WAKE COUNTY PUBLIC SCHOOL SYSTEM

High School Programs

Math 2 UNIT 6 OVERVIEW: Probability Parent Guide

Unit Outcomes At the end of this unit, your student should be able to:	**Key Vocabulary** Terms to deepen students' understanding
✓ Define event and sample space. ✓ Establish events as subsets of a sample space. ✓ Define union, intersection, and complement. ✓ Establish events as subsets of a sample space based on the union, intersection, and/or complement of other events. ✓ Create a two way table from categorical data. ✓ Create a tree diagram that shows the sample space resulting from a multi-event situation. ✓ Calculate the probability of an event. ✓ Apply the Addition Rule to determine the probability of the union of two events using the formula P(A or B) = P(A) + P(B) - P(A and B). ✓ Interpret the probability of unions and intersections based on the context of the given problem. ✓ Define and identify independent events. ✓ Explain and provide an example to illustrate that for two independent events, the probability of the events occurring together is the product of the probability of each event. ✓ Calculate the probability of an event. ✓ Apply the general Multiplication Rule to calculate the probability of the intersection of two events using the formula. ✓ Compute probabilities of compound events. ✓ Find the union and intersection of two or more sets using Venn diagrams and set notation. ✓ Create Venn diagrams to find conditional probabilities. ✓ Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. ✓ Construct and interpret two way tables. ✓ Calculate conditional probabilities based on two categorical variables and interpret in context. ✓ Determine whether two events are independent or dependent. ✓ Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. ✓ Determine if two categorical variables are independent by analyzing a two-way table of data collected on the two variables. ✓ Look at data and determine whether the information gathered is theoretical or experimental. ✓ Interpret experimental data to find the probability of an event occurring.	Sample space element union intersection complement two-way table tree diagram Probability Outcomes Mutually exclusive Mutually inclusive Addition Rule Compound event Multiplication Rule Replacement Independent Events Conditional probability Experimental probability Theoretical probability simulation

WAKE COUNTY PUBLIC SCHOOL SYSTEM

Math 2 UNIT 6 OVERVIEW: Probability Parent Guide

✓ Create a simulation of an event with a historical probability of occurring. ✓ Look at data and determine whether the information gathered is theoretical or experimental. ✓ Interpret experimental data to find the probability of an event occurring. ✓ Create a simulation of an event with a historical probability of occurring. ✓	

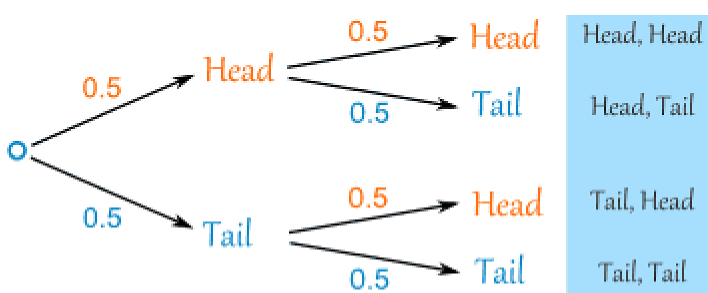
Key Standards Addressed Connections to Common Core/NC Essential Standards	**Where This Unit Fits** Connections to prior and future learning
NC.M2.S-IC.2: Use simulation to determine whether the experimental probability generated by sample data is consistent with the theoretical probability based on known information about the population. **NC.M2.S-CP.1**: Describe events as subsets of the outcomes in a sample space using characteristics of the outcomes or as unions, intersections and complements of other events. **NC.M2.S-CP.3**: Develop and understand independence and conditional probability. a. Use a 2-way table to develop understanding of the conditional probability of A given B (written P(A|B)) as the likelihood that A will occur given that B has occurred. That is, P(A|B) is the fraction of event B's outcomes that also belong to event A. b. Understand that event A is independent from event B if the probability of event A does not change in response to the occurrence of event B. That is P(A|B)=P(A). **NC.M2.S-CP.4**: Represent data on two categorical variables by constructing a two-way frequency table of data. Interpret the two-way table as a sample space to calculate conditional, joint and marginal probabilities. Use the table to decide if events are independent.	**Coming into this unit, students should have a strong foundation in:** • Basic probability: 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. • Approximating the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency • Developing probability models and using them to find probabilities of events. • Finding probabilities of compound events using organized lists, tables, tree diagrams, and simulation. **This unit builds to the following future skills and concepts:** Students will use the concepts in this unit as they progress through the curriculum to upper level courses in probability and statistics. Probability is the basis upon which statistical inference in built;

NC.M2.S-CP.5: Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations. **NC.M2.S-CP.6**: Find the conditional probability of A given B as the fraction of B's outcomes that also belong to A, and interpret the answer in context. **NC.M2.S-CP.7**: Apply the Addition Rule, P(A or B) = P(A) + P(B) – P(A and B), and interpret the answer in context. **NC.M2.S-CP.8**: Apply the general Multiplication Rule P(A and B) = P(A)P(B|A) = P(B)P(A|B), and interpret the answer in context. Include the case where A and B are independent: P(A and B) = P(A) P(B).	statistical inference is the process of making conclusions after analysis of data.

