Title: Pioneering Data

Brief Overview:

The main focus of this unit is for the student to analyze and interpret data organized and derived from a few day-to-day experiences of the 19th century American child thus integrating math and social studies curricula.

NCTM Content Standard/National Science Education Standard:

- Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them
- Select and use appropriate statistical methods to analyze data
- Develop and evaluate inferences and predications that are based on data

Grade/Level:

5th.

Duration/Length:

Three 60-minute lessons

Student Outcomes:

- Students will collect data using observations, surveys, and experiments.
- Students will represent data using tables and graphs such as line plots, circle graphs, bar graphs, stem and leaf plots, and line graphs.
- Students will describe the shape and important features of a set of data and compare related data sets, with an emphasis on how the data are distributed.
- Students will use measures of center, focusing on the median, and understand what each does and does not indicate about the data set
- Students will propose and justify conclusions and predictions that are based on data and design studies to further investigate the conclusions or predictions.
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Materials and Resources:

<u>Lesson 1</u>
- Chores Early American Children Did – Directions (TR1)
- Chores Early American Children Did – Reading Passage (SR1)
- Questions for Chores Early American Children Did (TR2)
- Chores Early American Children Did – Graph Form (SR2)
- Graph Matching Game Cards (SR3)
- **teacher should also make a transparency set for the overhead
- **cut the cards apart and mix them up before distributing
- Sentence Strips
- Vocabulary (TR3)

- Ninepins – Lesson directions (TR4)
- Ninepins - Information (SR4)
- Ninepins Brief Constructed Response 1 (SR5)
- Ninepins Brief Constructed Response 1 (TR5)
- Ninepins Brief Constructed Response 2 (SR6)
- Ninepins Brief Constructed Response 2 (TR6)
- Brief Constructed Response Mathematics Rubric (SR7)
- Ninepins Games – either purchased or teacher made
- Ninepins – Activity directions (SR8)
- Blank overhead film
- Overhead markers
- Ninepins Stem and Leaf Chart (SR9)
- Writing About Graphs Assessment (SR10)
- Writing about Graphs Scoring Rubric (SR11)

Lesson 2
- A Brief History of the Pinwheel (SR12)
- How to Make a Pinwheel (SR13)
- Analyzing Graph Data (SR14)
- Analyzing Graph Data (TR7)
- Pushpins (2 per student)
- Plain white paper (2 per student)
- Pencils (2 per student)
- Scissors

Lesson 3
- Pinwheel Combinations (SR15)
- Pinwheel Combinations Answer Key (TR8)
- Pushpins
- Plain white paper
- Copy paper (4 different colors--3 sets per group)
- Pencils (2 different colors—3 sets per group)
- Scissors
- Frequency Table (TR9)
- Graph Paper (SR16)
- Pinwheel Pricing (SR17)
- Choosing Your Pinwheel (SR18)
- Choosing Your Pinwheel Rubric (SR19)

Development/Procedures:

Lesson 1

Preassessment –
- Directions for today's activity will be put on the overhead (TR1). The students will be given a narrative about children's chores (SR1). Allow the students one minute to read the narrative. Ask the students to answer the first set of questions about the narrative (TR2). Discuss how difficult this is. Ask students how they could better organize this information to answer the questions. Distribute the graph with the organized information (SR2) to the class. Ask the second set of questions and discuss how answering these questions were different from answering the questions the first time.

Launch –
- Give students cards to match (SR 3). Use the transparency set to show students the correct matches and instruct as needed.

Teacher Facilitation –
- Model the making of a stem and leaf plot for the students. Students will be given two Post-it Notes and asked to write the day of their birth on two separate Post-it Notes (i.e. if the child's birthday is Oct. 25, they would write 2 on one Post-it, and 5 on the other, if their birthday is June 1 then they will write 0 on one Post-it and 1 on the other). The teacher will draw the axes for the stem and leaf plot on the board. Then model how to put the Post-it notes on the graph by putting the notes with the date of the birthday in the correct place on the graph. The rest of the class follows suit with teacher guidance. Once the graph is complete have the class come up with a title. Add a key at the bottom.
- Use the Vocabulary list (TR3) to write one word per sentence strip. Divide the class into groups. Evenly divide and pass out the sentence strips with vocabulary words to each group. Tell the students they will be having a contest to see how many of the terms their group can properly define and apply to the birthday graph. Allow each group to work together to complete the vocabulary strips. After each group has taken turns sharing the vocabulary and applying their words to the graph, post the sentence strips with correct definitions in the room. If definitions are partially incorrect or incomplete, guide the students to the appropriate definition. Teach those terms that are unfamiliar to the students and add those sentence strip cards to the class list. The teacher can use (TR3) as a student resource as well.

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Student Application –
- Display the directions for the Ninepins lesson (TR4) on the overhead. Pass out the information sheet on Ninepins (SR4), Ninepins Brief Constructed Responses (SR5 and SR6) and the Constructed Brief Response Rubric (SR7).
- Students will read the information and answer the Ninepins Brief Constructed Responses (SR5 and SR6). Answers can be found on TR5 and TR6.
- Set out the Ninepins games and the activity directions (SR8) on how to play the game. Have an overhead available for students to record their total score.
- Students will create a stem and leaf plot using the class data (SR9).

