

Title: Building Brilliant Bar Graphs

Brief Overview:

This unit is written for second and third grade students who have some basic background knowledge of graphing. Students will be introduced to the parts of a bar graph, organizing and comparing data by creating a number of different bar graphs including a double bar graph. Students will also be introducing to scale and intervals on a bar graph. Students will acquire these skills through teacher modeling, guided practice, and independent practical application of collecting and organizing data through taste testing activities and games.

NCTM Content Standard/National Science Education Standard:

- Pose questions and gather data about themselves and their surroundings;
- Represent data using concrete objects, pictures, and graphs.
- Describe parts of the data and the set of data as a whole to determine what the data show.

Grade/Level: 2-3

Duration/Length:

3 to 4 days for 60 minutes daily

Student Outcomes:

Students will:

- Be able to identify, create, and interpret a bar graph.
- Be able to collect and compare data on a bar graph.
- Be able to identify, create, and interpret a bar graph with different intervals.

Materials and Resources:

Lesson 1

- Pre-Assessment (**Student Resource Sheet 1**)
- Scissors
- Glue
- Pretzels (Three different types)
- Overhead of What Kind of Pretzel is Best?
- What Kind of Pretzel is the Best? Tally Chart (**Student Resource Sheet 2**)
- Parts of a graph on sentence strips
- Sticky notes
- Overhead of inch grid paper
- Inch Grid paper (**Student Resource Sheet 3**)

- Snap cubes
- Crayons
- Overhead of Pretzel Taste Test tally chart (**Teacher Resource Sheet 1**)
- Pretzel Taste Test bar graph (**Student Resource Sheet 4**)

Lesson 2

- Pets We Own (**Teacher Resource Sheet 2**)
- Entry Ticket (**Student Resource Sheet 5**)
- Pencils
- Trash Cans/Buckets – 1 per pair of students
- Ball of paper – 1 per pair of students
- Classroom Basketball tally chart (**Student Resource Sheet 6**)
- 2 overheads of bar graph (**Teacher Resource Sheet 3**)
- Overhead of How Well Did You Throw?
- How Well Did You Throw? bar graph (**Student Resource Sheet 7**)
- Overhead of Right Hand vs. Left Hand
- Right Hand vs. Left Hand bar graph (**Student Resource Sheet 8**)
- Rubric for Right Hand vs. Left Hand bar graph (**Teacher Resource Sheet 4**)
- Snap cubes
- Inch Grid paper (**Student Resource Sheet 3**) – if needed
- Crayons

Lesson 3

- Entry Ticket (**Student Resource Sheet 9**)
- Overhead of Hershey Kisses data (**Teacher Resource Sheet 5**)
- Hershey Kisses Grab bar graph (**Teacher Resource Sheet 6**) Either on overhead or large chart
- Gummy Bear Data organizer (**Student Resource Sheet 10**)
- How Many is a Handful? (**Teacher Resource Sheet 7**) – Put on large charts – one for each group of four students
- What Did You Learn? (**Student Resource Sheet 11**)
- Scoring Tool for How Many is Handful? group bar graphs (**Teacher Resource Sheet 8**)
- How Many Peanuts do Elephants Eat? data chart (**Student Resource Sheet 12**)
- if needed
- How Many Peanuts do Elephants Eat? bar graph (**Student Resource Sheet 13**)
- if needed
- Pencils
- Crayons
- Tape
- Snap cubes
- Inch Grid paper (**Student Resource Sheet 3**)
- Number lines - if needed
- Hundreds chart - if needed

Development/Procedures:

Lesson 1.....

Pre-Assessment –

- Give students the bar graph pre-assessment. (**Student Resource Sheet 1**)
- Give students a few minutes to try to answer the question and label the parts of the graph. Collect **Student Resource Sheet 1** for use at a later time.

Launch –

- Throughout the lesson, as vocabulary is discussed, add the words to the board, Math Word Wall, etc. so the students can use them in discussions and assignments.
- Set the stage for new learning: *The pretzel factory is making too many kinds of pretzels that people are not eating. This is causing them to lose money. They have asked us to taste test three different types of pretzels in order to discover which is most liked. The pretzel factory can then stop making the other pretzels and make just the most popular type.* (Teacher can pick three different types of pretzels to give to the students. Ex. Pretzel sticks, Butter Snap pretzels, and Ranch flavored)
- Create a tally chart to collect the data from the class. Give each student What Kind of Pretzel is the Best? tally chart so they can follow along. (**Student Resource Sheet 2**) Ask students to raise their hands for their favorite type of pretzel and gather data.

