

Title: Bear Business
Probability and Data Analysis

Brief Overview:

The students will explore the concept of probability. Students will do a variety of activities that involves the students in making predictions, collecting data, using data to make decisions, and learning that some outcomes are more likely than others. The first lesson begins with the student's idea of chance and what is most likely to happen and what is least likely to happen with the use of dice. The use of problem solving strategies will help the students in identifying possible outcomes that happen while rolling the dice and selecting items from a grab bag. At the completion of the lessons, students will be able to describe the likelihood of such events by using the vocabulary terms associated with probability. Students will be assessed on their knowledge of probability through tests, word search games and journal entries.

NCTM Content Standard/National Science Education Standard:

Probability and Data Analysis

Grade/Level:

Grade 2nd

Duration/Length:

3 days (60 minutes per lesson)

Student Outcomes:

Students will:

- Explore probability, practice addition, develop number sense and use probability terms as they play a game with Teddy Bear counters.
- Create, read and interpret a pictograph and bar graph
- Record data on a pictograph where each symbol represents more than one unit.
- Predict and draw conclusions by conducting a probability investigation.
- Use probability vocabulary during the investigation.

Materials and Resources:

Lesson One

- Teddy Bear counters
- Small bowls or paper plates (large enough to hold 12 Teddy Bear counters)

- Dice (one for each pair of students)
- Book: Probably Pistachio by Stuart J. Murphy
- Plastic Baggies
- Resource Sheet #1 - Student
- Resource Sheet #2 - Student
- Resource Sheet #3 - Student
- Resource Sheet #4 – Formative Assessment

Lesson Two

- Teddy Graham Crackers (in 3 different flavors: honey, cinnamon and chocolate)
- Bowl
- Masking tape
- Pencils
- Math journals
- Resource Sheet #5 – Student
- Resource Sheet #1 – Teacher (Wall Chart)
- Resource Sheet #6 – Student
- Resource Sheet #7 – Formative Assessment

Lesson Three

- Teddy Bear counters
- Brown paper bags (about 10)
- Pencils
- Connecting cubes (blue, yellow, red)
- Resource Sheet #8 – Student
- Resource Sheet #9 – Student
- Resource Sheet #10 – Student (Word Game)
- Resource Sheet #11 – Summative Assessment
- Resource Sheet #2 – Teacher (Answer Sheet)

Development/Procedures:

Lesson 1: “Rolls to Empty the Bowl”

Preassessment

- Students will choose a card from ten cards in a plastic baggie. (Resource Sheet #1 – Student). On these cards are examples of events that are possible or impossible to happen. On their T-chart worksheet (Resource Sheet #2 – Student), they will identify which events are possible or impossible, by placing them on the correct side of the chart. Students will share and discuss their choices. Encourage students to make up statements that are possible, impossible and certain.

Launch

- Read the book, Probably Pistachio by Stuart J. Murphy as a way to introduce and/or review the concept of probability. Discuss the probability vocabulary used

in the story. Write these words and definitions on the chalkboard such as, probably, chance, impossible, etc. Explain to the students that they are going to play a probability game today and after they play a few times; they'll investigate what's likely or probable to happen.

Teacher Facilitation

- Post the class chart paper with the heading "Rolls to Empty the Bowl" in a location where students can add to it. Divide the students into pairs. Give each pair one die, 12 Teddy Bear counters and a bowl. Each student needs a worksheet (Resource Sheet #3 – Student) and pencil for recording. To play the game, students will roll the die, note the number that comes up and take out that many Teddy Bears. While one student rolls to see how many times it takes to empty the bowl, the other student will record each roll on the worksheet. They will continue with one rolling and the other recording until the bowl is empty. Whatever the student rolls, the recorder puts tally marks and then the final count. Explain that it is not necessary to have the exact number on the last roll. If the number is larger than the amount remaining in the bowl, it is okay. For example, if there are two bears in the bowl, and a five is rolled, you may remove the bears because you don't have to wait until you roll a 2. Play an example round with one of the students to demonstrate the game. Before you let the student roll the die, ask the student to predict how many rolls it will take to empty the bowl.

