

Previous Year Questions 2024

Q1: Vocational training complements traditional education by providing practical skills and

Age (in years)	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54
Number of participants	62	132	96	37	13	11	10	4

From the above answer the following questions: (CBSE 2024)

(A) What is the lower limit of the modal class of the above data?

(B) Find the median class of the above data.

OR

Find the number of participants of age less than 50 years who undergo vocational training.

(C) Give the empirical relationship between mean, median and mode.

Ans:

First convert the given table in exclusive form subtract 0.5 from lower limit and add 0.5 to upper limit, so the new table will be:

Age (in years)	No. of Participants
14.5 - 19.5	62
19.5 - 24.5	132
24.5 - 29.5	96
29.5 - 34.5	37
34.5 - 39.5	13
39.5 - 44.5	11
44.5 - 49.5	10
49.5 - 54.5	4

(i) Modal class is the class with highest frequency, so, it is 19.5 – 24.5. hence, lower limit will be '19.5'.

(ii) (a)

Age (C.I.)	No. of Participants (f)	C.F.
14.5 - 19.5	62	62
19.5 - 24.5	132	194
24.5 - 29.5	96	290
29.5 - 34.5	37	327
34.5 - 39.5	13	340
39.5 - 44.5	11	351
44.5 - 49.5	10	361
49.5 - 54.5	4	365

$$N/2 = 365/2 = 182.5$$

Medium class will be 19.5 – 24.5.

OR

(b) Approx 361 participants are there at Class Interval 44.5-49.5 showing 361 cumulative frequency.

Hence 361 participants are less than 50 year of age who undergo vocational training.

(iii) Empirical relationship between mean, median and mode.

$$\text{Mode} = 3 \text{ Median} - 2 \text{ Mean}$$

Previous Year Questions 2023

Q2: If the value of each observation of statistical data is increased by 3. then the mean of the data (2023)

(a) remains unchanged

(b) increases by 3

(c) increases by 6

(d) increases by $3n$

Ans: (b)

If each value of observation is increased by 3. then mean is also increased by 3.

Q3: For the following distribution. (2023)

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

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

(a) 15

(b) 25

(c) 30

(d) 35

Ans: (b)

Class	Frequency (f)	Cumulative frequency [c.f.]
0-5	10	10
5-10	15	25
10-15	12	37
15-20	20	57
20-25	9	66

Here, $n/2 = 66/2 = 33$

Cumulative frequency just greater than 33 is 37.

So, median class is 10 - 15. Lower limit of median class = 10

Highest frequency is 20 so modal class is 15 - 20.

Sum of the lower limits of the median and modal class is $10 + 15 = 25$

Q4: India meteorological department observes seasonal and annual rainfall every year in different subdivisions of our country.



It helps them to compare and analyse the results. The table given below shows sub-division wise seasonal (monsoon) rainfall [mm] in 2018:

Rainfall [mm]	Number of Sub-divisions
200-400	2
400-600	4
600-800	7
800-1000	4
1000-1200	2
1200-1400	3
1400-1600	1
1600-1800	1

Based on the above information, answer the following questions.

(I) Write the modal class.

(II) Find the median of the given data.

OR

Find the mean rainfall in this season.

(III) If sub-division having at least 1000 mm rainfall during monsoon season, is considered good rainfall sub-division, then how many sub-divisions had good rainfall? (2023)

Ans:

Rainfall (mm)	Number of Sub-divisions	Cumulative frequency (c.f.)
200-400	2	2
400-600	4	6
600-800	7	13
800-1000	4	17
1000-1200	2	19
1200-1400	3	22
1400-1600	1	23
1600-1800	1	24

(i) Here, maximum class frequency is 7 and class corresponding to this frequency is 600-800, so the modal class is 600-800.

(ii) Here $n/2 = 24/2 = 12$

Class whose cumulative frequency just greater than and nearest to $n/2$ is called median class.

Here, c.f. = 13 (> 12) and corresponding class 600 - 800 is : median class.

