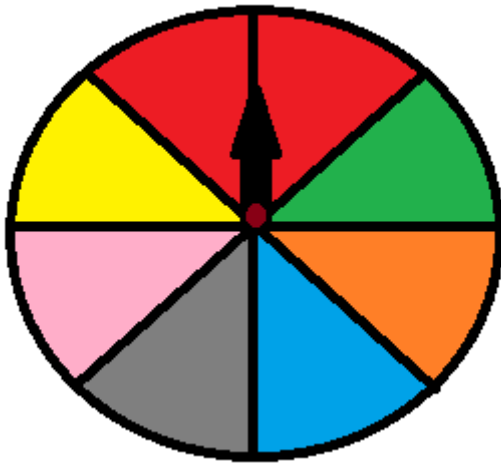


Learning Progression Formative Assessment

The grade level that the learning progression will involve are high school students in an Algebra B classroom. This is a group of 11 students that are behind in algebra. This is why grade level 7 common core state standards are chosen. These students need more time for practicing new activities and more time to master new skills. The book used in this classroom is titled *Algebra 1: Applications, Equations, Graphs*. This textbook was published in 2004 by McDougal Littell, a division of Houghton Mifflin Company. This book is not used very much during class time. This learning progression will be for three probability activities. The first lesson will be an introduction of how to find probability and identify the likelihood of an event. Students will make a connection that if an event has a high probability, the event is more likely to take place. The second lesson will have students perform their own investigation of finding probability. Finally, the third lesson will have students create their own probability project. Students will use a real world application that can be used to collect data that relates to probability.

CCSS.MATH.CONTENT.7.SP.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 $\frac{1}{2}$ indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.



The primary concept of the first lesson is to introduce probability to the students. The teacher will go over vocabulary of what probability is and what equation is used to find it. This will give students a better understanding of what probability is and when it can be used. Students will be taking notes all through the lesson, even of the vocabulary words. Students will be able to refer to their notes on vocabulary on other important information if they need to at any time. After developing an equation, the teacher will go through a practice problem with the students. The teacher will walk through how to find the

probability of each color on the spin wheel. By walking through a practice problem, the students will gain an idea of what it expected of them when they need to solve these kind of probability problems. The teacher will also indicate what the likelihood of landing on each color will be based on what the colors probability is. This will give students the knowledge of what color has a higher probability and the students will make a connection that if the event has a higher likelihood then it has a high probability of taking place. How students will reach the following standard is by completing a worksheet where they will calculate the probability for picking fruit out of a bag. The worksheet will give students a lot of practice when solving for probability by using the equation developed during the

lecture. After calculating probability, the students will have to indicate which event is more likely to take place, which is less likely to take place, and justify their answers. When the students have completed the worksheet, the teacher will collect the worksheets from the students and assess their work. If the data from the worksheets indicate the students need more time to practice, then students will complete an additional worksheet that will give them more practice on the new skill.

CCSS.MATH.CONTENT.7.SP.6. Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.

The primary concept in the second lesson is to collect data and approximate probabilities based on the data collected. The procedure to be learned is to calculate the probability of all the colors of M&M's contained in one bag. The probability will be written in a fraction, a decimal, and a percentage. The vocabulary needed in this lesson is probability, ratios, decimal, and percentage. Some of these vocabulary words were discussed in the previous lesson, students should have them in their notes. However, the teacher will review all vocabulary during the second lesson. The students will start the class period with a warm up that consists of converting fractions to decimals and decimals to fractions. This warm up will give students an idea of how they will be writing their probability answers on the worksheet they will be completing later in the lesson. The students already recognize that by dividing the numerator by the denominator they will compute a decimal. Also, the students will recognize that "percentage" means "per 100" and that by multiplying the decimal by 100 they will compute the correct percentage. For example, one problem will be converting .95 into a percentage. The students will multiply .95 by 100 to get 95%. This activity will help they students fill out their worksheet later in the lesson. After the warm up, the teacher will then review and talk with the students of what the definition of probability is along with other vocabulary words. The students will first be asked to give their own definition of probability and then the teacher will review the actual definition of probability. This will give students the opportunity to compare their definition of probability to the actual definition; the students can either alter or add on to their definitions of probability if needed. In addition, the students will be asked to think of and share "real life" examples that involve probability. This is a way for students to discover why it is relevant and important to learn how to find probability. The teacher will review with the students in creating the equation to find probability. The teacher will then go on to introduce the activity of M&M Probability that the students will carry out. The students will be split into small groups, given a worksheet, and will investigate what the probability is for one certain color of an M&M is. The students will find the probability of all 7 colors in a random bag of M&M's. For example, if there is a total of 50 M&M's and 10 blue M&M's, the probability of blue is $10/50$ in a fraction, .20 as a decimal, and 20% as a percentage. The teacher will relate this situation to the equation the class created previously. The worksheet consists of two tables that represent two trials with three columns and eight rows. The three columns are for fractions, decimals, and percentages. The warm up prepares them for filling out the tables. Seven of the eight rows represent the colors of M&M's and the last one is a "sum of columns" row. This will help the students identify that when adding all the fractions

