

Title: Dabbling with Dicey Data

Brief Overview:

This unit will help students understand how to collect and display the data in a bar graph. The students will also have a chance to explore probability through the use of spinner and dice games.

NCTM Content Standard/National Science Education Standard:

Students should collect data using observations, surveys, and experiments.
Students should represent data such as line plots, bar graphs, and line graphs.
Students will predict the probability of the outcomes of simple experiments and test their predictions.
Students will develop and evaluate inferences and predictions that are based on data.
Students will discuss events related to students' experiences as likely or unlikely.

Grade/Level:

Grades 2 and 3

Duration/Length:

Three 60-minute lessons

Student Outcomes:

Students will:

- Be able to collect data in order to compare and contrast the information with their peers.
- Be able to record data in order to create a bar graph.
- Be able to interpret data from a bar graph in order to identify missing data.

Materials and Resources:

- Primary Graph Paper (one inch)
- Crayons or Markers
- Highlighters
- A pair of dice per each student
- Overhead Transparencies
- Pupil Response Cards (optional)
- Sticky Notes
- Cards with Tally Marks
- Colored Pen
- Unifix cubes (optional)
- Tally "Posters"
- Spinners (Divided into quarters) You will need one spinner for every two students.

Day One:

On each spinner, label one section with one of the following numbers: 5, 6, 7, 8

If you do not have “commercial” spinners, you may make paper spinners provided by www.webeans.net/hutt/gamespinners.htm. Select the blank black and white spinner divided into four sections.

Day Three:

Divide the spinners into quarters. You will need one spinner for each small group. Label each section using the color words 2 blue or 2 red.

Development/Procedures:

Day 1

- Pre-assessment

Distribute a copy of the vocabulary matching sheet (Student Resource 1) to each student. The students will match the math vocabulary to the definitions to assess their background knowledge for the lesson.

- Engagement

Students will read the poem, Classroom Dice (Student Resource 2). Have the students highlight the words that pertain to math. (i.e. number words, sum, total)

- Exploration

Discuss the poem, Classroom Dice. Who can share the math vocabulary found in the poem? Ask: How did the student in the poem keep track of the numbers he/she rolled?

Reread the last line of the poem. What is the highest possible score that the student could have earned? What math vocabulary word do we use for the answer we get when we add two or more numbers? (**sum**)

Tell students that today they are going to collect information just as the student in the poem did inside his/her desk. Encourage students to use mathematical vocabulary. Ask: Can you think of another word (or a synonym) a mathematician might use in place of the word information? (**data**)

- Explanation

Have the students name board games that they have played that require a die or dice. List the titles of several of the games on the board or overhead. Students will raise their hands or hold pupil response cards to cast their votes for their favorite game (Remind the students that they can only vote once).

Tell the class you do not want to write their individual names and you would like to use a quicker method of recording the **data** in this activity. Ask the class to suggest a way to record this data. Lead the class to the idea of recording the data using **tally marks**. However, do not use the standard format for tallies in which you cross the fifth tally. In counting the tallies you want to emphasize how long it takes to count

each tally mark.

Emphasize that counting tallies by ones takes a long time and mistakes can easily be made. Explain the method for making groups of five. The students will practice counting orally by 5's.

Individually display sets of tally marks on sentence strips. Display each set of tally marks for a few seconds (quick images) and have the students tell the amount that was displayed (Example: ||| = 3). Practice tally counting with more flash cards.

- Application
Have each student work with a partner on the next activity. Each pair will need one spinner and two tally recording sheets (Student Resource 3). Students will each take fifteen turns spinning the spinner and using tally marks to record the number on which they landed (Prior to the game they should predict the outcome). Encourage the early finishers to compare/contrast their data with their partners' data. Discuss the game with the students and have them share their experience, predictions, and observations.
- Differentiation
 - Reteach
Students who have difficulty with utilizing the tally marks they may highlight each set of 5 tallies.
 - Enrich
Ask the students to write (or discuss) how the data would have been affected if one of the numbers was omitted and another number was written twice on the spinner.
- Assessment
Teacher Observation throughout spinner activity

Closing Questions:

- What type of data did we record today?
- What type of activity in real life could be recorded through the use of tally marks? (surveys, traffic studies, polls, etc.)

