 15	14	6	84
15 – 17	16	9	144
17 – 19	18	13	234
19 – 21	20	f	$20f$
21 – 23	22	5	110
23 – 25	24	4	96
		$\Sigma f = 40 + f$	$\Sigma fx = 704 + 20f$

1

$$\Sigma f = 40 + f$$ **1**

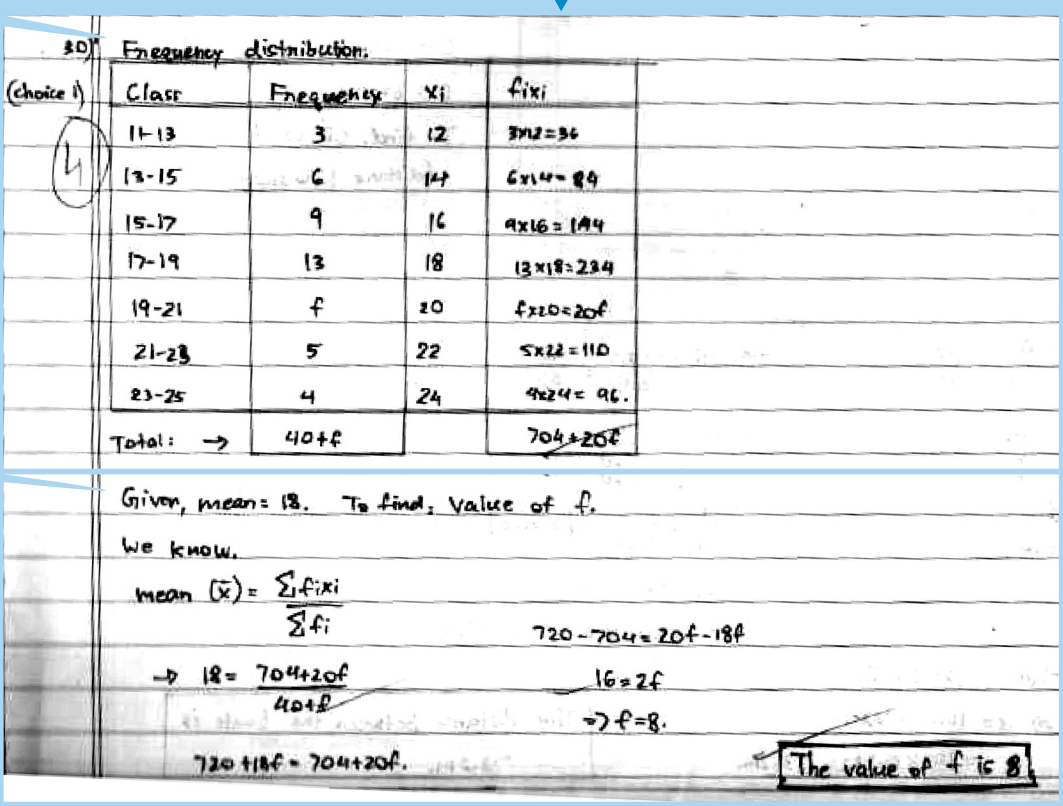
$$\Sigma fx = 704 + 20f$$ **1**

$$\text{Mean} = 18 = \frac{704 + 20f}{40 + f}$$ **1**

$$\Rightarrow \quad 720 + 18f = 704 + 20f$$ **1**

$$\Rightarrow \quad f = 8$$ **[CBSE Marking Scheme, 2018]**

Topper Answer, 2018



30) Frequency distribution.

(choice i)

Class	Frequency	x_i	$f_i x_i$
11-13	3	12	3×12=36
13-15	6	14	6×14=84
15-17	9	16	9×16=144
17-19	13	18	13×18=234
19-21	f	20	f×20=20f
21-23	5	22	5×22=110
23-25	4	24	4×24=96.
Total: →	40+f		704+20f

Given, mean = 18. To find: Value of f.

