ALGEBRA II CURRICULUM MAP

REVISED: October 2019

9 Weeks	Envision Algebra II	Topic/Lesson	WV College and Career Readiness Standard(s)
1st	**Topic 1 Linear Functions and Systems**	Note: For lesson 1.1 – 1.3, use only linear functions. Pearson uses quadratic functions - Use outside resources instead. **Lesson 1.1:** M.A2HS.27 M.A2HS.29 **Lesson 1.2:** M.A2HS.28 M.A2HS.34 **Lesson 1.3:** M.A2HS.28 M.A2HS.30a	**M.A2HS.27** For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. Instructional *Note: Emphasize the selection of a model function based on behavior of data and context.* **M.A2HS.29** Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. *Note: Emphasize the selection of a model function based on behavior of data and context* **M.A2HS.28** Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. (e.g., If the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.) *Note: Emphasize the selection of a model function based on behavior of data and context* **M.A2HS.34** Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them. *Instructional Note: Use transformations of functions to find models as students consider increasingly more complex situations. Observe the effect of multiple transformations on a single graph and the common effect of each transformation across function types.* **M.A2HS.30** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. a. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. b. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing

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1st	**Topic 1 Linear Functions and Systems**	**Lesson 1.5:** M.A2HS.23 M.A2HS.17	period, midline, and amplitude. *Instructional Note: Focus on applications and how key features relate to characteristics of a situation, making selection of a particular type of function model appropriate.* **M.A2HS.23** Create equations and inequalities in one variable and use them to solve problems. Instructional Note: Include equations arising from linear and quadratic functions, and simple rational and exponential functions. **M.A2HS.17** Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. *Instructional Note: Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions. Instructional Note: Include combinations of linear, polynomial, rational, radical, absolute value, and exponential functions.*
		Lesson 1.6: M.A2HS.24 M.A2HS.25	**M.A2HS.24** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. *Instructional Note: While functions will often be linear, exponential, or quadratic the types of problems should draw from more complex situations than those addressed in Algebra I. (e.g., Finding the equation of a line through a given point perpendicular to another line allows one to find the distance from a point to a line).* **M. A2HS.25** Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. (e.g., Represent inequalities describing nutritional and cost constraints on combinations of different foods.) *Instructional Note: While functions will often be linear, exponential, or quadratic the types of problems should draw from more complex situations than those addressed in Algebra I. For example, finding the equation of a line through a given point perpendicular to another line allows one to find the distance from a point to a line.*
		Lesson 2.1:	**M.A2HS.24** Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

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1st	**Topic 2 Quadratic Functions and Equations**	M.A2HS.24 M.A2HS.27 M.A2HS.34 **Lesson 2.2:** M.A2HS.24 M.A2HS.27 **Factoring Polynomials** (GCF, Difference of Two Squares & Trinomials. Cubes will be covered prior to 4-3) **Lesson 2.3:** M.A2HS.7 M.A2HS.11 **Radicals (simplify, add, subtract multiply and divide)** **Lesson 2.4:** M.A2HS.1 M.A2HS.2 M.A2HS.4 **Lesson 2.5 (honors only):** M.A2HS.3	*Instructional Note: While functions will often be linear, exponential, or quadratic the types of problems should draw from more complex situations than those addressed in Algebra I. (e.g., Finding the equation of a line through a given point perpendicular to another line allows one to find the distance from a point to a line).* **M.A2HS.27** For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. *Instructional Note: Emphasize the selection of a model function based on behavior of data and context.* **M.A2HS.34** Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them. *Instructional Note: Use transformations of functions to find models as students consider increasingly more complex situations. Observe the effect of multiple transformations on a single graph and the common effect of each transformation across function types.* **M.A2HS.7** Use the structure of an expression to identify ways to rewrite it. For example, see x4 – y4 as (x2)2 – (y2)2, thus recognizing it as a difference of squares that can be factored as (x2 – y2)(x2 + y2). *Instructional Note: Extend to polynomial and rational expressions.* **M.A2HS.11** Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial. **M.A2HS.1** Know there is a complex number i such that i2 = –1, and every complex number has the form a + bi with a and b real.