Distribute the copy of the pre-made tally/survey chart (Student Resource 4) and the students will write their observations about the information provided.

Day 2

- Engagement
Place vocabulary sheet on overhead to review terms from the previous lesson (Teacher Resource 1).
Review yesterday's lesson.

- Exploration
Read the story of Goldilocks and the Three Bears to the students (Teacher Resource 2.) Say: A quick way (tally marks) was used to count Goldilocks berries and today we will use a quick way to represent her data.
- Explanation
Today we will use a special type of graph called a **bar graph**. Why do you think it is called a *bar* graph? (compare to a candy bar, bar bell, sand bar) The bars in a graph can be vertical or horizontal.

Create a vertical bar graph with the data from Goldilocks.

- **Application**
Today is a guided practice lesson. Your goal is to have the students make the bar graph with you as you guide them toward an understanding of the elements of a bar graph.

Distribute primary graph paper. Say: Let's take a look at Goldilocks data (See the Goldilocks story).

How many containers of berries did Goldilocks have to collect? (3)
Who will receive the berries? (Daddy Bear, Mother Bear, Junior Bear)

Write the initials of each bear at the bottom of the graph, so we know who is represented in our data (Use initials as children have a tendency to write outside of the width of the bars). Model on the overhead as students copy. Circulate around the room to ensure they are labeling the bears in the correct position.

Say: What other data should we include? (amount of berries) Since we know how to count by fives from our study of tally marks, let us enter numbers counting by fives. Now, before we count by fives on our graph, why do you think we should start with a zero? Students will enter the numbers 0 through 50 counting by fives on the y axis.

Say: Now we will add bars to our graph. Remember that we need to start at the zero when we color in our bars. Students color in the bars with crayons or markers. Guide the students when entering the data for the next two bars.

Ask: What do you think we will need to label on our graph? What do you think is important information that we want the readers of our graphs to know? Instruct the students to label the x and y axis (The Bear Family, Amount of Berries Collected).

Ask: What do we usually put on our writing papers when we write stories? (a title) Our graph needs a title just as our stories have a title. However, we need to make sure that our graph title matches the date we have represented. Does anyone have a title suggestion for our graph?

- Differentiation
 - Reteach

Students who need a visual representation may use sticky notes for their data instead of coloring. The sticky notes could be placed on the board stacked as a “bar” to represent each amount. You may also use small paper squares and have the students write tally marks or a number on each square prior to stacking them on their papers. You could also use Unifix cubes to represent each section of the bar.
 - Enrich

Students can respond to the question, “How would have the data change if Goldiblocks gave each bear two containers?”

Students may draw the decorated containers that were presented to the Bears in the story.
- **Assessment**

Students will answer graph questions related to the Bears Boogie Board Business (Student Resource 5). The answers are: 1: 30, 2: Wed. Thurs., 3: $25 + 10 = 35$, 4: four.

Day 3

- Engagement

Make one big class spinner divided into four equal parts. Two parts should be colored red and the other two parts colored blue. Let the students predict where the spinner will land before spinning it.

What color do you think the spinner will land on? Why?
Defend your answer and share it with your classmates.
- Exploration

Ask them if they are familiar with dice or know how to play with them. Show double dice and standard dice. Explain to students the use of dice in a game.

Present a problem story, Students’ Dice Game (Student Resource 6). Ask: What is the first step you will do in order to solve the problem? How will you know what group has the highest score or the lowest score? Explain your answer.
- Explanation

Divide students into groups of four. Each group will need dice and a copy of Student Resource 7- “Double Dude in a Dice” Tally sheet.

Each student will roll the two dice and find the sum of the two numbers. The students will take turns rolling the dice. Tally the number of times the sum of the dice land on 2,3, 4,5,6,7,8,9,10,11 and 12.

Discuss the game with the students and have them share their experience and observations. Collect the data from each group and display individual students' data on an overhead. Students will create a bar graph chart using Student Resource 8 to compare the data. Students will use the tally chart data to make a bar graph .