Student Application

- The students will work in pairs. Each pair will play this game 3 times. After each game, have the pair record the number of rolls it took to empty the bowl on their worksheet.

Embedded Assessment

- Discuss the fewest and the greatest number of rolls it took to empty the bowls and how likely or unlikely that would be. What amount of rolls could never empty the bowl? Why? Point to the words on the probability words chart as they are discussed.

Reteaching/Extension

- Play the game using 20 Teddy Bear counters. Have the students use subtraction skills instead of addition by subtracting the numbers rolled on the dice from the 12 Teddy Bears.

Formative Assessment

- See Student Resource Sheet #4

Lesson 2 "Teddy Graham Taste Test"

Preassessment

- Distribute worksheet (Resource Sheet #5 – Student). This is a pictograph of Trees Planted for Nature Day (3 pine tree, 6 oak, 4 willows and 2 maples). Ask the

students questions to determine their level of understanding of this pictograph. Have students complete the questions.

Launch

- Teacher displays the three different bags of Teddy Grahams. Ask students if they have heard of Teddy Grahams. Ask how many have tasted them. What are your favorite flavors?

Teacher Facilitation

- Add the word survey and definition to the probability word chart. Explain to the students that they're going to take a survey to see which kind of Teddy Graham the class likes the best. Write the word survey on the probability word chart and see that children understand what the word survey means. Allow the students to taste the three different flavors before voting. After students have tasted the different kinds of Teddy Grahams, have them select their favorite flavor from the bag and tape it up on the large pictograph on the wall. (Resource Sheet #1 – Teacher) Explain that the Teddy Grahams are going to make a pictograph. Review meaning of a pictograph. Children will count the number of bears beside each flavor to determine which flavor is the most popular. Allow the children to give the pictograph a name. Remind the students the importance of lining up the Teddy Grahams to make it easier to interpret and to analyze the data.

Student Application

- After the pictograph is completed, explain to the students that we will interpret and analyze the data by answering these questions:
How many children voted in all?
Which flavor got the most votes?
Which flavor got the least votes?
Did any flavors get the same amount of votes?
How many more children liked chocolate than cinnamon?
How many more children liked cinnamon than honey?

Embedded Assessment

- In their math journals have the children write at least three findings about their investigation and include an illustration. While they are writing in their journals, teacher will circulate throughout the classroom to informally assess students' knowledge of a pictograph.

Reteaching/Extension

- Students struggling with the concept will be put in a small group to work with the teacher.
- Discuss with the children what success and/or problems they encountered.
- Using their worksheet (Resource Sheet #6 – Student) have students create a bar graph using the same data. Teacher circulates room to assure all the students understand the task.

Formative Assessment

- See Student Resource Sheet #7

Lesson 3 “A Beary Good Guess”

Preassessment

- Review probability vocabulary with the students. Ask questions such as:
What will probably happen to you after school?
What is unlikely to happen to you after school?
What is the chance that you will have chicken for dinner?
Are you certain that it will rain today?

Launch

- Have a paper bag of 10 Teddy Bear counters. For example, 6 blue, 3 yellow, 1 red. Pass the sealed bag around the room. Students are allowed to shake and to smell the bag. They are not allowed to look inside. Ask the students to predict what is in the bag. Record their responses on the board. After all have had a turn or until some have guessed the contents of the bag. Tell the children that there are colored Teddy Bear counters in this bag.

Teacher Facilitation

- Have students work in cooperative groups of no more than four per group. Each group will have a sealed paper bag with colored Teddy Bear Counters inside. The colors will differ in each group. Students pick one bear from the bag without looking and record the color with tally marks on (Resource sheet # 8 – Student) They will repeat this 30 times. Then they have to make a prediction on the number of colored bears in their bag. After making their prediction, they will empty the bag and make an actual count of how many bears and their color.

