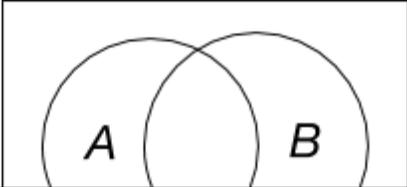


Richmond Public Schools
Curriculum Framework
Algebra, Functions, and Data Analysis

Strand: Data Analysis	
<p>AFDA.6 The student will calculate probabilities. Key concepts include</p> <ul style="list-style-type: none"> a) conditional probability; b) dependent and independent events; c) mutually exclusive events; d) counting techniques (permutations and combinations); and e) Law of Large Numbers. 	
Suggested Pacing	
10 Class Periods	
Spiraling Standards	
<p>All.12-The student will compute and distinguish between permutations and combinations.</p>	<p>PS.11 -The student will identify and describe two or more events as complementary, dependent, independent, and/or mutually exclusive.</p> <p>PS.12 -The student will determine probabilities (relative frequency and theoretical), including conditional probabilities for events that are either dependent or independent, by applying the Law of Large Numbers concept, the addition rule, and the multiplication rule.</p> <p>MA.4-The student will determine the limit of an algebraic function, if it exists, as the variable approaches either a finite number or infinity</p>
Essential Questions	Common Misconceptions
<ul style="list-style-type: none"> • How are theoretical and experimental probabilities determined? • How can a Venn diagram be used to illustrate the relationship between events? • What are dependent, independent, and mutually exclusive events? • What is the difference between a permutation and a combination? 	<p>Students will mix the definitions and outcomes of theoretical and experimental probability.</p> <p>Students may have trouble identifying outcomes with conditions</p> <p>Students will confuse dependent and independent events.</p> <p>Students will confuse permutations and combinations</p>

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Understanding the Standard	Essential Knowledge and Skills
<ul style="list-style-type: none"> • The Fundamental Counting Principle states that if one decision can be made <i>n</i> ways and another can be made <i>m</i> ways, then the two decisions can be made <i>nm</i> ways. • A sample space is the set of all possible mutually exclusive outcomes of a random experiment. • An event is a subset of the sample space. • $P(E)$ is a way to represent the probability that the event E occurs. • Mutually exclusive events are events that cannot both occur simultaneously. • Mutually exclusive events are calculated using the addition or multiplication rules. • If A and B are mutually exclusive, then $P(A \cup B) = P(A) + P(B)$. • The complement of event A consists of all outcomes in which event A does not occur. • $P(B A)$ is the probability that B will occur given that A has already occurred. $P(B A)$ is called the conditional probability of B given A. • Exploration of the representation of conditional statements using Venn diagrams may assist in deepening student understanding. • • • <div style="text-align: center; margin-top: 20px;">  </div>	<p>The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to</p> <ul style="list-style-type: none"> • Analyze, interpret and make predictions based on theoretical probability within practical context. (a, b, c, e) • Determine conditional probabilities for dependent, independent, and mutually exclusive events. (a, b, c) • Represent and calculate probabilities using Venn diagrams and probability trees. (a) • Define and give contextual examples of complementary, dependent, independent, and mutually exclusive events. (b, c) • Given two or more events in a problem setting, determine whether the events are complementary, dependent, independent, and/or mutually exclusive. (b, c) • Compare and contrast permutations and combinations, including those occurring in practical situations. (d) • Calculate the number of permutations of n objects taken r at a time, without repetition. (d) • Calculate the number of combinations of n objects taken r at a time, without repetition. (d)

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$$P(B|A) = \frac{P(A \cap B)}{P(A)}$$

$$\Rightarrow P(A \cap B) = P(A)P(B|A)$$

- Two events, A and B , are independent if the occurrence of one does not affect the probability of the occurrence of the other. If A and B are not independent, then they are said to be dependent.
- If A and B are independent events, then
$$P(A \cap B) = P(A)P(B) \quad P(A \cap B) = P(A)P(B) .$$
- A permutation is the number of possible ways to arrange a group of objects without repetition and when order matters (e.g., the outcome 1, 2, 3 is different from the outcome 3, 2, 1 when order matters; therefore, both arrangements would be included in the possible outcomes).
- A combination is the number of possible ways to select or arrange objects when there is no repetition and order does not matter (e.g., the outcome 1, 2, 3 is the same as the outcome 3, 2, 1 when order does not matter; therefore, both arrangements would not be included in the possible outcomes).
- The Law of Large Numbers states that as a procedure is repeated again and again, the relative frequency probability of an event tends to approach the actual probability.

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Vocabulary	
conditional probability, theoretical probability, experimental probability, dependent event, independent event, mutually exclusive event, combination, permutation, Law of Large Numbers, Fundamental Counting Principle, sample space, outcomes, random experiment, subset, simultaneous, complement, Venn diagram, probability tree, occurrence, repetition	<p>Textbook</p> <p>Eureka Math Algebra 2 Module 4 Topic A Eureka Math Precalculus and Advanced Topics Module 5 Topic A Algebra 1, ©2012, Price, et al, McGraw-Hill School Education Group, page(s) 764-770, 771-792 Algebra 2, ©2012, Price, et al, McGraw-Hill School Education Group page(s) 759-771</p> <p>Notes</p> <p>Conditional Probability (Math is Fun) Independent and Mutually Exclusive Events (I Do Math)</p> <p>Resources</p> <ul style="list-style-type: none"> ● Print Coach book Algebra 1, Virginia edition, Lesson(s) 37 page(s) 252-257 Coach book Algebra 2, Virginia edition, Lesson(s) 26-32, 34 page(s) 169-212, 228-236 ● Technology-based Fundamental Counting Principle (Virtual Nerd) Law of Large Numbers (Khan Academy) Mutually Exclusive, Independent, Dependent (Practice) <p>Station Activities</p> <p>My Way</p>
Assessment	
Classroom Teacher Developed Assessments	

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Cross-Curricular Connections	Tiered Differentiations
<p>Science- Probability can be used in Genetics, Chemical Combinations, Environmental Change Factors, etc.</p> <p>CTE-Probability can be used in Marketing, Merchandising, Production, etc</p> <p>English-Student may write stories in which outcomes and endings can be changed based on given events</p>	<p>Tier 1- Students can be given tasks that require intense calculation and larger numbers of possibilities. Events may have various factors.</p> <p>Tier 2- Students can be given task that require multiple steps in calculation with some large numbers of possibilities.</p> <p>Tier 3- Students will start with simple calculations of probability and small numbers of possibilities.</p>