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1st	**Topic 2 Quadratic Functions and Equations**	M.A2HS.4 **Lesson 2.6:** M.A2HS.3 M.A2HS.4 **Lesson 2.7:** M.A2HS.27 Short, just with the calculator	**M.A2HS.2** Use the relation $i2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers. **M.A2HS.3**Solve quadratic equations with real coefficients that have complex solutions. *Instructional Note: Limit to polynomials with real coefficients.* **M.A2HS.4** Extend polynomial identities to the complex numbers. For example, rewrite $x2 + 4$ as $(x + 2i)(x – 2i)$. *Instructional Note: Limit to polynomials with real coefficients.*

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2nd	**Topic 3 Polynomial Functions**	**Lesson 3.2:** M.A2HS.9 M.A2HS.32 M.A2HS.33 **Lesson 3.4:** M.A2HS.7 M.A2HS.10 M.A2HS.14 **Chapter 5** **5-5** M.A2HS.33 **Lesson 3.5:** M.A2HS.7 M.A2HS.11 **Lesson 3.1:** M.A2HS.27 M.A2HS.29 **Lesson 3.7:** M.A2HS.34	**M.A2HS.9** Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials. *Instructional Note: Extend beyond the quadratic polynomials found in Algebra I.* **M.A2HS.32** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). (e.g., Given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.) *Instructional Note: Focus on applications and how key features relate to characteristics of a situation, making selection of a particular type of function model appropriate.* **M.A2HS.33** Write a function that describes a relationship between two quantities. Combine standard function types using arithmetic operations. (e.g., Build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.) *Instructional Note: Develop models for more complex or sophisticated situations than in previous courses.* **M.A2HS.7** Use the structure of an expression to identify ways to rewrite it. For example, see x4 – y4 as (x2)2 – (y2)2, thus recognizing it as a difference of squares that can be factored as (x2 – y2)(x2 + y2). *Instructional note: Extend to polynomial and rational expressions.* **M.A2HS.10** Know and apply the Remainder Theorem: For a polynomial p(x) and a number a, the remainder on division by x – a is p(a), so p(a) = 0 if and only if (x – a) is a factor of p(x) {Long division of polynomials should be included here.] **M.A2HS.14** Rewrite simple rational expressions in different forms; write a(x)/b(x) in the form q(x) + r(x)/b(x), where a(x), b(x), q(x), and r(x) are polynomials with the degree of r(x) less than the degree of b(x), using inspection, long division, or, for the more complicated examples, a computer algebra system. *Instructional Note: The limitations on rational functions apply to the rational expressions.*

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9 Weeks	Envision Algebra II	Topic/Lesson	WV College and Career Readiness Standard(s)
2nd	**Topic 3 Polynomial Functions**		**M.A2HS.11** Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial. **M.A2HS.27** For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. *Instructional Note: Emphasize the selection of a model function based on behavior of data and context.* **M.2HS.29** Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. *Note: Emphasize the selection of a model function based on behavior of data and context.* **M.A2HS.4** Extend polynomial identities to the complex numbers. For example, rewrite x2 + 4 as (x + 2i)(x – 2i). Instructional Note: Limit to polynomials with real coefficients. **M.A2HS.5** Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials. *Instructional Note: Limit to polynomials with real coefficients.* **M.A2HS.34** Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them. *Instructional Note: Use transformations of functions to find models as students consider increasingly more complex situations. Observe the effect of multiple transformations on a single graph and the common effect of each transformation across function types.*

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9 Weeks	Envision Algebra II	Topic/Lesson	WV College and Career Readiness Standard(s)
3rd	**Topic 4 Rational Functions**	**Lesson 4.2:** M.A2HS.14 M.A21HS.17 **Review Factoring and include sum and difference of cubes.** **Lesson 4.3:** M.A2HS.7 M.A2HS.14 M.A2HS.15 **Lesson 4.4:** M.A2HS.7 M.A2HS.15 **Lesson 4.5:** M.A2HS.23 M.A2HS.16	**M.A2HS.14** Rewrite simple rational expressions in different forms; write a(x)/b(x) in the form q(x) + r(x)/b(x), where a(x), b(x), q(x), and r(x) are polynomials with the degree of r(x) less than the degree of b(x), using inspection, long division, or, for the more complicated examples, a computer **M.A2HS.17** Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. *Instructional Note: Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions. Instructional Note: Include combinations of linear, polynomial, rational, radical, absolute value and exponential functions.* **M.A2HS.7** Use the structure of an expression to identify ways to rewrite it. For example, see x4 – y4 as (x2)2 – (y2)2, thus recognizing it as a difference of squares that can be factored as (x2 – y2)(x2 + y2). *Instructional note: Extend to polynomial and rational expressions.* **M. A2HS.15** Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions. *Instructional Note: This standard requires the general division algorithm for polynomials.* **M.A2HS.23** Create equations and inequalities in one variable and use them to solve problems. *Instructional Note: Include equations arising from linear and quadratic functions, and simple rational and exponential functions.* **M.A2HS.16** Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. *Instructional Note: Extend to simple rational and radical equations.*

