Lesson Title: Statistics and Probability

Unit Title: Probability

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Subject, Grade Level, and Date: Pre-Algebra, 7th, February 4th, 2014

Placement of Lesson in Sequence

This lesson is placed in succession after students learned about mean, median, and mode which are used to measure central tendency.

Central Focus and Essential Questions

The central focus of this lesson is to help students to begin to build a basic understanding of probability. By the end of the lesson students will understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Students should also be able to show an understanding that the larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

Content Standards

**7.SP.C.5.**

**Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.**

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| Learning Outcomes | Assessment |
| Students will be able to:   1. Understand that the probability of a chance event is a number between 0 and 1, which expresses the likelihood of an event occurring. 2. Understand that the larger the number, the greater the likelihood of the event occurring. 3. Understand that a probability of near zero indicates that the probability is very unlikely or even maybe near impossible. 4. Understanding that the probability of ½ of an event means that an event is near neither unlikely nor likely; that the probability of that chance event is about equal. 5. Understand that the probability of 1 or near one means that the event is likely or always true (if the probability is 1). | 1. Strategic questions during the lesson and class discussion after direct instruction. 2. Questions asked to each student during direct instruction. 3. Benchmark assessment 1A and 1G. 4. Benchmark assessment 1C and 1F. 5. Benchmark assessment 1B. |

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| Learning Targets | Student Voice |
| 1. I understand that the probability of a chance event is a number between 0 and 1, which expresses the likelihood of an event occurring. 2. I understand that the larger the number, the greater the likelihood of the event occurring. 3. I understand that a probability of near zero indicates that the probability is very unlikely or even maybe near impossible. 4. I understanding that the probability of ½ of an event means that an event is near neither unlikely nor likely; that the probability of that chance event is about equal. 5. I understand that the probability of 1 or near one means that the event is likely or always true (if the probability is 1). | The learning targets will be written on a document for the students. The main learning target will be written on the board. This will give the students access to the objectives of the lesson and let them be aware of what they are required to know by the end of the lesson. Throughout the lesson students will answer questions posed by the teachers. Students will then have the opportunity to both interact with their peers in the Trading Transformations activity and then have the opportunity to create their own translations and reflections. At the end of the lesson, students will self-assess their learning, the lesson, and teacher’s instruction on the exit slip. |

Prior Content Knowledge and Pre-Assessment

Previously students have learned about measurements of central tendency. Conceptually, even though they don’t know it, students have been working with statistics and probability all their lives in games. For example, students understand the definition of fractions, equivalent fractions, and can add, subtract, multiply and divide fractions. This can help students understand probability by relating it to prior knowledge of fractions. Procedurally, students know how to add, subtract, and multiply both proper and improper fractions; meaning that they understand how to work with examples of probability, they have just never really related fractions with probability outcomes.

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| Academic Language Demands | | |
| Vocabulary & Symbols | Language Functions | Precision, Syntax & Discourse |
| * Math terms: * Probability * Outcome * Simple event * Sample Space * Theoretical probability * Experimental probability | * Students will express their knowledge of how to describe probability by being able to express several probability questions correctly and then create their own probability scenarios. Assessed by the benchmark assessment homework activity worksheet. | Mathematical Precision:  Students must be able to correctly express probability in scenarios and to create their own probability models.  Syntax:  Students must obtain at least 80% of the correct answers on their homework worksheet to show understanding of the math terms.  Discourse:  Students will be able to discuss as a class the connection between probability scenarios and how probability is seen in the real-world. At the end of the lesson, students will have to again explain how well he or she felt the concept was understood. |

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| Language Target | Language Support | Assessment of Language Target |
| I can describe the definition of probability and understand what it means for an event to be almost impossible to occur, equally likely to occur, and certain to occur. | The language target is supported by direct instruction, then strengthened when students do the lesson activity, and then assessed by the homework for the day. | The language target is assessed using the benchmark assessment homework activity. If students are able to complete the homework with at least 80% accuracy, students are showing knowledge of understanding that probability is a desired event out of a total sample space. |

Lesson Rationale (Connection to previous instruction and Objective Standards)

This lesson connects to the previous lesson, because students are learning how they can use their knowledge of graphing and create 2D figures that they can manipulate in order to change the location of the object. This lesson meets the objective standards because students learn various meanings of probability and then can show their understanding of probability in several ways. After learning the definition of probability, students will then learn about different kinds of probability such as: uniform probability and non-uniform probability, relative frequency, long-run relative frequency, and compound events.

Differentiation, Cultural Responsiveness and/or Accommodation for Individual Differences

In order to accommodate for students with differences, during my observation of the class, I made sure to observe my students and obtain their methods of learning style, so now when I teach I make sure to teach using all three learning types: visual, auditory, and kinesthetic to make sure all my students have an opportunity to learn in their desired learning style. To adapt to cultural responsiveness I try to find activities and worksheets that are not bias or offensive. I also try to use examples that all my students will know, not examples that some students will not know just based on their gender, race, or ethnicity.

Materials – Instructional and Technological Needs (attach worksheets used)

White board

White board markers (having a few colors would be best)

Pencils (at least one for each student along with a few extras)

Paper (for students to take notes)

Rock, paper, scissors Worksheet

Homework assignment

Activities Relating to Each CCSS in Learning Progression

7.SP.C.5.Activity:

The purpose of this activity is to introduce basic information on probability and statistics. After this activity, the student will be able to determine whether or not the game is fair and be able to interpret and display the data obtained. The student will also be able to see that probability is used often in society.