$l = 600$, c.f. = 6, $f = 7$, $h = 200$

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

$$= 600 + \left(\frac{12 - 6}{7} \right) \times 200 = 600 + \frac{6}{7} \times 200 = 771.429$$

So, the median of the given data is 771.429

OR

Rainfall (mm)	Number of Sub-divisions (f_i)	x_i	$u_i = \frac{x_i - a}{h}$	$f_i u_i$
200-400	2	300	-4	-8
400-600	4	500	-3	-12
600-800	7	700	-2	-14
800-1000	4	900	-1	-4
1000-1200	2	$a = 1100$	0	0
1200-1400	3	1300	1	3
1400-1600	1	1500	2	2
1600-1800	1	1700	3	3
	$\Sigma f_i = 24$			$\Sigma f_i u_i = -30$

Assumed mean $a = 1100$ and class size, $h = 400 - 200 = 200$

$$\therefore \text{Mean} = a + \frac{h}{\Sigma f_i} [\Sigma f_i u_i]$$

$$= 1100 + \frac{200}{24} \times (-30) = 1100 - \frac{6000}{24} = 850$$

So, mean rainfall in the season is 850 mm.

(iii) Number of sub-division having good rainfall

$$= 2 + 3 + 1 + 1 = 7$$

Q5: The monthly expenditure on milk in 200 families of a Housing Society is given below

Monthly Expenditure (in Rupees)	Number of Students
1000-1500	24
1500-2000	40
2000-2500	33
2500-3000	X
3000-3500	30
3500-4000	22
4000-4500	16
4500-5000	7

Find the value of x and also, find the median and mean expenditure on milk. (CBSE 2023)

Ans:

Monthly Expenditure (in ₹)	Number of families (f_i)	x_i	$u_i = \frac{x_i - 3250}{500}$	c.f.	$f_i u_i$
1000-1500	24	1250	-4	24	-96
1500-2000	40	1750	-3	64	-120
2000-2500	33	2250	-2	97	-66
2500-3000	28	2750	-1	125	-28
3000-3500	30	3250 = A	0	155	0
3500-4000	22	3750	1	177	22
4000-4500	16	4250	2	193	32
4500-5000	7	4750	3	200	21
	$N = \sum f_i = 200$				$\sum f_i u_i = -235$

Since, $200 = 172 + x \Rightarrow x = 28$

Let the assumed mean, $a = 3250$ and class size, $h = 500$

$$\text{Mean}(\bar{x}) = a + h \times \left\{ \frac{1}{n} \sum f_i \cdot u_i \right\} = 3250 + 500 \times \frac{1}{200} (-235)$$

$$= 3250 - 587.5 = 2,662.5$$

Mean expenditure = Rs. 2,662.5

Also, we have $n/2 = 100$, which lies in the class interval 2500 - 3000.

Median class is 2500 - 3000.

Here $l = 2500$, c.f. = 97, $f = 28$, $h = 500$

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

$$= 2500 + \left[\frac{100 - 97}{28} \right] \times 500 = 2553.57$$

\therefore Median expenditure = ₹ 2553.57

Q6: For the following distribution:

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

The modal class is:

- (a) 10–20
- (b) 20–30
- (c) 30–40
- (d) 50–60 (CBSE 2023)

Ans: (c)

Step 1: Identify the Class Intervals

The table provided shows cumulative frequencies for marks below certain values:

- Marks below 10: 3 students
- Marks below 20: 12 students
- Marks below 30: 27 students
- Marks below 40: 57 students
- Marks below 50: 75 students
- Marks below 60: 80 students

To find the frequencies for each class, we calculate the difference between consecutive cumulative frequencies:

1. 10–20: $12 - 3 = 9$
2. 20–30: $27 - 12 = 15$
3. 30–40: $57 - 27 = 30$
4. 40–50: $75 - 57 = 18$
5. 50–60: $80 - 75 = 5$

So, the frequencies for each interval are:

- 10–20: 9
- 20–30: 15
- 30–40: 30
- 40–50: 18
- 50–60: 5

Step 2: Determine the Modal Class

The modal class is the class interval with the highest frequency. From the calculated frequencies, the highest frequency is 30, which corresponds to the class interval 30–40.