Embedded Assessment –
- Students will use the vocabulary words and the results of the class graph to write about their graphs. Distribute the assessment (SR 10) and scoring rubric (SR11).

Reteaching/Extension –
- For those who have difficulty completing the stem and leaf plot, meet in a small group for directed lesson.

Lesson 2

Preassessment—
- The students will take part in an informal assessment by reviewing the elements of a stem and leaf plot (title, median, mode, range, and outlier).

Launch—
- A brief history of the pinwheel will be discussed (SR12) Students will be given specific directions on how to make a pinwheel (SR13) and given time to make one individually.

Teacher Facilitation—
- After practicing the assembly process, students will be asked to assemble their second pinwheel with a partner recording their time in seconds. These times will be displayed on an overhead or chalkboard in the form of a stem and leaf plot. Students will be guided to identify the median, mode, range, and outliers.

Student Application—
- Students will then be asked if working in teams might be a faster method of assembly. Students and teacher will hold a small discussion on efficiency and assembly lines. Students will predict which method, single assembly or assembly line, will be faster. To test this prediction, students will work in teams of four assembling 4 more pinwheels, one at a time recording the times for each assembled pinwheel. All four times will be reported to the teacher who will display the data adjacent to the previous data (individual assembly) forming a back to back stem and leaf plot.

Embedded Assessment—
- Students will be asked to analyze the class data display using Analyzing Graph Data (SR14) as an individual assessment tool. The assessment tool will ask students to identify the range, mode, median, and outliers (if any) for the new data and to compare the two sets of data (new and old). Answers can be found on TR7.

Reteaching/Extension—

- Students who show difficulty grasping the concept can be paired with students from stronger groups and asked to repeat the experiment.
- Students who show exceptional understanding of the concept can use calculators to figure the means for both sets of data. Additionally, they might add designs to their personal pinwheels.

Lesson 3

Preassessment—
- Students will review and discuss the previous day's pinwheel building activity. Next students will conduct a brainstorming activity to suggest ways to modify or improve their pinwheels. Students will show how many combinations of new pinwheels they could create if they had 2 pencils of different colors and 4 different paper colors (SR15 and TR8).

Launch—
- Students will then divide into their original small assembly building groups and pretend that they have formed new corporations that will improve upon the design of their "original" pinwheels. They will be given the following parameters: a choice of 4 different paper colors, a choice of 2 different pencil colors, and a choice of 4 different pushpin colors.   Each group will be asked to design and build 3 new pinwheels based on their selected characteristics.

Teacher Facilitation—
- Each group will present its new set of pinwheels to the class. A survey will be conducted to see which pinwheel the class likes the best. The teacher will construct a frequency table to record and display the results of the survey (TR9).

Student Application—
- Each student will create a bar graph (SR16) from the frequency table data. Next, students will be given a cost of materials list (SR17) and will be asked to figure out how much each design costs to manufacture. Then, the students will be given a market price for selling their pinwheels. Students will then be asked to figure out the profit of each pinwheel (SR 17).

Embedded Assessment—
- Each student will be asked to analyze the data and choose which design should be marketed. Lastly, students will be asked to justify in paragraph form (SR 18) why they think their pinwheel should be chosen for production. Give students SR19 to evaluate their own answers.

Reteaching/Extension—

- As an extension, students can choose any company they like (with teacher approval), research the company to locate its address, and write a letter to the company asking how a particular product came to be marketed.

Summative Assessment:

The students will complete Summative Assessment Activities (SR 20-23). For this assessment, the students will apply their knowledge of data analysis, charts and graphs, and they will be asked to analyze and interpret the data. (Answer key can be found on TR10 and TR11). This activity will allow the students to prepare explanations for mathematical concepts.

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Chores That Early American Children Did

Today we will be reading about chores that Early American children did. You will be given one minute to read this passage. I will be asking you questions about this information, so read carefully.

Chores That Early American Children Did

During the 19th Century much of a family's time and energy was spent taking care of basic needs. Families were very big during this time. For example, Ben Franklin had 17 brothers and sisters. Just feeding a family took a lot of work and everybody had to do their share.

Children worked hard and had many responsibilities. Even very young children were expected to help out around the house. Three-year old Susie would help fix breakfast by setting the table. Her older brother Johnny would chop wood for the fire and fetch water to cook with. Mary, who is eight would collect eggs and feed the chickens. Tommy who is five would help Mary feed the chickens. Ten year-old Joseph would chop wood. Molly would help fix breakfast and fetch water. Benjamin who is twelve would milk the cow. Once all the chores were done, everyone was ready to eat!
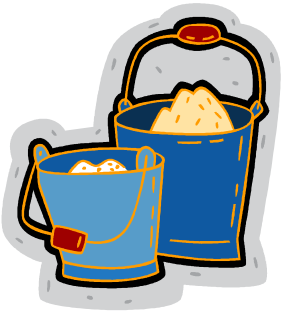
Questions for
Chores That Early American Children Did

