The central focus of this learning segment is the relationship between the probability of simple and compound events. The learning segment will focus on the conceptual understanding of both simple and compound events. This will lead into the different ways of finding such probabilities and how they are both related.

The purpose for this content stems from the Common Core State Standards that explicitly state this is content that students must learn prior to taking their state exams in April. This learning segment focuses in on the first four lessons of the unit on probability. Besides being a part of the Common Core State Standards probability introduces students to a different way of thinking about problems in the real world. Many students may previously have a misconception about probability thinking that if they have two possible outcomes then the probability of one happening over the other is obviously one-half. However this may not always be the case as one of the outcomes may be more likely than the other resulting in a probability higher than one-half. }

Lesson #1 focuses on students’ understanding that the probability of an event happening is always between zero and one; the higher the probability the more likely the event is to happen. This idea aligns with standard 7.SP.5. By the end of the lesson it is expected that students will be able to classify particular events into three categories: extremely likely to happen, 50/50 chance, and extremely unlikely to happen; as well as predict theoretical and compute experimental probabilities. Classifying probabilities and predicting theoretical probabilities addresses conceptual understanding. During these two activities students are asked to tap into what they already know about particular events. As they classify the events into the three categories students need to take a step back and think about the event to decide the probability of it happening. For example, is there really going to be a bear in the hallway after first period? The answer to this question is most likely no, therefore students should realize that the probability of such an event happening is extremely unlikely. Once the columns are complete students will be able to see that the probabilities of such events taking place are 1, ½, and 0 respectively.

Conceptual understanding is also addressed in the learning segment when students predict theoretical probability based on the information they already know about a quarter. They know it has two sides and therefore can say there is an equal chance of getting heads as there is tails when you flip a coin, resulting in a theoretical probability of ½ when you flip a fair coin. Additionally students are able to apply their knowledge about different tools during lesson #3 to aid them in choosing an appropriate tool for each situation presented.
Procedural fluency is addressed in lessons #2 and #4 as all of the standards in the learning segment are addressed. Particularly in lesson #4 students are able to take what they have learned the previous three class periods and apply that knowledge to station work in order to show how much they understand thus far about probability. Lesson #4 is a time where students can show they have mastered finding theoretical and experimental probability, creating tree diagrams and sample spaces as well as creating a simulation to find the probability of an event. This lesson reviews all of the learning objectives and standards taught in the previous three classes as it can be termed a review day as students complete each station.

Lesson #2 addresses procedural fluency as students apply their knowledge of probability to the standards of 7.SP.8. The lesson objectives are to create and analyze tree diagrams and sample spaces to show all possible outcomes of compound events. In this lesson students are asked to apply what they know about simple events and apply it to compound events. This connects to procedural fluency because there is only one way of creating a tree diagram and sample space. Therefore students need to show precision in their work as they create these diagrams.

Lastly mathematical reasoning and problem solving skills are shown through standard 7.SP.8.c which asks students to design and use a simulation to compute compound probabilities in lesson #3. In this lesson students are asked to choose an appropriate “tool” such as a coin, a die, a deck of cards, or digits of pi to model the probability of an event unrealistic to actually attempt for various reasons. Students need to problem solve as they determine which “tool” works best for the given situation as there is only one correct answer. Each individual and/or group may visualize one “tool” as being more beneficial than another.

c. Explain how your plans build on each other to help students make connections between facts, concepts, and procedures, and to develop their mathematical reasoning and/or problem solving skills to deepen their learning of mathematics.

[ My lesson plans begin by allowing students to connect what they already know about probability to simple events. All students will come into the classroom knowing there are two sides to any coin and the chance of getting heads would be ½. I will then tell them that knowing this is an example of theoretical probability. They will then be asked to explain why this may be considered theoretical. This again taps into what they already know about the term “theoretical.” Students will then be able to use this knowledge to generate an understanding of the concept of experimental probability through actual trials of a situation. The next day students will apply this knowledge about the probability of simple events to produce a procedure to find the probability of compound events with the help of tree diagrams and sample spaces. Students will enhance their knowledge of probability by applying the facts they already know about simple events in order to find probabilities of compound events as they are based upon similar ideas. The following day students will be asked to take all the facts they know about probability and events to devise a procedure using problem solving skills to create a simulation that will aid them in determining the probability of an event that cannot be realistically done. Finally in the last lesson, students will be able to apply all of the knowledge about probability that they have gained over the previous three lessons to practice their understanding through various examples.