Teacher Facilitation –

- Re-Introduce a bar graph and explain to students that in order to display their data, they will use a bar graph. Use the acronym **TAILS** to help students learn how to label the graph. (**T**itle, **A**xis, **I**nterval, **L**abels, **S**cale) Draw a graph on the board and have students label the parts of the graph using sentence strips.
- Give each student a sticky note and ask him or her to write his or her first names on it. Each student will then come up to the board and place his/her sticky note above the name of their favorite type of pretzel. Facilitate what students should do if there is already a sticky note there. (Place it above the previous one.)
- Point out to students that they have just created a vertical bar graph.

Student Application –

- Give students **Student Resource Sheet 3** and snap cubes. Students will represent the pretzel data as they place the cubes on the graph to represent a bar, mark the top, remove cubes, and color in the bar. This is to be done individually. Use an overhead of **Student Resource Sheet 3** to model how to do the first one. Have students complete the rest of the graph.

Embedded Assessment –

- Throughout lesson use oral questioning and discussion questions to assess students' learning. Ex. Which pretzel got more votes? How do you know?

- Observe students while they are completing their graphs.
- Observe which students are able to label the parts of the graph and who will need more direction.

Reteaching/Extension –

- Show students Pretzel Taste Test (**Teacher Resource Sheet 1**) on the overhead. Explain how another teacher’s class also did this taste testing activity and gathered their data in a Tally Chart. This teacher asked us to display this data in a bar graph.
- Give students Pretzel Taste Test Results (**Student Resource Sheet 4**) and ask them to create a bar graph. Those students who are having difficulty can do this activity as a small group with the teacher. Give unifix cubes to students who want to use them to help make their graph.
- Remind student to label all parts of the graph. These labels could be brainstormed as a class and ideas listed on the board.
- Student can visit the website to practice making bar graphs:
<http://www.shodor.org/interactivate/activities/bargraph/index.html>
<http://www.shodor.org/interactivate/activities/bargraph2/index.html>

Lesson 2.....

Pre-Assessment –

- Place a copy of Pets We Own on the overhead (**Teacher Resource Sheet 2**) and give students the entry ticket of five questions to answer about the graph. (**Student Resource Sheet 5**) Students can work with partners in order to answer the questions.
- As a class go over the questions and review the parts of a graph.

Launch –

- Play “Classroom Basketball”. Pair students in groups of two. Students will throw a ball of trash into a trashcan or bucket 10 times with their right hands. They will then repeat with their left hands. Students will keep track of how many times they make a basket with each hand on the Classroom Basketball Tally Chart. (**Student Resource Sheet 6**)

Teacher Facilitation –

- Using at least two students data, create a bar graph on the overhead as a class showing right hand versus left hand. (**Teacher Resource Sheet 3**)
- Explain to students that when comparing data you can use bar graphs. The purpose of this bar graph is to compare data sets. Review data on the bar graph with students. Ask questions such as “How many left hand throws did _____ get?”
- Discuss the graphs and have students verbally give sentences describing and comparing the data of the students’.

Student Application –

- Students are to graph both their own and their partner's data on Right Hand vs. Left Hand (**Student Resource Sheet 8**). They are to work with partners to complete the assignment. (Teacher may also have students work in groups of 3.)
- Once their bar graphs are complete, they are to write three sentences in their journals describing and analyzing their bar graphs. This is to be done individually.

Embedded Assessment –

- Observe while students are working to create their bar graphs with partners.
- Throughout the lesson have discussions about the graphs that are made.
- Use the rubric for grading the "Right Hand vs. Left Hand" bar graph. (**Teacher Resource Sheet 4**)
- Read the three sentences that the students create to discuss and analyze the "Right Hand vs. Left Hand" bar graph.

Reteaching–

- Students who are having difficulties reading data and making the bar graph can work in a small group with the teacher.
- Those students can use snap cubes and inch grid paper to make the bar graphs as well. (**Student Resource Sheet 3**)
- If students can make a bar graph, but have trouble combining them together, they can create separate graphs on overheads and then place them on top of each other in order to compare.

Extension-

- If students finish making their bar graph and writing their sentences, they can find another pair of students to put on their bar graph.
- Students could also try ten throws using both hands and create another bar on their graph for that data.
- Student can visit the website to practice making bar graphs:
<http://www.shodor.org/interactivate/activities/bargraph/index.html>
<http://www.shodor.org/interactivate/activities/bargraph2/index.html>

Lesson 3

Pre-Assessment –

- Give students an entry ticket asking them to count by 1's, 2's, 5's, and 10's in order to give them time to practice for the lesson. (**Student Resource Sheet 8**)
- For those students who finish early, ask them to count by 3's as well.

