

Discrete Math

Numbers and Operations Standard: Understands and applies concepts of numbers and operations.

Power Benchmark 1: Understands numbers, ways of representing numbers, relationships among numbers, and number systems

Course Level Benchmark	Vocabulary	Background Knowledge/Prior Skills	Skills to Assess	
a. Explores new number systems, such as matrices	<ul style="list-style-type: none"> • matrix • element • order • transpose • scalar multiplication 	<ul style="list-style-type: none"> • Commutative and associative properties • Solving systems of equations 	<ul style="list-style-type: none"> • Determines what operation properties hold for matrix addition and multiplication - • Calculates sums, differences, and products of matrices - • Solves problems using matrices. 	
b. Understands basic counting techniques	<ul style="list-style-type: none"> • Multiplication principle • Addition principle • Mutually exclusive • Disjoint • Factorial • Permutation • Combination • Venn diagrams 	<ul style="list-style-type: none"> • 	<ul style="list-style-type: none"> • Uses the addition and multiplication principles to solve problems - • Uses permutations and combinations to solve problems - • Uses Venn diagrams to model situations and solve problems 	
c. Understands basic graph theory procedures	<ul style="list-style-type: none"> • Connected • Adjacent • Complete • Degree • Loop • Digraph • Planar • Bipartite • Subgraph 	<ul style="list-style-type: none"> • 	<ul style="list-style-type: none"> • Knows the vocabulary and can draw an example of each concept - • Writes an adjacency matrix for a graph - 	

Algebra Standard: Understands and applies concepts of algebra and functions				
Power Benchmark 3: Understands patterns, relations and functions				
Grade Level Benchmark	Vocabulary	Background Knowledge/Prior Skills	Skills to Assess	
a. Uses patterns and relationships to analyze mathematical situations	<ul style="list-style-type: none"> • sequences • series • arithmetic recursion • geometric recursion 	<ul style="list-style-type: none"> • Knowledge of linear equations 	<ul style="list-style-type: none"> • Knows sequences and series can be used to model problems - • Uses words, tables, and graphs and symbolic rules to describe patterns - • Describes the relationship of sequences symbolically - • Generates formulas to describe a pattern - 	

Data Analysis & Probability Standard: Understand and apply concepts of data analysis and probability				
Power Benchmark 2: Selects and uses appropriate statistical methods to analyze data				
Course Level Benchmark	Vocabulary	Background Knowledge/Prior Skills	Skills to Assess	
a. Uses a variety of methods to determine probabilities	<ul style="list-style-type: none"> • Simulation • theoretical probability • experimental probability • mutually exclusive • complement • probability distribution • binomial distribution • expected value 	<ul style="list-style-type: none"> • combinations 	<ul style="list-style-type: none"> • Uses a variety of methods to determine probability of events • Determines the best method for determining probability for a given situation - • Compares theoretical probabilities with experimental probabilities - • Uses combinations to represent a given situation - 	

<p>b. Uses a variety of statistical measures to analyze data</p>	<ul style="list-style-type: none"> • Standard Deviation • variance • frequency distribution • histogram • stem and leaf plot • box plot • normal distribution • z-score 	<ul style="list-style-type: none"> • Mean • Median • Mode 	<ul style="list-style-type: none"> • Uses a variety of methods to evaluate data - • Determines which method best describes the given situation - • Generates graphs that depict information given - • Compares data to normal standard distribution - 	
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Data Analysis & Probability Standard: Understand and apply concepts of data analysis and probability				
Power Benchmark 4: Understands and applies concepts of probability				
Grade Level Benchmark	Vocabulary	Background Knowledge/Prior Skills	Skills to Assess	
a. Applies the concepts of conditional probability and independent events	<ul style="list-style-type: none"> • independent event • dependent event • conditional probability • tree diagrams 	<ul style="list-style-type: none"> • Basic probability 	<ul style="list-style-type: none"> • Finds the probability of two disjoint events - • Finds the probability of one independent event followed by another independent event - • Identifies simple and compound events - • Identifies dependent and independent events - • Identifies dependent and independent events - 	

Problem Solving Standard: Understands and applies problem solving strategies				
Power Benchmark 4: Uses a variety of strategies to solve problems				
a. Uses mathematical modeling to solve social decision making problems	<ul style="list-style-type: none"> • Preference schedule • Plurality • Majority • Borda count • Runoff • Sequential runoff • Paradox • Approval voting • Weighted voting • Power index 	<ul style="list-style-type: none"> • 	<ul style="list-style-type: none"> • Determines the plurality, Borda, runoff, and sequential runoff winners for a set of preferences - • Understands Arrow's Conditions - • Determine the Condorcet and approval winners for a set of preferences - • Determine power indexes for weighted voting systems - 	

Problem Solving Standard: Understands and applies problem solving strategies

Power Benchmark 4: Uses a variety of strategies to solve problems (con't)

Grade Level Benchmark	Vocabulary	Background Knowledge/Prior Skills	Skills to Assess	
b. Uses mathematical modeling to solve apportionment problems	<ul style="list-style-type: none"> • Hamilton method • Hill method • Jefferson method • Webster method • Quota • Arithmetic mean • Geometric mean 	<ul style="list-style-type: none"> • 	<ul style="list-style-type: none"> • Solves apportionment problems using the Hamilton, Hill, Jefferson, and Webster methods - • Divides an estate into fair parts - 	
c. Uses matrices to solve problems	<ul style="list-style-type: none"> • Leslie model • Leontief input-output model • Markov chains • Game theory 	<ul style="list-style-type: none"> • Matrix Operations 	<ul style="list-style-type: none"> • Uses the Leslie model to find population distributions - • Uses the Leontief input-output model to analyze the flow of goods and services among sectors in an economy - • Solves problems using Markov chains - 	
d. Uses graph theory to solve problems	<ul style="list-style-type: none"> • critical path • Euler path • Euler circuit • Hamilton path • Hamilton circuit • Chromatic number • Cycle • Tree • Spanning tree • traversal 	<ul style="list-style-type: none"> • 	<ul style="list-style-type: none"> • Draw a task graph and find the critical path and the minimum project time - • Represents real world problems using graphs - • Finds Euler paths and circuits - • Finds Hamilton paths and circuits - • Colors a graph - • Finds the shortest path from Point A to Point B in a graph - • Finds minimum spanning trees - 	

Communication Standard: Communicates and reasons mathematically

Power Benchmark 2: Uses tools (such as technology) to enhance mathematical learning

Grade Level Benchmark	Vocabulary	Background Knowledge/Prior Skills	Skills to Assess	
a. Uses the graphing calculator to explore data	<ul style="list-style-type: none">• Window• Matrix• Permutation• Combination•	<ul style="list-style-type: none">• Basic operations on the calculator•	<ul style="list-style-type: none">• Uses the calculator to add, subtract and multiply matrices -• Uses the calculator to find permutations and combinations -• Uses the calculator to do recursion problems -	