Title: I T ' S P R O B A B L Y P R O B A B L E !

Brief Overview:

Students will learn the meaning of probability. Students will make predictions and draw conclusions from available information and provide examples, which support or refute their conclusions.

NCTM Content Standard/National Science Education Standard
Data Analysis and Probability Standard for Grades 6-8

Learn and apply the basic concepts of probability by:

- Understand and use appropriate terminology to describe complementary and mutually exclusive events.
- Use proportionality and a basic understanding of probability to make and test conjectures about the results of experiments and simulations.
- Compute probabilities for simple compound events, using such methods as organized lists, tree diagrams, and area models.

Grade/Level:

Grades 6-8

Duration/Length:

Three class periods of 45 minutes each.

Student Outcomes:

Students will be able to:

1. Organize and display data using a graph choice.
2. Predict the best solution for linear data.
3. Determine the outcomes using counting techniques.
4. Find the probability of an event with unequally likely outcomes.
5. Express probability outcomes as a ratio, decimal or percent.
6. Predict the probability of actual or simulated events.
7. Define the probability of dependent or independent events.

Materials and Resources:

- Bingo Materials (see 1A)
- Worksheets
- Picture book, Probably Pistachio by Stuart Murphy
- Set of dice
- Five car game markers
- Math journal
- Calculators
- Composition book

Development/Procedures:

LESSON 1: PROBABILITY BINGO

Lesson Procedure

A.	Preassessment/Launch -	Teacher conducts Bingo Game & Scoring	(15 mins)
B.	Teacher Facilitation -	Teacher reviews bingo answers	(10 mins)
C.	Student Application -	Teacher explains Probability Worksheets	(5 mins)
D.	Embedded Assessment -	Students do Exit Problem	(10 mins)
E.	Reteaching -	Student discussion/summarization	(5 mins)
F.	Extension -	Do worksheet for homework	_____
			(45 mins)

Preassessment

Ask students to recall fractions, rate, ratios and percents. Find out how they organize data or forecast the results of a dice throw mathematically. Then have them recollect how to play Bingo and establish class rules for playing.

Launch (Instructions)

1. Open class by writing instructions on the board for the students to clear their desks and have only a writing utensil ready.
2. Distribute Student Bingo Cards.
3. Make sure teacher master copy and worksheets are ready.
4. Review the rules for probability bingo.
5. Remind the students to follow the rules for the game as specified in the class.
6. (Play by reading out definitions and checking the boxes as they are called out. Have students quickly cover their spot with a bingo chip. They can call out BINGO whenever they have got five in a row, but the teacher should keep playing until all clues are done. Students can make a bingo in any direction – vertically, horizontally, or diagonally.)
7. Play until all definitions/questions are done.

Teacher Facilitation

After all questions have been asked, have students score bingo cards by giving a point for each word correct, and 5 pts for each row of answers that they made.
Score Sheets when game is declared over. Teacher will review the key ideas behind probability and to the bingo game after scoring. (See Teacher Master 1A) This lesson is designed to review previous knowledge of terms associated with probability and check for weaknesses in foundational concepts (like fractions, percents, decimals, proportions, estimation, prediction etc.) leading to this topic. This will also assist the student in tallying.

Finally, the teacher will handout and review homework expectations for the worksheet (See Teacher Master 3A).

Student Application –

After students have played and scored the bingo game using their bingo cards (see Probability Cards 1B, 1C, 1D). They will be handed a probability worksheet to clarify questions they may have at home when doing the homework without the teacher. Students solve and predict various types of probability problems *(See Worksheet 3B).*

Embedded Assessment –

The teacher will hand out the exit problem (See 2B) . The students will complete an exit problem for understanding. The teacher will check the students (using Teacher Master 2A) individually as they leave.

Reteaching -

The teacher will conduct a group discussion on the topic of probability with 2 sentences oral summaries from students.

Extension -

The student will complete their worksheets for homework, and the teacher check using the master copy for their outcomes. Desired outcome: 80%.