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9 Weeks	Envision Algebra II	Topic/Lesson	WV College and Career Readiness Standard(s)
3rd	**Topic 5 Rational Exponents and Radical Functions**	**Lesson 5.1** M.A1HS.11 M.A1HS.12 **Lesson 5.2** M.A2HS.6 M.A2HS.7 **Lesson 5.3** M.A2HS.27 M.A2HS.30a M.A2HS.34 **Lesson 5.4** M.A2HS.26 M.A2HS.16	**M.A1HS.11** Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents. (e.g., We define $5^{1/3}$ to be the cube root of 5 because we want $(5^{1/3})^3 = 5^{(1/3)3}$ to hold, so $(5^{1/3})^3$ must equal 5.) *Instructional Note: Address this standard before discussing exponential functions with continuous domains.* **M.A1HS.12** Rewrite expressions involving radicals and rational exponents using the properties of exponents. *Instructional Note: Address this standard before discussing exponential functions with continuous domains.* **M.A2HS.6** Interpret expressions that represent a quantity in terms of its context. a. Interpret parts of an expression, such as terms, factors, and coefficients. b. Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret P(1 + r)n as the product of P and a factor not depending on P. *Instructional Note: Extend to polynomial and rational expressions.* **M.A2HS.7** Use the structure of an expression to identify ways to rewrite it. For example, see x4 – y4 as (x2)2 – (y2)2, thus recognizing it as a difference of squares that can be factored as (x2 – y2)(x2 + y2). *Instructional note: Extend to polynomial and rational expressions.* **M.A2HS.27** For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. *Instructional Note: Emphasize the selection of a model function based on behavior of data and context* **M.A2HS.30** Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. a. Graph square root, cube root, and piecewise-defined functions, including step

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4th	**Topic 5 Rational Exponents and Radical Functions**		functions and absolute value functions. b. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude. *Instructional Note: Focus on applications and how key features relate to characteristics of a situation, making selection of a particular type of function model appropriate.* **M.A2HS.34** Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them. *Instructional Note: Use transformations of functions to find models as students consider increasingly more complex situations. Observe the effect of multiple transformations on a single graph and the common effects of transformation across function types.* **M.A2HS.26** Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. (e.g., Rearrange Ohm's law V = IR to highlight resistance R.) While functions will often be linear, exponential, or quadratic the types of problems should draw from more complex situations than those addressed in Algebra I. For example, finding the equation of a line through a given point perpendicular to another line allows one to find the distance from a point to a line. This example applies to earlier instances of this standard, not to the current course. **M.A2HS.16** Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise. *Instructional Note: Extend to simple rational and radical equations.*
	Topic 7	**Lesson 7.1** M.A2HS.20	**M.A2HS.19** Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.

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4th	**Trigonometric Functions**	**Lesson 7.2** M.A2HS.19 M.A2HS.20	**M.A2HS.20** Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.
	Topic 10 Matrices	**Lesson 10.1** **Lesson 10.2**	Cover material to prepare for the SAT – not Algebra II standards
	Topic 6 Exponential and Logarithmic Functions	**Lesson 6.3** M.A2HS.35 M.A2HS.36 **Lesson 6.5** M.A2HS.7 M.A2HS.36 **Lesson 6.6** M.A2HS.7 M.A2HS.36	**M.A2HS.35** Find inverse functions. Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. (e.g., f(x) = 2 x3 or f(x) = (x+1)/(x-1) for x ≠ 1.) *Instructional Note: Use transformations of functions to find models as students consider increasingly more complex situations. Extend this standard to simple rational, simple radical, and simple exponential functions; connect this standard to M.A2HS.34.* **M.A2HS.36** For exponential models, express as a logarithm the solution to a $b^{ct} = d$ where a, c, and d are numbers and the base b is 2, 10, or e; evaluate the logarithm using technology. *Instructional Note: Consider extending this unit to include the relationship between properties of logarithms and properties of exponents, such as the connection between the properties of exponents and the basic logarithm property that log xy = log x +log y* **M.A2HS.7** Use the structure of an expression to identify ways to rewrite it. For example, see x4 – y4 as (x2)2 – (y2)2, thus recognizing it as a difference of squares that can be factored as (x2 – y2)(x2 + y2). *Instructional note: Extend to polynomial and rational expressions.*

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4th	**Topic 7 Trigonometric Functions** **If time allows**	**Lesson 7.4** M.A2HS.29 M.A2HS.32 M.A2HS.34	**M.A2HS.29** Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. *Note: Emphasize the selection of a model function based on behavior of data and context* **M.A2HS.32** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). (e.g., Given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.) *Instructional Note: Focus on applications and how key features relate to characteristics of a situation, making selection of a particular type of function model appropriate.* **M.A2HS.34** Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them. *Instructional Note: Use transformations of functions to find models as students consider increasingly more complex situations. Observe the effect of multiple transformations on a single graph and the common effects of transformation across function types.*
	Topic 8 Trigonometric equations and Identities **Topic 9 Conic Lessons** **Topic 11 Data Analysis and Statistics** **Topic 12 Probability**	**Skip these Topics**	If time allows at the end of the year, review these topics. Do not prioritize covering these topics unless all other material has been covered. Optional: on random less useful instructional days throughout year (ex. day before holiday, etc.) cover day lesson of probability, etc.

