

Statistics

Basic Concepts

1. The Mean for grouped data can be found by:

(i) The direct method $\bar{X} = \frac{\sum f_i x_i}{\sum f_i}$

(ii) The assumed mean method

$$\bar{X} = a + \frac{\sum f_i d_i}{\sum f_i} \text{ where } d_i = x_i - a$$

(iii) The Step deviation method

$$\bar{X} = a + \frac{\sum f_i d_i}{\sum f_i} \times h \text{ where } u_i = \frac{x_i - a}{h}$$

2. The mode for the grouped data can be found by using the formula

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

l = Lower limit of the modal class

f_1 = frequency of the modal class.

f_0 = frequency of the preceding class of the modal class

f_2 = frequency of the succeeding class of the modal class

h = Size of the class interval

Modal class - class interval with highest frequency

3. The median for the grouped data can be found by using the formula

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

- l = lower limit of the median class
 n = number of observations
 cf = cumulative frequency of class interval preceed the median class
 f = frequency of median class
 h = class size

VERY SHORT ANSWER TYPE QUESTIONS

- What is the mean of first 12 prime numbers?
- The mean of 20 numbers is 18. If 2 is added to each number, what is the new mean?
- the mean of 5 observations 3, 5, 7, x and 11 is 7, find the value of x .
- What is the median of first 10 natural numbers?
- 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
- what is the mode of the observations 5, 7, 8, 5, 7, 6, 9, 5, 10, 6.
- Write the relation between mean, median and mode.
- What measure of the central tendency is represented by the abscissa of the point whers 'less than' and 'more than' intersect?
- Which measure of the central tendency cannot be determined graphically.
- The arithmetic mean and mode of a data are 24 and 12 respectively. Find the median
- Write the class mark of the class 19.5 – 29.5.
- The mean of 5 numbers is 18. If one number is excluded then their mean is 16. Find the excluded number.
- 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.
- Find the mean of following distribution

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

- Find the median of the following distribution

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

16. 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 |

17. 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 |

18. Write the following data into less than cumulative frequency distribution table.

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

SHORT ANSWER TYPE QUESTIONS (II)

19. Find the mean of the following data

| | | | | | |
|------|------|-------|-------|-------|-------|
| C. I | 0–10 | 10–20 | 20–30 | 30–40 | 40–50 |
| f | 8 | 12 | 10 | 11 | 9 |

20. 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 |

21. 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 |

22. The median of following frequency distribution is 24. 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 |

23. 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 |

24. Draw a 'more than type' O give 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 |

25. 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 |

LONG ANSWER TYPE QUESTIONS

26. 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 |

27. The mean of the following distribution is 57.6 and the sum of its frequencies is 50, find the missing frequencies f_1 and f_2 .

| | | | | | | |
|-----------|------|-------|-------|-------|--------|---------|
| Class | 0–20 | 20–40 | 40–60 | 60–80 | 80–100 | 100–120 |
| Frequency | 7 | f_1 | 12 | f_2 | 8 | 5 |

28. 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 |

29. 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 |

30. Find the mean, median and mode of the following data

| | | | | | | | |
|----------|-------|-------|-------|-------|-------|--------|---------|
| C.I | 45–55 | 55–65 | 65–75 | 75–85 | 85–95 | 95–105 | 105–115 |
| <i>f</i> | 7 | 12 | 17 | 30 | 32 | 6 | 10 |

31. Find the mean, median and mode of the following data

| | | | | | | | | |
|----------|------|-------|-------|-------|-------|-------|-------|-------|
| C.I | 1–15 | 16–20 | 21–25 | 26–30 | 31–35 | 36–40 | 41–45 | 46–50 |
| <i>f</i> | 2 | 3 | 6 | 7 | 14 | 12 | 4 | 2 |

32. 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 |

Calculate the median rainfall using a more than type ogive. Why is water conseruation necessary?

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

| | | | | | |
|-------------------|---------|---------|---------|---------|---------|
| Daily Exponditure | 100–150 | 150–200 | 200–250 | 250–300 | 300–350 |
| No. of Households | 4 | 5 | 12 | 2 | 2 |

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

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

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

35. The annual profit earned by 30 factories in an industrial area is given below. Draw both ogives for the data and hence find the median.

| Profit (Rs. 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 |

ANSWERS

- | | |
|---|-------------------------|
| 1. 16.4 | 2. 20 |
| 3. 9 | 4. 3 |
| 5. $x = 25$ | 6. 5 |
| 7. Mode = 3 median – 2 mean | 8. Median |
| 9. Mean | 10. Median = 20 |
| 11. 24.5 | 12. 26 |
| 13. 56 | 14. 20 |
| 15. 14 | 16. 12.89 |
| 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 |
| 19. 25.2 | 20. 11 |
| 21. 27 | 22. 25 |
| 23. 20 | 25. 63.75 |
| 26. $f_1 = 18, f_2 = 29$ | 27. $f_1 = 8, f_2 = 10$ |
| 28. $x = 20, y = 7$ | 29. $a = 35, b = 25$ |
| 30. mean = 81.05, median = 82, mode = 85.71 | |
| 31. Mean = 32, median = 33, mode = 34.38 | |
| 32. Median = 25 | 33. Mean = 211 |
| 34. Median = 24 | 35. Median = 17.5 |