Remedial extension:

Students can redo the worksheets, citing the reason each problem was wrong and making the necessary corrections. Study it and then redo without help.
Students will use the review to increase their probability knowledge.

TEACHER MASTER COPY (IA)

PROBABILITY BINGO

B	I	N	G	O
Probability calculated using mathematics. **Ans**: **THEORETICAL PROBABILITY**	In tossing dice, the ratio fraction to get odd numbers would be? **Ans: 1/2**	Proof that a solution is correct. Ans: **VALIDATE**	The probability of getting a dime from a purse with 1 nickels, 2 dimes is **Ans: 1/2**	2:3 is a __. **Ans: RATIO**
If events are impossible, they have a probability of… **Ans: ZERO**	A mathematical way used to compare two units. **Ans: RATE**	How many combinations can 2 flavors and 3 toppings of ice cream make? **Ans: 6**	Numbers or expressions that have the same value. **Ans: EQUIVALENT**	Probability calculated from actual results. **Ans: EXPERIMENTAL PROBABILITY**
The set of all possible outcomes of a probability experiment**.** **Ans: SAMPLE SPACE.**	A number that measures the likelihood that an event will occur. **Ans: PROBABILITY**	A ratio that compares a number to 100 and uses a special symbol**.** **Ans: PERCENT**	If events are certain, they have a probability of… **Ans: ONE**	A comparison of two whole numbers by division**.** **Ans: RATIO**
One of the probable results in a probability. **Ans: OUTCOME**	2/4 x 2/5 = ? **Ans:4/20**	A favorable outcome is always… **Ans: POSITIVE**	Its probability depends on the outcome of another event. **Ans: DEPENDENT EVENT**	If you flip 2 coins at the same time, what's the probability of getting 2 heads? **Ans: 1/4**
Its probability does not depend on any other outcome. **Ans:INDEPENDENT EVENT**	Events in a sample that have the same chance of occurring. **Ans: EQUAL OUTCOMES**	A blue ball from a jar with 4 pink, 2 blue, and 1 green ball has a probability of… **Ans: 2/7**	An equation where a/b = c/d states that the two sides are equivalent. **Ans: PROPORTION**	An unfavorable outcome is always… **Ans: NEGATIVE**
A term for picking something without a set pattern is… **Ans: RANDOM**	If you scrambled letters in the word "remember", how likely are you to use an 'e'. **Ans: 3/8**	Investigations to seek the answer to a question is called an… **Ans: EXPERIMENT**	These drawings help figure out probability. **Ans: TREE DIAGRAMS**	A visual tool to represent data in math is called a… **Ans: GRAPH**

MATERIALS:

Teacher Resource
- Teacher Master Bingo Card (1A)
- A class set of Bingo cards
- A class set of Bingo chips
- Teacher Master Worksheets (3A)
- Teacher Master Exit Problem (2A)
- Overhead Masters - Optional

Student Materials
- Student Probability Cards (1B, 1C, 1D)
  3 types – 1 per student
- Bingo chips
- Student Probability Worksheet (3B)
- Student Exit Problem Sheet (2B)
- Pen/Pencil

STUDENT COPY (1B)

PROBABILITY BINGO

Student Name: _____ Grade/Class: _____

B	I	N	G	O
THEORETICAL PROBABILITY	**½**	Free Space	**2/3**	**RATIO**
ZERO	**RATE**	**6**	**EQUIVALENT**	**EXPERIMENTAL PROBABILITY**
SAMPLE SPACE	**PROBABILITY**	**PERCENT**	**ONE**	**RATIO**
OUTCOME	**4/20**	**POSITIVE**	**DEPENDENT EVENT**	**1/4**
INDEPENDENT EVENT	**EQUAL OUTCOMES**	**2/7**	**PROPORTION**	**NEGATIVE**

Correct answer points: _____

Bingo points: _____

Overall score:

STUDENT COPY (1C)