- Application
Students will need to work on the bar graph independently. Each student needs one bar graph sheet (Student Resource 8) and a colored pen for markings. The students will make their own bar graph based on the data they have gathered. If necessary, the teacher can pull a small group. Go over the graph as a class having the students compare their answers.
- Differentiation
 - Reteach
Students who have difficulty using the graph may highlight the numbers on the y axis and x axis.
 - Enrich
For students who are mastering the bar graphs, let them go to the Bar Graph Machine website to create their own using gathered data.
<http://nces.ed.gov/nceskids/creategraph/default.aspx>.

Summative Assessment:

Students will complete the Summative Assessment on Student Resource 9 and 10 to demonstrate that they are able to analyze, synthesize and create a bar graph using a tally chart. Answers can be found on Teacher Resource 3.

Authors:

Name: Velma A. Taboada
School: Calvin Rodwell Elementary
Baltimore City Public Schools System

Name: Karen Nichols
School: Orem Elementary
Baltimore County Public Schools



Name _____

FUN WITH WORDS

Direction : Draw a line from the math vocabulary word to the correct definition.

Vocabulary Words

Definitions

Data .

. marks used to keep score

Tally marks .

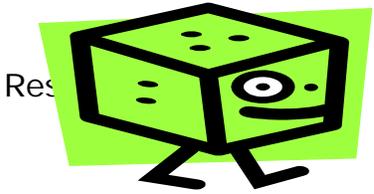
. information

Graph .

. an answer when you add numbers

Sum .

. a chart used to show information



Student

Classroom Dice

I picked up a set of dice from the dull classroom floor.

I secretly threw them in my desk and I rolled a number four.

I placed them in my hand to try my luck again. Much to my surprise, two fives, I rolled the sum of ten.

I threw the dice ever so quietly, the teacher wasn't looking... I was doing fine. I rolled a four and a five, my first total of nine!

I was enjoying this awesome dice game but just as I rolled a three... the teacher placed out her hand and bellowed, "Give those dice to me!"

I guess I will have to wait for Math class to roll the dice once more.

I will just sit and wonder about the highest possible score!

Name _____

Student Resource 3

Spinner Tally Sheet

Your partner and you will take turns spinning the spinner and recording your *own* data. Use tally marks to record your data. Each person should take 15 turns.

Before you start the game complete the chart below with your predictions.

Number	My Predictions (Make a guess as to how many times the spinner will land on this number.)
5	
6	
7	
8	

Number	Tally Marks	Total
5		
6		
7		
8		

Name _____

Student
Resource 4

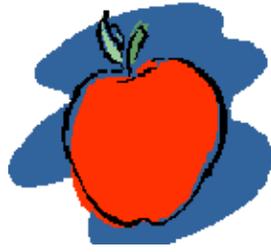
Title of the Graph _____

Popcorn	
Peanuts	
Chips and Dip	
Apples	

The fourth grade teacher conducted a survey in her class. The tally chart shows the class data. What question do you think she asked the class?

What results does the tally chart tell about the class?

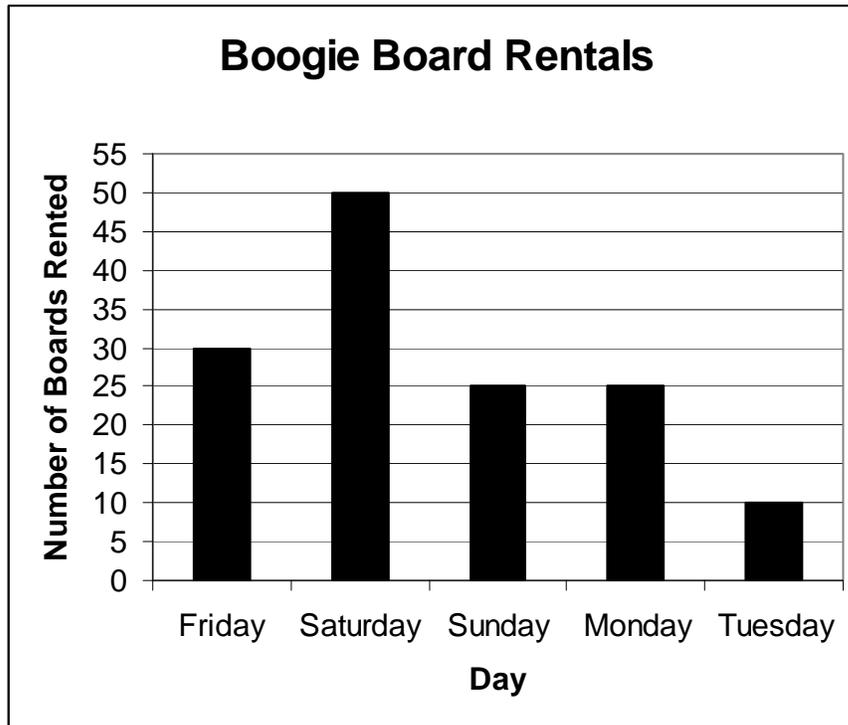
Think of a title for the tally chart. Write a clever title above the chart. Remember a title should relate to the given data!