In the first two lessons students will be given opportunities to work with their learning partners to learn and understand simple and compound event probabilities before we review answers as a class. In these lessons I will guide students into the beginning steps by asking probing questions that will lead them in the direction of an appropriate answer. The third lesson gives students the opportunity to work through creating a simulation before it is even discussed in class as they are given a guided question sheet that leads them through the process of creating a simulation. After they have successfully completed the packet they should have a good understanding of what a simulation actually is. The fourth lesson allows students to
connect all new knowledge they have gained the previous three lessons as they are given an opportunity to practice each type of question using stations.

2. Knowledge of Students to Inform Teaching

For each of the prompts below (2a–c), describe what you know about your students with respect to the central focus of the learning segment.

Consider the variety of learners in your class who may require different strategies/support (e.g., students with IEPs, English language learners, struggling readers, underperforming students or those with gaps in academic knowledge, and/or gifted students).

a. Prior academic learning and prerequisite skills related to the central focus—What do students know, what can they do, and what are they learning to do?

[Students have previously heard about probability in the earlier grades but they only touched on the concept. Much of what students will know about probability will come from their real-world experiences. Within this learning segment students are asked to create tree diagrams. They should be familiar with this as they have used similar tactics in many other classes in school such as science class. When we begin to create the sample space I am almost certain they have not heard of it referred to as such however once I explain the concept to them I think they will be able to draw a connection between their experiences creating genotypes in science and with the sample space. In this learning segment students are going to learn the correct terminology for different problems involving probability. I believe that before beginning this unit a student can tell you if one event such as a bear being in the hallway after first period is likely, unlikely or has a 50/50 chance of happening. What students may not know is that this would represent a simple event. Therefore a portion of what students will be learning in the first part of this learning segment will focus on incorporating the correct terminology with ideas they actually already know. We will then use this vocabulary to expand on creating events with probabilities other than zero, one-half, and one.]

b. Personal/cultural/community assets related to the central focus—What do you know about your students' everyday experiences, cultural backgrounds and practices, and interests?

[My focus class is very diverse. Since this is an inclusion class I have seven students who have some type of disability. These disabilities include a learning disability in reading or math, ADHD, multiple disabilities and speech language impairment. I know a couple of my students have a trying home life that at times finds itself in the classroom as students are thinking about what is going on at home during class. Although this does not occur for long extended periods of time, it does happen and these students are the ones who cannot afford to be missing out on essential class time. Additionally one of my students has a disability from birth that slows down his ability to think and comprehend information and at times prevents him from ever understanding a concept no matter how hard he tries.

My class is not only diverse based upon their mathematical and learning ability but also in their interests. I have students who are into athletics while others are into drama while others are into video games. This variation in interest outside of school can actually be beneficial towards the focus of the learning segment as we are able to gather a wide variety of perceptions based upon likes and dislikes.

My students have expressed interest in activities where they are allowed to move around and perform tasks at their own pace. They enjoy the freedom in choosing what they do when as we review and practice materials.]

c. Mathematical dispositions—What do you know about the extent to which your students...
- perceive mathematics as “sensible, useful, and worthwhile”¹
- persist in applying mathematics to solve problems
- believe in their ability to learn mathematics

[From the conversations I have had with my students both during and outside of class I feel as though many of them only think math is important when they can see how what they are learning can be applied to real life. If they are unable to make that connection through what we do in class then they have a hard time perceiving math as useful and worthwhile. Because of this notion I try my best to also make a connection they can relate to with the math I teach them. I have had students say to me the only reason we must be learning this is because the state wants us too. Although this is true as the standards state they need to learn this material I do not want my students thinking that they will never use this again when they leave my classroom; as mathematics is everywhere in the real world.

From what I have seen my students for the most part do apply their mathematics knowledge to solving problems. The nice thing about mathematics is that for many problems there is more than one way to solve the problem so students are able to choose the method that works best for them. I believe this aids students in persistently applying mathematics to solve problems as they do have a choice.

I have found that a student’s perception on their mathematical ability depends on the unit. For the most part if a student feels they are horrible in mathematics that feeling sticks around throughout the majority of the units taught. However, when it comes to teaching probability I have found from past experiences that for some students this type of math makes sense to them. Even students who tell me day in and day out that they stink at math; they hopefully will have a chance to turn this feeling around. Unfortunately the same is true for the opposite situation. I have several students who see their ability to learn mathematics as high that will feel a sense of low ability when we start probability. I know of about two students that verbally tell me they cannot learn mathematics and therefore believe they cannot learn mathematics. On the opposite side I know of about four students who are and believe they are very strong in math which enables them to successfully learn mathematics. For the remainder of the class their belief of their ability depends on the topic and the day.]