PROBABILITY BINGO

Student Name: _____ Grade/Class: _____

B	I	N	G	O
EQUIVALENT	EXPERIMENTAL PROBABILITY	TREE DIAGRAMS	SAMPLE SPACE	GRAPH
EQUAL OUTCOMES	2/7	4/20	DEPENDENT EVENT	1/4
RATE	POSITIVE	Free Space	1/2	OUTCOME
ONE	INDEPENDENT EVENT	3/8	EXPERIMENT	ZERO
NEGATIVE	2/3	PROPORTION	PERCENT	RANDOM

Correct answer points: _____

Bingo points: _____

Overall score:

STUDENT COPY (1D)

PROBABILITY BINGO

Student Name: _____ Grade/Class: _____

B	I	N	G	O
6	ONE	1/4	EQUIVALENT	2/3
RATE	PERCENT	DEPENDENT EVENT	NEGATIVE	THEORETICAL PROBABILITY
ZERO	4/20	TREE DIAGRAMS	PROPORTION	GRAPH
SAMPLE SPACE	OUTCOME	2/7	Free Space	PROBABILITY
INDEPENDENT EVENT	3/8	RANDOM	1/2	VALIDATE

Correct answer points: _____

Bingo points: _____

Overall score:

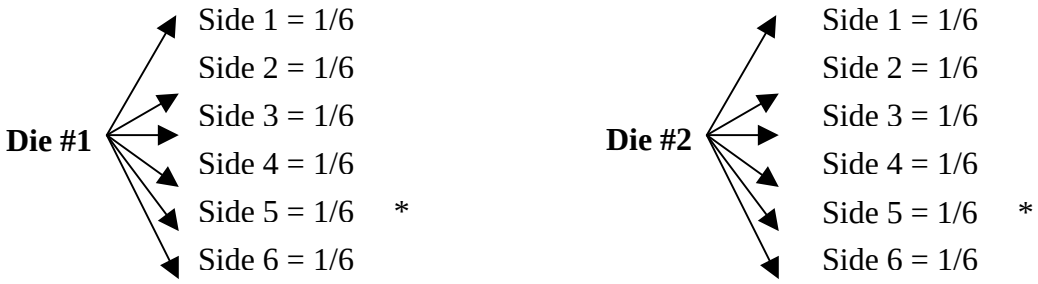
TEACHER MASTER CLOSURE/EXIT QUESTION (2A)

What is the possibility of two kids rolling one die each and both of them rolling a five?

Answer: P(two 5s) = 1/36. or 1 out of 36

Draw a diagram, then explain briefly your answer (2-3 sentences max).

Answer: Each die has six sides, and only one five. Therefore, there is a one in six chance that each kid can get a five. The chance that both of them will is 1/6 x 1/6 = 1/36.



What % is this?

Ans: 1/36 = 0.0278 = approximately 3%

STUDENT EXIT PROBLEM SHEET (2B)

Student Name: _____ **Grade/Class:** _____

What is the possibility of two kids rolling the dice and getting a five on their die?

Draw a diagram and explain briefly (2-3 sentences max).

What % is this?

----------✂----------

STUDENT EXIT PROBLEM SHEET (2B)

Student Name: _____ **Grade/Class:** _____

What is the possibility of two kids rolling the dice and getting a five on their die?

Draw a diagram and explain briefly (2-3 sentences max).

What % is this?

----------✂----------

STUDENT EXIT PROBLEM SHEET (2B)

Student Name: _____ **Grade/Class:** _____

What is the possibility of two kids rolling the dice and getting a five on their die?

Draw a diagram and explain briefly (2-3 sentences max).

What % is this?

