Grade 10 Mathematics Lesson Plan

Median

Strand:	**Statistics and Probability**
Sub-Strand:	Ungrouped Data
Specific Learning Outcome:	Determine mean, mode and median of grouped and ungrouped data
Duration:	40 minutes
Key Inquiry Questions:	What is statistics? How do we represent data? How do we use statistics in day to day life?
Learning Resources:	CBC Grade 10 textbooks, calculators, chart paper, markers

Phase 1: Problem-Solving and Discovery (15 minutes)

Anchor Activity: Mathematics Test Marks

Objective: Students work in groups to arrange data and discover the concept of median as the middle value.

Work in groups to analyze the following scenario:

The following are the marks obtained by 15 students in a mathematics test:

45, 78, 56, 90, 67, 82, 54, 88, 73, 60, 95, 80, 70, 85, 68

Tasks:

- (a) Arrange the marks in ascending order.
- (b) Identify the median mark.
- (c) What does the median tell us about the score of the group?
- (d) Share your work with the class.

Discussion prompts for teachers:

- Why do we need to arrange the data first?
- What does "middle value" mean when there are 15 numbers?
- How is the median different from the average (mean)?
- Does the median represent a typical student's performance?
- What happens if we add one more student's mark? How would we find the median then?

Phase 2: Structured Instruction (10 minutes)

Key Takeaways

1. Definition of Median

The median is the middle value of a data set.

2. Critical First Step

To find median, data must first be arranged in ascending or descending order.

3. Case 1: Odd Number of Observations

If the number of observations is odd, the median is the value at the middle position.

Formula for position: (n + 1) / 2

Example: For 15 students with marks arranged as:

45, 54, 56, 60, 67, 68, 70, 73, 78, 80, 82, 85, 88, 90, 95

Position = (15 + 1) / 2 = 8th position

The 8th value is 73, so Median = 73

4. Case 2: Even Number of Observations

If the number of observations is even, the median is the average of the two middle values.

Formula: Median = (Middle value 1 + Middle value 2) / 2

Example: For the data set 45, 56, 60, 67, 68, 70, 73, 78 (8 values)

Two middle values are at positions 4 and 5: 67 and 68

Median = (68 + 70) / 2 = 69

5. What Median Tells Us

- The median represents the "middle" or "typical" value.
- Half the values are below the median, half are above.
- Median is not affected by extreme values (outliers).

Phase 3: Practice and Application (15 minutes)

Worked Example 3.1.27 (Even Number - Student Ages)

Problem: The ages of 6 students are: 12, 15, 14, 13, 16, 15. Find the median age.

Solution:

Step 1: Arrange the ages in ascending order

12, 13, 14, 15, 15, 16

Step 2: Count the observations

n = 6 (even number)

Step 3: Identify the two middle values

For 6 values, the middle positions are 3rd and 4th

3rd value = 14, 4th value = 15

Step 4: Calculate the average of the two middle values

Median = (14 + 15) / 2 = 14.5

Answer: The median age is 14.5 years.

Worked Example 3.1.28 (Even Number - Goals Scored)

Problem: The following data set represents the number of goals scored by a football team in 20 matches:

2, 3, 1, 4, 2, 5, 3, 2, 4, 1, 3, 2, 4, 5, 3, 2, 1, 4, 3, 2

Determine the median of the data set.

Solution:

Step 1: Arrange the data in ascending order

1, 1, 1, 2, 2, 2, 2, 2, 2, 3, 3, 3, 3, 3, 4, 4, 4, 4, 5, 5

Step 2: Count observations

n = 20 (even number)

Step 3: Find the 10th and 11th values

For 20 values, middle positions are 10th and 11th

10th value = 3, 11th value = 3

Step 4: Calculate the average

Median = (3 + 3) / 2 = 3

Answer: The median is 3 goals.

Phase 4: Assessment (5 minutes)

Exit Ticket

1. Find the median of the following data: 50, 30, 10, 40, 20

2. The number of goals scored in six football matches were: 2, 3, 1, 4, 2, 5

3. The ages (in years) of students participating in a debate competition are:

14, 15, 14, 16, 15, 17, 16, 14, 15

Find the median age of the students.

4. The daily earnings (in Ksh) of small business owners are:

500, 800, 750, 600, 900, 1200, 700

(a) Find the median of the daily earnings.

(b) One business owner earned 5000 Ksh instead of 1200 Ksh. Calculate the new median.

5. The following data set represents the number of hours spent on homework by a group of students in a week:

2, 3, 1, 4, 2, 5, 3, 4, 1, 2

Determine the median of the data set.

Differentiation Strategies

For Struggling Learners:

- Provide pre-printed number cards that students can physically arrange in order.
- Use smaller datasets (5-7 values) to build confidence.
- Color-code the middle value(s) after arranging data.
- Provide step-by-step worksheets with guided practice.
- Use calculators freely for averaging two middle values.
- Work in pairs with peer support.

For Advanced Students:

- Explore larger datasets (30+ values) and use position formulas.
- Compare mean vs median and discuss when each is more useful.
- Investigate how outliers affect mean but not median.
- Calculate median for grouped data using cumulative frequency.
- Research real-world applications: house prices, salaries, test scores.
- Create their own datasets where median differs significantly from mean.

Extension Activity: Comparing Mean and Median

Scenario: Explore how outliers affect mean and median differently.

Dataset: Monthly salaries (in Ksh) of 7 employees in a small company:

20000, 22000, 25000, 24000, 23000, 26000, 150000

Tasks:

1. Arrange the salaries in ascending order.

2. Calculate the median salary.

3. Calculate the mean (average) salary.

4. Compare the median and mean. Which is higher? Why?

5. Which measure (median or mean) better represents a "typical" employee's salary? Explain.

6. Remove the outlier (150000) and recalculate both median and mean. What do you notice?

7. Discuss: When is median more useful than mean in real life?

Expected Findings:

- Median = 24000 Ksh (middle value, not affected by the 150000 outlier)
- Mean ≈ 38571 Ksh (pulled up by the outlier)
- Median better represents typical salary because mean is distorted by one very high value
- Real-world applications: house prices, income data, test scores often use median