Step by step guide_Median (Grouped)

Pre-Class Preparation

- Prepare group assignments (4-5 students per group).
- Have calculators ready for all students.
- Prepare chart paper and colored markers.
- Write anchor activity table on the board or prepare handouts.
- Prepare worked examples on cards or slides.
- Have formula cards ready with L, CF, F, C clearly labeled.
- Prepare number line visual aids to show median class location.

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

[0-2 minutes] Introduction

[SAY] "Good morning! Remember median for ungrouped data? We found the middle value by arranging and counting."

[ASK] "For grouped data, can we find the exact middle value?"

[LISTEN] Students say: No, we only have intervals.

[SAY] "Right! So we need to ESTIMATE the median using a special formula. Let's discover how!"

[2-3 minutes] Group Formation

[DO] Divide students into groups of 4-5.

[DO] Distribute calculators, chart paper, and markers.

[3-5 minutes] Explain the Activity

[SAY] "Here's pocket money data grouped into intervals."

[DO] Display or write the pocket money table on the board.

[SAY] "Task 1: Add a Cumulative Frequency column. CF is the RUNNING TOTAL of frequencies."

[SAY] "Task 2: Find which interval contains the middle student. You have 10 minutes."

[5-13 minutes] Group Work

[DO] Circulate among groups, observing their strategies.

[ASK] "How many students are there in total?"

[LISTEN] Students count: 8+15+22+20+10 = 75

[ASK] "What is cumulative frequency? How do you calculate it?"

[LISTEN] Students explain: Running total, add each frequency to previous CF.

[DO] Guide groups to build CF column: 8, 23, 45, 65, 75

[ASK] "Which student is in the middle position?"

[LISTEN] Students calculate: 75/2 = 37.5, so between 37th and 38th student.

[ASK] "Look at your CF column. Which interval contains the 37.5th student?"

[LISTEN] Students identify: 300–399 (CF = 45, first one ≥ 37.5)

[13-15 minutes] Group Sharing

[SAY] "Group 1, what CF values did you get?"

[LISTEN] Students share: 8, 23, 45, 65, 75

[WRITE] CF column on the board.

[SAY] "Group 2, which student is in the middle?"

[LISTEN] Students say: 37.5th student (75 ÷ 2)

[SAY] "Group 3, which interval contains that student?"

[LISTEN] Students say: 300–399 because CF = 45 (first ≥ 37.5)

[SAY] "Excellent! You found the MEDIAN CLASS! Now we need a formula to estimate the exact median."

Phase 2: Structured Instruction (10 minutes)

[15-17 minutes] Median Formula Introduction

[SAY] "For grouped data, we use this formula to estimate the median:"

[WRITE] "Median = L + ((n/2 - CF) / F) × C"

[SAY] "Let me explain each part."

[17-20 minutes] Formula Components

[WRITE] "L = Lower boundary of median class"

[SAY] "This is where the median class starts. For 300–399, L = 300."

[WRITE] "n = Total observations (Σf)"

[SAY] "Total students. We had 75."

[WRITE] "CF = Cumulative frequency BEFORE median class"

[SAY] "How many students are BELOW the median class. For us, CF = 23 (from 200–299)."

[WRITE] "F = Frequency of median class itself"

[SAY] "How many students IN the median class. For 300–399, F = 22."

[WRITE] "C = Class width"

[SAY] "The range of the interval. For 300–399, C = 100."

[20-25 minutes] Step-by-Step Process

[SAY] "Here are the 6 steps:"

[WRITE] "Step 1: Add CF column (running total)"

[WRITE] "Step 2: Find n/2 (middle position)"

[WRITE] "Step 3: Identify median class (first CF $\geq$ n/2)"

[WRITE] "Step 4: Identify L, CF, F, C"

[WRITE] "Step 5: Apply formula"

[WRITE] "Step 6: Interpret (half below, half above)"

[SAY] "IMPORTANT: This median is an ESTIMATE!"

[SAY] "We assume values are evenly spread within each class."