TEACHER MASTER PROBABILITY WORKSHEET (3A)

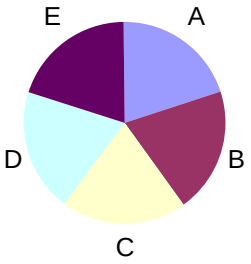
1. Write a number that indicates that an event will certainly occur.
   Ans: One

2. How should you indicate that an event would probably not occur?
   Ans: Zero

3. How many ways can three dolls on a shelf be arranged side by side?
   Ans: 3x2x1 = 6 ways

4. If a boy spins the dial on this spinner. What is the probability of landing on C?
   Ans: 1/5

5. What is the probability of landing on A or B? ***Ans: 1/5 + 1/5=2/5***



6. What is the probability of landing on D? ***Ans: 1/5***

7. A girl had all her skirts made in the same style. She has three uniforms that she wears to school plus two other skirts – one red, and one blue. If a skirt is chosen without looking, what is the possibility of selecting two uniform skirts consecutively?

   Ans: To start, the girl takes one uniform from the five skirts, a probability of 3/5. That leaves four skirts. When she takes the second skirt, the probability of the second being a uniform will be 2/4. So the probability of both of these two being a uniform skirt is 3/5 x 2/4 = 3/10.

8. Use this statement to answer 8-10: ***A ratio is a comparison of two numbers being divided.***

9. True or False? 2:3 is a ratio. ***Ans: True***

10. True or False? 2/3 is not a ratio. ***Ans: False***

11. True or False? 2 out of 3 is not a ratio. ***Ans: False***

STUDENT PROBABILITY WORKSHEET (3B)

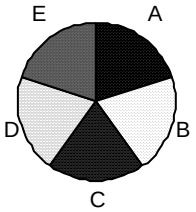
1. Write a number that indicates that an event will certainly occur.

2. How should you indicate that an event would probably not occur?

3. How many ways can three dolls on a shelf be arranged side by side?

4. If a boy spins the dial on a spinner, what is the probability of landing on C?

5. What is the probability of landing on A or B?



6. What is the probability of landing on D?

7. A girl had all her skirts made in the same style. She has three uniforms that she wears to school plus two other skirts – one red, and one blue. If a skirt is chosen without looking, what is the possibility of selecting a uniform skirt?

Use this statement to answer 8-10: ***A ratio is a comparison of two numbers being divided.***

8. True or False? 2:3 is a ratio.

9. True or False? 2/3 is not a ratio.

10. True or False? 2 out of 3 is not a ratio.

LESSON 2: PROBABLY…

PreAssessment –

Students are able to organize and display data using circle, line, and bar graphs. Students are able to solve fraction problems, and convert fractions to decimals and the reverse.

Launch –

Read the picture book, Probably Pistachio by Stuart J, Murphy to introduce the vocabulary terms that relate to the meaning of probability.

Teacher Facilitation –

Provide vocabulary list of words. (See Vocabulary worksheet)
Define each vocabulary word and then briefly review each word with examples. Teacher will begin an activity on tree math diagrams. (See worksheet, *Probably a Tree Sandwich Diagram.)*
Note that this lesson is designed to develop student's ability to create tree diagrams and figure probabilities of events based on those diagrams.

Student Application –

Students should write vocabulary words in math composition book for a math glossary on probability.
Students will interpret data to make decisions and predictions for their probability activity, *Probably a Tree Sandwich Diagram.*

Embedded Assessment –

Teacher observes students with tree diagram activity.
Use answer key to check their outcomes.

Reteaching/Extension -

Provide another probability activity; *Probably a Car Race.* (See worksheet)
Students will use thinking and problem solving to understand a game of experimental probability.
In this car race, does each car have an equal chance of winning this car race?
Have students predict which car will be most likely to win when two number dice are tossed and the value is subtracted from the value of the other dice. The difference is how the racers move their cars forward and backward on the car board game.
The game continues until someone wins the race.
Play the game two or three times.
Discuss all possible outcomes.
Have students complete a math journal entry by explaining how they arrived at their outcomes *Math Journal Entry* (See worksheet). Write entry in paragraph form.

Lesson #2

Vocabulary List

Probability –

The number of favorable outcomes compared to the number of possible outcomes of an experiment. A number from 0 to 1, which indicates how likely something, is to happen.

Probability of an event –

A number that measures the likelihood that the event will occur.