Launch –

- Display two bar graphs on the board. These graphs can display data on any subject just as long as they are both bar graphs and they have different scales. Ask students what they notice about the bar graphs. What is the same? What is

different? Give students a few minutes think time and remember to ask them to explain their answer.

- Facilitate the answer that both graphs have different scales; that they are counting by different numbers.

Teacher Facilitation –

- Introduce the term “Interval” and explain that today we are going to learn how to make bar graphs using different scales. (Numbers up the side)
- Set the stage for new learning: *The second grade teachers were at a meeting yesterday after school, and our Principal gave us a bowl of Hershey Kisses to snack on. Each of us grabbed a handful and counted how many we grabbed. Here is the data that we collected.* Show students the data from the teachers. (**Teacher Resource Sheet 5**)
- Discuss the data with the students. *How else could we show this data? Right! A bar graph!* Place the Hershey Kisses Grab bar graph on the overhead and point out that there are only ten blocks going up, but our data has numbers that are higher than ten. (**Teacher Resource Sheet 6**) *How could we still use this graph to display our data?* Facilitate the idea that they could count by something other than 1 up the side in order to include all the information. *What should we count by?* Take students’ answers and discuss if each one would work and why/why not. Make sure that this graph is scaled in intervals of two.
- Have students help label and set up the bar graph on the overhead. Begin graphing data.
- When the number 7 is reached in the data chart, think aloud, *How should I graph the 7? I do not see a seven anywhere in my numbers.* Ask the students to help you solve the problem. Lead students to note that 7 comes between 6 and 8, so they can mark a line in the middle of the box between 6 and 8, and then shade in that entire bar.
- When the number 15 comes in the data chart, think aloud again, and ask the students what should be done.
- Once graph is complete, discuss the results. Ex. Was it easier to graph when counting by 2’s? Why or why not? Who has more? Who grabbed the least? Make sure to ask questions comparing data. Ex. How many more does Mrs. ____ have than Mrs. _____?

Student Application –

- Explain to students that they are able to eat a snack during the rest of math class today and their snack is Gummy Bears. However, this snack comes with some rules. They are only allowed to eat what they grab out of the bowl the first time. They are only allowed to use **one** hand to grab the candy. They cannot eat their snack until everyone in their group has started to work on their graphs.
- In groups of four, students will perform the investigation. Give students their Gummy Bear data organizer (**Student Resource Sheet 9**) and large copy of How Many is a Handful? Bar graph. (**Teacher Resource Sheet 7**) In their groups, each student will get one handful of Gummy Bears, count them, and add their data onto the organizer. Once all the group members have gotten Gummy Bears, then

- the group will work together to make a large bar graph of their data. This bar graph will then be displayed in the room.
- Once the group is finished displaying their data, they are to work individually to answer the questions on What Did You Learn? (**Student Resource Sheet 10**) which will be collected and checked for student understanding of the lesson.

Embedded Assessment –

- Observe groups making their bar graphs, and use collected worksheet to monitor learning.
- Oral questioning throughout the lesson should be used to monitor students' understanding as well as discussions.
- Use the scoring tool to check large graphs to see if all parts are included and data is displayed correctly. (**Teacher Resource Sheet 8**)

Reteaching –

- If students are having difficulty, teacher can help in small groups.
- Students who are still having difficulty making the bar graph can use unifix cubes and Inch Grid paper. (**Student Resource Sheet 3**)
- If students have difficulties counting by 2's, give them either a number line or hundreds chart to use.

Extension –

- Those students who finish early and excel at this task, will be given copies of How Many Peanuts do Elephants Eat? (**Student Resource Sheet 11** and **Student Resource Sheet 12**) to work on in their groups or individually. Have students use intervals of five to make this graph.
- Student can visit the website to practice making bar graphs:
<http://www.shodor.org/interactivate/activities/bargraph/index.html>
<http://www.shodor.org/interactivate/activities/bargraph2/index.html>

Summative Assessment:

Students will demonstrate an understanding of the parts of bar graphs, comparing bar graphs, and interpreting bar graphs. Students will show this understanding by creating a bar graph from a given set of data and answering a brief constructed response using the bar graph. (**Student Resource Sheet 14**) They will need to justify how they used their knowledge. The Answer Key is **Teacher Resource Sheet 9**.