The modal class is: (c) 30–40.

Previous Year Questions 2022

Q7: If the mean of the following frequency distribution is 10.8. then find the value of p: (2022)

Class	0-4	4-8	8-12	12-16	16-20
Frequency	3	p	5	8	2

Ans: Table for the given data is as follows:

Class interval	Frequency (f_i)	Class marks (x_i)	$f_i x_i$
0-4	3	2	6
4-8	p	6	6p
8-12	5	10	50
12-16	8	14	112
16-20	2	18	36
Total	$\Sigma f_i = 18 + p$		$\Sigma f_i x_i = 204 + 6p$

Now Mean =

$$10.8 = \frac{(2 \times 3) + (6 \times p) + (10 \times 5) + (14 \times 8) + (18 \times 2)}{3 + p + 5 + 8 + 2}$$

Solving for p:

$$10.8 = \frac{6 + 6p + 50 + 112 + 36}{18 + p}$$

$$10.8 = \frac{204 + 6p}{18 + p}$$

$$(10.8)(18 + p) = 204 + 6p$$

$$194.4 + 10.8p = 204 + 6p$$

$$4.8p = 9.6$$

$$p = \frac{9.6}{4.8}$$

$$p = 2$$

$$\therefore p = 96/48 = 2$$

Q8: Find the mean of the following frequency distribution: (2022)

Class	Frequency
0-10	12
10-20	18
20-30	27
30-40	20
40-50	17
50-60	6

Ans:

$$\text{Midpoint} = \frac{\text{Lower Limit} + \text{Upper Limit}}{2}$$

For the given class intervals:

- Midpoint of 0-10: $\frac{0+10}{2} = 5$
- Midpoint of 10-20: $\frac{10+20}{2} = 15$
- Midpoint of 20-30: $\frac{20+30}{2} = 25$
- Midpoint of 30-40: $\frac{30+40}{2} = 35$
- Midpoint of 40-50: $\frac{40+50}{2} = 45$
- Midpoint of 50-60: $\frac{50+60}{2} = 55$

Now, we'll multiply each midpoint by its corresponding frequency, sum up these products, and divide by the total frequency to find the mean:

$$\text{Mean} = \frac{\sum (\text{Midpoint} \times \text{Frequency})}{\text{Total Frequency}}$$

So, the mean is:

$$\text{Mean} = \frac{(5 \times 12) + (15 \times 18) + (25 \times 27) + (35 \times 20) + (45 \times 17) + (55 \times 6)}{12 + 18 + 27 + 20 + 17 + 6}$$

$$\text{Mean} = \frac{60 + 270 + 675 + 700 + 765 + 330}{100}$$

$$\text{Mean} = \frac{2800}{100}$$

$$\text{Mean} = 28$$

Therefore, the mean of the given frequency distribution is 28.

Q9: The weights (in kg) of 50 wild animals of a National Park were recorded and the following data was obtained is

Weight (In kg)	Number of animals
100-110	4
110-120	12
120-130	23
130-140	8
140-150	3

Find the mean weight (in kg) of animals, using assumed mean method. (2022)

Ans: Let the assumed mean, $a = 125$ We have the frequency distribution table for the

Weight (in kg)	Number of animals (f_i)	Class marks (x_i)	$d_i = x_i - a = x_i - 125$	$f_i d_i$
100-110	4	105	-20	-80
110-120	12	115	-10	-120
120-130	23	125	0	0

given data as follows :

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120-130	23	125	0	0
130-140	8	135	10	80
140-150	3	145	20	60
Total	$N = \sum f_i = 50$			$\sum f_i d_i = -60$

$$\begin{aligned} \therefore \text{Mean } (\bar{x}) &= a + \frac{1}{N} \sum f_i d_i = 125 + \frac{1}{50} \times (-60) \\ &= 125 - \frac{60}{50} = 125 - 1.2 = 123.8 \end{aligned}$$

Hence, mean weight of animals = 123.8 kg.