Experimental probability –

A probability calculated from the results of an experiment.

Sample –

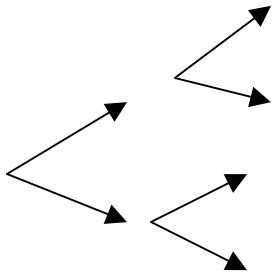
The set or collection of all possible outcomes of a probability experiment.

Outcomes of the activity –

One of the possible events in a probability situation.

Tree Diagram -

A way to list a series of outcomes in a given experiment. The branches shown are branches for each possible outcome.



Examples Verbally or Written on Chalk or White Board:

Find the probability and answer as a fraction. A dice is rolled:

1.) P (1) = **1/6** 2.) P (3 or 4) = **2/6 or 1/3** 3.) P (7) = **0** 4.) P (<6) = **5/6**

Eight cards that spell **M A R Y L A N D**.

1.) P (A) = **2/8** 2.) P (M) = **1/8** 3.) P (Consonants) = **6/8 or 3/4**

Vocabulary
http://mdk12.org/instruction/curriculum/mathematics/bygrade/glossary.shtml

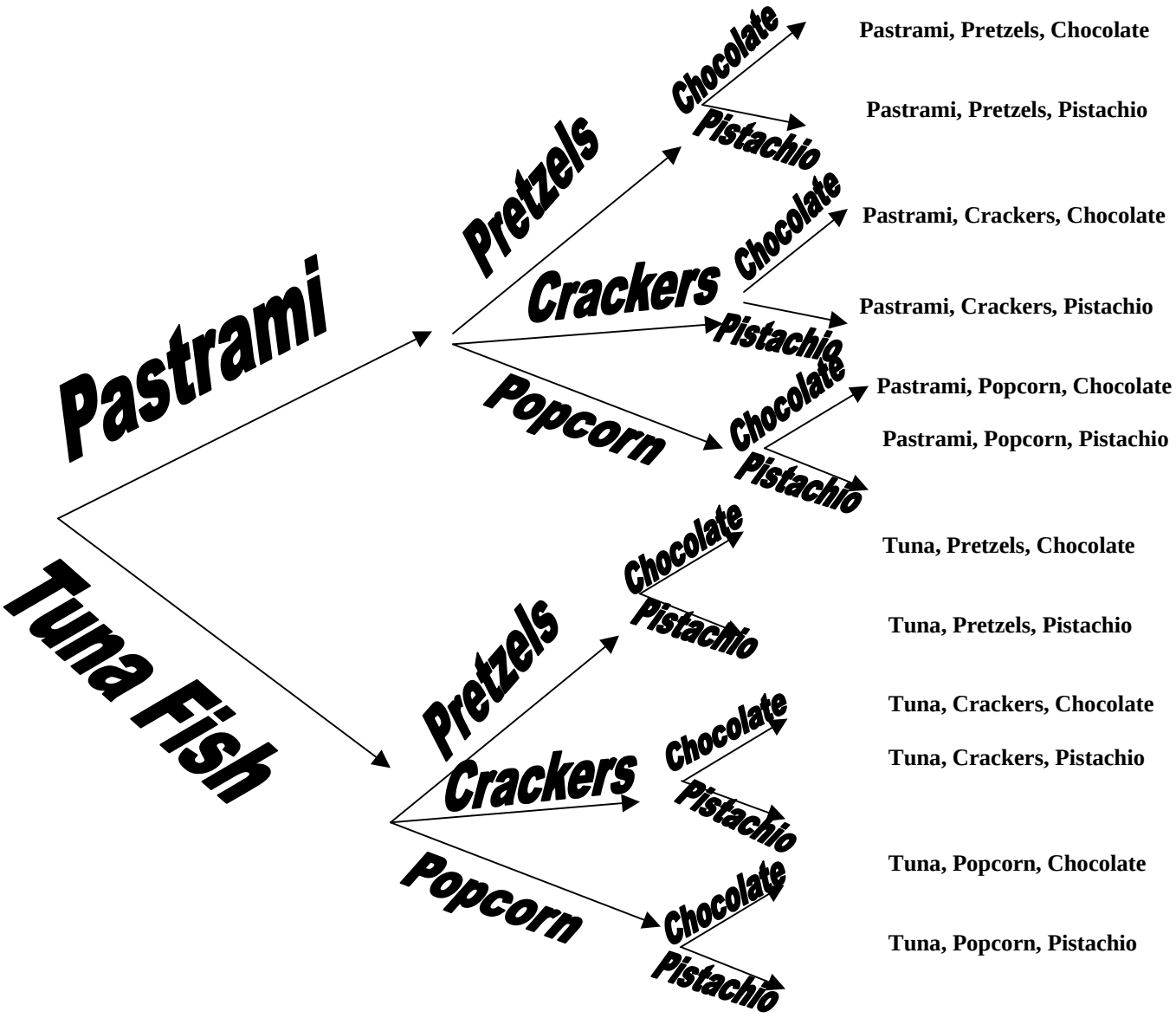
Lesson #2

Probably a Tree Sandwich Diagram

Make a tree diagram by listing all possible outcomes to Jack's lunch. The lunch choices of the day are pastrami and tuna fish with pretzels, crackers, or popcorn, and either chocolate or pistachio ice cream.

Lesson #2

Probably a Tree Sandwich Diagram
Answer Key
Twelve Outcomes



Lesson #2

Probably a Car Race

#1

#2

#3

#4

#5

Lesson #2

Math Journal Entry

What was the outcome of the car races? Did you predict the winner? How did you arrive at this predication?

LESSON 3: WHERE WILL I SIT?

Lesson 3

Preassessment - Note that the students will be familiar with the language of probability from the previous lessons.

Launch – The students will read Student Resource Sheet 1. Then, the students will complete the seating chart for the bus by using Student Resource Sheet 2.

Teacher Facilitation –There will be a short class discussion as to the layout of the bus. The students, prompted by the teacher, will work as a class to complete problems 1 through 5 on Student Resource Sheet 3. The students will use the Student Resource Sheet 2 as a visual aid. For problem 1, students will be able to see