Phase 3: Practice and Application (15 minutes)

[25-40 minutes] Worked Example 3.1.52 (Race Times)

[SAY] "Example: 100m race times. Estimate the median time."

[DO] Display the race times table.

[SAY] "Step 1: Add CF column. Let's do it together."

[DO] Build CF column on board: 2, 6, 11, 15, 20, 26, 31, 35, 36

[ASK] "Does the last CF equal total observations?"

[LISTEN] Students verify: Yes, 36 = 36 ✓

[SAY] "Step 2: Find n/2."

[WRITE] "n = 36, n/2 = 18"

[SAY] "Step 3: Identify median class."

[ASK] "Look at CF column. Which is the first CF ≥ 18?"

[LISTEN] Students find: 20 (for interval 13.5–13.9)

[WRITE] "Median class: 13.5–13.9"

[SAY] "Step 4: Identify formula values."

[ASK] "What is L, the lower boundary?"

[LISTEN] Students say: 13.5

[WRITE] "L = 13.5"

[ASK] "What is CF, the cumulative frequency BEFORE median class?"

[LISTEN] Students find: 15 (from interval 13.0–13.4)

[WRITE] "CF = 15"

[ASK] "What is F, the frequency OF median class?"

[LISTEN] Students say: 5

[WRITE] "F = 5"

[ASK] "What is C, the class width?"

[LISTEN] Students calculate: 13.9 - 13.5 = 0.4, or count values = 0.5

[WRITE] "C = 0.5"

[SAY] "Step 5: Apply formula."

[WRITE] "Median = L + ((n/2 - CF) / F) × C"

[WRITE] "Median = 13.5 + ((18 - 15) / 5) × 0.5"

[WRITE] "Median = 13.5 + (3/5) × 0.5"

[WRITE] "Median = 13.5 + 0.6 × 0.5"

[WRITE] "Median = 13.5 + 0.3"

[WRITE] "Median = 13.8 seconds"

[SAY] "Step 6: Interpret."

[SAY] "The estimated median race time is 13.8 seconds. Half the runners finished faster, half slower."

Phase 4: Assessment (5 minutes)

[40-45 minutes] Exit Ticket Review

[SAY] "Question 1: Finishing times at Karura Forest."

[DO] Quick guide: CF = 4, 16, 31, 40

[DO] n = 40, n/2 = 20

[DO] Median class: 140-149 (CF = 31, first $\geq$ 20)

[DO] L = 140, CF = 16, F = 15, C = 10

[DO] Median = 140 + ((20-16)/15) × 10 = 140 + 2.67 = 142.67 minutes

[SAY] "Question 2: Hospital waiting times."

[DO] Quick guide: CF = 10, 35, 50, 60

[DO] n = 60, n/2 = 30

[DO] Median class: 20-39 (CF = 35, first $\geq$ 30)

[DO] L = 20, CF = 10, F = 25, C = 20

[DO] Median = 20 + ((30-10)/25) × 20 = 20 + 16 = 36 minutes

[SAY] "Remember: Median is an ESTIMATE! Always include units!"

[DO] Collect exit tickets.

Teaching Tips

- Build CF column together - emphasize it's a running total.
- Always verify last CF equals n (total observations).
- Use visual aids - draw number line showing median class location.
- Emphasize n/2 is the key to finding median class.
- Show the logic - we're finding where the middle person is.
- Connect to ungrouped median - same idea (middle value), different method.
- Use real Kenyan contexts: matatu fares, waiting times, race times.
- Practice identifying L, CF, F, C before applying formula.
- Stress that CF in formula is BEFORE median class, not OF median class.

Common Student Errors to Watch For

- Not creating CF column - jumping straight to formula.
- Using frequency instead of cumulative frequency in formula.
- Using CF of median class instead of CF before median class.
- Confusing L (lower boundary) with midpoint.
- Wrong class width - subtracting instead of counting.
- Not finding n/2 first - guessing the median class.
- Arithmetic errors in the formula calculation.
- Forgetting units in final answer.
- Not understanding it's an estimate - thinking it's exact.