We know,

mean $(\bar{x}) = \frac{\sum f_i x_i}{\sum f_i}$

$\rightarrow 18 = \frac{704+20f}{40+f}$

$720 + 18f = 704 + 20f.$

$720 - 704 = 20f - 18f$

$16 = 2f$

$\Rightarrow f = 8.$

The value of f is 8.

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3. Daily wages of 110 workers, obtained in a survey, are tabulated below:

Daily Wages (in ₹)	100 – 120	120 – 140	140 – 160	160 – 180	180 – 200	200 – 220	220 – 240
Number of Workers	10	15	20	22	18	12	13

Compute the mean daily wages and modal daily wages of these workers. A **[CBSE SQP, 2020-21]**

Sol.

Daily Wages (in ₹)	Number of Workers (f_i)	x_i	u_i	f_iu_i
100 – 120	10	110	–3	– 30
120 – 140	15	130	–2	– 30
140 – 160	20	150	–1	– 20
160 – 180	22	170 = A	0	0
180 – 200	18	190	1	18
200 – 220	12	210	2	24
220 – 240	13	230	3	39
Total	$\Sigma f_i = 110$			$\Sigma f_iu_i = 1$

1

$$\text{Mean daily wages} = 170 + \frac{1}{110} \times 20 = ₹\ 170.19 \text{ (approx..)}$$ **2**

$$\text{Mode} = 160 + \frac{22 - 20}{44 - 20 - 18} \times 20 = ₹\ 166.67 \text{ (approx.)}$$ **[CBSE Marking Scheme, 2020]** **2**

Detailed Solution:

1. Calculation of mean:

Daily Wages (Class interval)	Class mark (x_i)	No. of Workers (f_i)	$f_i x_i$
100 – 120	110	10	1100
120 – 140	130	15	1950
140 – 160	150	20	3000
160 – 180	170	22	3740
180 – 200	190	18	3420
200 – 220	210	12	2520
220 – 240	230	13	2990
Total		$\Sigma f_i = 110$	$\Sigma f_i x_i = 18720$

$$\text{Mean, } x = \frac{\Sigma f_i x_i}{\Sigma f_i} = \frac{18720}{110} = 170.182$$

Hence, mean daily wages are ₹ 170.182 (Approx.)

2. Calculation of mode:

Daily Wages (in ₹)	100 – 120	120 – 140	140 – 160	160 – 180	180 – 200	200 – 220	220 – 240
Number of Workers	10	15	20 → f_1	22 → f_0	18 → f_2	12	13

Here, maximum frequency, $f_0 = 22$.

So, corresponding class 160 – 180 is modal class.

l = lower boundary of modal class = 160

f_0 = maximum frequency = 22.

f_1 = frequency of pre-modal class = 20

f_2 = frequency of post modal class = 18

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h = width of modal class = 180 – 160 = 20

$\therefore$ $$\text{Mode} = l + \left[\frac{f_0 - f_1}{f_0 - f_1 - f_2}\right]h$$

$$= 160 + \left[\frac{22 - 20}{2(22) - 20 - 18}\right] \times 20$$

$$= 160 + \frac{2}{6} \times 20$$

$$= 160 + 6.67$$

$\therefore$ Mode = 166.67

Therefore, modal wages of workers is ₹ 166.67. (Approx.)

4. If the median of the following frequency distribution is 32.5. Find the values of f_1 and f_2.

Class	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70	Total
Frequency	f_1	5	9	12	f_2	3	2	40

A [CBSE Delhi Set-I, 2019]

Sol.