that there are 4 seats x 10 rows + 5 seats in the back for a total of 45 seats on the bus. For problem 2, students will be able to see that there are 2 window seats per row x 10 rows + 2 window seats in the back of the bus, total of 22 window seats. For problem 3, students will see that an aisle seat is a seat that is adjacent on the left or right of an aisle. There are a total of 20 aisle seats. For problems 4 and 5, students will use the probability formula: Probability = What you want to happen/ Everything that could happen. Answers will be written as a fraction, decimal, and then a percent. For problem 4, what is the probably of sitting in an even- numbered row? P (sit in evened- numbered row) = (4 seats x 5 rows)/45seats = $\frac{20}{45} = \frac{4}{9}$.

This is very close to one half. Set up a long division problem and do the work. $9\overline{)4} = 9\overline{)4.000}$ and round to the nearest hundredth. Notice that you will always arrive at the same remainder of 4. The answer is a repeating decimal and can be written as .444…; the three dots mean and so on. Since you are rounding to the nearest hundredth, the digit 4 is less than 5 so round down. The answer is approximately equal to .44. Move the decimal two places to the right, add a percent sign and you arrive at approximately 44%. For problem 5, P (sit in window seat) = 22/45, which is approximately equal to .49 or 49%.

(Students can use calculators for this exercise)

Student Application – The students will work with a partner to complete Student Resource Sheet 3, problems 6 through 10.

Embedded Assessment – Circle the room to make sure students are using the probability formula and converting their answers to both decimals and percents properly. Have students write their own probability question and solve it on an index card. Collect and post on bulletin board.

Reteaching/Extension - Have the students who understand probability to work with students who are not quite sure of the process. Have the former explain and guide the latter through the process.