Question Set 1

1. How many children helped to fix breakfast? (2)
2. Which child fed the chickens and collected the eggs? (Mary)
3. How many children chopped wood? (2)
4. How many children had more than one chore? (4)
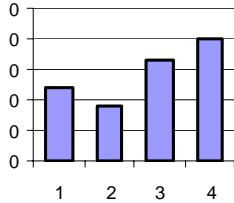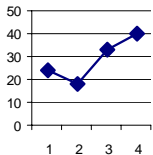
Question Set 2

1. Which job did only one person do? (Milk the cow)
2. How many children fetched water? (2)
3. Which job did the greatest number of children do? (Fetch the water)
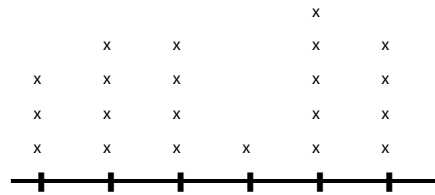4. How many children had only one chore? (3)

Chores That Early American Children Did

Fix Breakfast	Chop Wood	Fetch Water	Collect Eggs	Feed the Chickens	Milk the Cow
		Mary			
Molly	Joseph	Molly	Joseph	Tommy	
Susie	Johnny	Johnny	Mary	Mary	Benjamin

Graph Matching Game

A graph that shows how parts of the data are related to the whole and to each other		**Circle Graph**
A graph used to compare countable data and to compare results		**Bar Graph**
A graph that shows how something Changes over time		**Line Graph**

A graph that shows the frequency of Data along a number line	x x x x x x x x x x x x x x x x x x x x x	**Line Plot**
A graph that shows groups of data arranged by place value	6 | 0 2 3 5 | 4 5 6 6 4 | 1 1 1 9 3 | 0 0 2 2 | 7 8 1 | 1 3 3 4	**Stem and Leaf Plot**
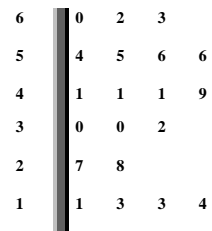
Vocabulary

Cluster: Data that is grouped together

Gap: Space between data

Key: Used on a graph to tell the meaning of a symbol

Mean: A measure of central tendency that tells the typical measure. It is calculated by adding all of the measurements and dividing by the number of measurements.

Median: A measure of central tendency found by ordering the data from least to greatest and finding the measure in the middle. If there are two measures in the middle, the median is halfway between the two.

Mode: A measure of central tendency that tells the number(s) that occur most often. There can be no mode, one mode, or several modes.

Outlier: Data or a point that is a great distance away from the rest

Range: The difference between the largest value and the smallest value in the data set

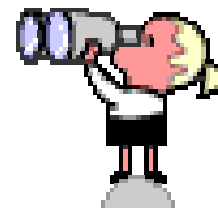**Trend:** A pattern or shape that the data displays

Ninepins

You are going to read and answer questions about Ninepins, a game that many children played during the 19th century.

Once you have finished:

1. Form a group of 4.
2. Send a volunteer from your group to get your supplies.
3. Follow the directions to play and graph Ninepins.

NINEPINS

Ninepins was a popular bowling game in the American colonies from the 17th century until the early 19th century when it was outlawed in many areas and replaced by tenpins—the type of bowling we do today. However, you can still find ninepins played in Texas. Ninepins was so popular that alleys were built by clubs for family entertainment. Texas taxed these alleys $150 in 1837 as a way for the state government to make money.

Ninepins was played by bowlers rolling a wooden ball (the size varied) at nine wooden pins set up either in a straight row, in three rows of three, or in a diamond shape. The game was played several ways:

Version 1: The pins are set up either in a straight row or in three rows of three. The object is to knock down exactly 31 pins. If you knock down more than 31, your next goal is to knock down 39. If you miss 39, you have to get 48 down. If you miss 48, you need to knock down 57 pins.

Version 2: The pins are set up in the diamond configuration. The object is for a team to knock down eight surrounding pins and leave the number-five pin, which was larger than the rest, standing. (The number five pins were called the kingpin.) If you are successful with this move you score 12 points. If you knock down all nine pins, you score 9. Pins are re-set once all members of the team bowl two balls, or all pins are knocked down, or if only the kingpin remains.

You can make a set of your own ninepins by gathering nine empty water bottles. Now, find a small ball and you are ready to play! Or, if you wish to order a set of your own ninepins, you may check of the following web site: http://www.jastown.com/games/np-55.htm
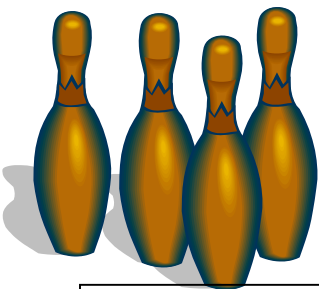
Ninepins Brief Constructed Response

In Version 1 of Ninepins, to win you need to knock down exactly 31 pins. If you knock down more than 31, your next goal is to knock down 39. If you miss 39, you have to get 48 down. If you miss 48, you need to knock down 57 pins.