Student Application

- Each group will have a recorder, reporter, materials gatherer and task captain. Students will choose a job. After the students have recorded their findings, the reporter will report their findings to the entire class.

Embedded Assessment

- In their math journals, students write their findings and explain how close their predictions were to the actual count of bears in the bag.

Reteaching/Extension

- Pull any students who are struggling with the concept and work with them in a small group. Once the teacher feels they understand, let them return to their group.
- Students could repeat the activity using different color connecting cubes (Resource Sheet #9 – Student). They could also write fractions for the number of red, blue and yellow cubes that were picked.
- If time allows, let students complete the Probability Word Search (Resource Sheet # 10 - Student). Answer to Word Search (Teacher Resource Sheet #2).

Summative Assessment:

- See (Resource Sheet #11 – Student)

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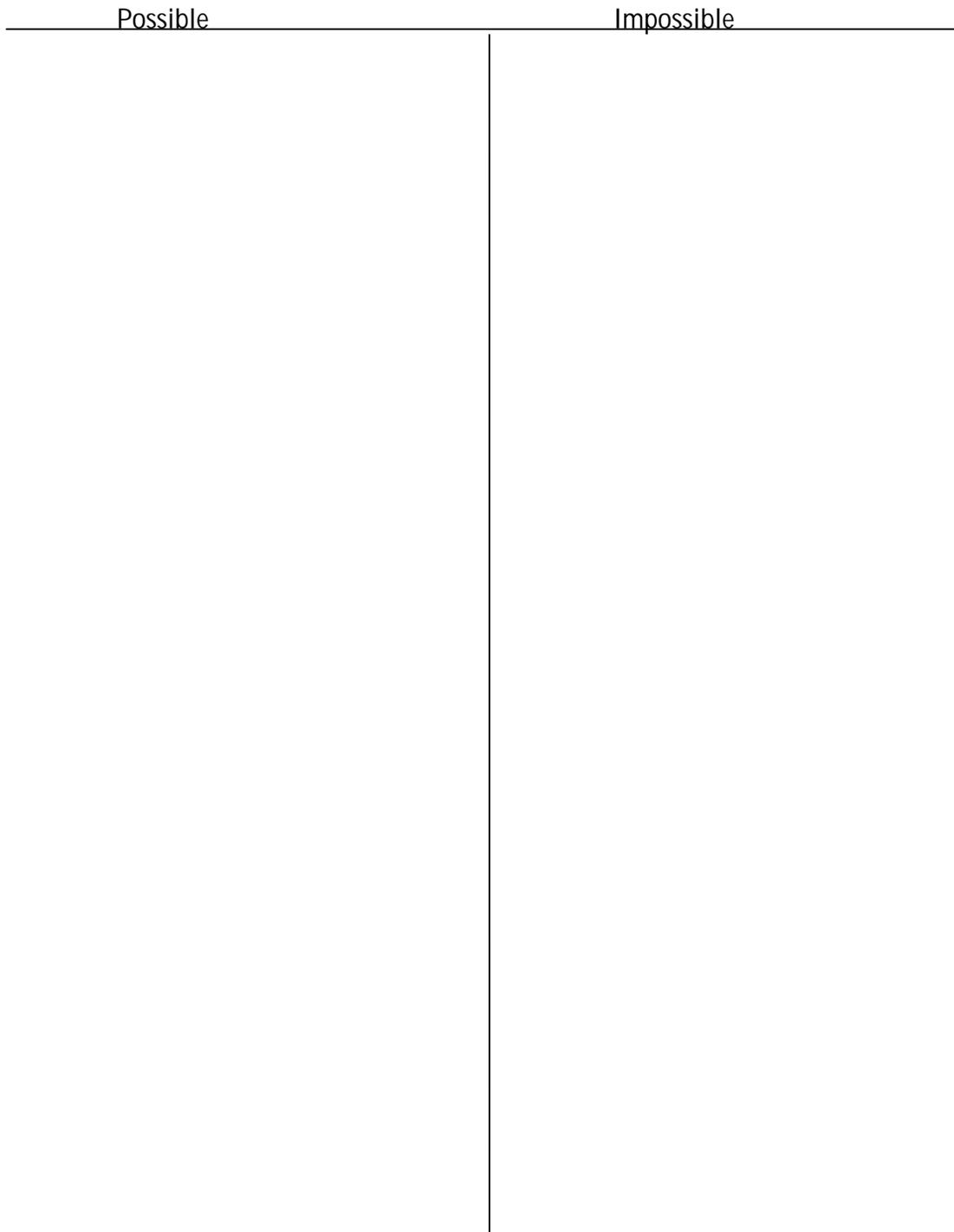
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“Rolls to Empty the Bowl”