Name_____
Date_____Class_____

DESTINATION SIX FLAGS

ALL ABOARD

Imagine that you are boarding a bus for a trip to Six Flags. The rows are numbered 1 to 10. There are 4 seats per row, two on each side of the aisle.

In the back of the bus, there is one long bench that has room for 5 students. Seats in each row are labeled A through D and the seats in the back of the bus are labeled A through E. The aisle seats of the first two rows are reserved for the handicapped. Work in pairs to illustrate the seating on the bus. Use squares for each seat. Label the seats, rows, and aisle. Place W's to show the location of side windows. Label the seats for the handicapped with the seat appropriate letter and an h.

Name_____
Date_____Class_____

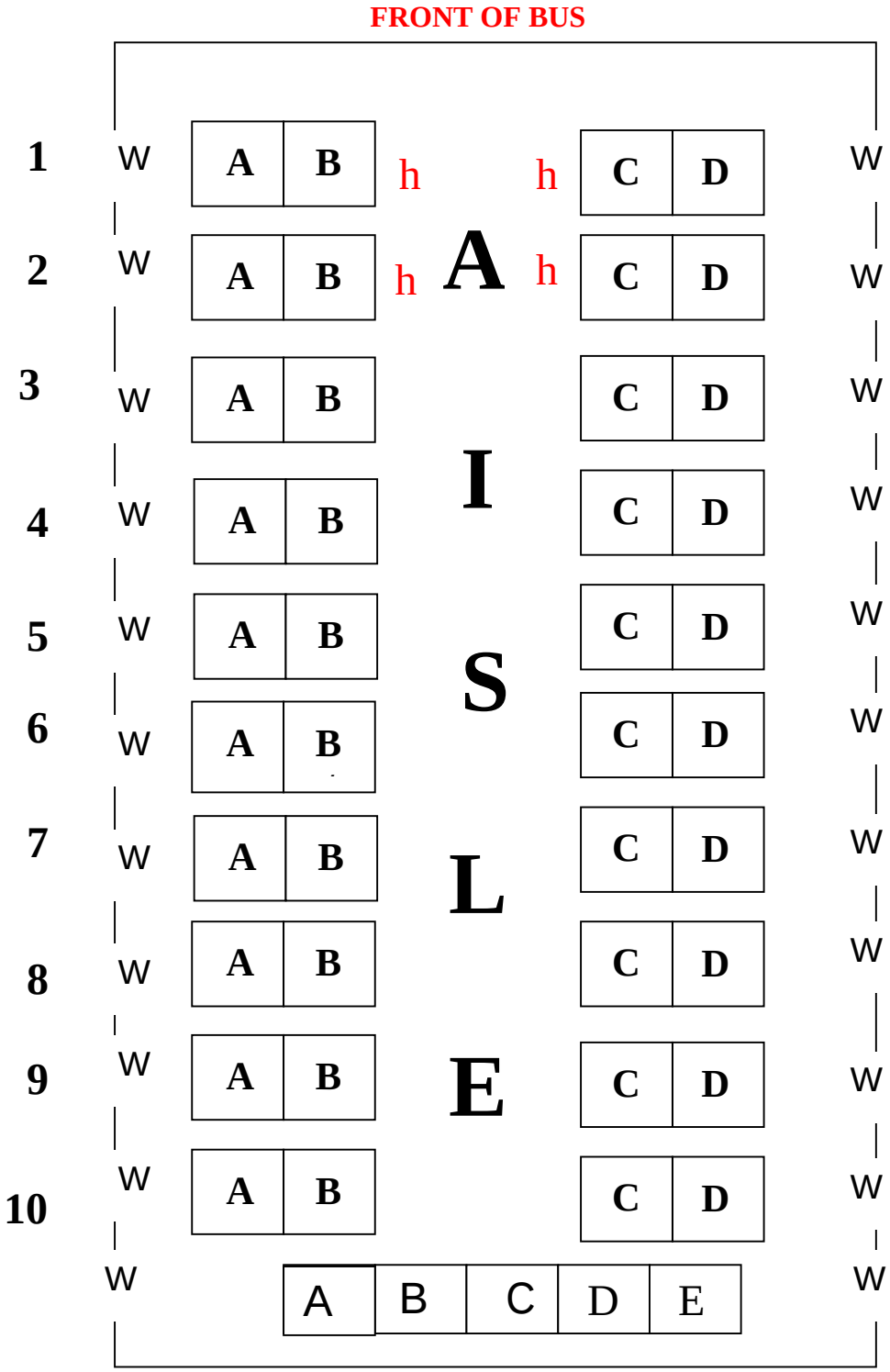
THE BUS

Use the Destination Six Flags All Aboard Sheet to draw the seats on the bus.

FRONT OF BUS

THE BUS

Use the Destination Six Flags All Aboard Sheet to draw the seats on the bus.



Lesson 3 Student Resource Sheet 3

Name_____
Date_____Class_____

WHAT ARE MY CHANCES OF SITTING ……?

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Use the seating chart of the bus and the probability formula to answer the following questions. All probabilities are to be shown as a ratio, decimal, and percent.

Probability = What You Want to Happen/All Possibilities

1. **How many seats are on the bus? How did you arrive at this figure?**
2. **How many window seats are there on the bus? How did you arrive at this? Figure?**
3. **What is an aisle seat? How many aisle seats are there**
4. **What is the probability of sitting in an even-numbered row?**
5. **What are your chances of sitting in a window seat?**

Work with a partner to solve.

6. **What are your chances of sitting in an aisle seat?**
7. **What are your chances of sitting in an "A" seat?**
8. **What are your chances of sitting in a handicapped seat? (All seats on the bus must be filled.**
9. **What is the probably of sitting in row 12?**
10. **What are your chances of in a window seat or an aisle seat?**

Exit Quiz

With your partner, write another probability problem based on the seating chart for the bus. Use the probability formula to solve. Write your answer as a fraction, decimal and percent.

