



# SHIKSHA CLASSES

Sub. : Maths  
Std. : X<sup>th</sup> - CBSE

Answer Paper  
13 : Statistics

Marks : 30

## Section : A (Each 1 Mark)

### Multiple choice Questions (MCQs).

Q.1 : One of the methods for determining mode is

Ans : b) Mode = 3 Median – 2 Mean

Q.2 : Mode is the

Ans : c) maximum frequent value

Q.3 : Construction of a cumulative frequency table is useful in determining the

Ans : b) median

Q.4 : Which of the following can not be determined graphically?

Ans : a) Mean

Q.5 : The mode and mean is given by 7 and 8, respectively. Then the median is:

Ans : c)  $23/3$

Q.6 : If the mean of first n natural numbers is  $3n/5$ , then the value of n is:

Ans : c) 5

Q.7 : The mean of following distribution is:

$x_i$	11	14	17	20
$f_i$	3	6	8	7

Ans : d) 16.4

Q.8 : Consider the following frequency distribution of the heights of 60 students of a class:

Height (in cm)	150–155	155–160	160–165	165–170	170–175	175–180
Number of students	15	13	10	8	9	5

The sum of the lower limit of the modal class and upper limit of the median class is

Ans : b) 315

Q.9 : While computing mean of grouped data, we assume that the frequencies are

Ans : a) centred at the class marks of the classes

For question number 10 to 11 two statements are given one labeled Assertion and other labeled Reason select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below

Q.10 : Assertion: If the value of mode and mean is 60 and 66 respectively, then the value of median is 64.

Reason: Median = (mode + 2 mean)/2

Ans : c) If Assertion is correct but Reason is incorrect.

Q.11 : Assertion: The arithmetic mean of the following given frequency distribution table is 13.81.

$x$	4	7	10	13	16	19
$f$	7	10	15	20	25	30

Reason:  $\bar{x} = \frac{\sum f_i x_i}{\sum f_i}$ .

Ans : a) If both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

**Section : B (Each 2 Marks)**

**Q.12 :** If the value of mean and median are 264 & 272, then find the value of mode.

**Ans :** **Given :** mean = 264, median = 272  
Formula

$$\begin{aligned} \text{Mode} &= 3 \text{ Median} - 2 \text{ mean} \\ &= 3 \times 272 - 2 \times 264 \\ &= 816 - 528 \\ &= 288. \end{aligned}$$

**Q.13 :** Calculate the median from

Marks	0-20	20-40	40-60	60-80	80-100
No. of students	5	15	30	8	2

**Ans :** We have

Marks	No. of students (f)	C.F.
0-20	5	5
20-40	15	20(C)
40-60	30(f)	50
60-80	8	58
80-100	2	60
	$N = \sum f_i = 60$	

Since,  $\frac{N}{2} = \frac{60}{2} = 30$  which is in the class 40-60.

$\therefore$  Median class is 40-60

We know that median ( $M_e$ ) is given by

$$M_e = l + \frac{\frac{N}{2} - C}{f} \times h$$

Here,  $l = 40$ ,  $h = 20$ ,  $\frac{N}{2} = 30$ ,  
 $C = 20$ ,  $f = 30$

$$\begin{aligned} \therefore M_e &= 40 + \frac{30 - 20}{30} \times 20 \\ &= 40 + \frac{10 \times 20}{30} \\ &= 40 + 6.6666 = 46.67. \end{aligned}$$

**OR**

**The marks distribution of 30 students in mathematics examination are given below :**

Marks	10-25	25-40	40-55	55-70	70-85	85-100
No. of students	5	15	30	8	2	6

**Find the mode of this data.**

**Ans :** Since maximum frequency = 30 and it corresponds to the class 40-55.

$\therefore$  The modal class = 40-55

Here,  $l = 40$ ,  $h = 15$ ,  $f_1 = 30$ ,  $f_0 = 15$ ,  $f_2 = 8$

We know that mode ( $M_o$ ) is given by

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

$$\Rightarrow M_o = 40 + \frac{30 - 15}{2 \times 30 - 15 - 8} \times 15$$

$$= 40 + \frac{15}{60 - 23} \times 15$$

$$= 40 + \frac{225}{37} = 40 + 6.08$$

Thus, Mode = 46.08

**Section : C (Each 3 Marks)**

**Q.14 :** If the median of the distribution given below is 28.5, find the value of x and y.

class interval	0-10	10-20	20-30	30-40	40-50	50-60	Total
No. of students	5	x	20	15	y	5	60

