Stem & Leaf Plots: Murder Mystery Game

Lesson Overview

In this lesson, students will read and interpret a series of stem and leaf plots to find clues and solve a murder mystery.

SC Standards Addressed

Private School Standard: Read, interpret, and use data in graphs and charts. *NOTE: This lesson was prepared for a 7th grade class in a private school whose standards are different than the SCDE's Academic Standards. It has been adapted to accommodate the following SC 6th grade academic mathematics standards:*

6.DS.5 Describe numerical data sets in relation to their real-world context.

a. State the sample size.
b. Describe the qualitative aspects of the data (e.g., how it was measured, units of measurement).
c. Give measures of center (median, mean).
d. Find measures of variability (interquartile range, mean absolute deviation) using a number line.
g. Describe the impact that inserting or deleting a data point has on the measures of center (median, mean) for a data set.

6.DS.4 Select and create an appropriate display for numerical data, including dot plots, histograms, and box plots.

Disciplinary Literacy

Strategies Used: Collaborative Groups, Popsicle Sticks (*adapted: see Elaboration section*), Think-Ink-Pair-Share (TIPS)

Computational Thinking

Tools:

Games, (*could be easily adapted for physical breakout – clue numbers could also reveal an area in the room or school where the next clue can be found – clues could be placed in envelopes instead of held by the teacher*)

Cornerstone(s) Addressed:

- **Decomposition and Abstraction** will be used when students read the plots and examine the contents to determine which pieces of information are needed, and which are not.
- **Pattern Recognition** will be developed as they recognize that each plot has the same basic set up - using digits in the ones place as "leaves" and other digits as "stems".

Lesson Plan

Time required: 90 minutes

Focus Question(s): Stem-and-Leaf plots are another way to present information in an organized fashion, but sometimes they contain more than we need for a certain situation. As you read these stem-and-leaf plots, can you decipher what information is needed to answer your questions?

Disciplinary Vocabulary: Stem-and-leaf plots, mean, mode, median, range, data set, data point, outlier data, interquartile

Materials needed:

- *1 copy of an Accusation Sheet per group (See attached)*
- *1 copy of each Clue per group (See attached)*
- *1 copy of Forensic Notes sheet per group (See attached)*

Engage Students are grouped into trios. Read the following scenario OR one similar: "You have recently been selected to participate in a reality show. However, you and your fellow competitors awoke this morning to discover that one of you had been murdered! It is now your mission to find and solve all 10 clues and bring the murderer to justice before he or she strikes again!"

Explore Each group is given Clue # 1 (see attached). Students move from one clue to the next by completing the work on the clue sheet, checking for accuracy (group's consensus) and submitting it to receive the next clue.

Explain All groups solve the mystery using the clues. Record all group accusations in a class table (make visible to all). IF there are different accusations made, have groups review their forensic notes to determine which accusations they can disprove with evidence (i.e. data from their notes). IF the accusations are all the same (i.e. correct) have groups review their forensic notes for supporting evidence.

Elaborate All groups are randomly selected to defend the correct accusation and/or disprove the incorrect ones. Use an adapted "popsicle sticks" (see Disciplinary Literacy above) – *Adaptation: Use groups names or numbers on the sticks instead of student names.* Groups choose to either defend or disprove.

Evaluate Students reflect on the ease or difficulty of each clue and task. Groups use Think-Ink-Pair-Share (*see Disciplinary Literacy strategies above*) to answer the following: What did you notice about the clue, the data and the question? What patterns emerged as you worked through the clues? What might make this game more challenging? What might you do differently if presented with a similar game? *Adaptations for time: Assign questions to groups.* H*ave pairs, square, before whole class shares.*

Assessment Notes: Allow students to make changes to the plots where needed and post all of them.

Teacher Biographical Information

Lesson Author: *Rebecca Gentry - 24 years teaching 3rd-7th, all subjects*
Bachelor of Science in Elementary Education with an emphasis on Middle School

Stem & Leaf Plot Murder Mystery Forensic Notes

Clue #*1* Last Week's Test Scores
What is the highest test score for this data set?

Record the clue:

Record the mean, mode, and median of this set of data.

Clue #2 Weight of students in a 1st grade class (in lb)
What is the weight of the lightest 1st grader in this class?

Record the clue:

Record the sample size, range, and units of measure for this data set.