Directions: Sort the things that are possible and impossible to happen on the T- chart.

A dog will talk.	It will snow in December.
It will be hot tomorrow.	You will see a pot of gold at the end of a rainbow.
A pig will fly.	Lunch will be ready at 12: 00 today.
You will see a blue car today.	A bird will have a baby fish.
You will find a quarter while walking home.	You will receive a hug today.

Things that are:



“Rolls to Empty the Bowl”

Part I

Directions: Predict how many times you will have to roll the die to remove all of the 12 bears from the bowl.

Player 1

Player 2

Your prediction _____

Your prediction _____

Part II

Directions: One player rolls while the other player records the number of rolls it takes to empty the bowl.

Tries	Tally	Count
Try # 1		
Try # 2		
Try # 3		

Formative Assessment

Name _____ Date _____

“Rolls to Empty the Bowl”

Directions: Answer each question in complete sentences.

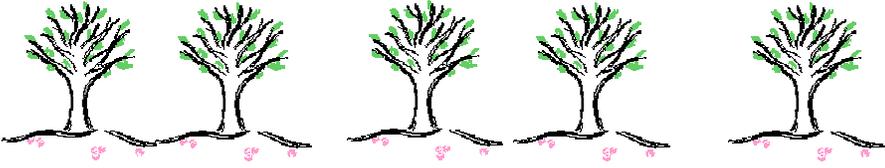
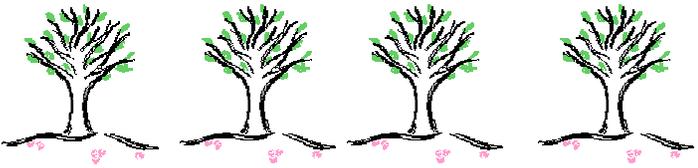
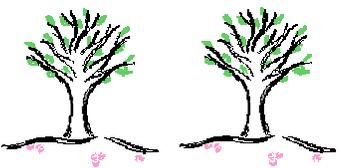
1. What was your prediction of rolls you made before the bowl was emptied?

2. How many rolls did it take to empty your bowl?

3. What was the difference between your prediction and the actual results?

Preassessment

Trees Planted for Nature Day

Pine	
Oak	
Willow	
Maple	

Each  stands for 1 tree

Solve

1. How many trees planted were Willow? _____
2. How many trees planted were Pine? _____
3. Which tree was planted the most? _____
4. Which tree was planted the least? _____

“Teddy Graham Taste Test” (Wall chart)