together and all the decimals together, the sum will equal one. And when adding all the percentages together, the sum will equal 100. A misconception will arise when adding the decimals; the students will have to add all of the decimal places to get exactly one. But there are too many decimal places in some cases so the students' sums will be close to 1. The students will distinguish that probabilities closer to one are more likely to happen than ones closer to 0. But the sums should equal one for fractions and decimals and 100 for percentages. By giving the students a clear instructional lecture and a clear description of what the lesson is about will enable them to carry out the procedures more easily and with little difficulty. The students will be excused to carry out the two experiments of finding the probability of two different bags of M&M's. The teacher will walk around the room observing and assisting the students. This activity will give the students a lot of practice of using the probability equations and calculating the probability for each color of M&M's. To conclude the second lesson, the teacher will review results with students and go over review questions about the experiment. The teacher will ask students to talk about their reflection questions on their worksheet. This will give the teacher an idea of how well the students understood the mathematical procedures and if the students had reached the learning targets or not.

CCSS.MATH.CONTENT.7.SP.7.a. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected.

In the last part of the lesson, students will use their knowledge of probability to create their own model and use it to calculate the probabilities of their model. Students will work in small groups, create a model, collect data of probability, describe what the likelihood of each event in the model, and present their model to the rest of the class. This will give students the opportunity to use real world applications and find probabilities relating to that specific application. This last project is a summative assessment of what the students have learned and if they have reached each standard.

Lesson Plan:

Lesson Title: M&M Probability

Unit Title: Probability and Statistics

Teacher Candidate: Taylor Richards

Subject, Grade Level, and Date: Mathematics, High School, January 2015

Placement of Lesson in Sequence

This is the first lesson in the unit of probability and statistics. The students already have an understanding of fractions.

Central Focus and Essential Questions

This lesson is going to have students find the probability of drawing a certain color of M&M's. This lesson will have students write the probability as a fraction, decimal, and a percentage. The students will find probability for each color of M&M's in a fraction, a decimal, and a percentage. Students will carry out 2 data collections that consist of 2 different bags of M&M's. Students will talk about the similarities and differences between their results. Students will also be able to understand that probability lies between 0 and 1.

Content Standards

CCSS.MATH.CONTENT.7.SPC.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 $\frac{1}{2}$ indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

Learning Outcomes (Objectives)	Assessment
Students will be able to: <ul style="list-style-type: none">• Identify the ratio of each color of two bags of M&M's.• Write the theoretical probability in a fraction, a decimal, and a percentage.• Explain that probability of an event lies between 0 and 1.• Identify the differences and similarities between both data collections.	In this lesson, the formative assessment will consist of a worksheet that the students will complete and hand in to the teacher as well as observation by the teacher. The teacher will split the students into 4 small groups so each group can experiment with 2 bags of M&M's. The teacher will walk around to each group to observe how each group is doing and if each group understands the task at hand. The teacher will comment on the students' work. After the students finish their worksheet, the teacher will conduct a class discussion about the result of the students' data collection and go over the reflection questions. The teacher will also put up a question for the students to find the probability of 2 colors.

Learning Targets	Student Voice
<ul style="list-style-type: none">• I can write the probability as a fraction, decimal, and a percentage.• I can explain that probability lies between 0 and 1.• I can identify the ratio of all the colors in a bag of M&M's.	Learning targets will be discussed with the students after they have completed their warm up. The warm up will consist of turning fractions to decimals and decimals to percentages. Students will then be split into small groups to collect data from the 2 bags of M&M's. The teacher will go over a small introduction of how to calculate the ratios then let the students finish the worksheet in their groups. When each group finishes their worksheet, the students will give their worksheets to the teacher.

Prior Content Knowledge and Pre-Assessment

Students have an understanding of fractions and little knowledge of decimals. Pre-Assessment will be included in the warm up. This will give the students practice in converting from fractions to decimals and decimals to percentages.