Part A
Identify the number pattern in this game. Continue the pattern by writing the next 3 numbers that are needed to win.

_____

Part B
Use what you know about number patterns to explain why your answer is correct. Use numbers and/or words in your explanation.

_____
_____
_____
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_____
_____
_____

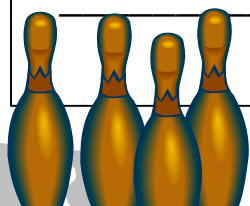# Ninepins Brief Constructed Response

In Version 1 of Ninepins, to win you need to knock down exactly 31 pins. If you knock down more than 31, your next goal is to knock down 39. If you miss 39, you have to get 48 down. If you miss 48, you need to knock down 57 pins.

Part A

Show the scores that you would need to get exactly 31 pins down in the least number of

rolls.

_____

Part B

Use what you know about number relationships to explain why your answer is correct. Use numbers and/or words in your explanation.

_____
_____
_____
_____
_____
_____
_____
_____
_____
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Ninepins Brief Constructed Response

In Version 1 of Ninepins, to win you need to knock down exactly 31 pins. If you knock down more than 31, your next goal is to knock down 39. If you miss 39, you have to get 48 down. If you miss 48, you need to knock down 57 pins.

Part A

Identify the number pattern in this game. Continue the pattern by writing the next 3 numbers that are needed to win.

The second number increased by 8 and all of the rest increased by 9. The next three numbers are: 66, 75, 84.

Part B

Use what you know about number patterns to explain why your answer is correct. Use numbers and/or words in your explanation.

There are only 9 pins . Therefore, even though the pattern starts by adding 8, it continues by adding 9 each time.

Brief Constructed Response

In Version 1 of Ninepins, to win you need to knock
down exactly 31 pins. If you knock down more than
31, your next goal is to knock down 39. If you
miss 39, you have to get 48 down. If you miss 48,
you need to knock down 57 pins.

Part A

Show the scores that you would need to get exactly 31 pins down in the least number of

rolls.

9 + 9 + 9 + 4 = 31 (any combination)

Part B

Use what you know about number relationships to

explain why your answer is correct. Use numbers

and/or words in your explanation.

*I divided 31 by 9 (the most pins you can knock down
on one roll). I found that 9 would not divide
evenly. But I know that 9 x 3 = 27. So I
subtracted 27 from 31 and got 4.*

MSA Brief Constructed Response "Kid Speak"
Mathematics Rubric
Grades 1 through 8

| Score	
2	**My answer shows I completely understood the problem and how to solve it:** • **I used a very good, complete strategy to correctly solve the problem.** • **I used my best math vocabulary to clearly explain what I did to solve the problem. My explanation was complete, well organized and logical.** • **I applied what I know about math to correctly solve the problem.** • **I used numbers, words, symbols or pictures (or a combination of them) to show how I solved the problem.**
1	**My answer shows I understood most of the problem and how to solve it:** • **I used a strategy to find a solution that was partly correct.** • **I used some math vocabulary and most of my reasons were correct to explain how I solved the problem. My explanation needed to be more complete, well organized or logical.** • **I partly applied what I know about math to solve the problem.** • **I tried to use numbers, words, symbols or pictures (or a combination of them) to show how I got my answer, but these may not have been completely correct.**
0	**My answer shows I didn't understand the problem and how to solve it:** • **I wasn't able to use a good strategy to solve the problem.** • **My strategy wasn't related to what was asked.** • **I didn't apply what I know about math to solve the problem.** • **I left the answer blank.**

Ninepins

Your group is going to play a game of Ninepins. You will play until someone in your group gets one of the scores in Version 1 of your Ninepin information sheet. Once your group has a winner, everyone needs to put their total score (even if you are not a winner) on the class chart.