Pose questions and gather data about themselves and their surroundings:

- Represent data using concrete objects, pictures, and graphs.
- Describe parts of the data and the set of data as a whole to determine what the data show.
- Be able to identify, create, and interpret a bar graph.
- Be able to collect and compare two sets of data on a bar graph.
- Be able to identify, create, and interpret a bar graph with different intervals

Authors:

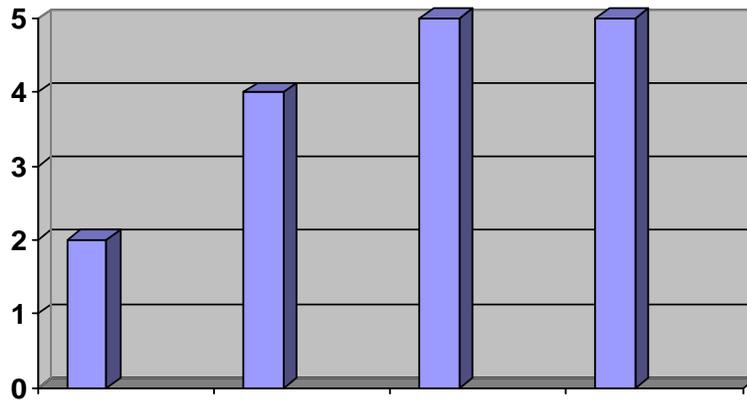
Briana Bower
Piney Ridge Elementary School
Carroll County, MD

Mary Miller
Sinclair Lane Elementary School
Baltimore City, MD

Name: _____ Date: _____

Bar Graph - Pre- Assessment

Cut and Paste to complete the graph below:

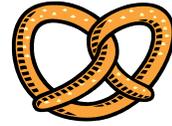


What type of graph is this? _____

<u>Pets in Our Class</u>	Dogs	Cats	Fish	Rabbits	Number of Pets
Types of Pets					

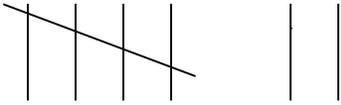
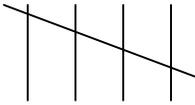
Name: _____ Date: _____

What kind of pretzel is the best?

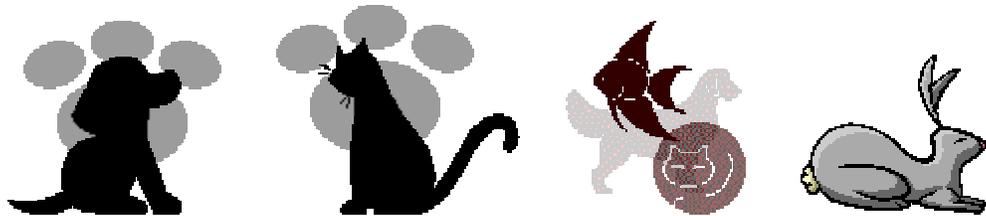
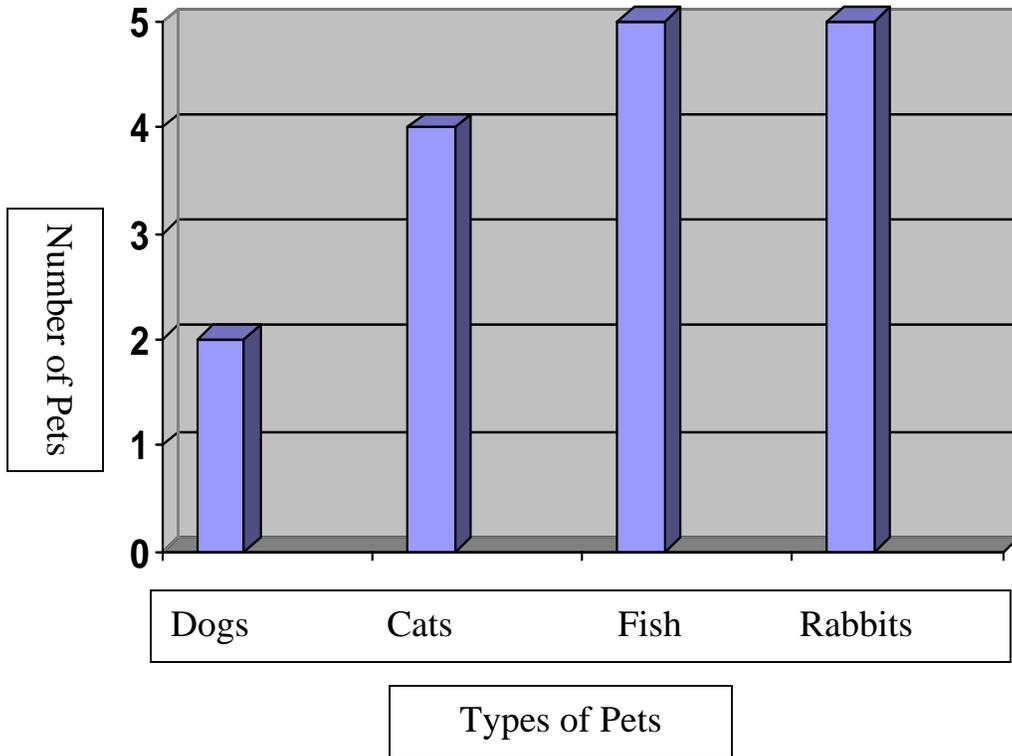