Q10: The mean of the following frequency distribution is 25. Find the value of f. (2022)

Class	CMC	10-20	20-30	30-40	40-50
Frequency	5	18	15	f	6

Ans: The frequency distribution table from the given data is as follows:

Class	Class marks (x_i)	Frequency (f_i)	$f_i x_i$
0-10	5	5	25
10-20	15	18	270
20-30	25	15	375
30-40	35	f	35f
40-50	45	6	270
Total		$\sum f_i = 44 + f$	$\sum f_i x_i = 940 + 35f$

$$\begin{aligned} \therefore \text{Mean } (\bar{x}) &= \frac{\sum f_i x_i}{\sum f_i} \\ \Rightarrow 25 &= \frac{940 + 35f}{44 + f} \quad [\because \text{Given, mean} = 25] \\ \Rightarrow 25(44 + f) &= 940 + 35f \Rightarrow 1100 + 25f = 940 + 35f \\ \Rightarrow 10f &= 160 \Rightarrow f = 16 \end{aligned}$$

Hence, the value of f is 16.

Q11: Find the mean of the following data using assumed mean method. [2022, 2 Marks]

Class	05	5-10	10-15	15-20	20-25
Frequency	8	7	10	13	12

Ans: Let the assumed mean, $a = 12.5$ $\therefore d$

$$\Rightarrow d = x_i - a = x_i - 12.5$$

Now, we have the frequency distribution table as follows:

Class	Class marks (x_i)	Frequency (f_i)	$d_i = x_i - a = x_i - 12.5$	$f_i d_i$
0-5	2.5	8	-10	-80
5-10	7.5	7	-5	-35
10-15	12.5	10	0	0
15-20	17.5	13	5	65
20-25	22.5	12	10	120
Total		$N = \sum f_i = 50$		$\sum f_i d_i = 70$

$$\therefore \text{Mean}(\bar{x}) = a + \frac{1}{N} \sum f_i d_i = 12.5 + \frac{70}{50} = 12.5 + 1.4$$

$$= 13.9$$

Q12: The mode of a grouped frequency distribution is 75 and the modal class is 65-80. The frequency of the class preceding the modal class is 6 and the frequency of the class succeeding the modal class is 8. Find the frequency of the modal class. (2022)

Ans: We know that

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

Here given $l = 65, f_0 = 6, f_1 = f, h = 15, f_2 = 8$ and mode = 75

So, from equation (i), we get

$$75 = 65 + \left(\frac{f - 6}{2f - 6 - 8} \right) \times 15 ; 75 = 65 + \frac{f - 6}{2f - 14} \times 15$$

$$75 - 65 = \frac{(f - 6)15}{2f - 14}$$

$$(2f - 14) 10 = 15f - 90 \Rightarrow 20f - 15f = -90 + 140$$

$$5f = 50 \therefore f = 10$$

Q13: Find the missing frequency 'x' of the following data, if its mode is 240: (2022)

Daily house hold expenditure (in Rs.)	0-100	100-200	200-300	300-400	400-500
Number of families	140	230	270	X	150

Ans: Here the given mode = 240, which lies in interval 200-300.

$l = 200, f_0 = 230, f_1 = 270, f_2 = x$ (missing frequency) and $h = 100$

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

$$240 = 200 + \left(\frac{270 - 230}{2 \times 270 - 230 - x} \right) \times 100$$

$$240 = 200 + \frac{40}{310 - x} \times 100 \Rightarrow 240 - 200 = \frac{4000}{310 - x}$$

$$\Rightarrow 40 = \frac{4000}{310 - x} \Rightarrow 310 - x = 100$$

$$\Rightarrow x = 310 - 100 = 210$$

Missing frequency, $x = 210$

Q14: If mode of the following frequency distribution is 55, then find the value of x.

(2022)

Class	0-15	15-30	30-45	45-60	60-75	75-90
Frequency	10	7	X	15	10	12

Ans: Here, mode of the frequency distribution = 55.

which lies in the class interval 45-60.