Name _____

Student Resource 5

The Bear Family likes to leave the woods and go to the beach in the summer. They own the Bear Boogie Board Shop. This graph represents the boogie boards that they rented. Answer the questions below the graph.



1. How many boogie boards were rented on Friday? _____
2. What 2 days of the week does the Bear Family close their shop?

3. How many boards were rented in all on Monday and Tuesday? _____

Write a number sentence that explains your answer:

Name: _____

Students' Dice Game

The third grade students are playing a dice game. They are divided into 3 groups. Group 1- Daisy has rolled the dice with 2,3, 4 and 5. While the second group- Dairy has 1, 4, 5, and 6. The 3rd group-Davey has rolled 4 times having 6 each time. What group has the highest total in all?

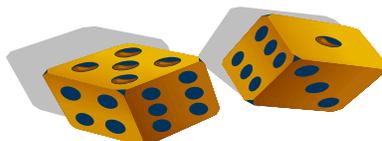


Name: _____

DOUBLE DUDE IN A DICE

Direction; Make a guess as how many times the dice will land on the Double Dude's numbers using tallies.

Double DUDE Numbers	MY GUESS (Predictions)	Total
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
Total		



Direction: Roll the dice 20 times and find out how many times the Double Dude Dice will land on numbers 2,3,4,5,6,7,8,9,10,11 and 12. Add the total number of your rolled dice .