Academic Language Demands		
Vocabulary & Symbols	Language Functions	Mathematical Precision, Syntax, & Discourse
<ul style="list-style-type: none"> • Vocabulary: probability, ratio, decimal, percentage. • Symbols: % • Probability is equal to the number of favorable outcome divided by the total number of possible outcomes written as a fraction, a decimal, and a percentage. 	<ul style="list-style-type: none"> • Students will be able to write the probability in three different manners. • Students will be able to relate the given probability equation to finding the probability of each color of M&M's. • Students will be able to identify and write about similarities and differences between their results of two different bags of M&M's. 	<p>Mathematical Precision: Students must be able to correctly write the probability as a fraction, decimal, and a percent. Students will be able to identify which probability is in what form.</p> <p>Syntax: Students must have an understanding of finding probability and how to convert between each unit of probability.</p> <p>Discourse: Worksheets will be completed in small groups. Students will carry out two data collections and calculate probabilities in three different forms. After the activity is complete, the students will be able to explain differences and similarities between the data collections.</p>

Language Target	Language Support	Assessment of Language Target
I can write probability in three different forms and write in my own words the similarities and/or differences that evolved during my activity.	Model how to find probability in the small introduction. Also familiarize the students with converting from fractions to decimals and decimals to percentages through the warm up.	When going over the warm up, the teacher will ask the students to answer the questions. Based on the students' responses, the teacher will evaluate if the students need more emphasis on what each term means. At the end of the activity, the teacher will facilitate a class discussion where the students will talk about the results of their results and talk about similarities and/or differences between the experiments.

Lesson Rationale

Because this is the first lesson of the unit, students will only have knowledge of how to write a fraction and how to write a decimal. This lesson will help students understand that fractions can be written as decimals and decimals can be converted into percentages.

Differentiation, Cultural Responsiveness and/or Accommodation for Individual Differences

To accommodate for a large difference in mathematical ability, the students will be carrying out a 7-8th grade level probability experiment. Also, students will work together in small groups to complete the tasks

at hand. Hence, students who understand how to complete the problems can help ones who are falling behind.

Materials

8 bags of Chocolate M&M's
 25 Worksheets
 25 calculators
 25 pencils

Teaching & Instructional Activities			
Time	Teacher Activity	Student Activity	Purpose
5min.	Warm Up: give the students a warm up of converting fractions to decimals and decimals to percentages. Go over as a class.	The students will complete the warm up individually. Students will ask questions if needed.	This activity will introduce students to probability that is represented in fractions, decimals, and percentages.
10min.	Give the students a short introduction of probability and what the class will be doing today.	Listening to teachers instructions and follow directions.	The short introduction will help the students recognize the learning targets and how to reach them.
2min.	Split the class into 4 small groups.	Follow the teachers' instructions.	This will allow the students to collect data with 2 bags of M&M's.
10min.	Walk around and observe that the students are carrying out the activity correctly. Answer any questions that are asked.	Carry out the activity of finding the probabilities asked for on the work sheet of each bag of M&M's.	This will relate back to their warm up problems.
6min.	Ask students to talk about the similarities and differences of their results. Answer reflection questions at the end of worksheet.	The students will write on their worksheet and talk in their groups the differences and similarities they found in after carrying out their data collections. Answer reflection questions.	This activity will have the students compare and contrast their work and think of theoretical events that could or could not take place.
5min	Write a question on the board for the students to find the probability of two colors of M&M's. Go over the question as a class when the students are finished.	Solve the question.	This will give the students a preview of the following lessons that will come.

Warm Up:

Convert $\frac{1}{2}$ into a decimal. Convert $\frac{3}{8}$ into a decimal. Convert .33 into a percent. Convert .95 into a percent.



Name:

M&M

Probability

Today you are going to carry out an experiment that tests two bags of M&M's.

1. What is probability?

2. If you were to open a bag of regular chocolate M&M's, which color would you

	<u>Trial 1</u>	<u>Trial 2</u>
Most likely get?		
Least likely get?		

3. Do you think the probabilities for each color will be the same in each bag you test?

• **Experiment:**

1. Take one bag of M&M's
2. Count the total number of M&M's in the bag
3. Separate the M&M's into each color
4. Count how many M&M's are in each pile
5. Fill in the table
6. Follow steps 1 through 5 for a different bag of M&M's

Trial 1: Bag# _____

Color	Fraction	Decimal	Percentage
Blue			
Green			
Red			
Brown			
Orange			
Yellow			
Sum of Column =			

Trail 2: Bag # _____

Color	Fraction	Decimal	Percentage
Blue			
Green			
Red			
Brown			
Orange			
Yellow			

Sum of Column =			
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Reflection Questions:

1. Were your predictions from question 2, on the first page, correct? If not, what were your experimental results?

2. What are some similarities and differences between your two trails of you experiment?

Similarities:

Differences:

3. Based on your data, do you think the probability for each color will be the same if you bought a different kind of M&M's? (Dark chocolate, Peanut, Peanut Butter, est.)

- **End of class Question (EOC):** Say you buy a bag of Peanut Butter M&M's. You count that there are 50 M&M's in the bag total. There are 20 blue, 10 red, 5 yellow, 5 orange, 6 green, and 4 brown M&M's. Find the probability of picking a blue M&M and a green M&M. For a red M&M and a brown M&M.]