<u>Type of Pretzel</u>	<u>Tally Marks</u>	<u>Total Number</u>

Pretzel Taste Test

Pretzel Sticks	
Butter Snap Pretzels	
Ranch Flavored Pretzels	

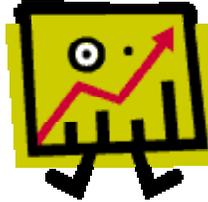
Pets We Own



Name: _____ Date: _____

Entry Ticket

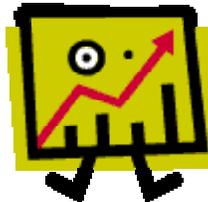
1. What type of graph is this? _____
2. What is the title? _____
3. Name one label. _____
4. What pet do people have the least of? _____
5. How many more people have fish than dogs? _____



Name: _____ Date: _____

Entry Ticket

1. What type of graph is this? _____
2. What is the title? _____
3. Name one label. _____
4. What pet do people have the least of? _____
5. How many more people have fish than dogs? _____



Name: _____ Date: _____

Classroom Basketball

Directions for Classroom Basketball:

1. Stand 4 BIG steps away from the basket.
2. Throw 1 “ball” at a time at the basket only!
3. Throw 10 balls with your left hand and 10 balls with your right hand.
4. After you are finished put all of the balls together in the basket.
5. Record your data on the tally chart below.