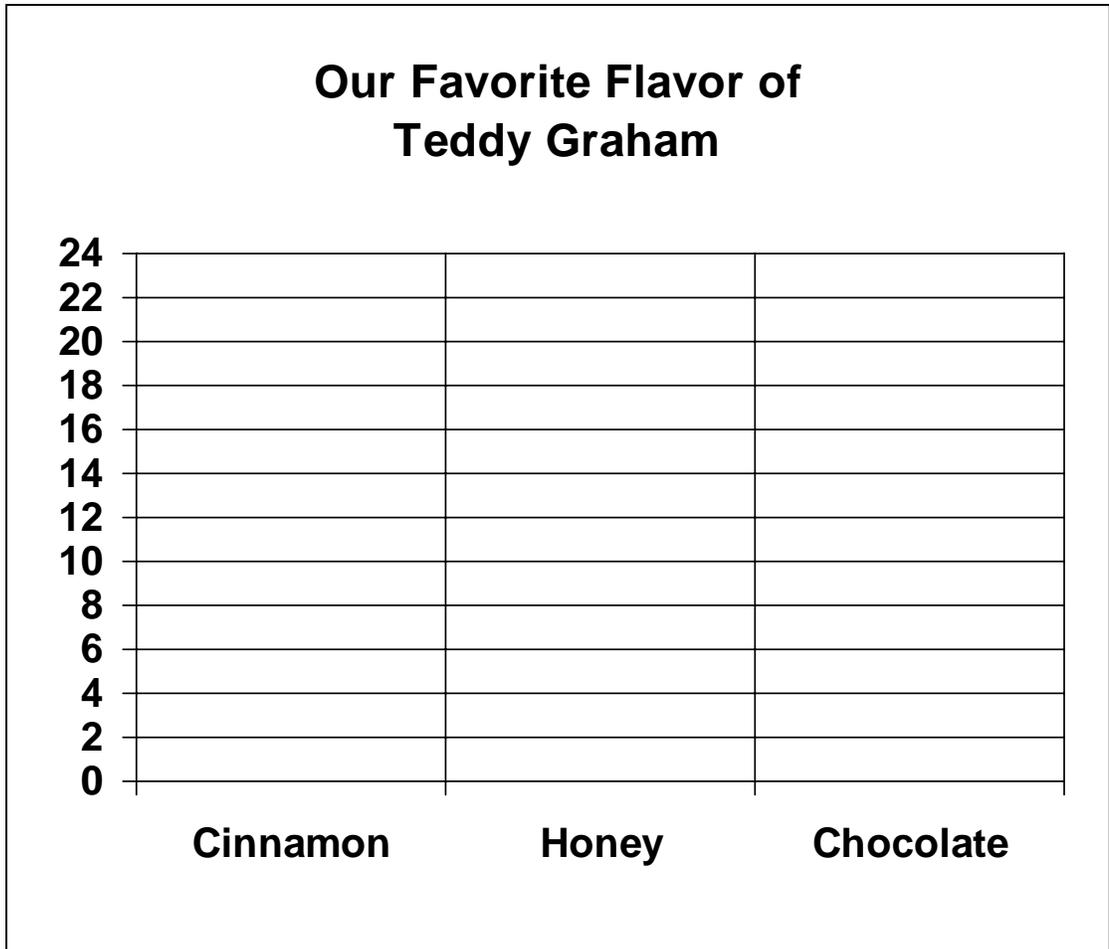
Honey	
Cinnamon	
Chocolate	

1  = 1 vote

“Teddy Graham Taste Test”

Extension Activity

Directions: Use the data from your class vote to create a bar graph of your classes’ favorite flavor of Teddy Grahams.



Formative Assessment

Name _____ Date _____

Directions: Use the tally marks to create a pictograph. Answer the following questions about Mrs. Brown’s students’ favorite flavor of Teddy Grahams.

Tally Marks

Chocolate 

Honey 

Cinnamon 

Mrs. Brown’s Students’ Favorite Flavor of Teddy Grahams

Cinnamon	
Chocolate	
Honey	

1  = 1 vote

1. Which flavor of Teddy Graham was liked most? _____
2. Which flavor of Teddy Graham was liked least? _____
3. How many more children liked Honey than Cinnamon? _____
4. How many children voted in all? _____

“A Beary Good Guess”

Group Name _____

Part I

Directions: Choose one bear from the bag. Mark a tally of the color you chose.

