8. If mean of $x_1, x_2, ..., x_n$ is $\bar{x}$ then

(a) Mean of $kx_1, kx_2, ..., kx_n$ is $k\bar{x}$

(b) Mean of $\frac{x_1}{k}, \frac{x_2}{k}, ..., \frac{x_n}{k}$ is $\frac{\bar{x}}{k}$

(c) Mean of $x_1 + k, x_2 + k, ..., x_n + k$ is $\bar{x} + k$

(d) Mean of $x_1 - k, x_2 - k, ..., x_n - k$ is $\bar{x} - k$

9. If mean of n_1 observation is $\bar{x}_1$ and mean of n_2 observation is $\bar{x}_2$ then their combined

$$\text{Mean} = \frac{n_1 \bar{x}_1 + n_2 \bar{x}_2}{n_1 + n_2}$$

10. $\Sigma x_i = n\bar{x}$

11. Range = Highest observation – Lowest observation

12. Graphical Representation of Mode is a Histogram.

VERY SHORT ANSWER TYPE(I) QUESTIONS

1. What is the mean of first 12 prime numbers?

2. The mean of 20 numbers is 18. If 2 is added to each number, what is the new mean?

3. The mean of 5 observations 3, 5, 7, x and 11 is 7, find the value of x.

4. What is the median of first 5 natural numbers?

5. What is the value of x, if the median of the following data is 27.5?
24, 25, 26, $x + 2$, $x + 3$, 30, 33, 37

6. What is the mode of the observations 5, 7, 8, 5, 7, 6, 9, 5, 10, 6?

7. The mean and mode of a data are 24 and 12 respectively. Find the median.

8. Write the class mark of the class 19.5 – 29.5.

9. Multiple Choice Question

(i) If the class intervals of a frequency distribution are 1 – 10, 11 – 20, 21 – 30, ..., 51 – 60, then the size of each class is:

(a) 9 (b) 10 (c) 11 (d) 5.5

(ii) If the class intervals of a frequency distribution are 1 – 10, 11 – 20, 21 – 30 ...., 61 – 70, Then the upper limit of 21 – 30 is:

(a) 21 (b) 30

(c) 30.5 (d) 20.5

(iii) Consider the frequency distribution.

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

The upper limit of median class is :

(a) 17 (b) 17.5 (c) 18 (d) 18.5

(iv) Daily wages of a factory workers are recorded as:

Daily wages (in ₹)	121 – 126	127 – 132	133– 138	139 – 144	145 – 150
No. of workers	5	27	20	18	12

The lower limit of Modal class is:

(a) ₹ 127 (b) ₹ 126 (c) ₹ 126.50 (d) ₹ 133

(v) 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 the median class and modal class is (CBSE 2020)

(a) 15 (b) 25 (c) 30 (d) 35

(vi) The median and mode respectively of a frequency distribution are 26 and 29. Then, its mean is (CBSE 2020)

(a) 27.5 (b) 24.5 (c) 28.4 (d) 25.8

10. Find the class-marks of the classes 10-25 and 35-55. (CBSE 2020)

11. Fill in the blank

(a) Mode = 3_____ – 2 _____

(b) An ogive curve is used to determine _____ .

(c) If the point of intersection of 'more than' and 'less than' ogive is (20. 5, 30.7), then the value of median is _____ .

(d) The mode of a frequency distribution is determined graphically by _____ .

(e) If the mode is 8 and mean is also 8, then median will be _____ .

(f) The measure of central tendency which cannot be determined graphically is _____ .

(g) If the class marks of a continuous frequency distribution are 22, 30, 38, 46, 54, 62 then the class corresponding to class mark 46 is _____ .

(h) Construction of cumulative frequency distribution table is useful in determining _____ .

(i) The step deviation formula for finding mean is _____ .

(j) The formula to find median of grouped data is _____ .

(k) The formula to find mode of grouped data is _____ .

(l) The Range of the observations 255, 125, 130, 160, 185, 170, 103 is _____ .

(m) Class mark = $\frac{1}{2}$ (_____ + _____) .

(n) The median of Ist ten prime numbers is _____ .

(o) The assumed mean method to find mean is _____ .

SHORT ANSWER TYPE QUESTIONS (I)

12. The mean of 11 observation is 50. If the mean of first Six observations is 49 and that of last six observation is 52, then find sixth observation.