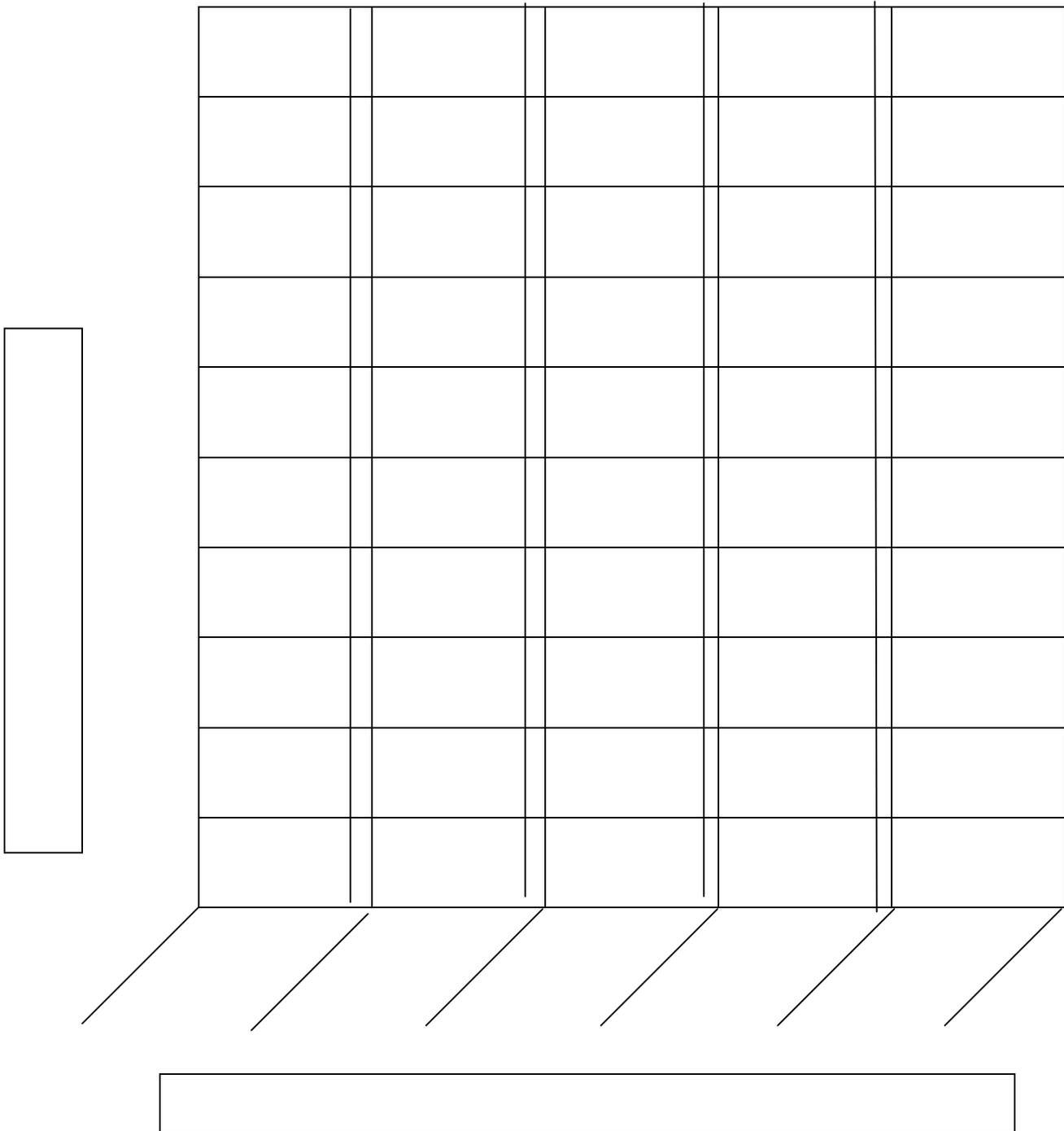
Classroom Basketball Tally Chart

Tally Marks

Total Number

	<u>Tally Marks</u>	<u>Total Number</u>
Right Hand		
Left Hand		

Classroom Basketball



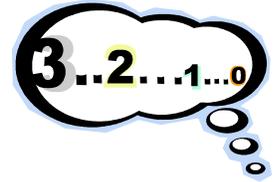
Bar Graph Rubric

- 4**
- All 4 parts of the graph are present and correct
 - Contains a left hand and right hand for each student in the group.
 - Is neat and easy to read
 - Data on graph matches the data collected on the tally chart.
- 3**
- At least 3 parts of the graph are present and correct
 - Contains a left hand and a right hand for most students in the group.
 - Data on graph matches only some of the data collected.
 - There is an attempt at making the graph neat and easy to read.
- 2**
- At least two parts of the graph are present and correct.
 - Does not have bars for both the right and left hand of each student in the group.
 - Data on the graph matches only some of the data collected.
 - There is little attempt at making the graph neat and easy to read.
- 1**
- At least one part of the graph is present and correct.
 - Does not include bars for both right and left hand of each student in the group.
 - Data on the graph matches only some of the data collected.
 - There is no attempt at making the graph neat and easy to read.
- 0**
- Graph is not attempted.
 - Data on the graph does not match any of the data collected.

Name: _____ Date: _____

Entry Ticket

Directions: Complete each pattern.



1. 1, 2, 3, 4, 5, _____, _____, _____, _____, _____, _____

2. 2, 4, 6, 8, _____, _____, _____, _____, _____, _____

3. 5, 10, 15, 20, _____, _____, _____, _____, _____, _____

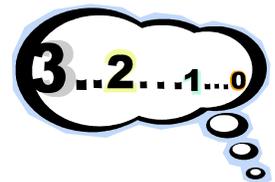
4. 10, 20, 30, 40, _____, _____, _____, _____, _____, _____

***Extra:** 3, 6, 9, 12, 15, _____, _____, _____, _____, _____

Name: _____ Date: _____

Entry Ticket

Directions: Complete each pattern.



1. 1, 2, 3, 4, 5, _____, _____, _____, _____, _____, _____

2. 2, 4, 6, 8, _____, _____, _____, _____, _____, _____

3. 5, 10, 15, 20, _____, _____, _____, _____, _____, _____

4. 10, 20, 30, 40, _____, _____, _____, _____, _____, _____

***Extra:** 3, 6, 9, 12, 15, _____, _____, _____, _____, _____

Hershey Kisses

<u>Teacher's Name</u>	<u>Total Number</u>
	12
	18
	7
	10
	15



Gummy Bear Data

Directions:

1. Every one in your group takes **one** handful of gummy bears.
2. Count how many each person has and fill in the chart.
3. Create a large bar graph to display your data.

* Remember to make your scale counting by 2.

* Remember all the parts of a bar graph.

<u>Group Member's</u>	<u>Total Number of Gummy Bears</u>
<u>Name:</u> 	
<u>Name:</u> 	
<u>Name:</u> 	
<u>Name:</u> 	

Name: _____ Date: _____

How Many is a Handful?

<input type="checkbox"/>				

*Use this graph as a guide for creating large bar graphs – one for each group of four students.

What Did You Learn?

Directions: Answer the following questions about your bar graph in complete sentences. This is to be done individually.

1. Who grabbed the most gummy bears? _____

2. Who grabbed the least amount of gummy bears? _____

3. Why did you make the scale of the bar graph counting by 2's? _____

4. Write three sentences about your bar graph using math vocabulary.

Name: _____ Date: _____

Scoring Tool for How Many is a Handful?

