

Title: Compare and Share

Brief Overview

This is a capability, comparison study in which sports balls of varied sizes will be used to count bounce frequency as they are dropped from a table 3ft. in height. Following student predictions, outcomes will be analyzed and data recorded on bar graphs.

NCTM Content Standard/National Science Education Standard:

Data Analysis and Probability

Instructional programs should enable all students to:

- 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 predictions that are based on data

Students will collect, organize, display, analyze, and interpret data in order to make decisions or predictions. This data will be displayed using both vertical and horizontal bar graphs. Students will, also, utilize mathematical reasoning, computation, and estimation to answer questions presented by the teacher that addresses the data as the students explain their logic.

Grade/Level:

3rd grade

Duration/Length:

Three days of 45 minutes each day

Student Outcomes:

Students will be able to:

- Develop and evaluate inferences and predictions
- Answer given questions relevant to the data
- Determine what the data shows and interpret it with an appropriate statistical method Utilize personal observations, surveys, investigations, and experiments to justify predictions and data results

Materials and Resources:

- 1 Inch Grid Paper
- Stop Watch
- Basketball
- Volleyball
- Tennis Ball
- Soccer Ball
- Markers
- 3ft Table
- Lined Paper
- Vocabulary Terms
- Copies of Activity Sheets
- Bat and Ball (ball with elastic string attached)

Development/Procedures:

Lesson 1 Collecting Data

Preassessment- Students will complete a K/W/L chart, SR1, to assess prior knowledge of the four balls to be used in the lesson. As a group of eight, a survey will be taken to determine each student's favorite ball. Each of the eight students will then develop a bar graph showing the data from the survey. Students will write a Brief Constructed Response telling why the ball selected was his/her favorite. These writings will be shared with the class. SR2 will be used for this survey.

Launch- The teacher will facilitate a discussion with the students to look at the data collected and generate questions to be answered:

1. How are the balls in our activity generally used?
2. Name a country in which you will find a game in which these balls are necessary to the playing of the game.
3. Locate the country on a map or globe.
4. Choose a ball and describe all of the attributes that you know.

Teacher Facilitation: The teacher will introduce and display various bar graphs on the chalkboard to explore and reinforce the construction and interpretation of bar graphs, the information that they can display and the format in which they can be produced (Vertical/Horizontal).

Give a bat and ball to each of the eight students. For fifteen (15) seconds, each child will strike the bat surface and record the number of "hits" the ball made on the chalkboard. Write each score next to each student's name. Following this task, each student will construct a bar graph to show the chalkboard data. This graph will be evaluated on: title, labeling the axes, accurate drawing of the bars, and proper scaling. Display the completed graphs in the hall.

Student Application: Students will work in groups of four to develop other bar graphs with teacher given information. Example: There are eleven dogs living in a kennel. Two of the dogs have lived there for five years. One dog has lived there for three years. Two other dogs have lived there for seven years. Three dogs have lived there for one year. The other three dogs have lived there for nine years. Make a bar graph showing this data and using all of the five components listed on the chalkboard. (title, labeling the axis, accurate drawing of the bars, proper scaling, and correct data). Students will use 1 inch grids and markers to highlight and develop their graphs. SR3 worksheet will be used.

Embedded Assessment: Students will orally discuss and explain their data and show how their bar graphs were created.

Reteaching/Extension: Students having difficulty with setting up and/or developing a bar graph, will meet with the teacher for extended instruction. The teacher will then review step by step how a bar graph should look, the information it should contain, how it is developed, and assist the student in making a teacher/student example with teacher given data.. The teacher will allow the student to produce another bar graph independently with new information. Use SR3 again for this activity.

Lesson 2 Carrying Out The Investigation

The first thing the teacher will develop will be the necessary vocabulary (. compare, prediction, bounces, etc). Having now identified the balls, (basketball, volleyball, tennis ball, and golf ball), students will predict and record which ball will bounce the most number of times in 20 seconds. Predictions will be written in journals and shared.