You may go back and play another game until the entire class has recorded their score.
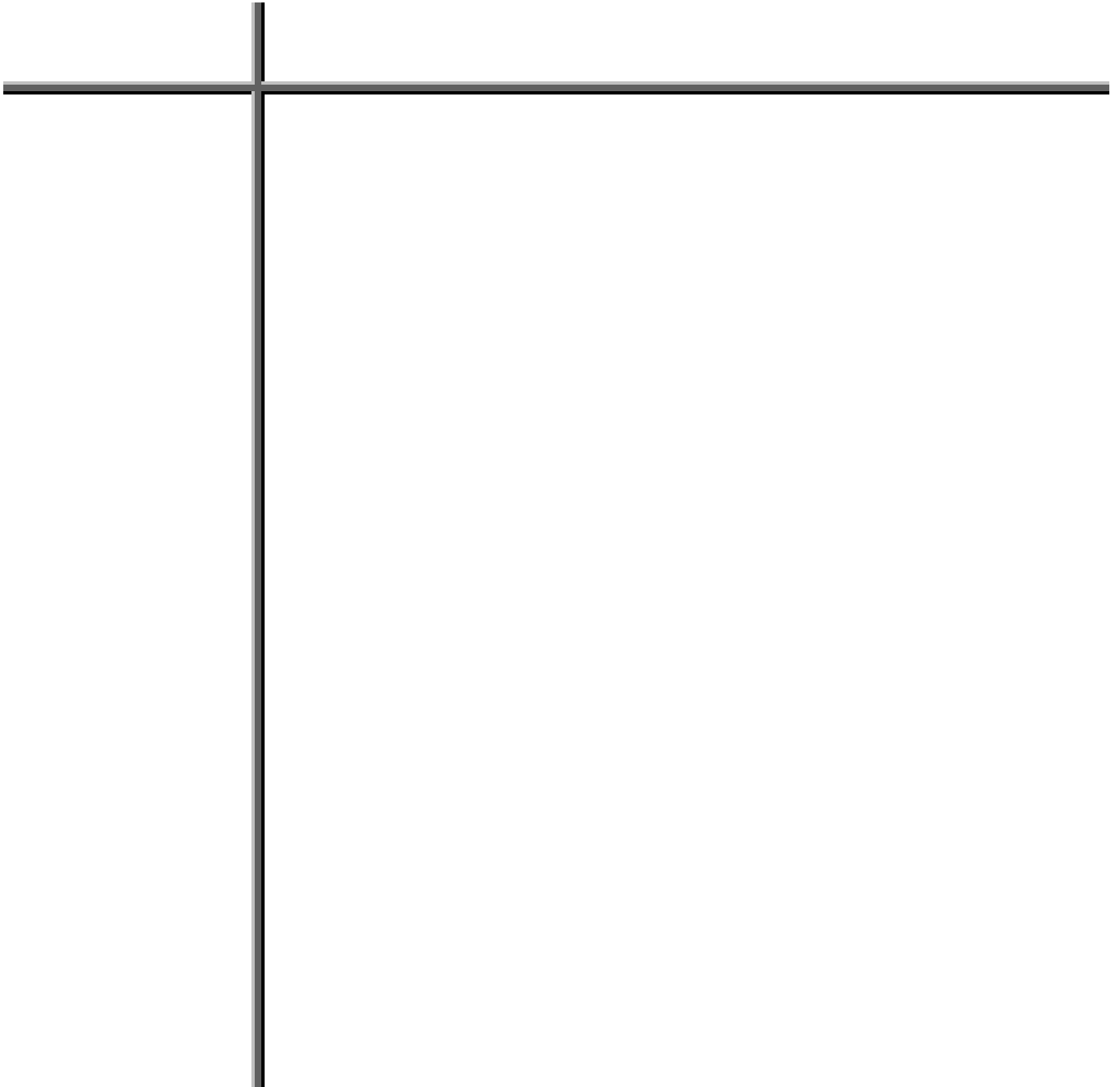
You will now write about the data from your Ninepins stem and leaf plot.

What is the data telling you? What conclusions can you come to about the data? Remember to use your data vocabulary words to answer these questions.

Mathematics Rubric
Grades 1 through 8

| Score	
2	**My answer shows I completely understood the problem and how to solve it:** • **I used a very good, complete strategy to correctly solve the problem.** • **I used my best math vocabulary to clearly explain what I did to solve the problem. My explanation was complete, well organized and logical.** • **I applied what I know about math to correctly solve the problem.** • **I used numbers, words, symbols or pictures (or a combination of them) to show how I solved the problem.**
1	**My answer shows I understood most of the problem and how to solve it:** • **I used a strategy to find a solution that was partly correct.** • **I used some math vocabulary and most of my reasons were correct to explain how I solved the problem. My explanation needed to be more complete, well organized or logical.** • **I partly applied what I know about math to solve the problem.** • **I tried to use numbers, words, symbols or pictures (or a combination of them) to show how I got my answer, but these may not have been completely correct.**
0	**My answer shows I didn't understand the problem and how to solve it:** • **I wasn't able to use a good strategy to solve the problem.** • **My strategy wasn't related to what was asked.** • **I didn't apply what I know about math to solve the problem.** • **I left the answer blank.**

A Little History of the Pinwheel

Pinwheels are wind-activated toys and the predecessors to whirligigs that are often made by carving wood into three-dimensional figures with a pair of rotating propeller-like paddles. During the nineteenth century in America, any wind driven toy held aloft by a running child was characterized as a whirligig including pinwheels. Pinwheels provided many a child with almost endless hours of enjoyment and amusement.

How to Make a Pinwheel

1. Cut a piece of paper into a square measuring 6 inches on each side.
2. Fold the square in half on each diagonal. Crease each fold.
3. Cut along the fold from each corner to about one half inch from the center. Be careful not to cut too close to the center.
4. Pull up the lower right hand corner flap to the center and attach a pushpin.
5.   Repeat this process for each lower right hand corner flap attaching it to the same pushpin.
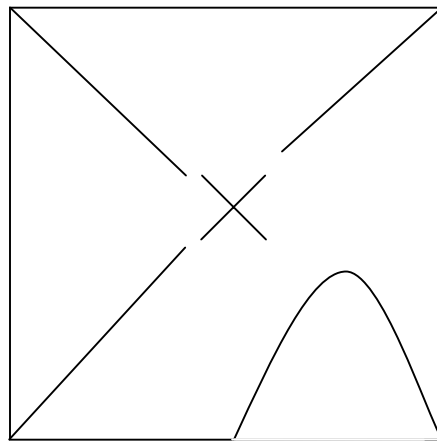
6. Poke the pin through the center of the pinwheel and attach to the eraser end of a pencil.
7.   Make the pinwheel spin by blowing into the paper.