Clue #3 Number of Raffle Tickets Sold
How many students did not sell any raffle tickets?

Record the clue:

Record the mean, mode, and median of this set of data.

Clue #4 Daily Rainfall this Month (in mm)
What was the highest rainfall this month?

Record the clue:

Record the sample size, range, and units of measure for this data set.

Clue #5 Number of Crackers found per box
The number of boxes with more than 20 crackers?

Record the clue:

Record the interquartile range, and units of measure for this data set.

Stem & Leaf Plot Murder Mystery Forensic Notes

Clue #6 Number of Raffle Tickets Sold
How many students sold more than 24 tickets?

Record the clue:
Record the interquartile range, and units of measure for this data set.

Clue #7 Daily Rainfall for the Month (in mm)
How many days are in this month's data set?

Record the clue:

Sketch the histogram of the data in this set.

Clue #8 Weight of students in a 1st grade class (in lb)
How many students are in this 1st grade class?

Record the clue:

Sketch your dot plot of the data set.

Clue #9 Number of Push-up in a Minute
How many people did less than 20 pushups?

Record the clue:

Record the data from your box plot of the data in this set.

Clue #10 Math Exam Scores
If the passing mark is 50, how many students failed the test?

Record the clue:

Record your explanation of what would happen to the mean and median of this data set, if you removed the outlier data of 21 and 92.

Names: _____

Accusation Sheet

Use all the clues you've gathered to eliminate as many of the "Who", "Where", and "How' options as you can. Then solve the murder mystery.

WHO	WHERE	HOW
Dr. Alpha	The Atrium	Electrocution
Miss Beta	The Kitchen	Drowning
Mr. Epsilon	The Pool	Mauled by a cougar
Professor Delta	The Movie Theater	A fallen object
Coach Omega	The Library	A venomous dart
Mrs. Gamma	The Gym	Chemical poisoning

Who? _____

Where?_____

HOW? _____

Stem & Leaf Plot Murder Mystery

Clue #1

Last Week's Test Scores

Stem	Leaf					
4	0	1	5	9		
5	4	5	6	6	7	
6	2	3	6	9	9	
7	1	2				
8	6	6	6	7	8	9
9	2					

What is the highest test score for this data set?

72 Mr. Epsilon was with the lifeguard by the pool at the time of the murder.

89 The victim was not mauled by the cougar.

92 Ms. Beta was doing yoga in the gym, the PE teacher confirmed.

69 Forensics have ruled out drowning.

Use the space below to calculate the mean, mode, and median of this set of data. Be sure to show your work. Be sure to record the information above in your Forensic notes. Once completed turn this sheet in to receive your next clue.

Stem & Leaf Plot Murder Mystery

Clue #2

Weight of students in a 1st grade class (in lbs.)

Stem	Leaf								
3	0	5	8	9	9	9			
4	0	0	0	1	1	2	3	6	8
5	1	3	6						
6	1	2							

What is the weight of the lightest 1st grader in this class?

30 Ms. Gamma was in the kitchen winding her watch, cook confirms.

31 Professor Delta was in the atrium looking for his book, librarian confirms.

40 The gym has been ruled out by forensics.

51 The victim was not mauled by the cougar.

Use the space below to indicate the sample size, range, and units of measure for this data set. Show your work.
Be sure to record the information above in your Forensic notes. Once completed turn this sheet in to receive your next clue.

Stem & Leaf Plot Murder Mystery

Clue #3

Number of Raffle Tickets Sold

Stem	Leaf							
0	0	0	1	1	2	5		
1	1	1	4	4	4			
2	0	0	2	4	4	7	7	8
3	0	2						

How many students did not sell any raffle tickets?

2 Chemical Poisoning has been ruled out by forensics.

4 Dr. Alpha was taking a break in the atrium, librarian confirms.

5 Mr. Epsilon was checking equipment in the gym, PE teacher confirms.

8 The victim was not mauled by the cougar.

Use the space below to calculate the mean, mode, and median of this set of data. Be sure to show your work.
Be sure to record the information above in your Forensic notes. Once completed turn this sheet in to receive your next clue.

Stem & Leaf Plot Murder Mystery

Clue #4

Daily Rainfall this Month (in mm.)

Stem	Leaf							
1	1	1	5	6	7	8		
2	0	1	3					
3	4	4	5	7	9			
4	0	1	1	1	3	4	5	9
5	1	2	2	3	4			
6	0							

What was the highest rainfall this month?