Class	Frequency	Cumulative frequency
0 – 10	f_1	f_1
10 – 20	5	$f_1 + 5$
20 – 30	9	$f_1 + 14$
30 – 40	12	$f_1 + 26$
40 – 50	f_2	$f_1 + f_2 + 26$
50 – 60	3	$f_1 + f_2 + 29$
60 – 70	2	$f_1 + f_2 + 31$
	40	

1

Median = 32.5 $\Rightarrow$ median class is 30 – 40. **1**

Now $$32.5 = 30 + \frac{10}{12}(20 - 14 - f_1)$$ **1**

$\Rightarrow$ $f_1 = 3$ **1**

Also $f_1 + f_2 + 31 = 40$

$\Rightarrow$ $f_2 = 6$ [CBSE Marking Scheme, 2019] **1**

Detailed Solution:

Class	Frequency (f)	Cumulative Frequency (*c.f.*)
0 – 10	f_1	f_1
10 – 20	5	f_1+5
20 – 30	9	f_1+14
30 – 40	12	f_1+26
40 – 50	f_2	f_1+f_2+26
50 – 60	3	f_1+f_2+29
60 – 70	2	f_1+f_2+31
	$n = \Sigma f = 40$	

Now, $f_1 + f_2 + 31 = 40$

$\Rightarrow$ $f_1+f_2 = 9$

$\Rightarrow$ $f_2 = 9 - f_1$ ...(i)

Given that median is 32.5, which lies in 30 – 40

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Hence, median class = 30 – 40.

Here; $l = 30$, $\frac{n}{2} = \frac{40}{2} = 20$, $f = 12$ and $c.f. = 14 + f_1$

Now, median = 32.5

$$\Rightarrow \quad l + \left(\frac{\frac{n}{2} - c.f.}{f}\right) \times h = 32.5$$

$$\Rightarrow \quad 30 + \left[\frac{20 - (14 + f_1)}{12}\right] \times 10 = 32.5$$

$$\Rightarrow \quad \left(\frac{6 - f_1}{12}\right) \times 10 = 2.5$$

$$\Rightarrow \quad \frac{60 - 10f_1}{12} = 2.5$$

$$\Rightarrow \quad 60 - 10f_1 = 30$$

$$\Rightarrow \quad 10f_1 = 30$$

$$\Rightarrow \quad f_1 = 3$$

From eq (i), we get $f_2 = 9 - 3 = 6$

Hence, $f_1 = 3$ and $f_2 = 6$

COMMONLY MADE ERROR

- Some candidates use incorrect formula for median. Some get confused that which formula has to be applied to find median.

ANSWERING TIP

- Learn all the formulae and carefully apply in the questions.

5. Monthly expenditures on milk in 100 families of a housing society are given in the following frequency distribution :

Monthly expenditure (in ₹)	0 – 175	175 – 350	350 – 525	525 – 700	700 – 875	875 – 1050	1050 – 1225
Number of families	10	14	15	21	28	7	5

Find the mode and median for this distribution. A **[CBSE Term-I 2016]**

Sol.

C.I.	f	$c.f.$
0 – 175	10	10
175 – 350	14	24
350 – 525	15	39
525 – 700	21	60
700 – 875	28	88
875 – 1050	7	95
1050 – 1225	5	100
	$n = 100$	

$$\text{Median} = \frac{n}{2}$$

$$= \frac{100}{2} = 50$$

Here Median class = 525 – 700

Now $l = 525$, $c.f. = 39$, $f = 21$ and $h = 175$

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$$\text{Median} = l + \frac{\frac{n}{2} - c.f.}{f} \times h$$

$$= 525 + \frac{50 - 39}{21} \times 175$$

$$= 525 + \frac{11}{21} \times 175$$

$$= 525 + 91.6$$

$$= 616.6 \text{ (Approx.)}$$

and $\text{Modal class} = 700 - 875$

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

Here, $l = 700, f_0 = 21, f_1 = 28, f_2 = 7$ and $h = 175$

$$\text{Mode} = 700 + \left(\frac{28 - 21}{2 \times 28 - 21 - 7} \right) \times 175$$

$$= 700 + \frac{7}{28} \times 175$$

$$= 700 + 43.75$$

$$= 743.75$$

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