MATHS BASEMAKER
Class 10 CBSE — Chapter 13: Statistics
Chapter Test Paper

Q1. For a given frequency distribution, if the mean is 24 and the median is 26, then using the empirical relationship between the three measures of central tendency, the value of the mode is:

(a) 30 (b) 28 (c) 25 (d) 32

Q2 If the mean of 20 observations is 15, and if each observation is multiplied by 3 and then increased by 2, then the new mean of the data will be:

(a) 45 (b) 17 (c) 47 (d) 51

Q3. While computing the mean of grouped data, we assume that the frequencies are:

(a) evenly spread over all intervals (b) centered at class marks of intervals
(c) centered at lower limits (d) centered at upper limits

Q4. A class teacher recorded the marks obtained by students in a mathematics unit test out of 30 marks. The continuous grouped frequency distribution of their performance is given below:

Marks Obtained (Out of 30)	**0 – 6**	**6 – 12**	**12 – 18**	**18 – 24**	**24 – 30**
Number of Students	4	6	16	6	5

Calculate the modal marks, and explain the significance of the modal marks for the teacher in the class

Q5. If the mean of the following frequency distribution is 18, find the missing frequency f:

Class Interval	**11 - 13**	**13 - 15**	**15 - 17**	**17 - 19**	**19 - 21**	**21 - 23**	**23 - 25**
Frequency	7	6	9	13	f	5	4

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Q6. The median of the following distribution is 525. Find the values of missing frequencies x and y, given that the total frequency is 100:

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

Q7. The marks obtained by 80 students in a mathematics examination are given in a cumulative frequency table as follows:

Marks Obtained	Less than 10	Less than 20	Less than 30	Less than 40	Less than 50	Less than 60
Cumulative Frequency	7	21	34	46	66	80

Convert the above cumulative distribution into a standard continuous grouped frequency distribution table and find the median marks.

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HINTS & STEPS / SOLUTIONS

Q1.

Hint: Empirical relation: Mode = 3 Median - 2 Mean.
1. Given: Mean = 24, Median = 26.
2. Mode = 3(Median) - 2(Mean) = 3(26) - 2(24) = 78 - 48 = 30.
Answer: (a) 30

Q2.

Hint: If every observation x_i is linearly transformed as $y_i = a\,x_i + b$, then New Mean = a (Old Mean) + b.
1. Old Mean = 15.
2. Each observation is multiplied by 3 and increased by 2.
3. New Mean = 3 × (Old Mean) + 2 = 3(15) + 2 = 45 + 2 = 47.
Answer: (c) 47

Q3.

Hint: In grouped frequency analysis, all values in an interval are assumed to be concentrated at its classmark (mid-value).

1. Classmark x_i = (Upper limit + Lower limit) / 2.
2. Therefore, frequencies are assumed to be centred at the classmarks of the intervals.

Answer: (b) centred at classmarks of intervals

Q4.

Hint: Modal class is the interval with maximum frequency (12 – 18, frequency = 16). Formula: Mode = l + [(f1 - f0) / (2f1 - f0 - f2)] × h.

1. Modal class = 12 – 18. Lower limit l = 12, class size h = 6.
2. f1 = 16 (modal frequency), f0 = 6 (preceding frequency), f2 = 6 (succeeding frequency).
3. Mode = 12 + [(16 - 6) / (2(16) - 6 - 6)] × 6
   = 12 + [10 / (32 - 12)] × 6
   = 12 + [10 / 20] × 6
   = 12 + 0.5 × 6
   = 12 + 3 = 15.
4. Conclusion: Most of the students got 15 marks out of 30 in the test.

Answer: Mode = 15 marks

Q5.

Hint: Take Assumed Mean a = 18 (since given Mean = 18). Deviations $d_i = x_i - 18$. Formula: Mean = a + ($\Sigma f_i d_i$ / Σf_i).

Deviations $d_i = x_i - 18$ and $f_i d_i$ values:

11–13 (x_1=12): d_1 = -6 => $f_1 d_1$ = 7 × (-6) = -42

13–15 (x_2=14): d_2 = -4 => $f_2 d_2$ = 6 × (-4) = -24

15–17 (x_3=16): d_3 = -2 => $f_3 d_3$ = 9 × (-2) = -18

17–19 (x_4=18 = a): d_4 = 0 => $f_4 d_4$ = 13 × 0 = 0

19–21 (x_5=20): d_5 = 2 => $f_5 d_5$ = f × 2 = 2f

21–23 (x_6=22): d_6 = 4 => $f_6 d_6$ = 5 × 4 = 20

23–25 (x_7=24): d_7 = 6 => $f_7 d_7$ = 4 × 6 = 24

Σf_i = 7 + 6 + 9 + 13 + f + 5 + 4 = 44 + f.

$\Sigma f_i d_i$ = (-42 - 24 - 18) + 0 + 2f + 20 + 24 = 2f - 40.

18+2f-40/44+f = 18

2f-40 = 0

f =20

Answer: f = 20

Q6.

Total frequency N = 100. Median class is 500 - 600 since median = 525.

1. Sum of frequencies: 2 + 5 + x + 12 + 17 + 20 + y + 9 + 7 + 4 = 100 => 76 + x + y = 100 => x + y = 24 --- (1)
2. Cumulative frequencies up to 500: cf = 2 + 5 + x + 12 + 17 = 36 + x.
3. Median class = 500 - 600: l = 500, f = 20, h = 100, N/2 = 50.
   Median = l + [(N/2 - cf) / f] × h
   525 = 500 + [(50 - (36 + x)) / 20] × 100
   25 = (14 - x) × 5 => 5 = 14 - x => x = 9.
4. From (1): y = 24 - 9 = 15.

Answer: x = 9, y = 15

Q7.

Hint: Convert cumulative frequencies to ordinary frequencies f: 7, 14, 13, 12, 20, 14. Total N = 80.

1. Continuous intervals and frequencies f:
   0-10: 7, 10-20: 14, 20-30: 13, 30-40: 12, 40-50: 20, 50-60: 14.
2. N/2 = 80 / 2 = 40. The cumulative frequency just greater than 40 is 46 (interval 30 - 40).
3. Median class = 30 - 40: l = 30, f = 12, cf = 34, h = 10.
   Median = l + [(N/2 - cf) / f] × h = 30 + [(40 - 34) / 12] × 10 = 30 + (6/12) × 10 = 30 + 5 = 35 marks.

Answer: Median = 35 marks

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