Richmond Public Schools
Curriculum Framework
Algebra II

Strand: Statistics	
AII.12 The student will compute and distinguish between permutations and combinations.	
Suggested Pacing	
2 Class Periods	
Spiraling Standards	
8.11-The student will a) compare and contrast the probability of independent and dependent events; and b) determine probabilities for independent and dependent events.	AFDA.6-The student will calculate probabilities. Key concepts include a) conditional probability; b) dependent and independent events; c) mutually exclusive events; d) counting techniques (permutations and combinations); and e) Law of Large Numbers. 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. 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.
Essential Questions	**Common Misconceptions**
What is a permutation and how is it determined? What is a combination and how is it determined? What is the difference between a permutation and a combination of the same items?	• Confusion of whether order matters or order does not matter • Deciding if there is repetition or no repetition

When is a permutation or a combination used?

Understanding the Standard	Essential Knowledge and Skills
• The *Fundamental Counting Principle* states that if one decision can be made *n* ways and another can be made *m* ways, then the two decisions can be made *nm* ways. • 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 student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** • Compare and contrast permutations and combinations. • Calculate the number of permutations of *n* objects taken *r* at a time. • Calculate the number of combinations of *n* objects taken *r* at a time. • Use permutations and combinations as counting techniques to solve practical problems. • Calculate and verify permutations and combinations using a graphing utility.
Vocabulary	**Instructional Activities Organized by Learning Objective**
permutation, combination, outcome, possibility, compare, contrast, calculate, fundamental counting principle, arrangements, repetition	**Textbook** Eureka Math Precalculus and Advanced Topics Module 5 Topic A Lesson 4 Algebra 2, ©2012, Price, et al, McGraw-Hill page(s) P12 – P14 **Notes** Combinations and Permutations (Math is Fun) **Resources** • **Print** Coach book, Virginia edition, lesson 37 of chapter 4
Assessment	
Common Assessment AII.12	

	VDOE Lesson Plan AII.12 • **Technology-based** Combinations and Permutations (Smartboard Exchange) **Station Activities** I Want It My Way
Cross-Curricular Connections	Tiered Differentiations
Science-Combinations and Permutations can be applied in genetics and chemical compositions. Combinations and Permutations can be used to analyze games of chance, passcodes and security, merchandising and stocking, composing music, etc.	**Tier 1-**Students can determine if a situation is solved using permutations or combinations and in some cases solve algebraically. **Tier 2-**Students can determine if a situation is solved using permutations or combinations and solve using a graphing calculator. **Tier 3-**Students be guided on whether a situations is a permutation or combinations and solve using a graphing calculator.