Student Name_____   Date _____

Analyzing Graph Data

Instructions: Answer each question with an appropriate response.

1. Using data from your new graph, identify each of the following:

Range_____ Mode_____ Median_____ Outlier(s)_____

2. Describe how you got the median.

_____

_____

_____

3. What are the similarities and differences between the data from your **individually** constructed stem and leaf plot and the new data from your **team's** constructed stem and leaf plot?

_____

_____

_____

_____

_____

_____

_____

4. Describe the shapes of each graph.

_____

_____

5. Is there a trend?

_____

_____

6. Identify any clusters or gaps.

_____

_____

_____

Analyzing Graph Data

Instructions: Answer each question with an appropriate response.

1. Using data from your new graph, identify each of the following:

Range *(answers depend on the data)*_____ Mode_(*answers depend on the data*)_____ Median_(*answers depend on the data*)_____Outlier(s) (*answers depend on the data*)_____

2. Describe how you got the median____(*students might identify the median by counting off the data points from each end, by simply identifying the middle data point, or in the case of an even number of data they might sum the two middle pieces and divide by two*).

3. What are the similarities and differences between the data from your **individually** constructed stem and leaf plot and the new data from your **team's** constructed stem and leaf plot? *Students might note changes in the overall positioning of the stem and leaf plots, the overall differences in median, range, modes, or any outliers.*

4. Describe the shape of each graph. *The shapes might be similar. High/low points might be similar. Gaps might appear in similar places.*

5. Is there a trend? *Does the data move one-way or another?*

6. Identify any clusters or gaps. *Answers may vary according to the data*
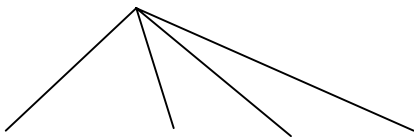
Name_____

Date_____

Pinwheel Combinations

Instructions: Create a tree diagram for making a pinwheel to show all of the possible pencil and paper combinations given the following materials:

black pencil	green paper
yellow pencil	blue paper
yellow paper	pink paper

Name_____

Date_____

Pinwheel Combinations

Instructions: Create a tree diagram for making a pinwheel to show all of the possible pencil and paper combinations given the following materials:
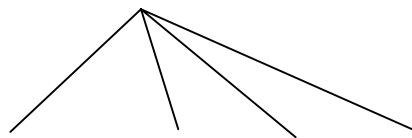
black pencil   green paper
yellow pencil   blue paper
yellow paper   pink paper

Yellow Pencil

Black Pencil

Yellow Green Pink Blue
 Paper Paper Paper Paper
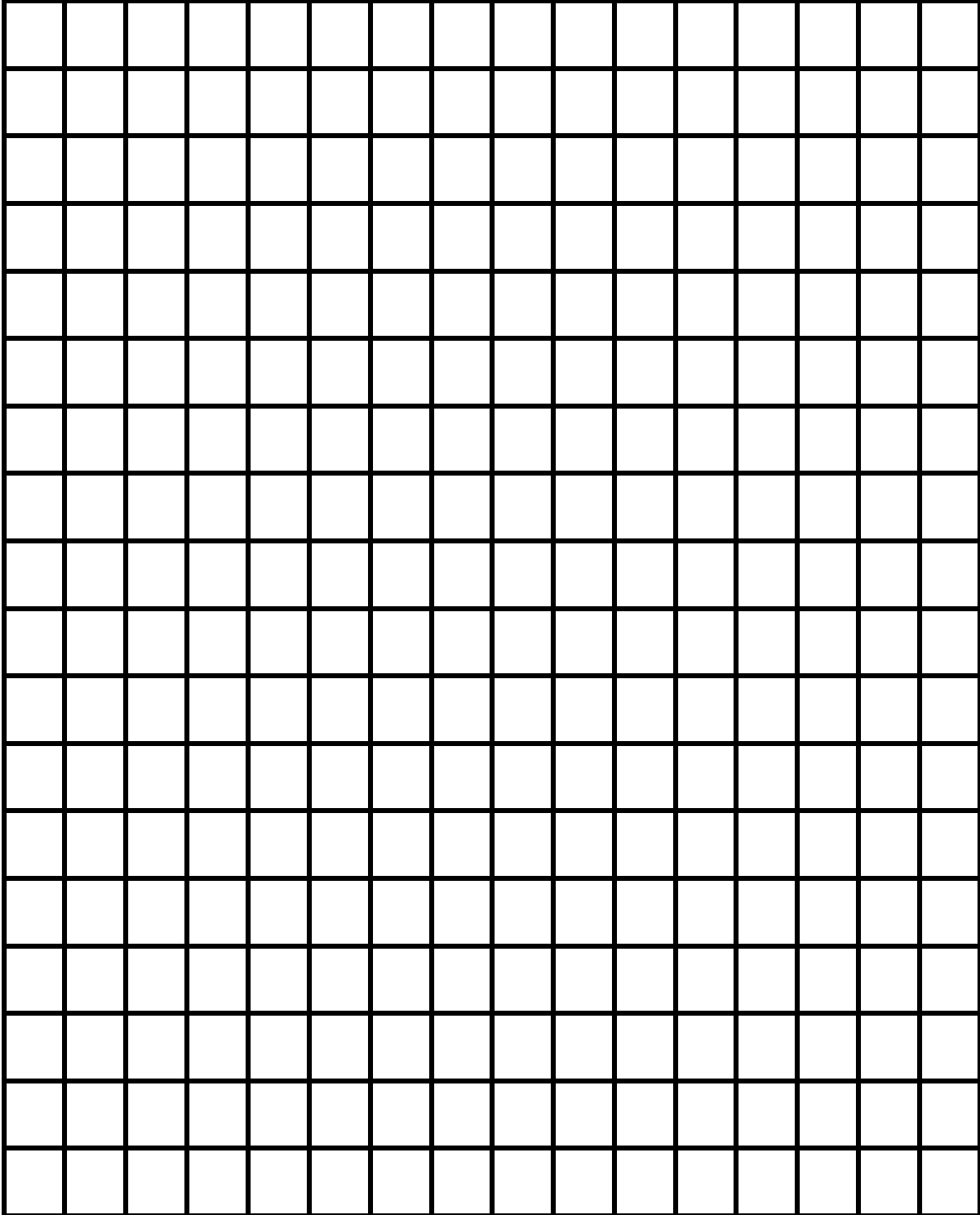
Yellow Green Pink Blue
 Paper Paper Paper Paper