13. Find the mean of following distribution:

x	12	16	20	24	28	32
f	5	7	8	5	3	2

14. Find the median of the following distribution:

x	10	12	14	16	18	20
f	3	5	6	4	4	3

15. Find the mode of the following frequency distribution:

Class	0–5	5–10	10 –15	15–20	20–25	25–30
Frequency	2	7	18	10	8	5

16. Draw a 'less than' ogive of the following data:

Marks	**No. of students**
Less than 20	0
Less than 30	4
Less than 40	16
Less than 50	30
Less than 60	46
Less than 70	66
Less than 80	82
Less than 90	92
Less than 100	100

17. Write the following data into less than cummulative frequency distribution table :

Marks	0–10	10–20	20–30	30–40	40–50
No. of students	7	9	6	8	10

18. Find mode of the following frequency distribution :

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

(CBSE 2018 - 19)

19. What is the median of the following data? **(CBSE 2011)**

x	10	20	30	40	50
f	2	3	2	3	1

20. Mean of a frequency distribution ($\bar{x}$) is 45. If $\Sigma f_i = 20$ find $\Sigma f_i x_i$

(CBSE 2011)

21. Find the mean of the following distribution : **(CBSE 2020)**

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

22. Find the mode of the following data : (CBSE 2020)

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

23. Compute the mode for the following frequency distribution: (CBSE 2020)

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

SHORT ANSWER TYPE QUESTIONS (II)

24. If the mean of the following distribution is 54, find the value of P.

Class	0–20	20–40	40–60	60–80	80–100
Frequency	7	P	10	9	13

25. Find the median of the following frequency distribution :

C.I.	0–10	10–20	20–30	30–40	40–50	50–60
f	5	3	10	6	4	2

26. The median of following frequency distribution is 24 years. Find the missing frequency x.

Age (In years)	0–10	10–20	20–30	30–40	40–50
No. of persons	5	25	x	18	7

27. Find the median of the following data:

Marks	Below 10	Below 20	Below 30	Below 40	below 50	Below 60
No. of student	0	12	20	28	33	40

28. Draw *a* 'more than type' ogive of the following data :

Weight (In kg.)	30–35	35–40	40–45	45–50	50–55	55–60
No. of Students	2	4	10	15	6	3

29. Find the mode of the following data:

Height (In cm)	Above 30	Above 40	Above 50	Above 60	Above 70	Above 80
No. of plants	34	30	27	19	8	2

30. The following table represent marks obtained by 100 students in a test:

Marks obtained	30 – 35	35 – 40	40 – 45	45 – 50	50 – 55	55 – 60	60 – 65
No. of students	14	16	28	23	18	8	3

Find mean marks of the students. **(CBSE 2018 -19)**

31. The following table represent pocket allowance of children of a colony. The mean pocket allowance is ₹ 18. Find the missing frequency.

Daily pocket allowance (in ₹)	11 – 13	13 – 15	15 – 17	17 – 19	19 – 21	21 – 23	23 – 25
No. of children	3	6	9	13	k	5	4

(CBSE – 2018)

32. Find mode of the following frequency distribution:

Class Interval	0–20	20–40	40–60	60–80	80–100
No. of Students	15	18	21	29	17

The mean of above distribution is 53. Use Empirical formula to find approximate value of median.

LONG ANSWER TYPE QUESTIONS

33. The mean of the following data is 53, Find the values of f_1 and f_2.

C.I	0–20	20–40	40–60	60–80	80–100	Total
f	15	f_1	21	f_2	17	100

34. If the median of the distribution given below is 28.5, find the values of x and y.

C.I	0–10	10–20	20–30	30–40	40–50	50–60	Total
f	5	8	x	15	y	5	60

35. The median of the following distribution is 35, find the values of a and b.

C.I	0–10	10–20	20–30	30–40	40–50	50–60	60–70	Total
f	10	20	a	40	b	25	15	170

36. Find the mean, median and mode of the following data:

C.I	11–15	16–20	21–25	26–30	31–35	36–40	41–45	46–50
f	2	3	6	7	14	12	4	2

37. The rainfall recorded in a city for 60 days is given in the following table:

Raifall (In cm)	0–10	10–20	20–30	30–40	40–50	50–60
No. of Days	16	10	8	15	5	6

Calulate the median rainfall using a more than type ogive.

38. Find the mean of the following distribution by step- deviation method:

Daily Expenditure (in ₹)	100–150	150–200	200–250	250–300	300–350
No. of Households	4	5	12	2	2

39. The distribution given below show the marks of 100 students of a class:

Marks	0–5	5–10	10–15	15–20	20–25	25–30	30–35	35–40
No. of Students	4	6	10	10	25	22	18	5

Draw a 'less than' type and a 'more than' type ogive from the given data. Hence obtain the median marks from the graph.