∴ Modal class is 45 - 60

Lower limit (l) = 45

Class interval (h) = 15

Also, $f_0 = 15$, $f_1 = x$ and $f_2 = 10$

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

$$\Rightarrow 55 = 45 + \left(\frac{15 - x}{30 - x - 10} \right) \times 15$$

$$\Rightarrow 55 - 45 = \frac{15(15 - x)}{30 - x - 10}$$

$$\Rightarrow 10(30 - x - 10) = 225 - 15x$$

$$\Rightarrow 300 - 10x - 100 = 225 - 15x$$

$$\Rightarrow 5x = 25$$

$$\Rightarrow x = 5$$

Q15: Heights of 50 students in class X of a school are recorded and following data is obtained: (2022)

(Height in cm)	130-135	135-140	140-145	145-150	150-155	155-160
Number of students	4	11	12	7	10	6

Find the median height of the students.

Ans: The cumulative frequency distribution table is as follows:

Height (in cm)	Number of students	Cumulative frequency (c.f.)
130-135	4	4
135-140	11	4 + 11 = 15
140-145	12	15 + 12 = 27
145-150	7	27 + 7 = 34
150-155	10	34 + 10 = 44
155-160	6	44 + 6 = 50
Total	N = 50	

Now, we have N = 50

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

Since, the cumulative frequency just greater than 25 is 27.

∴ The median class is 140 - 145

and also, $l = 140$, c.f. = 15, $f = 12$ and $h = 5$

$$\begin{aligned}\therefore \text{Median} &= l + \left[\frac{\frac{N}{2} - \text{c.f.}}{f} \right] \times h \\ &= 140 + \left[\frac{25 - 15}{12} \right] \times 5 = 140 + \left[\frac{10}{12} \right] \times 5 \\ &= 140 + 4.16 = 144.16\end{aligned}$$

∴ Median height of the students = 144.16 cm.

Q16: Health insurance is an agreement whereby the insurance company agrees to undertake a guarantee of compensation for medical expenses in case the insured falls ill or meets with an accident which leads to Hospitalisation of the insured. The government also promotes health insurance by providing a deduction from income tax.

An SB I health insurance agent found the following data for distribution of ages of 100 policyholders.

The health insurance policies are given to persons having age 15 years and onwards briefest than 60 years.

Age (In years)	Number of Policy Holders
15-20	2
20-25	4
25-30	10
30-35	21
35-40	33
40-45	11
45-50	3
50-55	6
55-60	2

(i) Find the modal age of the policy holders.

(ii) Find the median age of the policy holders. (2022)

Ans: (i) It is clear from the given data, maximum frequency is 33, which lies in 35-40

∴ Modal class is 35-40.

So, $l = 35$, $f_0 = 21$, $f_1 = 33$, $f_2 = 11$ and $h = 5$

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

So, modal age of policy holders

$$\begin{aligned}&= 35 + \left(\frac{33 - 21}{2 \times 33 - 21 - 11} \right) \times 5 = 35 + \left(\frac{12}{34} \right) \times 5 \\ &= 35 + \frac{60}{34} = 35 + 1.76 = 36.76 \text{ (approx)}\end{aligned}$$

So, modal age of policy holders is 37 years approx.

Previous Year Questions 2021

Q17: During the annual sports meet in a school, all the athletes were very enthusiastic. They all wanted to be the winner so that their house could stand first. The instructor noted down the time taken by a group of students to complete a certain race. The data recorded is given below:

Time (in sec)	0-20	20-40	40-60	60-80	80-100
Number of students	1	4	3	7	5

Based on the above, answer the following questions: (2021)

We need to make the following frequency table as follows:

Time (in sec)	No. of students (frequency(f_i))	Cumulative frequency (c.f.)
0-20	1	1
20-40	4	5
40-60	3	8
60-80	7	15
80-100	5	20
Total	$\Sigma f_i = 20$	

(i) What is the class mark of the modal class ?

- (a) 60
- (b) 70
- (c) 80
- (d) 140

Ans: (b)

Here the greatest frequency is 7, which lies in the interval 60-80.

So, modal class is 60-80.