3. Supporting Students’ Mathematics Learning

Respond to prompts below (3a–c). As needed, refer to the instructional materials and lesson plans you have included to support your explanations. Use principles from research and/or theory to support your explanations, where appropriate.

a. Explain how your understanding of your students’ prior academic learning, personal/cultural/community assets, and mathematical dispositions (from prompts 2a–c above) guided your choice or adaptation of learning tasks and materials.

[Since this is an inclusion class I am focusing on I have to incorporate different levels of differentiation into my lessons to allow all students to reach the expected level of learning. Because I know my students all have different interests, I try to incorporate things I hear them talking about or things they like into my lesson plans, usually through a problem to solve. By doing so I am able to grab their attention as we discuss the concept. Several of my students have a reading disability therefore throughout all of my lessons as a class we will read through the problems and if it is a word problem we will pick out and highlight the important information we need to solve the problem. This tactic works well for everyone in the class as high

¹ From The Common Core State Standards for Mathematics
performing students are able to assist low performing students in the work of choosing the important information. For these students I was also able to give them guided notes with vocabulary definitions and examples already filled in unlike the rest of the class’s notes. This allows these students the opportunity to participate in class when they ordinarily would not have because they were unsure of a correct answer. These completed notes also allow them the opportunity to actually sit back and listen to the concepts instead of having to focus on worrying about getting everything written down correctly in time.

I also know that several of my students think they are bad at math; this is where the use of learning partners helps. Having a partner with similar mathematical ability helps students grow and learn because they are able to work through problems with someone who has similar views on math as they do. Throughout all of my lessons I give students multiple opportunities to work either individually or with their learning partner to complete the work. By giving students time during class to complete problems we began as a class students are able to gain self confidence in the material because they are no longer just watching me complete the problem on the board. Instead they are using their knowledge of the concept to compete the problem. Additionally, these times of independent work allow students who need additional one on one attention the opportunity to receive that. This is especially important if a student is too shy to ask a question in front of the entire class.

My students have expressed interest in activities where they are able to get up, move around, and solve problems their own way. Therefore, I have incorporated stations into my fourth lesson. This allows students the opportunity to walk around the room practicing their understanding of probability at their own pace.

Another instructional strategy I incorporated into my learning segment is the use of learning partners. This is appropriate for the entire class as well as students with similar or specific learning needs because students are paired up with students who have a similar mathematical ability to them. This allows the two students the opportunity to work together to grow as math students. While students are working in learning partner pairs, I as the teacher, am given the opportunity to circulate the room to see where students are making misconceptions that I may need to incorporate into the next part of my lesson as well as the opportunity to help individual pairs of students more. This increased attention will assist them while allowing students who already understand the concept the opportunity to practice their understanding.

b. Describe and justify why your instructional strategies and planned supports are appropriate for the whole class and students with similar or specific learning needs.

Consider students with IEPs, English language learners, struggling readers, underperforming students or those with gaps in academic knowledge, and/or gifted students.
Another instructional strategy I have included in my learning segment is modeling. Throughout the lessons I will model acceptable ways of calculating answers to particular problems for students. This modeling may be in the form of writing or explaining the correct format or having a visual for them to see as we discuss the concept. For example, during lesson three I will have six cereal boxes lined up on the chalkboard. This visual representation will allow my visual learners an opportunity to understand the problem in their own way. Additionally, in lesson two I will model tree diagrams and sample spaces. These strategies benefit all learners in my classroom, disability or not, as I provide multiple entry points into every problem we discuss.

c. Describe common mathematical preconceptions, errors, or misunderstandings within your content focus and how you will address them.

In the first lesson I foresee students misunderstanding how to find the denominator for the rolling of a die problem. They may believe the denominator should be ten since we rolled the die ten times, however the fact is that for each of the probabilities they are asked to find, the denominator should be six since there are six sides to a die. I will address this misunderstanding by asking them to look back at the quarter example at the top of the page. I will ask how they found the denominator of two for that example. I will then tell them that they want to use the same idea for this example. I will lead them to this answer by asking them how many outcomes were possible when they rolled the die one time. The answer here is six because there are six sides to the die. I would then ask well what do the tally marks in box one represent. They should say they represent how many times the number one appeared when they rolled the die a total of ten times. These questions along with the question about why this is experimental data will lead them into seeing why the denominator is six and not ten.