Preassessment- With the teacher, students will review and define what a bar graph is and the type of information it can display. Students will use one that the teacher has prepared and displayed on the chalkboard for this discussion. The teacher will use large number cubes to have each of the eight students take five throws and record these throws on a chart. After tallying all of the throws per student, a “human” graph will be made using the classroom floor to illustrate the data outcome. Example: John=19 points, Barbara=10 points, etc. Lines on the floor will indicate the place the student should stand to indicate his/her score. This is the information that the students will then develop into a bar graph using each of the other student’s scores.

Teacher Facilitation- The teacher will explain the process that will be used to gather data regarding each ball being dropped from a 3ft table. Then, with students working in groups of two’s – one being the time keeper, and the other being the counter to count the number of bounces - data will be recorded based on the number of times each ball bounces. The teacher will assist students in completing a “trials sheet” of the ten trials carried out. The teacher will assist students in developing an accurate bar graph. Worksheet RS-5 will be used to record this data.

Student Application- Working in groups of two each student will have a chance to bounce each of the four balls from the 3ft. table and record the number of bounces/ rebounds that are made after 15 trials. After dropping each ball, the student will record the number of bounces and prepare to develop his/her bar graph. Students will first discuss their findings with their partner, however, later, come together with the larger group and discuss their mathematical reflections on what they observed from their trials. Students will develop an individual bar graph first, and then the larger group will come together to develop a group bar graph representing all of the combined data. Each student will present his/her own data and then participate in explaining and helping to present the group data from the group bar graph. Students will use vocabulary that supports their understanding of this math concept (bar graphs) and communicate this information clearly and coherently. SR6 will be used for this activity.

Embedded Assessment- Assess each ball based upon the data that it presented on its own merit. Discuss and make inferences as to why this data occurred. Example: In total numbers, did the basketball have more bounces than the golf ball? Other variances like this will also be presented.

Reteaching/Extension- Students that are having difficulty will receive added support in reviewing this lesson. The teacher will re-teach and re-explain terms, the process, and demonstrate with other worksheets, similar bar graph tasks. Worksheets SR3&4 will be used in this teaching extension.

Lesson 3 Comparing and Contrasting Data

Preassessment- Students using a volleyball, stand in a circle and call out a prediction of the number of times they feel that a soccer ball will bounce/rebound when held up in the air and dropped on a smooth surface floor. Each of the eight students will do this activity and their predictions will be recorded and a bar graph produced. Following this, the volleyball bar graph will be interpreted and discussed based on the data recorded. Example: Who made the nearest prediction? Based upon the graph, who made the largest number of bounces?, etc.

Launch- The teacher will present a Venn Diagram. Discuss the ways to use it and what information it displays. The vocabulary of compare and contrast will be introduced. Examples of comparing and contrasting will be used from objects and items found right in the classroom. A listing of words will be developed from the discussion. Example: Compare a dog and a cat/Contrast them.

Teacher Facilitation- The teacher will ask the students to choose two of the balls used in the initial investigation and complete a Venn Diagram to compare and contrast the balls chosen. As the diagrams are finished, a listing of words and terms will be written on the chalkboard for each of the four balls. After putting together these terms and ideas, (eliminating duplicates) a bar graph will be developed. This bar graph will show a computation of the terms and ideas used by the eight students in completing their Venn Diagrams that show similarities. RS-4 will serve as an example worksheet..

Student Application- Students will choose two other balls that have been investigated and using the Venn Diagram, compare and contrast them. A discussion will follow for each student in sharing his/her diagram. A journal paragraph will be written to discuss why the comparing and contrasting terms were used.

Embedded Assessment- Students write in their journals a paragraph explaining why the comparing and contrasting of their Venn Diagram is appropriate.

Reteaching/Extension- If reteaching is needed, the teacher will review any aspect of the Venn Diagram and the graphing that was developed from its data. The teacher will obtain the student's acquired knowledge by verbally questioning the student. An extended activity would be for the students to focus on the weight of the balls and to evaluate if weight affects or might have affected the results of our data.