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4th	**Only if time allows** **Topic 11 Data Analysis and Statistics**	**Lesson 11.1** M.A2HS.38	**M.A2HS.38** Understand statistics as a process for making inferences about population parameters based on a random sample from that population. *Instructional Note: Include comparing theoretical and empirical results to evaluate the effectiveness of a treatment.* **M.A2HS.40 Recognize** the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each. *Instructional Note: In earlier grades, students are introduced to different ways of collecting data and use graphical displays and summary statistics to make comparisons. These ideas are revisited with a focus on how the way in which data is collected determines the scope and nature of the conclusions that can be drawn from that data. The concept of statistical significance is developed informally through simulation as meaning a result that is unlikely to have occurred solely as a result of random selection in sampling or random assignment in an experiment.*
		Lesson 11.2 M.A2HS.38 M.A2HS.40 M.A2HS.43	**M.A2HS.43** Evaluate reports based on data. *Instructional Note: In earlier grades, students are introduced to different ways of collecting data and use graphical displays and summary statistics to make comparisons. These ideas are revisited with a focus on how the way in which data is collected determines the scope and nature of the conclusions that can be drawn from that data. The concept of statistical significance is developed informally through simulation as meaning a result that is unlikely to have occurred solely as a result of random selection in sampling or random assignment in an experiment.*
		Lesson 11.3 M.A2HS.37 M.A2HS.39	**M.A2HS.37** Use the mean and standard deviation of a data set to fit it to a normal distribution and to estimate population percentages. Recognize that there are data sets for which such a procedure is not appropriate. Use calculators, spreadsheets, and tables to estimate areas under the normal curve. *Instructional Note: While students may have heard of the normal distribution, it is unlikely that they will have prior experience using it to make specific estimates. Build on students' understanding of data distributions to help them see how the normal distribution uses area to make estimates of frequencies (which can be expressed as probabilities). Emphasize that only some data are well described by a normal distribution.* **M.A2HS.39** Decide if a specified model is consistent with results from a given data-generating process, *e.g., using simulation. (e.g., A model says a spinning coin falls heads up with probability 0.5. Would a result of 5 tails in a row cause you to question the model?)*

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4th	**Only if time allows** **Topic 11 Data Analysis and Statistics**	**Lesson 11.4** M.A2HS.37 M.A2HS.43 **Lesson 11.5** M.A2HS.38 M.A2HS.39 M.A2HS.41 M.A2HS.43 **Lesson 11.6** M.A2HS.38 M.A2HS.42 M.A2HS.43	**M.A2HS.41** Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling. *Instructional Note: In earlier grades, students are introduced to different ways of collecting data and use graphical displays and summary statistics to make comparisons. These ideas are revisited with a focus on how the way in which data is collected determines the scope and nature of the conclusions that can be drawn from that data. The concept of statistical significance is developed informally through simulation as meaning a result that is unlikely to have occurred solely as a result of random selection in sampling or random assignment in an experiment. Focus on the variability of results from experiments—that is, focus on statistics as a way of dealing with, not eliminating, inherent randomness.* **M.A2HS.42** Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant. *Instructional Note: In earlier grades, students are introduced to different ways of collecting data and use graphical displays and summary statistics to make comparisons. These ideas are revisited with a focus on how the way in which data is collected determines the scope and nature of the conclusions that can be drawn from that data. The concept of statistical significance is developed informally through simulation as meaning a result that is unlikely to have occurred solely as a result of random selection in sampling or random assignment in an experiment. Focus on the variability of results from experiments—that is, focus on statistics as a way of dealing with, not eliminating, inherent randomness*
	Only if time allows **Topic 12 Probability**	**Skip Lessons 12.1 - 12.5** **Lesson 12.6** M.A2HS.44 M.A2HS.45	**M.A2HS.44** Use probabilities to make fair decisions (e.g., drawing by lots or using a random number generator). *Instructional Note: Extend to more complex probability models. Include situations such as those involving quality control, or diagnostic tests that yield both false positive and false negative results.* **M.A2HS.45** Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, and/or pulling a hockey goalie at the end of a game). *Instructional Note: Extend to more complex probability models. Include situations such as those involving quality control, or diagnostic tests that yield both false positive and false negative results.*