Additional Resources Materials to support understanding and enrichment

WAKE COUNTY PUBLIC SCHOOL SYSTEM

Math 2 UNIT 6 OVERVIEW: Probability Parent Guide

<table>
<tr><th colspan="3">Glossary</th></tr>
<tr><td>Sample space</td><td>A sample space is the set of all possible outcomes of an event.</td><td rowspan="7"><u>Click to return to Key Vocabulary List</u></td></tr>
<tr><td>element</td><td>An element is a member of a set. In the set A = {1, 2, 3, 4, 5, 6}, there are 6 elements in the set.</td></tr>
<tr><td>union</td><td>A union of two sets consists of all of the members in either set. The union can be written as (A or B) or (A ∪ B).</td></tr>
<tr><td>intersection</td><td>An intersection of two sets consists of only the members in both sets. The intersection can be written as (A and B) or as (A ∩ B)</td></tr>
<tr><td>complement</td><td>The complement of a set consists of all of the members not in the set. The complement of A can be expressed as A’ or A^c.</td></tr>
<tr><td>two-way table</td><td>A two way table is a method of displaying categorical data that is broken up two ways. For example:
<table>
<tr><th></th><th>Male</th><th>Female</th></tr>
<tr><td>9th grade</td><td>15</td><td>16</td></tr>
<tr><td>10th grade</td><td>25</td><td>23</td></tr>
</table></td></tr>
<tr><td>tree diagram</td><td>A tree diagram is another way to display a scenario in which there are multiple events. They can be used to help determine complete sample spaces.

</td></tr>
</table>

Math 2 UNIT 6 OVERVIEW: Probability Parent Guide

Probability	The probability of an event occurring is the number of successes divided by the total number of possible outcomes . The probability of an event occurring is between 0 and 1 inclusive. A probability of zero means the event will not occur. A probability of one means the event will definitely occur.	
Outcomes	The possible outcomes of an event are the sample space – for example, the outcomes of rolling 1 die are {1, 2, 3, 4, 5, 6}	
Mutually exclusive	Two events are mutually exclusive if they cannot happen at the same time. For example, when rolling a die, rolling a 5 and rolling an even number are mutually exclusive. These events can also be called disjoint.	
Mutually inclusive	Two events are mutually inclusive if they can happen at the same time. For example, when rolling a die, rolling a 5 and rolling an prime number are mutually inclusive, since 5 is a prime number.	
Addition Rule	. The Addition Rule is used to find the probability of events. If the events area mutually inclusive, P(A or B) = P(A) + P(B) - P(A and B). The “overlap” is subtracted because it is actually counted twice – in both A and B. Mutually exclusive events have no events in common and therefore, P(A or B) = P(A) + P(B).	
Compound event	A compound event is made up of two or more different events. For example, picking two jellybeans from a bag and selecting a red one and then a green one is a compound event. The probabilities are determined based on whether the first item is replaced or not prior to selecting the second item.	

Math 2 UNIT 6 OVERVIEW: Probability Parent Guide

Multiplication Rule	The multiplication rule is used for compound events. P(A and B)=P(A)·P(B).	
Replacement	When finding the probability of compound events, replacement means putting the first item back in the mix. For example, when selecting two cards from a standard deck, if we pick with replacement, the first card is put back into the deck before picking the second card. If we select without replacement, the first card is not put back into the deck before selecting the second card.	
Independent Events	Two events, A and B, are independent events if the probability of event A occurring is unchanged whether B occurs or not. Two events A and B are independent if and only if P(A and B)=P(A)·P(B) or if P(A|B)=P(A) and P(B|A)=P(B).	
Conditional probability	The conditional probability of event A given event B has occurred is expressed as P(A|B) (read as "probability of A given B"). The conditional probability of event A given event B has occurred is P(A|B) = P(A and B)P(B). When finding the conditional probability of A given B, the sample space is reduced to the possible outcomes for event B. Therefore, the probability of event A happening is the fraction of event B's outcomes that also belong to A.	
Experimental probability	is the ratio of the number of times an event occurs to the total number of trials or times the activity is performed.	
Theoretical probability	**Theoretical Probability** of an event is the number of ways that the event can occur, divided by the total number of outcomes. It is finding the **probability** of events that come from a sample space of known equally likely outcomes.	
simulation	Simulation is a way to model random events, such that simulated outcomes closely match real-world outcomes. By observing simulated outcomes, researchers gain insight on the real world. Experimental probabilities are not the same as theoretical probabilities, but that the	

	experimental will approach the theoretical after a large number of trials (Law of Large Numbers) Different simulations will give different, although similar results and simulations can be generated in different ways, with different manipulatives.	

* **Please note**, the unit guides are a work in progress. If you have feedback or suggestions on improvement, please feel free to contact sdupree@wcpss.net.