

# Finite: Grades 9, 10, 11, 12

Adopted 2020

## Process Standards For Mathematics

1. Make sense of problems and persevere in solving them. [PS.1](#)
2. Reason abstractly and quantitatively. [PS.2](#)
3. Construct viable arguments and critique the reasoning of others. [PS.3](#)
4. Model with mathematics. [PS.4](#)
5. Use appropriate tools strategically. [PS.5](#)
6. Attend to precision. [PS.6](#)
7. Look for and make use of structure. [PS.7](#)
8. Look for and express regularity in repeated reasoning. [PS.8](#)

## Sets

1. Know and use the concepts of sets, elements, and subsets. [FM.S.1](#)
2. Perform operations on sets (union, intersection, complement, cross product) and illustrate using Venn diagrams. [FM.S.2](#)

## Matrices

1. Add, subtract, and multiply matrices of appropriate dimensions (i.e. up to 3x3 matrices). Multiply matrices by scalars. Calculate row and column sums for matrix equations. [FM.MA.1](#)
2. Understand that the zero and identity matrices play a role in matrix addition and multiplication similar to the role of 0 and 1 in the real numbers. [FM.MA.2](#)
3. Understand the determinant of a square matrix is nonzero if and only if the matrix has a multiplicative inverse. [FM.MA.3](#)
4. Solve problems represented by matrices using row-reduction techniques and properties of matrix multiplication, including identity and inverse matrices. [FM.MA.4](#)
5. Use matrices to solve real-world problems that can be modeled by a system of equations (i.e. up to 3 linear equations) in two or three variables using technology. [FM.MA.5](#)

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**6. Build and use matrix representations to model polygons, transformations, and computer animations.** [FM.MA.6](#)

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## Networks

**1. Use networks, traceable paths, tree diagrams, Venn diagrams, and other pictorial representations to find the number of outcomes in a problem situation.** [FM.N.1](#)

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**2. Optimize networks in different ways and in different contexts by finding minimal spanning trees, shortest paths, and Hamiltonian paths including real-world problems.** [FM.N.2](#)

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**3. Use critical-path analysis in the context of scheduling problems and interpret the results.** [FM.N.3](#)

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**4. Construct and interpret directed and undirected graphs, decision trees, networks, and flow charts that model real-world contexts and problems.** [FM.N.4](#)

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**5. Use graph-coloring techniques to solve problems.** [FM.N.5](#)

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**6. Construct vertex-edge graph models involving relationships among a finite number of elements. Describe a vertex-edge graph using an adjacency matrix. Use vertex-edge graph models to solve problems in a variety of real-world settings.** [FM.N.6](#)

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## Optimization

**1. Use bin-packing techniques to solve problems of optimizing resource usage.** [FM.O.1](#)

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**2. Use geometric and algebraic techniques to solve optimization problems with and without technology.** [FM.O.2](#)

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**3. Use the Simplex method to solve optimization problems with and without technology.** [FM.O.3](#)

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## Probability

**1. Use Markov chains to solve problems with and without technology.** [FM.P.1](#)

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**2. Understand and use the addition rule to calculate probabilities for mutually exclusive and non mutually exclusive events.** [FM.P.2](#)

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**3. Understand and use the multiplication rule to calculate probabilities for independent and dependent events. 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.** [FM.P.3](#)

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**4. Understand the multiplication counting principle, permutations, and combinations; use them to solve real-world problems. Use simulations with and without technology to solve counting and probability problems.** [FM.P.4](#)

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**5. Calculate the probabilities of complementary events.** [FM.P.5](#)

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- 6. Calculate the expected value of a random variable; interpret it as the mean of the probability distribution. FM.P.6**
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- 7. Analyze decisions and strategies using probability concepts. Analyze probabilities to interpret odds and risk of events. FM.P.7**
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- 8. 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. FM.P.8**
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- 9. Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value. FM.P.9**
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- 10. Use the relative frequency of a specified outcome of an event to estimate the probability of the outcome and apply the law of large numbers in simple examples. FM.P.10**