**Ans**

class interval	frequency	Cumulative frequency
0-10	5	5
10-20	x	5+x
20-30	20	25+x
30-40	15	40+x
40-50	y	40+x+y
50-60	5	45+x+y
	$N = \sum f = 60$	

We have

Median = 28.5

Clearly, it lies in the class interval 20–30,

So, 20–30 is the median class

$\therefore l = 20, h = 10, f = 20, cf = 5 + x$

and  $N = 60$

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

$$\Rightarrow 28.5 = 20 + \frac{30 - 5 - x}{20} \times 10$$

$$\Rightarrow 28.5 - 20 = \frac{25 - x}{2}$$

$$\Rightarrow 8.5 \times 2 = 25 - x$$

$$\Rightarrow x = 25 - 17 = 8$$

$$\Rightarrow x = 8$$

We have,  $N = 60$

$$\therefore 45 + x + y = 60$$

$$\Rightarrow x + y = 60 - 45 = 15$$

Putting  $x = 8$ , in  $x + y = 15$

We get  $y = 7$

Hence,  $x = 8, y = 7$

**OR**

**The mean of the following frequency table 50. But the frequencies  $f_1$  and  $f_2$  in class 20-40 and 60-80 are missing. Find the missing frequencies.**

class	0-20	20-40	40-60	60-80	80-100	Total
frequency	17	$f_1$	32	$f_2$	19	120

**Ans :** Let the assumed mean be  $a = 50$  and  $h = 20$

Class interval	frequency ( $f_i$ )	Mid values ( $x_i$ )	$f_i x_i$
0–20	17	10	170
20–40	$f_1$	30	$30f_1$
40–60	32	50	1600
60–80	$f_2$	70	$70f_2$
80–100	19	90	1710
Total	120		$3480 + 30f_1 + 70f_2$

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

$$f_1 + f_2 = 120 - 68$$

$$f_1 + f_2 = 52 \text{ ---(i)}$$

$$\frac{\sum f_i x_i}{\sum f_i} = 50 \text{ --- given}$$

$$\frac{3480 + 30f_1 + 70f_2}{120} = 50$$

$$30f_1 + 70f_2 = (50 \times 120) - 3480$$

$$30f_1 + 70f_2 = 6000 - 3480$$

$$30f_1 + 70f_2 = 2520$$

$$10(3f_1 + 7f_2) = 2520$$

$$3f_1 + 7f_2 = 252 \text{ --- (ii)}$$

Multiply eq<sup>n</sup> (i) by 3

$$3f_1 + 3f_2 = 156 \text{ --- (iii)}$$

Subtract eq<sup>n</sup> (iii) from (ii)

$$\cancel{3f_1} + 7f_2 = 252$$

$$\cancel{3f_1} + 3f_2 = 156$$

$$4f_2 = 96$$

$$f_2 = \frac{96}{4}$$

$$f_2 = 24$$

Putting the value of  $f_2 = 24$  in eq<sup>n</sup> (i) we get

$$f_1 + 24 = 52$$

$$f_1 = 52 - 24$$

$$f_1 = 28$$

**Q.15 :** Following table shows the weights of 12 students.

Weight (in kg)	67	70	72	73	85
No. of students	4	3	2	2	1

**Find the mean weight by using shortcut method.**

**Ans :** Let the assumed mean be  $a = 72$

Weight (in kg) $x_i$	No. of students ( $f_i$ )	$d_i = x_i - a$ $= x_i - 72$	$f_i d_i$
67	4	-5	-20
70	3	-2	-6
72	2	0	0
73	2	1	2
75	1	3	3
$N = \sum f_i = 12$			$\sum f_i d_i = -21$