Student's Name: _____

_____ The bar graph has all 5 parts.	<table border="1"><tr><td>Total:</td></tr><tr><td>_____</td></tr><tr><td>16</td></tr></table>	Total:	_____	16
Total:				

16				
_____ Every group member has their data on the bar graph.				
_____ Data on the bar graph matches the data collected.				
_____ The bar graph is neat and easy to read.				
4 – Excellent 3 – Very good 2 – Good 1 – Fair 0 - Poor				

Scoring Tool for How Many is a Handful?

Student's Name: _____

_____ The bar graph has all 5 parts.	<table border="1"><tr><td>Total:</td></tr><tr><td>_____</td></tr><tr><td>16</td></tr></table>	Total:	_____	16
Total:				

16				
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4 – Excellent 3 – Very good 2 – Good 1 – Fair 0 - Poor				

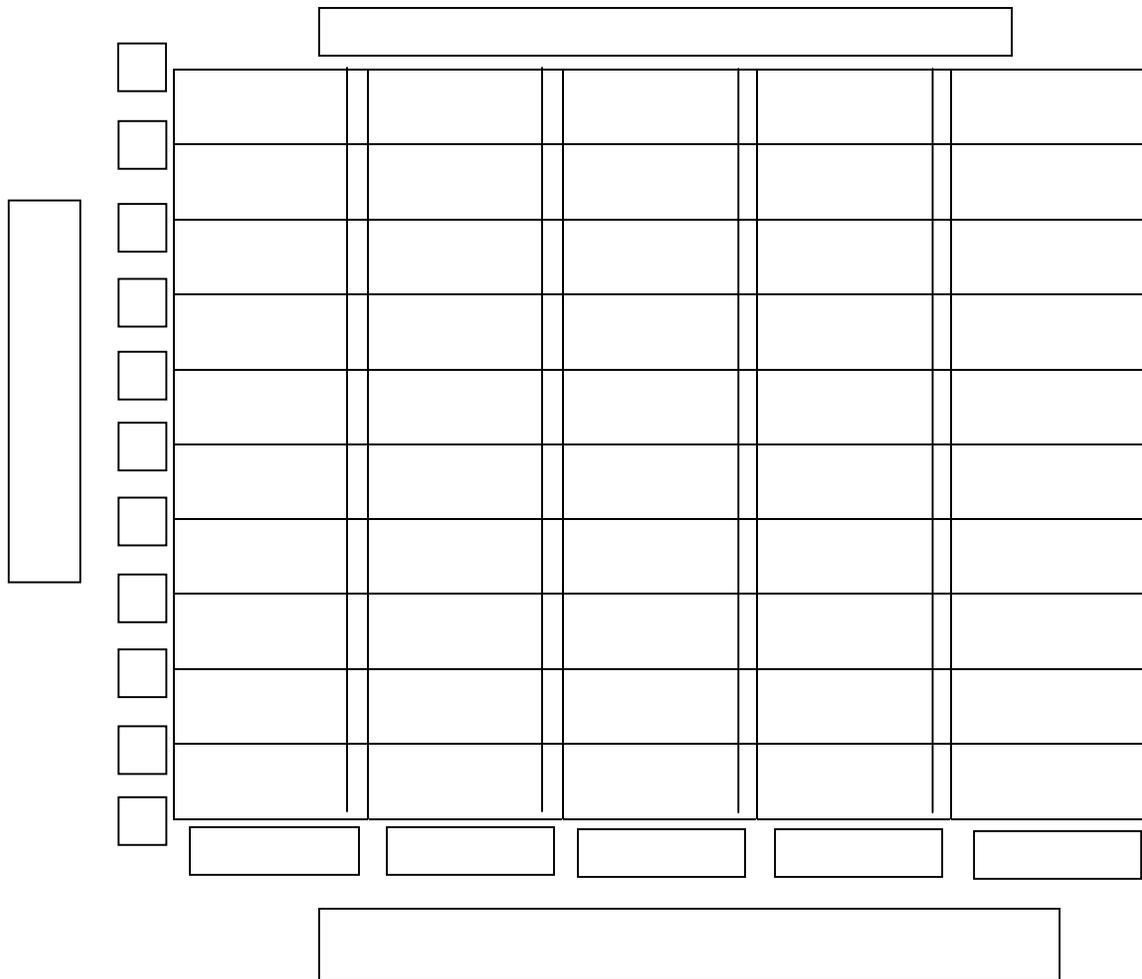
How Many Peanuts do Elephants Eat?

<u>Elephant's Names</u>	<u>Total Number of Peanuts</u>
Holly	10
Luke	20
Pam	5
Sue	45
Burt	30

Summative Assessment

Jack is a second grade boy who wanted to know how many games his friends had. He asked five friends and collected data on a chart. Jack now wants to display his data in a bar graph in order to show his teacher, but he doesn't remember how. Help Jack display his data on the bar graph.