Favorite Pinwheel

Pinwheel Choice	Tally	Frequency

Name _____   Date _____

Pinwheel Pricing

Profit = Market Price – Cost
*The market price = $.25

Cost

Plain white paper	$.05 per sheet
Green paper	$.06 per sheet
Pink paper	$.07 per sheet
Blue paper	$.09 per sheet
Yellow pencil	$.03 per pencil
Black pencil	$.07 per pencil
Blue pushpins	$.02 per pushpin
Yellow pushpins	$.01 per pushpin
Red pushpins	$.03 per pushpin
Green pushpins	$.02 per pushpin
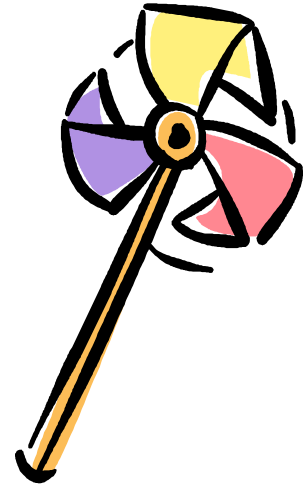
1. Using the price list, figure the cost of producing each pinwheel from your bar graph.

2. Now using the formula above for calculating profit, figure the profit for each pinwheel produced.
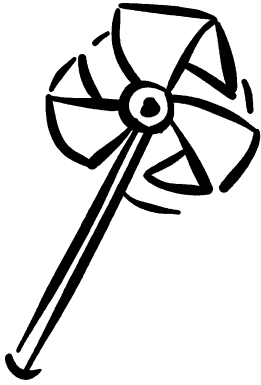
Choosing Your Pinwheel

Using the data you've collected from your bar graph and the calculations you've made from figuring the profits for all of the pinwheels to decide which pinwheel you think the class should mass-produce. Identify which pinwheel you would choose to mass-produce and explain why your choice would be the best choice for the class.

Choosing Your Pinwheel Rubric

2 The response demonstrates a complete understanding and analysis of a problem.

- Application of a reasonable strategy in the context of the problem is indicated
- Explanation of and /or justification for the mathematical process(es) used to solve a problem are clear, developed, and logical.
- Connections and/or extensions made within mathematics or outside of mathematics are clear.
- Supportive information and/or numbers are provided as appropriate.

1 The response demonstrates a minimal understanding and analysis of a problem.

- Partial application of a strategy in the context of the problem is indicated.
- Explanation of and /or justification for the mathematical process(es) used to solve a problem is partially developed, logically flawed, or missing.
- Connections and/or extensions made within mathematics or outside of mathematics are partial or overly general, or flawed.
- Supportive information and/or numbers may or may not be provided as appropriate.

0 The response is completely incorrect, irrelevant to the problem, or missing.

Student Name_____
Date   _____
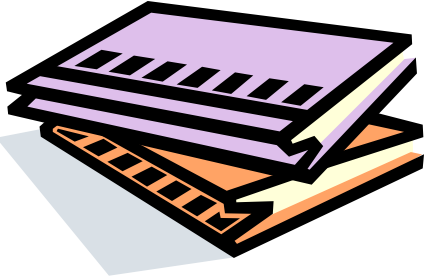
Directions: Your class wants to see how they are doing on their spelling tests. Use this data below to create a back-to-back stem and leaf plot.