Class mark of modal class = upper limit + lower limit / 2

$$= 60 + 80 / 2 = 70$$

So, class mark of modal class is 70.

(ii) The mode of the given data is

- (a) 70-33
- (b) 71-33
- (c) 72-33
- (d) 73-33

Ans: (d)

From the above data, we can conclude that

$$l_1 = 20, l = 60, f_1 = 7, f_0 = 3, f_2 = 5$$

$$\begin{aligned}\therefore \text{Mode} &= l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right) \times h = 60 + \left(\frac{7-3}{2 \times 7 - 3 - 5} \right) \times 20 \\ &= 60 + \frac{4}{6} \times 20 = 60 + 13.33 \\ \text{Mode} &= 73.33\end{aligned}$$

(iii) The median class of the given data is

- (a) 20-40**
- (b) 40-60**
- (c) 80-100**
- (d) 60-80**

Ans: (d)

Here $n = 20 \Rightarrow n/2 = 10$

Cumulative frequency just greater than 10 is 15 and corresponding interval is 60-80.

So, median class is 60-80.

(iv) The sum of the lower limits of median class and modal class is 1

- (a) 80**
- (b) 140**
- (c) 120**
- (d) 100**

Ans: (c)

Median class = 60-80 .

\therefore Lower limit of median = 60

Modal class - 60-80 = 120

\therefore Lower limit of modal class = 60

So, the sum of lower limit of median and modal class = 60 + 60 = 120

(v) The median time (in seconds) of the given data is

- (a) 65-7**
- (b) 85-7**
- (c) 45-7**
- (d) 25-7**

Ans: (a)

From the above data, we have

$l = 60, f = 7, \text{c.f.} = 8, h = 20$

$$\therefore \text{Median} = l + \left(\frac{\frac{n}{2} - \text{c.f.}}{f} \right) \times h = 60 + \left(\frac{\frac{20}{2} - 8}{7} \right) \times 20$$

$$= 60 + \frac{(10-8)}{7} \times 20 = 60 + \frac{40}{7} = 60 + 5.714 = 65.71 \text{ (approx)}$$

So, median time (in sec) of the given data = 65.7 sec.

Previous Year Questions 2020

Q18: If the mean of the first n natural number, is 15, then find n. (2020)

Ans: Given, mean of first n natural numbers is 15.

$$\Rightarrow \frac{1+2+3+\dots+n}{n} = 15$$

$$\Rightarrow 1+2+3+\dots+n = 15n$$

$$\Rightarrow \frac{n(n+1)}{2} = 15n$$

$$\Rightarrow n^2 + n = 30n \Rightarrow n^2 - 29n = 0$$

$$\Rightarrow n(n-29) = 0 \Rightarrow n = 29 \quad [n \neq 0]$$

Q19: In the formula $\bar{x} = a + \left(\frac{\sum f_i u_i}{\sum f_i} \right) \times h$, $u_i =$ _____. (2020)

Ans: In the formula

$$\bar{x} = a + \left(\frac{\sum f_i u_i}{\sum f_i} \right) \times h$$

$$u_i = \frac{x_i - a}{h}$$

where a is assumed mean and h = class size.

Q20: Find the mean of the following distribution: (2020)

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

Ans: The frequency distribution table from the given data can be drawn as :

Class	Class marks (x_i)	Frequency (f_i)	$f_i x_i$
3-5	4	5	20
5-7	6	10	60
7-9	8	10	80
9-11	10	7	70
11-13	12	8	96
Total		40	326

\therefore Mean = $326/40 = 8.15$

Q21: Find the mode of the following distribution: (2020)

Class	10-15	15-20	20-25	25-30	30-35	35-40
Frequency	45	30	75	20	35	15

Ans: From the given data, we have maximum frequency 75. which lies in the interval 20-25.