An error students are likely to make comes into play during lesson two when they are asked to draw a tree diagram. An error I can see students making is forgetting to add a branch somewhere. It is easy to get going on the tree diagram and all of a sudden forget to add a second branch to one of the first ones. This can happen for multiple reasons, one being students drew their first column of branches too close together. To aid in avoiding this problem I will be sure to be clear to students when we begin drawing this tree diagram to keep their first row of choices spread far apart as this will make adding more branches later seem less clustered together.

Another misunderstanding I can foresee students making occurs during the third lesson on simulations. During this lesson students are asked to use different tools in order to create this simulation. One of the first misconceptions I foresee comes when students are asked to say what the favorable outcome is in real-life and through their simulation. The error here may occur due to a lack of knowledge on what a favorable outcome is. Therefore I will push students in the correct direction by asking them what they want to happen in real-life if they were to perform this experiment. This question should be enough to get them to realize they want the prize which implies they received the star on the cereal box. Another error they may make while experimenting with their simulator is in misusing the simulator. Students may choose a simulator such as the three pennies and say that heads would be favorable. Well in this outcome the probability of heads is still one-half, not the required one-sixth. If I find students in this type of situation I will ask them what the probability of one penny is and then of three pennies if I am looking for heads. Hopefully through this questioning students will realize that no matter how many pennies they have the chance of flipping heads will always be one-half.

4. Supporting Mathematics Development Through Language

a. Language Demand: Language Function. Identify one language function essential for students to learn the mathematics within your central focus. Listed below are some
sample language functions. You may choose one of these or another more appropriate for your learning segment.

<table>
<thead>
<tr>
<th>Compare/contrast</th>
<th>Conjecture</th>
<th>Describe</th>
<th>Explain</th>
<th>Prove</th>
</tr>
</thead>
</table>

[ The language function I chose for this learning segment is “predict.” ]

b. Identify a key learning task from your plans that provides students with opportunities to practice using the language function. In which lesson does the learning task occur? (Give lesson day/number.)

[Students are able to practice using the language function briefly in lesson two prior to creating a tree diagram. After we read the word problem on page two of the notes I ask students to predict how many ice cream sundae combinations they think we can create using the lists provided.]

The key learning task for practicing prediction appears in lesson three when students are asked to create a simulation. In this lesson, the simulator students choose aids them in creating a prediction for how many cereal boxes they will need to buy before buying one that actually has a star granting them the prize. Prior to introducing the tools students can choose to use as their simulator students are asked to predict how many boxes of cereal they will have to buy prior to finding the one with the star if the company claims one in every six boxes has the star.

The idea presented in this lesson through the language function is that not everything in the real world can be predicted at a low cost. For example, at the end of the lesson I will ask students if it would be sensible to go to the store shelf and buy cereal boxes until you find the one with the star even if it took you buying thirty-three boxes before finding one with a star. Ideally, I hope students realize that this is not an ideal situation as no one wants to buy thirty-three boxes just to get a prize, that’s unrealistic. The same idea holds true for other circumstances in the real world and that is why researchers use simulators to determine the probability of particular events as they are a low-cost, sensible alternative to finding the probability of any event.

c. Additional Language Demands. Given the language function and task identified above, describe the following associated language demands (written or oral) students need to understand and/or use.

- Vocabulary and/or symbols
- Mathematical precision\(^2\) (e.g., using clear definitions, labeling axes, specifying units of measure, stating meaning of symbols), appropriate to your students’ mathematical and language development
- **Plus** at least one of the following:
  - Syntax
  - Discourse

Consider the range of students’ understandings of the language function and other demands—what do students already know, what are they struggling with, and/or what is new to them?

\(^2\) For an elaboration of “precision,” refer to the “Standards for Mathematical Practice” from The Common Core State Standards for Mathematics (June 2010), which can be found at [http://www.corestandards.org/the-standards/mathematics](http://www.corestandards.org/the-standards/mathematics).
[Since this is a unit on probability one of the first things students need to understand is how the symbol for probability is represented. Generally “P(event) =” is read “the probability of ‘event’ is...” This is essential as I will ask students to find the probability of certain events and the question will be posed in this format.

This learning segment includes many vocabulary words including: simple event, compound event, tree diagram, sample space, theoretical probability, experimental probability and simulation. Each student’s knowledge and conceptual understanding of these terms will be beneficial as they solve various problems since they will be asked to provide examples of these terms in their solutions. Vocabulary is important in mathematics considering many of these words have differed meanings compared to their English counterpart. Students will experience many of these vocabulary words without realizing it throughout each of the lessons as it is at the closing of the lesson we define many of these words based on the work completed in class.