We have

$$N = 12, \sum f_i d_i = -21 \text{ and } a = 72$$

$$\therefore \text{Mean} = a + \frac{\sum f_i d_i}{\sum f_i}$$

$$= 72 + \left( \frac{-21}{12} \right) = 72 - \frac{7}{4}$$

$$\Rightarrow \text{Mean} = 70.25 \text{ kg.}$$

**Section - D (Each 5 Marks)**

**Q.16 :** From the following data, find mean, median & mode.

Class	65-85	85-105	105-125	125-145	145-165	165-185	185-205
Frequency	4	5	13	20	14	07	04

**Ans :**

Class	Frequency	Class mark ( $n_i$ )	$d_i = x_i - 135$	$f_i d_i$
65-85	4	75	-60	-240
85-105	5	95	-40	-200
105-125	13	115	-20	-260
125-145	20	135	0	0
145-165	14	155	20	280
165-185	7	175	40	280
185-205	4	195	60	240
<b>Total</b>	$\sum f_i = 67$			$\sum f_i d_i = 100$

i) let  $a = 135$

Now  $h = 20$

using the short cut method

$$\therefore \text{Mean} = a + \frac{\sum f_i d_i}{\sum f_i}$$

$$= 135 + \frac{100}{67}$$

$$= 136.49$$

ii) Now  $N = \sum f_i = 67$  (odd)

$$\text{So, } \frac{N}{2} = \frac{67+1}{2} = 34$$

This observation lies in class 125-145

Therefore, 125-145 is the median class

$$\text{So, } l = 125, cf = 22, f = 20$$

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

$$= 125 + \left( \frac{34 - 22}{20} \right) \times 20$$

$$= 125 + 12$$

$$= 137$$

iii) Mode = 3 Median - 2 Mean

$$= 3 \times 137 - 2 \times 136.49$$

$$= 138.02.$$

**OR**

The following distribution shows the daily pocket allowance of children of a locality. The mean pocket allowance to Rs 18 find the missing  $f$ .

Daily pocket money	11-13	13-15	15-17	17-19	19-21	21-23	23-25
No. of Children	01	06	09	13	$f$	5	4

**Ans :** We may find class mark ( $x_i$ ) for each interval by using the relation.

$$x_i = \frac{\text{upper class limit} + \text{lower class limit}}{2}$$

Given that mean pocket allowance = Rs. 18

Now taking 18 as assumed mean ( $a$ ) we may calculate  $d_i$  and  $f_i d_i$  as following.

Daily pocket allowance (in Rs.)	Number of Children $f_i$	Class mark $x_i$	$d_i = x_i - a$	$f_i d_i$
11-13	7	12	-6	-42
13-15	6	14	-4	-24
15-17	9	16	-2	-18
17-19	13	18	0	0
19-21	$f$	20	2	$2f$
21-23	5	22	4	20
23-25	4	24	6	24
<b>Total</b>	$\sum f_i = 44 + f$			$\sum f_i d_i = 2f - 40$

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

$$a = 18$$

$$h = 13 - 11 = 2$$

putting value in formula

$$\text{Mean} = 18 + \frac{2f - 40}{44 + f}$$

$$\Rightarrow 18 = 18 + \frac{2f - 40}{44 + f}$$

$$\Rightarrow \frac{2f - 40}{44 + f} = 0$$

$$\Rightarrow 2f - 40 = 0$$

$$\Rightarrow 2f = 40$$

$$\Rightarrow f = 20$$

**Section : E**

**Q.17 : Case Study :**

The COVID-19 ----- distribution table.



Age(in year)	Below 15	Below 25	Below 35	Below 45	Below 55	Below 65
No. of Patients	6	17	38	61	75	80

Based on the above information, answer the following questions :

**i) Find the modal class interval. 1**

**Ans :** The median class interval is 35-45

**ii) Find the median class interval. 1**

**Ans :** The median class interval is 35 - 45

**iii) Find the modal age of the patients admitted in the hospital. 2**

**Ans :** Here Modal class - 35 - 45

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

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

$$= 35 + \left( \frac{23 - 21}{2 \times 23 - 21 - 14} \right) \times 10$$

$$= 35 + \left( \frac{2}{11} \right) \times 10$$

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

$$= 36.8$$

Therefore, The modal age = 36.8 years.

**OR**

**How many patients of the age 45 years and above were admitted?**

**Ans :** The no. of patients of the age 45 year and above = 14 + 5 = 19.

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