GROUP Name : _____

Double DUDE Numbers	Total	Tally Marks
2		
3		
4		
5		
6		
7		
8		
9		
10		

11	
12	
Total	

Student

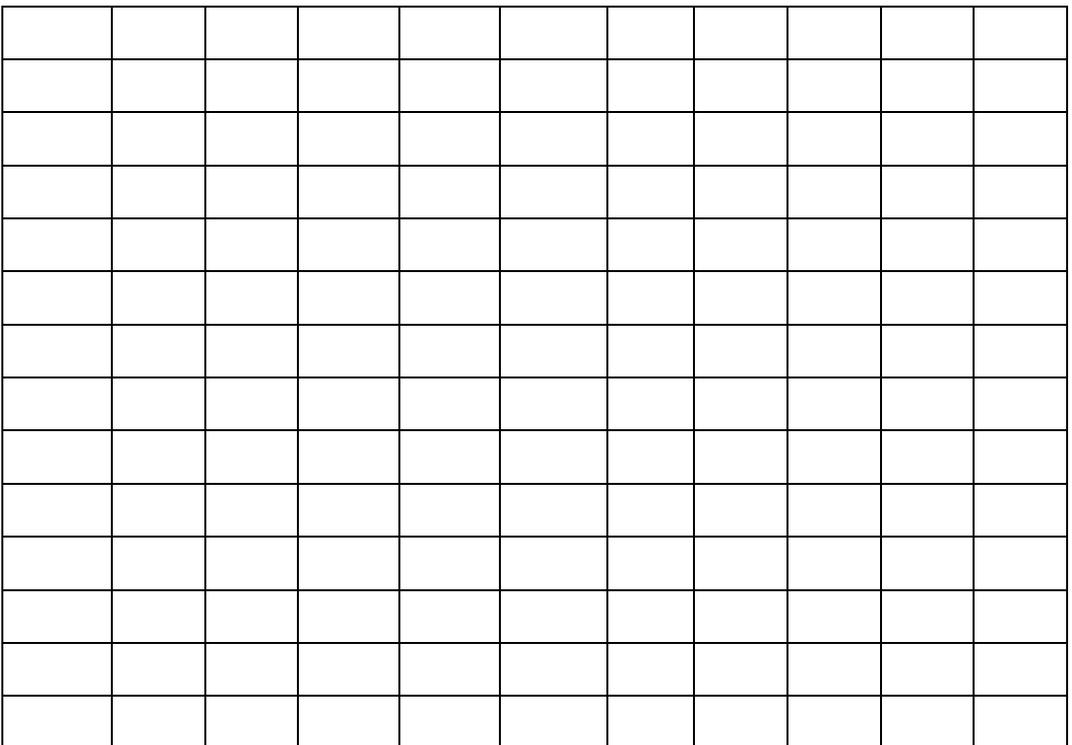
Resource 8

Name: _____



Double Dude Bar Graph

Direction: Complete the bar graph with your data and color it. Label each section on your graph.

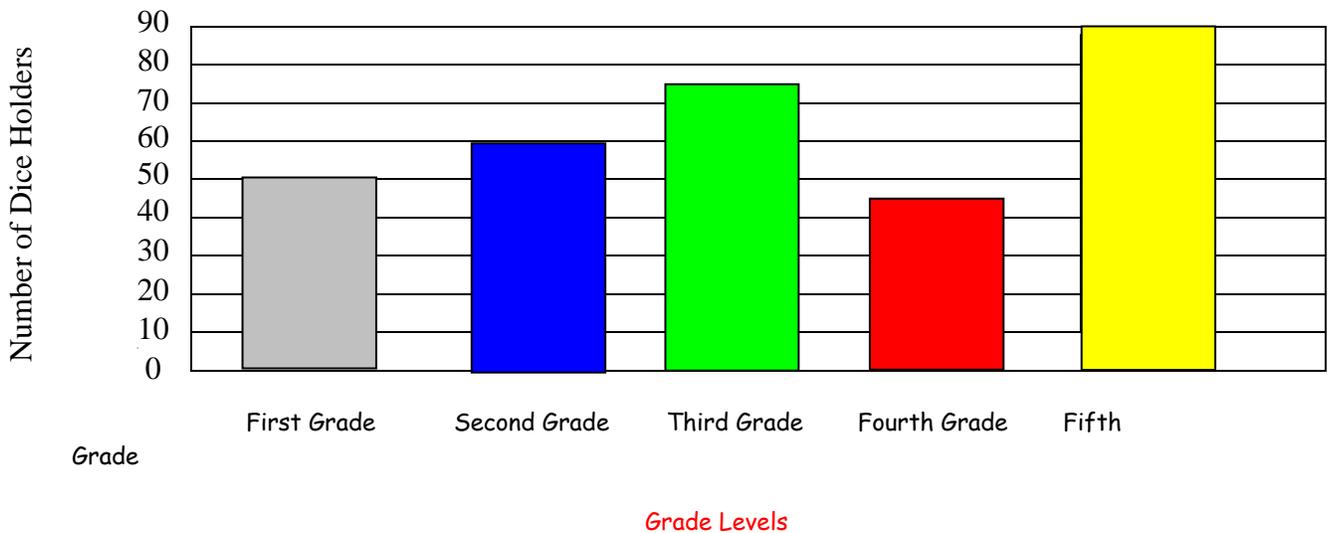


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Name: _____

Bar Graph - Student Assessment 1
Section 1

DICE HOLDERS



Part A:

How many more dice holders did 5th grade have than the 3rd grade dice holders?

Part B:

Use what you know about bar graphs to explain why your answer is correct. Use number and /or words in your explanations.

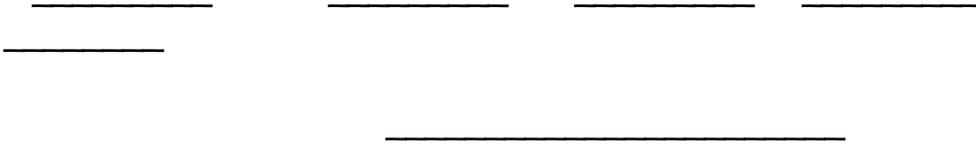
Name: _____

Section 2

Directions: Using the chart below, create a bar graph with the data provided. Make sure to include all parts of a bar graph.

