

**Mathematics**  
**Algebra II: Academic**  
**Unit 6: Logarithmic Functions**

<b>Essential Understandings</b>	<ul style="list-style-type: none"> <li>▪ Logarithmic functions can be used to model real-life situations.</li> </ul>
<b>Essential Questions</b>	<ul style="list-style-type: none"> <li>▪ What are the properties of Algebra and how are these used to solve logarithmic equations?</li> <li>▪ What natural phenomena are modeled by logarithmic functions?</li> <li>▪ How do you solve logarithmic equations?</li> <li>▪ How do you draw reasonable graphs of logarithmic functions?</li> <li>▪ How are a function and its inverse related?</li> </ul>
<b>Essential Knowledge</b>	<ul style="list-style-type: none"> <li>▪ Algebraic manipulation and the rules of exponents are used to solve logarithmic equations.</li> <li>▪ Understand the function of an asymptote.</li> </ul>
<b>Vocabulary</b>	<ul style="list-style-type: none"> <li>▪ <u>Terms:</u> <ul style="list-style-type: none"> <li>○ logarithmic function, asymptote, inverse functions, the number e, natural and common logs, logarithmic regression</li> </ul> </li> </ul>
<b>Essential Skills</b>	<ul style="list-style-type: none"> <li>▪ Apply order of operation.</li> <li>▪ Manipulate logarithmic expressions.</li> <li>▪ Solve logarithmic equations by various means.</li> <li>▪ Identify the inverse of a function graphically.</li> <li>▪ Sketch reasonable graphs of logarithmic functions.</li> <li>▪ Find inverses algebraically and graphically.</li> </ul>
<b>Related Maine Learning Results</b>	<p><u>Mathematics</u></p> <p>A. Number</p> <p>Real Number</p> <p>A1.Students will know how to represent and use real numbers.</p> <ol style="list-style-type: none"> <li>a. Use the concept of nth root.</li> <li>b. Estimate the value(s) of roots and use technology to approximate them.</li> <li>c. Compute using laws of exponents.</li> <li>d. Multiply and divide numbers expressed in scientific notation.</li> <li>e. Understand that some quadratic equations do not have real solutions and that there exist other number systems to allow for solutions to these equations.</li> </ol>

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<p><b>Related Maine Learning Results</b></p>	<p>B. Data Measurement and Approximation B1.Students understand the relationship between precision and accuracy.</p> <ul style="list-style-type: none"><li>a. Express answers to a reasonable degree of precision in the context of a given problem.</li><li>b. Represent an approximate measurement using appropriate numbers of significant figures.</li><li>c. Know that most measurements are approximations and explain why it is useful to take the mean of repeated measurements.</li></ul> <p>Data Analysis B2.Students understand correlation and cause and effect.</p> <ul style="list-style-type: none"><li>a. Recognize when correlation has been confused with cause and effect.</li><li>b. Create and interpret scatter plots and estimate correlation and lines of best fit.</li><li>c. Recognize positive and negative correlations based on data from a table or scatter plot.</li><li>d. Estimate the strength of correlation based upon a scatter plot.</li></ul> <p>B3.Students understand and know how to describe distributions and find and use descriptive statistics for a set of data.</p> <ul style="list-style-type: none"><li>a. Find and apply range, quartiles, mean absolute deviation, and standard deviation (using technology) of a set of data.</li><li>b. Interpret, give examples of, and describe key differences among different types of distributions: uniform, normal, and skewed.</li><li>c. For the sample mean of normal distributions, use the standard deviation for a group of observations to establish 90%, 95%, or 99% confidence intervals.</li></ul> <p>B4.Students understand that the purpose of random sampling is to reduce bias when creating a representative sample for a set of data.</p> <ul style="list-style-type: none"><li>a. Describe and account for the difference between sample statistics and statistics describing the distribution of the entire population.</li><li>b. Recognize that sample statistics produce estimates for the distribution of an entire population and recognize that larger sample sizes will produce more reliable estimates.</li><li>c. Apply methods of creating random samples and recognize possible sources of bias in samples.</li></ul>
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<p><b>Related Maine Learning Results</b></p>	<p>D. Algebra Symbols and Expressions D1. Students understand and use polynomials and expressions with rational exponents.</p> <ol style="list-style-type: none"><li>Simplify expressions including those with rational numbers.</li><li>Add, subtract, and multiply polynomials.</li><li>Factor the common term out of polynomial expressions.</li><li>Divide polynomials by <math>(ax+b)</math>.</li></ol>
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<p><b>Related Maine Learning Results</b></p>	<p>Equations and Inequalities</p> <p>D2.Students solve families of equations and inequalities.</p> <ol style="list-style-type: none"> <li>a. Solve systems of linear equations and inequalities in two unknowns and interpret their graphs.</li> <li>b. Solve quadratic equations graphically, by factoring in cases where factoring is efficient, and by applying the quadratic formula.</li> <li>c. Solve simple rational equations.</li> <li>d. Solve absolute value equations and inequalities and interpret the results.</li> <li>e. Apply the understanding that the solution(s) to equations of the form <math>f(x) = g(x)</math> are x-value(s) of the point(s) of intersection of the graphs of <math>f(x)</math> and <math>g(x)</math> and common outputs in table of values.</li> <li>f. Explain why the coordinates of the point of intersection of the lines represented by a system of equations is its solution and apply this understanding to solving problems.</li> </ol> <p>D3.Students understand and apply ideas of logarithms.</p> <ol style="list-style-type: none"> <li>a. Use and interpret logarithmic scales.</li> <li>b. Solve equations in the form of <math>x + b^y</math> using the equivalent form <math>y = \log_b x</math>.</li> </ol> <p>Functions and Relations</p> <p>D4.Students understand and interpret the characteristics of functions using graphs, tables, and algebraic techniques.</p> <ol style="list-style-type: none"> <li>a. Recognize the graphs and sketch graphs of the basic functions.</li> <li>b. Apply functions from these families to problem situations.</li> <li>c. Use concepts such as domain, range, zeros, intercepts, and maximum and minimum values.</li> <li>d. Use the concepts of average rate of change (table of values) and increasing and decreasing over intervals, and use these characteristics to compare functions.</li> </ol> <p>D5.Students express relationships recursively and use iterative methods to solve problems.</p> <ol style="list-style-type: none"> <li>a. Express the <math>(n+1)</math>st term in terms of the <math>n</math>th term and describe relationships in terms of starting point and rule followed to transform one terms to the next.</li> <li>b. Use technology to perform repeated calculations to develop solutions to real life problems involving linear, exponential, and other patterns of change.</li> </ol>
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<b>Sample Lessons And Activities</b>	<ul style="list-style-type: none"> <li>▪ Solve logarithmic equations using a variety of techniques. These include graphing and writing in exponential form.</li> <li>▪ Simplify logarithmic expressions using properties of logs.</li> <li>▪ Model real world data.</li> </ul>
<b>Sample Classroom Assessment Methods</b>	<ul style="list-style-type: none"> <li>▪ Evaluate homework.</li> <li>▪ Quizzes.</li> <li>▪ Chapter test.</li> </ul>
<b>Sample Resources</b>	<ul style="list-style-type: none"> <li>▪ <u>Publications:</u> <ul style="list-style-type: none"> <li>○ Holt Algebra 2</li> <li>○ McDougal Littell Algebra 2</li> </ul> </li> <li>▪ <u>Other Resources:</u> <ul style="list-style-type: none"> <li>○ Graphing calculators</li> <li>○ The A+ learning system for remediation</li> </ul> </li> </ul>