Modal class is 20-25

So, $l = 20$, $f_0 = 30$, $f_1 = 75$, $f_2 = 20$, $h = 5$

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

$$= 20 + \left(\frac{75 - 30}{2(75) - 30 - 20} \right) \times 5 = 20 + \frac{45}{100} \times 5$$

$$\text{Mode} = 20 + 2.25$$

$$= 22.25$$

Q22: Find the mode of the following distribution: (2020)

Marks	0-10	10-20	20-30	30-40	40-50	50-60
Number of Students	4	6	7	12	5	6

Ans: From the given data, we have maximum frequency 12.

which lies in the interval 30-40

Modal class is 30-40

So, $l = 30$, $f_0 = 12$, $f_1 = 7$, $f_2 = 5$, $h = 10$

$$\text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right) \times h = 30 + \left(\frac{12 - 7}{2 \times 12 - 7 - 5} \right) \times 10$$

$$= 30 + \left(\frac{5}{24 - 12} \right) \times 10 = 30 + \frac{50}{12} = 30 + 4.17 = 34.17$$

Q23: Find the mode of the following distribution: (2020)

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

Ans: From the given data, we have maximum frequency 12.

which lies in the interval 60-80.

Modal class is 60-80

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

$$\text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right) \times h = 60 + \left(\frac{12 - 10}{2 \times 12 - 10 - 6} \right) \times 20$$

$$= 60 + \left(\frac{2}{24-16} \right) \times 20 = 60 + \left(\frac{2}{8} \right) \times 20 = 60 + 5 = 65$$

Q24: The mean and median of a distribution are 14 and 15 respectively. The value of mode is (2020)

- (a) 16
- (b) 17
- (c) 13
- (d) 18

Ans: (b)

We know that Mode = 3 Median - 2 Mean

So, Mode = 3 × 15 - 2 × 14

$$= 45 - 28 = 17$$

Q25: The distribution given below shows the number of wickets taken by bowlers in one-day cricket matches. Find the mean and the median of the number of wickets taken. (2020)

Number of wickets	Number of bowlers
20-60	7
60-100	5
100-140	16
140-180	12
180-220	2
220-260	3

Ans: The frequency distribution table for the given data can be drawn as:

Number of wickets	Class marks (x_i)	Number of bowlers (f_i)	$f_i x_i$	Cumulative frequency (c.f.)
20-60	40	7	280	7
60-100	80	5	400	12
100-140	120	16	1920	28
140-180	160	12	1920	40
180-220	200	2	400	42
220-260	240	3	720	45
Total			$\Sigma f_i x_i = 5640$	

$$\text{Mean} = \frac{\Sigma f_i x_i}{\Sigma f_i} = \frac{5640}{45} = 125.33$$

$$\text{Here, } \frac{N}{2} = \frac{45}{2} = 22.5$$

∴ Median class is 100-140.

Also, $l = 100$, $c.f. = 12$, $f = 16$, $h = 40$

$$\begin{aligned}\text{So, Median} &= l + \left[\frac{\frac{N}{2} - c.f.}{f} \right] \times h \\ &= 100 + \left[\frac{22.5 - 12}{16} \right] \times 40 = 100 + \left[\frac{10.5}{16} \times 40 \right] \\ &= 100 + 26.25 \\ &= 126.25\end{aligned}$$

Hence, mean number of wickets is 125.33 and median number of wickets is 126.25.

Q26: Find the value of p, if the mean of the following distribution is 7.5. (CBSE 2020)

Classes	Frequency
2-4	6
4-6	8
6-8	15
8-10	p
10-12	8
12-14	4

Ans:

Class	Class-mark (x_i)	Frequency (f_i)	$f_i x_i$
2-4	3	6	18
4-6	5	8	40
6-8	7	15	105
8-10	9	p	9p
10-12	11	8	88
12-14	13	4	52

Here, $\Sigma f_i = 41 + p$

and $\Sigma f_i x_i = 303 + 9p$

We know, Mean = $\frac{\Sigma f_i x_i}{\Sigma f_i}$

But, Mean = 7.5 [Given]

$$\therefore 7.5 = \frac{303 + 9p}{41 + p}$$

$$\Rightarrow 303 + 9p = 307.5 + 7.5p$$

$$\Rightarrow 1.5p = 4.5$$

$$\Rightarrow p = 3$$

Hence, the value of p is 3.