Students are expected to incorporate mathematical precision throughout this lesson especially during lesson two. During this lesson as students create their tree diagram and sample space they need to be sure to include a key. Since creating the variables for the key is entirely up to the student it is important everything is labeled and clearly stated as to what it actually represents. The same holds true during lesson three when students create a simulation. Although two groups use the same tool as their simulator this does not mean that the two groups have the same favorable outcome on their simulator. Both groups can be correct as long as they explicitly state what their favorable outcome is.

Syntax is incorporated into this learning segment as students are shown acceptable ways to show their work for each type of problem solved. Throughout the lessons students are shown one acceptable way of creating a tree diagram, a sample space, a simulation with a particular tool, and a way to find the probability of a simple and/or compound event. The acceptable method displayed in class is not the only way any one of these problems can be solved. If students see another acceptable method they are more than welcome to use that for future problems.

d. Language Supports. Refer to your lesson plans and instructional materials as needed in your response to the prompt.
   - Describe the instructional supports (during and/or prior to the learning task) that help students understand and successfully use the language function and additional language identified in prompts 4a–c.

[Students are introduced to the unit on probability slowly as I look to build on their knowledge of real-life probabilities they have seen and thought about such as the probability of a quarter landing on heads. By building on these simple probabilities to create more complex probability situations, students are better prepared to predict these complex outcomes. Instructional supports are put in place and build on each other during the days leading up to the learning task where prediction is the language function. During the days prior to this task, students experiment with various kinds of probability including simple and compound events as well as the proper notation. This base will help them be better prepared for the learning task. Additionally, in the days prior to the learning task I will ask students at least once each day to predict something simple. These predictions are not complex but are more precise than the one they are asked about in lesson three. During the learning task I include visual supports of the question they are asked to predict by placing six cereal boxes along the back wall of the classroom, one of which actually contains the wanted star. This allows students who are visual learners the opportunity to see what they are being asked to predict. ]

5. Monitoring Student Learning

Refer to the assessments you will submit as part of the materials for Task 1.
a. Describe how your planned formal and informal assessments will provide direct
evidence of students’ conceptual understanding, procedural fluency, and mathematical
reasoning and/or problem solving skills throughout the learning segment.

[Informal assessments for this learning segment include the use of in class observations of
students through their work as I walk around the room, through checking their homework in the
beginning of class as they complete their warm up for the day, and the use of KWL charts.
These informal observations will allow me to assess what students do and do not understand by
looking at their homework and listening to their conversations about the concepts being taught.
As I informally assess I will be able to check procedural fluency particularly in lesson number
two’s assessment where students are asked to create a tree diagram. Since this contains a very
particular design it will be easy for me to check as I assess their fluency in the creation of such a
diagram. Conceptual understanding will be assessed through oral questioning and observations
of their conversations as they work through problems associated with the questions in lesson
three’s assessment. Problem solving skills will also be shown in lesson three’s as students need
to problem solve in order to choose an appropriate simulator.

My formal assessment will display students conceptual understanding, procedural fluency,
and problem solving as it is a culmination of all smaller informal assessments made the three
previous days. This formal assessment is shown in lesson four. For this formal assessment
students will be asked to show their conceptual understanding by providing valid definitions and
examples for vocabulary words we have discussed. Furthermore, students will be expected to
show their understanding of the material as they solve many of the problems because without
the content knowledge they have been taught they will be unable to perform many of the tasks
asked of them. Procedural fluency will be shown in questions two and three on this assessment
as students are asked to apply their knowledge of tree diagrams and sample spaces to answer
the question. These two questions in particular include particular steps students must take to be
able to answer the question correctly. Problem solving is evident in question six on this
assessment as students are asked to create a simulation to predict the number of questions one
may guess correctly on a fifty question multiple choice exam. ]

b. Explain how the design or adaptation of your planned assessments allows students with
specific needs to demonstrate their learning.

Consider all students, including students with IEPs, English language learners,
struggling readers, underperforming students or those with gaps in academic
knowledge, and/or gifted students.

[ With all of my assessments students are given opportunities in class to practice the concepts
covered. This allows students who need extra attention, especially my special education
students the opportunity to gain the attention needed. With the informal assessments that are
created through homework, I review all correct answers on the board after I have checked for
homework completion. This also allows students with the opportunity to ask questions where
they may be confused. Students with specific learning needs are able to demonstrate their
learning on these assessments because they are given all the time they need to complete the
assessment. There is no time limit for them. If I see they need additional time then the special
education teacher will allow them to complete the work with her during resource room time. This
allows all students an equal opportunity to finish all work to the fullest of their ability
demonstrating their true level of learning and understanding of the concepts presented. ]