Case Study Questions on Chapter 13 Statistics for Class 10

Case Study 1: Class 10 Maths Exam Results

Situation: In a school in Pune, 80 students of Class 10 appeared for a Mathematics unit test. The marks obtained (out of 50) are recorded in the table below. The class teacher wants to find the median marks to understand how the majority of students performed.

Marks Obtained	Number of Students (f_i)	Cumulative Frequency (cf)
0 – 10	5	5
10 – 20	9	14
20 – 30	20	34
30 – 40	28	62
40 – 50	18	80
Total	**80**	—

(i) The value of n/2 (used to find the median class) is _____:
(ii) The median class is:
(a) 20–30
(b) 30–40
(c) 10–20
(d) 40–50
(iii) Calculate the median marks of the students.
(iv) True or False:
The upper limit of the median class in this data is 40.

Solutions:

(i) Answer: 40
n = total frequency = 80, so n/2 = 80/2 = 40.

(ii) Answer: (b) 30–40
n/2 = 40. We look at cumulative frequencies: cf at 20–30 is 34 (less than 40), cf at 30 - 40 is 62 (first to exceed 40). So the median class is 30–40.
(iii) Median class = 30 - 40
l = 30, cf = 34, f = 28, h = 10, n/2 = 40
Median = l + [(n/2 − cf) / f] × h
= 30 + [(40 − 34) / 28] × 10
= 30 + [6/28] × 10
= 30 + 60/28
= 30 + 2.14
≈ 32.14 marks
The median marks is approximately 32.14. This means half the students scored below 32.14 and half scored above.
(iv) TRUE
The median class is 30 - 40. Its upper limit is indeed 40.

Case Study 2: Cricket Tournament

Situation: In a local cricket tournament held in Mumbai, the scores made by 60 batsmen in their respective innings are shown below. A sports analyst wants to study the central tendency of the scores.

Runs Scored	Number of Batsmen (f_i)	Class Mark (x_i)	Cumulative Frequency (cf)
0 – 20	4	10	4
20 – 40	8	30	12
40 – 60	16	50	28
60 – 80	20	70	48
80 – 100	12	90	60
Total	**60**	—	—

(i) Calculate the mean runs scored
(ii) The median class is:
(a) 40–60
(b) 60–80
(c) 20–40
(d) 80–100
(iii) Calculate the median runs scored.
(iv) Using the empirical relationship, find the mode of the runs scored.
(v) If the mean and mode of a distribution are both 45, the median is:
(a) 40
(b) 50
(c) 45
(d) 35

Solutions:

(i) Direct Method
$\Sigma f_i x_i = 4\times10 + 8\times30 + 16\times50 + 20\times70 + 12\times90$
$= 40 + 240 + 800 + 1400 + 1080$
$= 3560$
Mean $= \Sigma f_i x_i / \Sigma f_i = 3560 / 60 \approx 59.33$ runs
(ii) Answer: (b) 60 - 80
n = 60, so n/2 = 30.
cf at 40–60 is 28 (less than 30).
cf at 60–80 is 48 (first to exceed 30).
Median class = 60–80.
(iii) Median class = 60–80
l = 60, cf = 28, f = 20, h = 20, n/2 = 30
Median = 60 + [(30 − 28) / 20] × 20
= 60 + [2/20] × 20
= 60 + 2
= 62 runs
(iv) Empirical Formula:
Mode = 3 × Median − 2 × Mean
= 3 × 62 − 2 × 59.33
= 186 − 118.67
= 67.33 runs (approx)

(v) Answer: (c) 45
Using Empirical Formula
3 × Median = Mode + 2 × Mean
= 45 + 2 × 45 = 45 + 90 = 135
Median = 135 / 3 = 45