



Pre-Calculus Honors - Unit E - Sequences, Series, and Probability

Unit Focus

This unit is all about recognizing patterns. Formulas for n th terms and summations of arithmetic and geometric sequences are derived. The concept of induction is introduced as a way to prove other formulas for series, divisibility, and inequalities. Then the binomial theorem is taught as an application of another pattern. Finally, combinations and permutations are covered and these counting principles are used to find probabilities.

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer	
Common Core Mathematics: 9-12 - Derive the formula for the sum of a finite geometric series (when the common ratio is not 1), and use the formula to solve problems. For example, calculate mortgage payments.* (CCSS.MATH.CONTENT.HSA.SSE.B.4) - Know and apply the Binomial Theorem for the expansion of $(x + y)^n$ in powers of x and y for a positive integer n, where x and y are any numbers, with coefficients determined for example by Pascal's Triangle. (CCSS.MATH.CONTENT.HSA.APR.C.5) - Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. (CCSS.MATH.CONTENT.HSF.IF.A.3) - Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms. (CCSS.MATH.CONTENT.HSF.BF.A.2) - Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not"). (CCSS.MATH.CONTENT.HSS.CP.A.1) - Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent. (CCSS.MATH.CONTENT.HSS.CP.A.2) - Use permutations and combinations to compute probabilities of compound events and solve problems. (CCSS.MATH.CONTENT.HSS.CP.B.9)	<i>Students will be able to independently use their learning to...</i> T1 manipulate equations/expressions or objects to create order and establish relationships. T2 represent and interpret patterns in numbers, data and objects. T3 use appropriate tools to make reaching solutions more efficient, accessible and accurate.	
	Meaning	
	Understanding(s)	Essential Question(s)
	<i>Students will understand that...</i> U1 Mathematicians identify relevant tools, strategies, relationships, and/or information in order to draw conclusions. U2 Mathematicians examine relationships to discern a pattern, generalizations, or structure.	<i>Students will keep considering...</i> Q1 How do you express and describe a pattern and use it to make predictions and solve a problem? Q2 How can understanding a pattern help me? Q3 What is the most efficient way to solve this problem?
	Acquisition of Knowledge and Skill	
	Knowledge	Skill(s)
	<i>Students will know...</i> K1 how to express a sequence explicitly and recursively K2 what summation and factorial notations mean K3 how the process of induction works K4 how to determine coefficients of a binomial expansion using counting principles or Pascal's triangle	<i>Students will be skilled at...</i> S1 using n th term formulas to find specific terms of a sequence S2 determined n th term formulas for arithmetic and geometric sequences S3 applying summation formulas for arithmetic and geometric sequences

Stage 1: Desired Results - Key Understandings

- Make sense of problems and persevere in solving them. (CCSS.MATH.MP.1)
- Reason abstractly and quantitatively. (CCSS.MATH.MP.2)
- Look for and make use of structure. (CCSS.MATH.MP.7)

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- Analyzing: Examining information/data/ evidence from multiple sources to identify possible underlying assumptions, patterns, and relationships in order to make inferences. (POG.1.2)

K5 the various counting principles for events
K6 Vocabulary: Sequence, Series, Explicit, Recursive, Factorial, Summation, Arithmetic, Geometric, Induction, Binomial Expansion, Pascal's Triangle, Combinations, Permutations

S4 applying induction to prove summation patterns and divisibility and inequalities
S5 expanding a binomial using the binomial theorem
S6 using counting principles to determine probabilities