40. The annual profit earned by 30 factories in an industrial area is given below:

Profit (₹ in lakh)	**No. of Factories**
More than or equal to 5	30
More than or equal to 10	28
More than or equal to 15	16
More than or equal to 20	14
More than or equal to 25	10
More than or equal to 30	7
More than or equal to 35	3
More than or equal to 40	0

Draw both ogives for the data and hence find the median.

41. Convert the following distribution into 'Less than' and then draw its ogive

(CBSE 2018 -19)

Class Interval	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80	80 – 90	90 – 100
Frequency	7	5	8	10	6	6	8

42. If mean of the given distribution is 65.6 find the missing frequency.

(CBSE 2017)

Class Interval	10 – 30	30 – 50	50 – 70	70 – 90	90 – 110	110 – 130	Total
Frequency	5	8	f_1	20	f_2	2	50

43. The mode of the frequency distribution is 36. Find the missing frequency (f).

(CBSE 2020)

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

44. The mean of the following frequency distribution is 18. The frequency f in the class interval 19-21 is missing. Determine f. **(CBSE 2020)**

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

45. The following table gives production yield per hectare of wheat of 100 farms of a village : **(CBSE 2020)**

Production Yield	40 – 45	45 – 50	50 – 55	55 – 60	60 – 55	65 – 70
Frequency	4	6	16	20	30	24

Change the distribution to a 'more than' type distribution and draw its ogive.

ANSWERS AND HINTS

1. 16.4 approx.

2. 20

3. 9

4. 3

5. $x = 25$

6. 5

7. Median = 20

8. 24.5

9. (i) B (First make intervals continuous, Then find class size)

(ii) C

(iii) B

(iv) C

(v) B $\begin{bmatrix} \text{Modal class } 15-20 \\ \text{Median class } 10-15 \end{bmatrix}$

(vi) B

10. 17.5 and 45

11. (a) 3 Median – 2 mean

(b) Median

(c) 20.5

(d) Histogram

(e) 8

(f) Mean

(g) 42 – 50 (as difference b/w 2 consecutive observation is 8

$\therefore$ Subtract $\frac{8}{2}$ form 46 for Lower Limit and Add $\frac{8}{2}$ to 46 for upper Limit)

(h) Median

(i) $\bar{x} = a + \frac{\Sigma f_i u_i}{\Sigma f_i} \times h$

(j) Median $= l + \left(\frac{\frac{n}{2} - cf}{f} \right) \times h$

(k) Mode $= l + \frac{(f_1 - f_o)}{(2f_1 - f_o - f_2)} \times h$

(l) Range = 255 – 103 = 152

(m) $\frac{1}{2}$ (upper limit + Lower limit)

(*n*) 12.9

(o) $\bar{x} = a + \frac{\Sigma f_i d_i}{\Sigma f_i}$

12. 56

13. 20

14. 14

15. 12.89 approx.

17.

Marks	No. of students
less than 10	7
less than 20	16
less than 30	22
less than 40	30
less than 50	40

18.

Class Interval	Frequency
25 – 30	25
30 – 35	$34 = f_0$
35 – 40	$50 = f_1$
40 – 45	$42 = f_2$
45 – 50	38
50 – 55	14

$$\text{Mode} = l + \frac{(f_1 - f_0)}{(2f_1 - f_0 - f_2)} \times h = 35 + \frac{(50 - 34)}{(100 - 34 - 42)} \times 5 = 35 + \frac{16 \times 5}{24}$$

$= 35 + 3.33 = 38.33$ approx.

19.

x_i	f_i	cf
10	2	2
20	3	5
30	2	7
40	3	10
50	1	11
Total	11	

N = 11 (odd)

$$\text{Median} = \left(\frac{N+1}{2}\right)^{th} \text{ observation} = \text{6th observation} = 30$$

20. $\bar{x} = \dfrac{\Sigma f_i x_i}{\Sigma f_i} \Rightarrow 45 = \dfrac{\Sigma f_i x_i}{20} \Rightarrow \Sigma f_i x_i = 900$

21. 8.15

22. 62.5

23. 14.46 cm

24. 11

25. 27

26. 25

27. 30

29. 63.75 cm

30.