Summative Assessment:

A teacher-made assessment will be given to each student which will have the student predict, infer, and answer given questions from the teacher-made assessment. The final assessment will be for the student to develop a bar graph from a given worksheet. This worksheet will be SR8.

Authors:

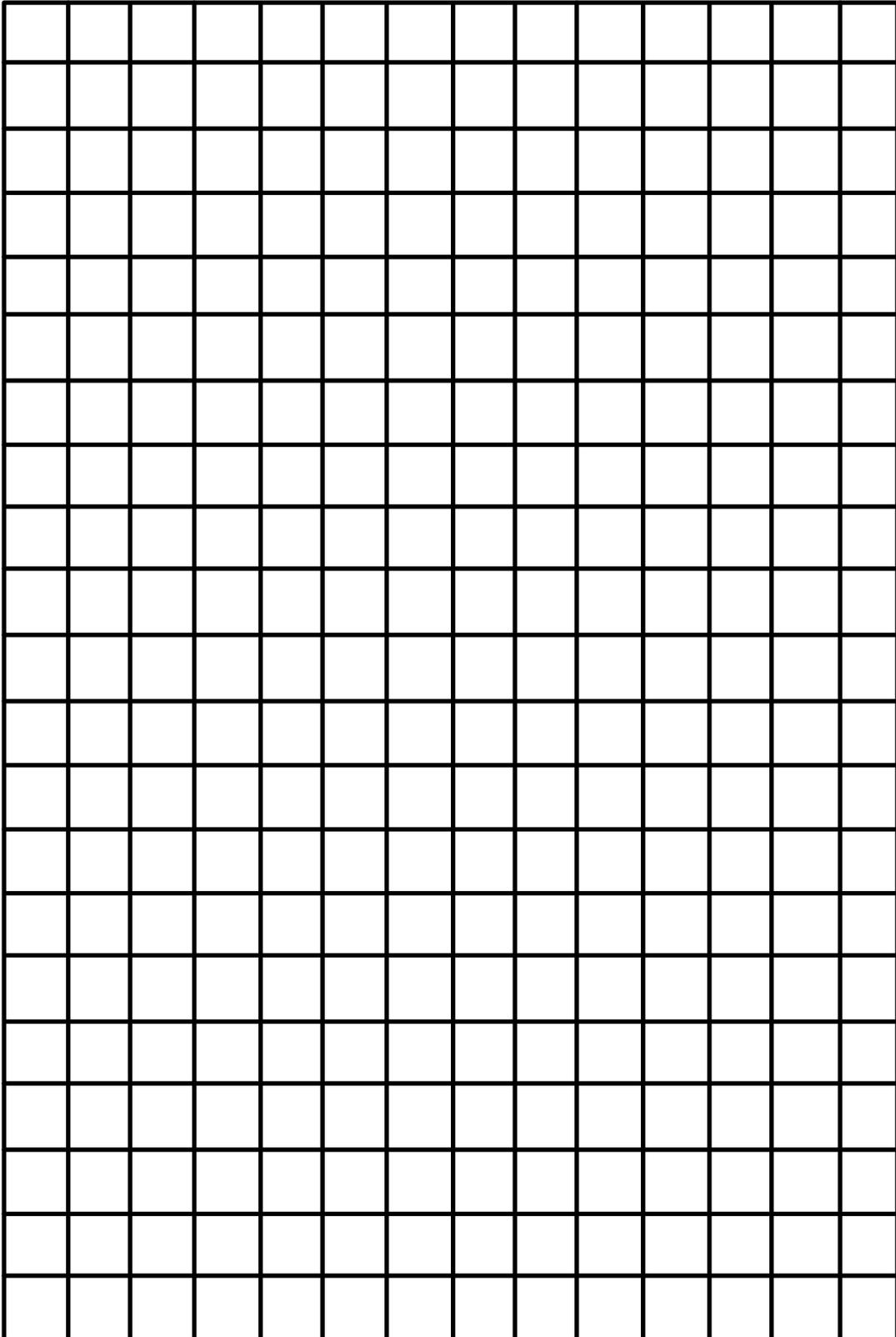
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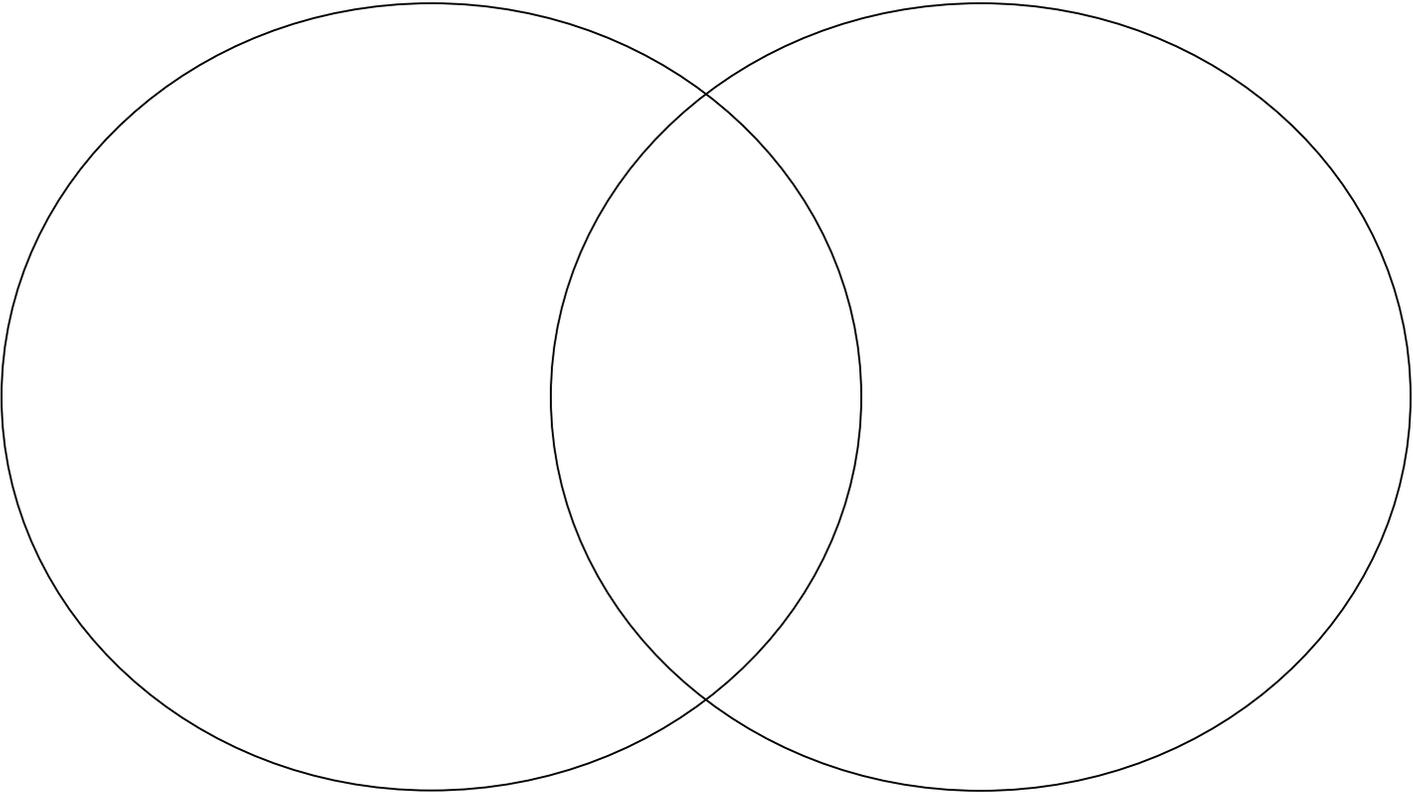
STUDENT'S GRAPHING FORM

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CENTIMETER GRID PAPER



VENN DIAGRAM



Brief Constructed Response

Part A

Draw and label a bar graph to show 10 bounces that the golf ball bounced.

Part B

Use what you know about bar graphs and your experiment with bouncing balls to explain why your answer is correct. Use words and/or numbers in your explanation.