Indiana Mathematics

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

	6. **Build and use matrix representations to model polygons, transformations, and computer animations.** FM.MA.6
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
	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
	3. **Use critical-path analysis in the context of scheduling problems and interpret the results.** FM.N.3
	4. **Construct and interpret directed and undirected graphs, decision trees, networks, and flow charts that model real-world contexts and problems.** FM.N.4
	5. **Use graph-coloring techniques to solve problems.** FM.N.5
	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
Optimization	1. **Use bin-packing techniques to solve problems of optimizing resource usage.** FM.O.1
	2. **Use geometric and algebraic techniques to solve optimization problems with and without technology.** FM.O.2
	3. **Use the Simplex method to solve optimization problems with and without technology.** FM.O.3
Probability	1. **Use Markov chains to solve problems with and without technology.** FM.P.1
	2. **Understand and use the addition rule to calculate probabilities for mutually exclusive and non mutually exclusive events.** FM.P.2
	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
	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
	5. **Calculate the probabilities of complementary events.** FM.P.5

6. **Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.** FM.P.6

7. **Analyze decisions and strategies using probability concepts. Analyze probabilities to interpret odds and risk of events.** FM.P.7

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

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

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