Mark	x_i	d_i	u_i	f_i	$f_i u_i$
30 – 35	32.5	– 15	– 3	14	– 42
35 – 40	37.5	– 10	– 2	16	– 32
40 – 45	42.5	– 5	– 1	28	– 28
45 – 50	47.5 = a	0	0	23	0
50 – 55	52.5	5	1	18	18
55 – 60	57.5	10	2	8	16
60 – 65	62.5	15	3	3	9
				110	–59

$$\bar{x} = a + \frac{\Sigma f_i u_i}{\Sigma f_i} \times h = 47.5 - \frac{59}{110} \times 5 = 47.5 - 2.68 = 44.82$$

31. (Make Table just like Q. 30)

$$\bar{x} = a + \frac{\Sigma f_i u_i}{\Sigma f_i} \times h$$

$$18 = 18 + \frac{(k-8)}{40+k} \times 2$$

$$2k - 16 = 0$$

$$k = 8$$

32. $\text{Mode} = l + \dfrac{(f_1 - f_0)}{(2f_1 - f_0 - f_2)} \times h$

$$= 60 + \frac{(29-21)}{(2 \times 29 - 21 - 17)} \times 20 = 68$$

Mode = 3 Median – 2 mean

$68 = 3 \text{ Median} - 2 \times 53$

$\frac{68+106}{3} = \text{Median}$

Median = 58

33. $f_1 = 18, f_2 = 29$ **34.** $x = 20, y = 7$

35. $a = 35, b = 25$

36. Mean = 32, median = 33, mode = 34.39 approx.

37. Median = 25 cm **38.** Mean = ₹ 211

39. Median = 24 **40.** Median = ₹ 17.5 lakhs.

41.

Less than	*f*	*cf*
Less than 40	7	7
Less than 50	5	12
Less than 60	8	20
Less than 70	10	30
Less than 80	6	36
Less than 90	6	42
Less than 100	8	50

Plot (40,7), (50, 12), (60, 20), (70, 30) (80, 36), (90, 42), (100, 50)

Join free hand to get ogive.

42.

C.I	f_i	x_i	$f_i x_i$
10 – 30	5	20	100
30 – 50	8	40	320
50 – 70	f_1	60	$60f_1$
70 – 90	20	80	1600
90 – 110	f_2	100	$100f_2$
110 – 130	2	120	240
	$\mathbf{35 + f_1 + f_2}$		$\mathbf{2260 + 60 f_1 + 100 f_2}$

$35 + f_1 + f_2 = 50 \quad \Rightarrow \quad f_1 + f_2 = 15$ ....(1)

$$\overline{x} = \frac{\Sigma fixi}{\Sigma fi}$$

$$65.6 = \frac{2260 + 60\ f_1 + 100\ f_2}{50}$$

$$\Rightarrow\ 3f_1 + 5f_2 = 51 \quad ...(2)$$

Solve (1) & (2) $\quad f_1 = 12, f_2 = 3$

43. $f = 10$

44. $f = 8$

PRACTICE-TEST

Statistics

Time : 1 Hr. ***M.M. : 20***

SECTION-A

1. Find the class mark of a class $a - b$. **1**

2. Find the mean of all the even numbers between 11 and 21. **1**

3. An ogive curve is used to detemine **1**

(a) Range (b) Mean (c) Mode (d) Median

4. State True/False : **1**

"Mean can be determined graphically."

SECTION-B

5. The mean of 50 observations is 20. If each observation is multiplied by 3, then find the new mean. **2**

6. The mean of 10 observations is 15.3. If two observations 6 and 9 are replaced by 8 and 14 respectively. Find the new mean. **2**

7. Write the modal class for the following frequency distribution **2**

Classes	1 – 4	5 – 8	9 – 12	13 – 16	17 – 20	21 – 24
frequency	8	9	1	12	8	9

SECTION-C

8. Find the mean: **3**

Marks	less than 20	less than 40	less than 60	less than 80	less than 100
No. of Students	4	10	28	36	50

9. Find the value of x if the mode is given to be 58 years. **3**

Age (in years)	20–30	30–40	40–50	50–60	60–70	70–80
No. of patients	5	13	x	20	18	19

SECTION-D

10. The mean of the following frequency distribution is 57.6 and the number of observations is 50. Find the value of f_1 & f_2. **4**

Class Interval	0–20	20–40	40–60	60–80	80–100	100–120
frequency		7	f_1	12	f_2	8 5

OR

Following is the age distribution of cardiac patients admitted during a month in a hospital:

Age (in years)	20–30	30–40	40–50	50–60	60–70	70–80
No. of patients	2	8	15	12	10	5

Draw a 'less than type' and 'more than type' ogives and from the curves, find the median.