49 Mr. Epsilon was practicing his backstroke in the pool, lifeguard confirms.

53 Professor Delta was arguing with someone in the movie theater.

54 The was not mauled by the cougar.

60 The victim was not killed by a falling object.

Use the space below to indicate the sample size, range, and units of measure for this data set. Show your work. Be sure to record the information above in your Forensic notes. Once completed turn this sheet in to receive your next clue.

Stem & Leaf Plot Murder Mystery

Clue #5

Number of Crackers found per box

Stem	Leaf								
1	9	9	9	9	9				
2	0	0	0	0	0	0	1	3	9
3	0	0	0	0	1	1			

The number of boxes with more than 20 crackers:

4 Ms. Beta was in the atrium with her iPad, librarian confirms.

6 Professor Delta was looking for his glasses in the theater, usher confirmed.

9 The victim was not mauled by a cougar.

15 The victim was not killed by chemicals or poisons.

Use the space below to indicate the interquartile range, and units of measure for this data set. Show your work. Be sure to record the information above in your Forensic notes. Once completed turn this sheet in to receive your next clue.

Clue #6

Number of Raffle Tickets Sold

Stem	Leaf							
0	0	0	1	1	2	5		
1	1	1	4	4	4			
2	0	0	2	4	4	7	7	8
3	0	2						

How many students sold more than 24 tickets?

4	Coach Omega was in the gym practicing free throws, PE teacher confirms.
5	Dr. Alpha was looking for his goggles in the pool, lifeguard confirms.
10	The victim did not have a dart mark.
16	The library has been ruled out by forensics.

Use the space below to indicate the interquartile range, and units of measure for this data set. Show your work. Be sure to record the information above in your Forensic notes. Once completed turn this sheet in to receive your next clue.

Stem & Leaf Plot Murder Mystery

Clue #7

Daily Rainfall for the Month (in mm.)

Stem	Leaf							
1	1	1	5	6	7	8		
2	0	1	3					
3	4	4	5	7	9	4		
4	0	1	1	1	3	4	5	9
5	1	2	2	3	4			
6	0							

How many days are in this month's data set?

30 Chemicals and poison have been ruled out.

31 Professor Delta was with the lifeguard by the pool at the time of the murder.

29 Coach Omega was eating in the atrium at the time of the murder, confirmed by 3.

39 Forensics have ruled out the pool.

Use the space below to draw a histogram of the data in this set. Be sure to record the information above in your Forensic notes. Once completed turn this sheet in to receive your next clue.

Stem & Leaf Plot Murder Mystery

Clue #8

Weight of students in a 1st grade class (in lb)

Stem	Leaf								
3	0	5	8	9	9	9			
4	0	0	0	1	1	2	3	6	8
5	1	3	6						
6	1	2							

How many students are in this 1st grade class?

15 Dr. Alpha was with a patient in the atrium at the time of the murder.

17 The victim was not electrocuted.

18 Mrs. Gamma was making pie in the kitchen, the cook confirms.

20 Forensics have ruled out drowning.

Use the space below to create a dot plot of the data set. Be sure to record the information above in your Forensic notes. Once completed turn this sheet in to receive your next clue.

Stem & Leaf Plot Murder Mystery

Clue #9

Number of Push-up in a Minute

Stem	Leaf					
0	5	6	8			
1	0	1	2	3	6	8
2	1	3	6			
3	0	2				

How many people did less than 20 pushups?

3 Mr. Epsilon was vacuuming in the library, librarian confirms.

8 The victim was not electrocuted.

9 Professor Delta was looking for his glasses in the theater, usher confirms.

10 Forensics have ruled out a venomous dart.

Use the space below to a box plot of the data in this set. Be sure to record the information above in your Forensic notes. Once completed turn this sheet in to receive your next clue.

Stem & Leaf Plot Murder Mystery

Clue #10

Math Exam Scores

Stem	Leaf							
2	1							
4	8	8	9					
5	4	5	6	6	7	7	8	
6	2	3	6	9	9	9		
7	4	6	6	6	7	7	8	9
8	0	2						
9	2							

If the passing mark is 50, how many students failed the test?