Procedures:

Divide the class into pairs and have them play the game fourteen times. A rock is a closed fist. Paper is palm on palm, and scissors is the number two horizontally. The student hits their other hand twice, and on the third time gives the symbol they wish. A rock beats scissors. Paper beats rocks, and scissors beats paper. Instruct the students to keep a record of wins and losses. Then, have students try to answer the activity questions in their groups. After most students have completed both the game and the activity questions, go over the activity questions as a class and ending the class with a class discussion.

**Student Worksheet**

**Rock, Paper, Scissors –The Study of Chance Game**

Directions:

First, pick if you’re going to be Player A or Player B. You and your partner will play rock, paper, scissors eighteen times and record your which hand sign you chose, which hand sign your partner choose, and who one the round after every turn.

How to Play the Game:

A rock is a closed fist. Paper is palm on palm, and scissors is the number two horizontally. The student hits their other hand twice, and on the third time gives the symbol they wish. A rock beats scissors. Paper beats rocks, and scissors beats paper. If the round results as a tie just write down which hand-sign you and your partner both pick, and then denote the round as a tie.

Table for Recording Data:

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| --- | --- | --- | --- |
| Trial/  Round | Player A sign chosen | Player B sign chosen | Outcome (who won) |
| 1 |  |  |  |
| 2 |  |  |  |
| 3 |  |  |  |
| 4 |  |  |  |
| 5 |  |  |  |
| 6 |  |  |  |
| 7 |  |  |  |
| 8 |  |  |  |
| 9 |  |  |  |
| 10 |  |  |  |
| 11 |  |  |  |
| 12 |  |  |  |
| 13 |  |  |  |
| 14 |  |  |  |

Activity Questions:

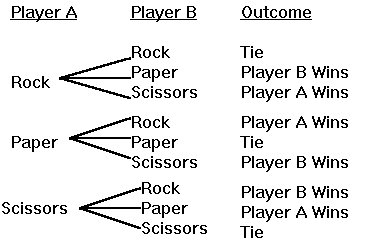
Answer the following questions to determine if the game is fair.

* Drawing a tree diagram, using what you know about how the game is played and won, plus your trial results to find how many possible outcomes the game has.

Solution: 9 possible outcomes per trial/round

* Label each possible outcome (results) on the tree diagram as to win for a, b, or tie.

Solution:



* Count the number of wins for A.

Solution: 3

* Find the probability A will win in any round.

Solution: 3/9 = 1/3

* Count the number of wins for B.

Solution: 3

* Find the probability B will win in any round.

Solution3/9 = 1/3

* Find the mean, mode, and range of your results.

Solution: Each answers will be slightly different.

* Is the game fair? Do both players have an equal probability of winning any round?

Solution: Yes!

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| Teaching & Instructional Activities | | | |
| Time | Teacher Activity | Student Activity | Purpose |
| 8:50AM-9:10AM | Teacher will teach through direct instruction the definition of probability. | Students will actively listen and take notes, as well as answer teacher’s questions. | Students will be able to learn as a class the definition of probability in a very direct and structured manner. Through the process of asking questions the teacher will make sure that students are all understanding the definition. |
| 9:10AM-9:40AM | Teacher hand out the rock, paper, scissors activity and then give student their pair groups. Then, teacher will walk around answering and helping students (if needed). | Students will play the rock, paper, and scissors game according to the worksheet and then be able to answer the end of activity questions.  By pairing students by heterogeneous ability level students can help each other out during the activity. This type of grouping benefits both students because it allows the lower level student to reach the expected level of learning and the higher achieving student by teaching can deeper their understanding of the conceptual and procedural of probability, because according to a well regarded philosophy, “by teaching we learn”. Students will monitor their learning by finishing their game trials, filling out the worksheet, and getting feedback from the teacher throughout the lesson and during the classroom discussion and review of activity questions. | Students are practicing learning about uniform probability and seeing if probability is actually equally likely. This activity is inclusive, because the game rock, paper, scissors is very popular and a majority of students are aware of this game and know how to play it and, for those who do not know how to play, it a simple game to learn. A teacher can support for varied learning by carefully structuring his or her pair groups. |
| 9:40AM-9:50AM | Teacher will lead a classroom discussion where he or she will gauge if students truly understood the lesson. | Students are actively participating in the discussion and answering teacher’s questions. | Students are expressing verbally if they understood the lesson and expressing their understanding of the concept. Then, through the benchmark assessment be able to prove that they understood the concept and are ready to move on.  The assessment assesses students’ ability to express their knowledge of where the probability lies on the probability scale through the asking of questions that are relatable to real-life. Where students use their reasoning and problem solving skills to correctly state the right probability. By being able to pass this benchmark assessment with at least 80% accuracy students are showing their understanding of the definition of probability and their ability to read a question pertaining to probability and correctly draw or create the given probability; showing their conceptual understanding of the objective: understand that the probability of an event is always between 0 and 1 and be able to use the probability range to express their conceptual understanding of probability. |
| Next lesson: | Teacher will explain collecting data, then observing and predicting relative frequency. | Students will take notes during direct instruction and then practice the concept in the activity. | Students learn how to collect money and then through observing events, they can find answers pertaining to their outcomes.  In this lesson students also learn about relating probability to the long-run (for more than five or ten trials) to relative frequency of a chance event using items such as coins, number cubes, cards, and spinners. |