Spelling Test Scores For Week 1
67,78,83,81,100,95,66,81,92,100,53,98,87,87,76,87,83,74,70,32

Spelling Test Scores For Week 2
76,89,97,92,100,100,76,92,90,100,70,98,88,91,84,89,93,76,73,45

Stem and Leaf Plot Analysis

Directions: Analyze the data from the stem and leaf plot by
answering the following questions.

1. Write three sentences that describe the stem and leaf plot.

   _____

   _____

   _____

   _____

2. What is the mode for week 1? _____

3. What is the mode for week 2? _____

4. What is the median for week 1? _____

5. What is the median for week 2? _____

6. What is the range for week 1? _____

7. What is the range for week 2? _____

8. What is the mean for week 1? _____

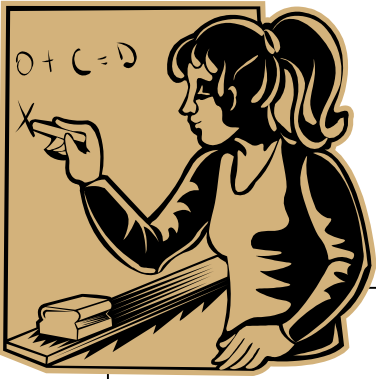9. What is the mean for week 2? _____

10. What trend do you notice?

    _____

    _____

    _____

11. Identify any gaps or clusters

_____

_____

_____

12. Does this stem and leaf plot have any outliers? Explain how
you know.

_____

_____

_____

_____

13. Based on the data and the current trend, predict how the
measures of central tendencies will change next week.

_____

_____

_____

MSA Brief Constructed Response

Taylor used the following data to compute the median:
59, 53, 82, 68, 45, 57, 19, 61, 77, 56, 76, 61

She said the median is: 61

Part A

 Is Taylor's answer correct?

_____

Part B

- Use what you know about central tendencies to
  explain why your answer is correct.

_____

_____

_____

_____

_____

_____

_____

_____

_____

Mathematics Rubric
Grades 1 through 8

Score	
2	**My answer shows I completely understood the problem and how to solve it:** • **I used a very good, complete strategy to correctly solve the problem.** • **I used my best math vocabulary to clearly explain what I did to solve the problem. My explanation was complete, well organized and logical.** • **I applied what I know about math to correctly solve the problem.** • **I used numbers, words, symbols or pictures (or a combination of them) to show how I solved the problem.**
1	**My answer shows I understood most of the problem and how to solve it:** • **I used a strategy to find a solution that was partly correct.** • **I used some math vocabulary and most of my reasons were correct to explain how I solved the problem. My explanation needed to be more complete, well organized or logical.** • **I partly applied what I know about math to solve the problem.** • **I tried to use numbers, words, symbols or pictures (or a combination of them) to show how I got my answer, but these may not have been completely correct.**
0	**My answer shows I didn't understand the problem and how to solve it:** • **I wasn't able to use a good strategy to solve the problem.** • **My strategy wasn't related to what was asked.** • **I didn't apply what I know about math to solve the problem.** • **I left the answer blank.**

Stem and Leaf Plot Analysis

Directions: Analyze the data from the
stem and leaf plot by answering the
following questions:

1. Write three sentences that describe the
stem and leaf plot.

*Suggested answer: Week 2 is shifted towards higher
scores. Every student passed during the second week
except for one and even that one improved.. All of the
scores in the second week are higher except for on score.*

2. What is the mode for week 1? *87*

3. What is the mode for week 2? *100 and 76
(it's bimodal)*

4. What is the median for week 1? *82*

5. What is the median for week 2? *89.5*

6. What is the range for week 1? *68*

7. What is the range for week 2? *55*

8. What is the mean for week 1? *79.5*

9. What is the mean for week 2? *85.95*

10. What trend do you notice? *The comparison of plots shows steady improvement.*

11. Identify any clusters or gaps. *The clustering for week one ranges from 70 to 87; the clustering for week two ranges from70 to 98. Both plots have gaps; week one has a gap from 32 to 53 and from 53 to 66 while week two has a significant gap from 45 to 70.*

12. Does this stem and leaf plot have any outliers? Explain how you know. *Yes, both plots have outliers. Week one has an outlier of 32. Week two has an outlier of 45. Both data pieces lay more than 1.5 times their interquartile range.*

13. Based on the data and the current trend, predict how the measures of central tendencies will change next week.
Based on the data trends from week one to week two, the scores should show steady improvement. Additionally, there are a number of scores that could easily move above 90.

MSA Brief Constructed Response Answer Key

Taylor used the following data to compute the median:
        59, 53, 82, 68, 45, 57, 19, 61, 77, 56, 76, 61

She said the median is: 61

Part A

 Is Taylor's answer correct?

                              No
_____

Part B

- Use what you know about central tendencies to
  explain why your answer is correct.

  I found that the median was between 59 and 61. When you add 59 + 61 you get 120.
When you divide by 2, you get 60, so 60 would be the median._____
_____
_____
_____
_____
_____
_____