3 Mr. Epsilon was cleaning up popcorn in the theater, usher confirms.

4 The victim was not electrocuted.

5 Professor Delta was changing light bulbs in the library, librarian confirms.

9 Forensics have ruled out venom.

Use the space below to explain what would happen to the mean and median of this data set, if you removed the outlier data of 21 and 92. Be sure to record the information above in your Forensic notes. Once completed turn this sheet in to receive your next clue.

KEY:

Clue 1: (92) Ms. Beta and Gym
Mean = 66.9I (67), Mode: 86 Median: 66

Clue 2: (30 lbs) Mrs. Gamma and Kitchen
Sample size = 20, range = 32 OR 62 30, Units are pounds (lbs)

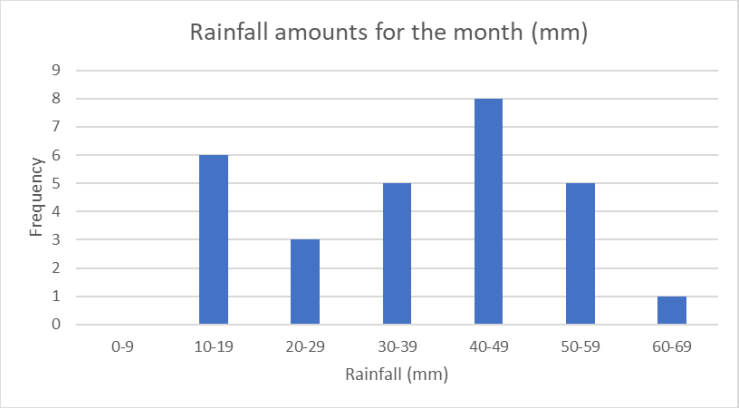
Clue 3: (2) Chemicals & Poison
Mean = I5.57 (I6), Median = I4, Mode = I4

Clue 4: (60 mm) Falling Object
Sample size = 28, Range = 49 or 60 II, units are millimeters (mm)

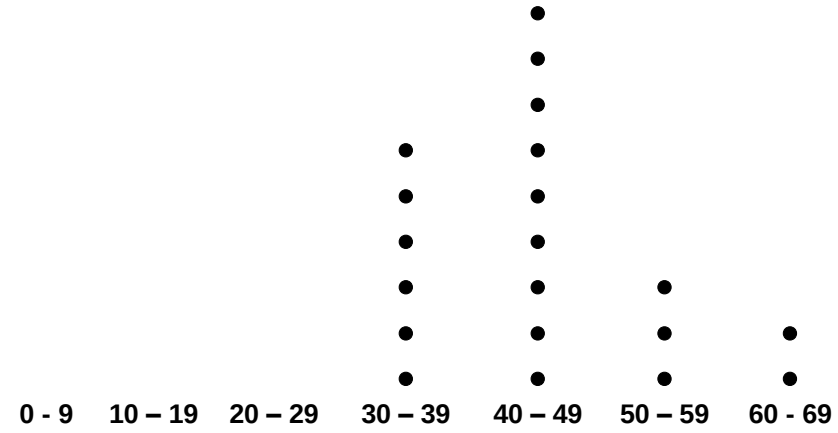
Clue 5: (9) Cougar
Units are crackers, IQR = I0.5 (II)

Clue 6: (5) Dr. Alpha and Pool
Units are tickets, IQR = I2

Clue 7: (29) Coach Omega and Atrium

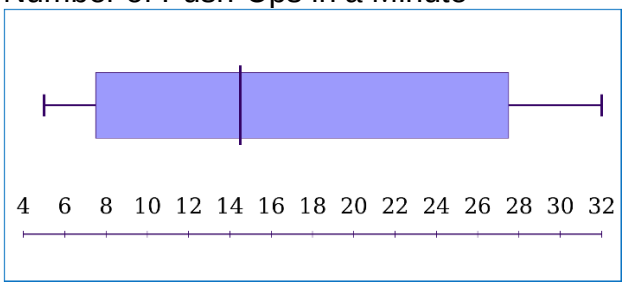


Clue 8: (20) Drowning



Clue 9: (9) Prof Delta and Theater

Number of Push-Ups in a Minute



Data: 5, 10, 14.5, 23, 32

Clue IO: (4) Electrocution

Answer – not much changes. The original mean = 65.14, the new mean = 65.8; since we just drop 1 number on both sides the median doesn't change = 67.5

Solution: Mr. Epsilon did it in the Library with a venomous dart.