Replace the bear back in the bag. Repeat this process 30 times.

Tally Marks

Blue	
Yellow	
Red	

Part II

Directions: Make a prediction of how many bears of each color are in the bag.

Our prediction:

Blue _____ Yellow _____ Red _____

Count the number of yellows, reds, and blues that are actually in the bag.

Our actual count:

Blue _____ Yellow _____ Red _____

“A Beary Good Guess”

Extension Activity

Part I

Directions: Choose one cube from the bag. Use a tally mark to record the color. Replace the cube back into the bag. Repeat this process 30 times.

Tally Marks

Red	
Blue	
Yellow	

Part II

Directions: Make a prediction of how many connecting cubes of each color are in the bag. Then count the number of yellows, reds, and blues that are in the bag.

Our prediction:

Blue _____ Yellow _____ Red _____

Our actual count:

Blue _____ Yellow _____ Red _____

Part III

Directions: Write a fraction for the actual number of blue, yellow, and red cubes found in the bag.

Blue _____ Yellow _____ Red _____

#10 - Student

Probability Word Search

J Y E E J T I H P Y M L K X I
U A P L C M C J D K M C L O X
F M C Z B U U I M W J A X E P
Y M A X H S C N D R Z O O S J
D S R T H E I Y L E P V E R M
G X V E H F X S M I R W T K J
Y M R D Q M F A S U K P W P S
G T U D G P Y T D O E E E R R
G L D Y L B A B O R P L L V L
C U G Z E C N A H C K W V Y H
S W Z A H F E A B F O O E N D
N X R I D K P Z L B F L C R E
U R O L L S X C Q Q S S Z K P
B C N A M S D V M X N B O O F
M H O U C N X R X Z E L D V E

BEAR

DICE

MAYBE

POSSIBLE

BOWL

LIKELY

PERHAPS

PREDICT

CHANCE

MATH

PISTACHIO

PROBABLY

ROLLS
UNLIKELY

TEDDY

TWELVE

Just for Fun!! Answer Sheet

Resource Sheet #2 - Teacher

Probability Word Search Solution

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+ + E + + T + + + + + + + + +
+ + + L + + C + D + + + + + + +
+ M + + B + U I + + + + + + + +
+ + A + + S C N D + + + + + + +
+ + + T + E I + L E P + + + + +
+ + + E H + + S M I R + T + + +
+ + + D + + + A S + K P W + + +
+ + + D + + Y T + O E E E + + +
+ + + Y L B A B O R P + L + + +
+ + + + E C N A H C + W V Y + +
+ + + A H + + A + + O + E + + +
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+ R O L L S + + + + + + + + + +
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- (Over, Down, Direction)
- BEAR(6,9,SW)
 - BOWL(10,12,NE)
 - CHANCE(10,10,W)
 - DICE(9,2,SW)
 - LIKELY(9,5,SE)
 - MATH(2,3,SE)
 - MAYBE(9,6,SW)
 - PERHAPS(12,7,SW)
 - PISTACHIO(11,5,SW)
 - POSSIBLE(11,9,NW)
 - PREDICT(12,7,NW)
 - PROBABLY(11,9,W)
 - ROLLS(2,13,E)
 - TEDDY(4,5,S)
 - TWELVE(13,6,S)
 - UNLIKELY(7,3,SE)

Summative Assessment

Name: _____ Date: _____

Part 1

1. John and Mary are playing the game Grab Bag. In the bag there are 9 white marbles, 6 red marbles and 2 yellow marbles. If Mary put her hand in the bag without looking which marble is she most likely to pull out?

Tell why _____

2. Make up your own grab bag game using the numbers 12, 5 and 3.

Part 2

Match these vocabulary words with the definitions: rolls, predict, probability, survey, pictograph.

_____ A question or set of questions answered by a population of people.

_____ A chance that an event will occur.

_____ Pictures used in a graph form to represent data.