Total Number of Dice Holders in Maryland

School Districts	Dice Holders
Ann Arundel Public School	10,000
Baltimore County Public School	12,000
Baltimore City Public Schools System	16,000
Carroll County Public School	4,000
Howard County Public School	8,000



Teacher Resource 1

Graphing Vocabulary

data

graph

tally marks

vertical

horizontal

record

title

key

compare

Goldiblocks and The Three Bears

Once upon a time a young girl named Goldiblocks went into the home of the three bears and made an awful mess. Goldiblocks' mom wanted Goldiblocks to apologize for the trouble she caused the Bear Family and to do something nice for each member of the family. Goldiblocks decided that she would pick berries for each member of the family. She decided it would be nice to place the berries in three separate containers. Mom suggested that she decorate each container to make the gift special. As Goldiblocks was walking through the woods (with adult supervision of course) she thought about her Math class. She had just learned to use tally marks. She thought it would be a great way of keeping track of the berries that she picked for the Bear Family. Goldiblocks picked berries on three days so that she could give the gifts to Daddy Bear, Mother Bear, and Junior Bear. She showed her mom her tally sheets and Mom hugged her for all of her hard work. Mom and Goldiblocks walked the presents to the Bear Cottage and the Bear Family was delighted. They accepted Goldiblocks' apology and her thoughtful gifts.

The End

Goldiblocks Data:

She picked 20 berries for Daddy Bear.

She picked 40 berries for Mother Bear.

She picked 30 berries for Junior Bear.



Summative Assessment Answer Key

Section 1. Part A: **15 more dice holders.**

Section 1 part A;

A two- point answer should include the following;

- An explanation of how many dice holders of grade 5 and grade 3 students.
- A description or a number sentence showing the subtraction problem to find the difference of dice holders. (3rd and 5th graders)
- Bar graph vocabulary while students are explaining their answer.

Section 2:

Give students 2 points if they have included:

- Title
- A correct number scale
- Axis labels
- Axis beginning at zero
- Bars graphed to the correct number on the scale

Name: _____

Read each question. If you answered yes, place a \checkmark on the line.



Primary Bar Graph Checklist

Does your graph have a title? _____

Does your graph title match the data? _____

Does your graph have a description label for the bars? _____

Does your graph have a description label for the numbers? _____

Did you remember to start your number amounts with a zero? _____

Dice Fun Facts



Did you know the singular word for dice is die? _____

Did you know the circular patches or pits on dice are called pips? _____

Did you know that dice are considered polyhedral objects? _____

Do you know the numbers on a die range from one to six? _____



Dice Games

Two-Dice Sums (Grades 1–8)

Math concepts: Students of all ages can play this game, as long as they're able to add the numbers that come up on two dice. While younger children benefit from the practice of adding, older students have the opportunity to think about the probability of the sums from rolling two dice.

The object: to remove all the counters in the fewest rolls possible.

How to play: Two or more players can play. Each player needs 11 counters, a game strip that lists the numbers from 2 to 12 spaced far enough apart so the counters can fit on top of each number, and a recording sheet. Here are the rules for playing:

1. Each player arranges 11 counters on the game strip and records the arrangement.
 2. Once the counters are arranged, players take turns rolling the dice.
 3. For each roll, all players can remove one counter if it is on the sum rolled.
- Players keep track of the number of rolls of the dice it takes to clear their game board.

After students have had the chance to play the game for several days or so, have a class discussion about the different ways they arranged the counters and the number of rolls it took. Have them write about the arrangements that are best for removing the counters in the fewest number of rolls. For an extension, try Which Number wins.

Which Number Wins? (Grades 1–8)

Math concepts: In this individual activity, students roll two dice and record the results. Make a recording sheet that is an 11 x 12 block grid with the numbers 2 through 12 across the top. While young children gain practice with addition facts, older children can examine the data, compare results with other classmates, and think about why some sums are more likely than others. To do the activity, students need two dice and a recording sheet.

The object: to roll the dice and record the number fact in the correct column, stopping when one number gets to the finish line.

How to play: Post a class chart that lists the numbers from 2 to 12 and have students make a tally mark to show the winning sum. Have each child do the experiment at least twice.

After you've collected the data, discuss with the class why it seems that some sums "win" more than others. Young children may not be able to explain it, but older students often figure out that there is only one way to get the sums of 2 and 12, and six ways to get a sum of 7.