WHAT ARE MY CHANCES OF SITTING ……?

.

Use the seating chart of the bus and the probability formula to answer the following questions. All probabilities are to be shown as a ratio, decimal, and percent.

Probability = What You Want to Happen/All Possibilities

1. How many seats are on the bus? How did you arrive at this figure?
   45 **4 seats x 10 rows + 5 seats in back**

2. How many window seats are there on the bus? How did you arrive at this?
   22 window seats **2 x 10 rows and 2 at the end of the bus**

3. What is an aisle seat? How many aisle seats are there?
   An aisle seat is a seat that is adjacent to the aisle (touches to the left or right).
   20 aisle seats

4. What is the probability of sitting in an even-numbered row?
   P = 20/45 = 4/9 = approximately equal to .44 or 44%

5. What are your chances of sitting in a window seat?
   P = 22/45 which is approximately equal to .49 or 49%

Work with a partner to solve.

6. What are your chances of sitting in an aisle seat?
   P = 20/45 = 4/9 = approximately equal to .44 or 44%

7. What are your chances of sitting in an "A" seat?
   P = 11/45 which is approximately equal to .24 or 24%

8. What are your chances of sitting in a handicapped seat? (All seats on the bus
   P = 4/45 which is approximately equal to .09 or 9%

9. What is the probability of sitting in row 12?
   P = 0/45 This is impossible.

10. What are your chances of sitting in a window seat or an aisle seat?
    P = $\frac{22+20}{45}$ **=** $\frac{43}{45}$ **= which is approximately equal to .96 or 96%**

Exit exams are to be placed on index cards and collected.

Summative Assessment:

Students will be assessed throughout all classroom activities from each daily lesson presented. The written journal exercise from Lesson #2 will not only be a Math assessment, but also cross curriculum as an English writing grade.

Authors:

Karen Zipp
Diggs-Johnson Middle School
Baltimore City, Maryland

Anita Blank
Mother of God School
Archdiocese of Washington, D.C.

Hilary Daly
Sligo Adventist Middle School
Potomac Conference, Maryland