<u>Friends' Names</u>	<u>Total Number of Games</u>
Paul	5
Susan	10
Jake	5
Linda	2
Matt	7



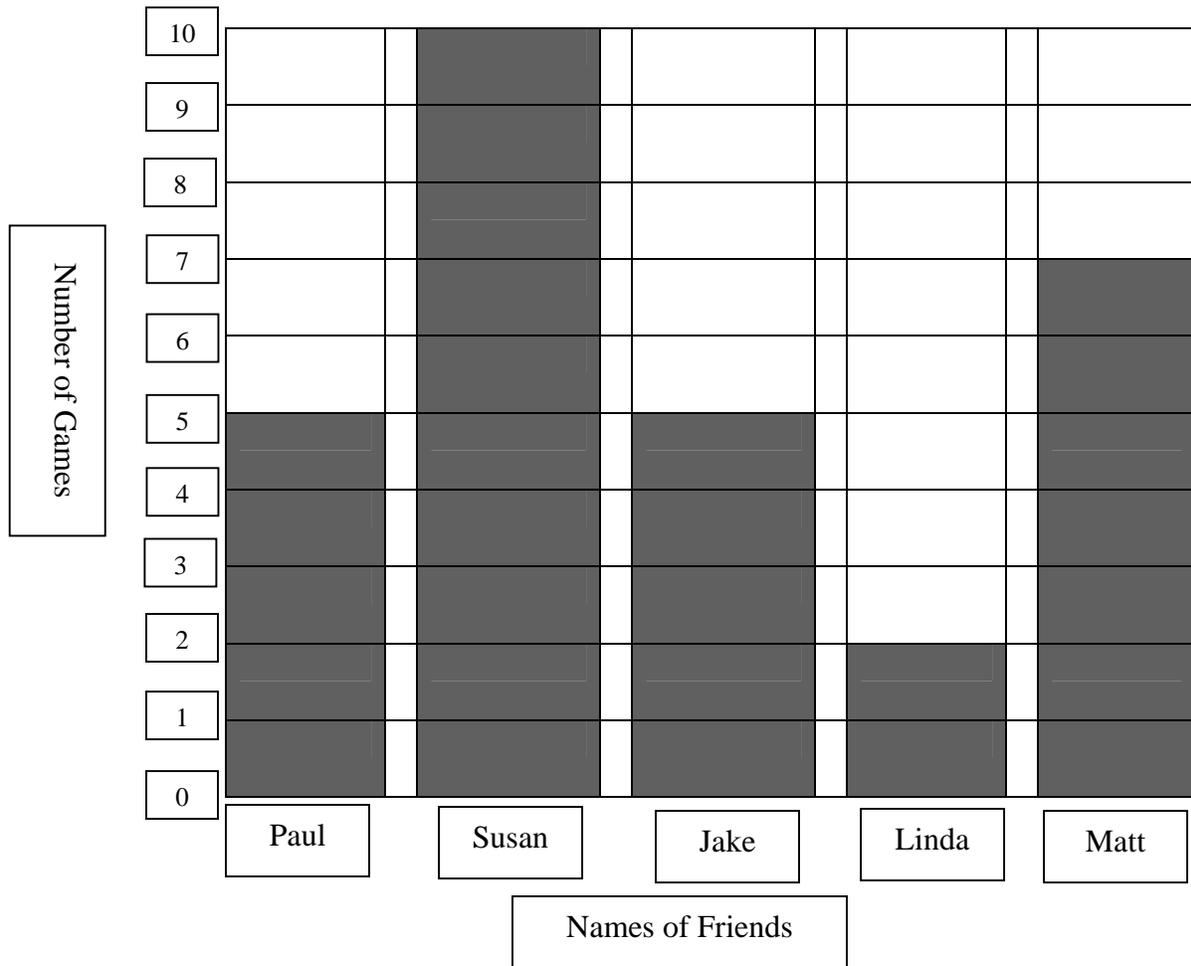
Name: _____ Date: _____

Student Resource Sheet 13
Summative Assessment (Continued)

Step A. How many more games does Susan have than Matt? Write a number sentence to show how you solved the problem.

Step B. Using what you know about bar graphs, explain how the bar graph helped you solve the problem.

Name: _____ Date: _____



Step A. How many more games does Susan have than Matt?

3 more games 1 point

Step B. Using what you know about bar graphs, explain how the bar graph helped you solve the problem.

2-point response – Student response shows a full understanding of the combination strategy used. Response refers back to the problem.

1-point response – Student response shows a limited understanding of the combination strategy used. Response loosely refers back to the problem.

0 point response – Student response is incomplete or incorrect.