

**Portsmouth City School District
Lesson Plan Checklist**

Twelfth Grade Mathematics Academic Content Standards

Standard 1	Standard 2	Standard 3
<i>Number, Number Sense and Operations</i>	<i>Measurement</i>	<i>Geometry and Spatial Sense</i>
Benchmarks	Benchmarks	Benchmarks
<p>A. Demonstrate that vectors and matrices are systems having some of the same properties of the real number system.</p> <p>B. Develop an understanding of properties of and representations for addition and multiplication of vectors and matrices.</p> <p>C. Apply factorials and exponents, including fractional exponents, to solve practical problems.</p> <p>D. Demonstrate fluency in operations with real numbers, vectors and matrices, using mental computation or paper and pencil calculations for simple cases and technology for more complicated cases.</p> <p>E. Represent and compute with complex numbers.</p>	<p>A. Explain differences among accuracy, precision and error, and describe how each of those can affect solutions in measurement situations.</p> <p>B. Apply various measurement scales to describe phenomena and solve problems.</p> <p>C. Estimate and compute areas and volume in increasingly complex problem situations.</p> <p>D. Solve problem situations involving derived measurements; e.g., density, acceleration.</p>	<p>A. Use trigonometric relationships to verify and determine solutions in problem situations.</p> <p>B. Represent transformations within a coordinate system using vectors and matrices.</p>
Grade Level Indicators	Grade Level Indicators	Grade Level Indicators
<p><u>1. Determine what properties (closure, identity, inverse, commutative and associative) hold for operations with complex numbers.</u></p> <p><u>2. Apply combination as a method to create coefficients for the Binomial Theorem, and make connections to everyday and workplace problem situations.</u></p>	<p><u>1. Solve problems involving derived measurements; e.g., acceleration and pressure.</u></p> <p><u>2. Use radian measures in the solution of problems involving angular velocity and acceleration.</u></p> <p><u>3. Apply informal concepts of successive approximation, upper and lower bounds, and limits in measurement situations; e.g., measurement of some quantities, such as volume of a cone, can be determined by sequences of increasingly accurate approximations.</u></p>	<p><u>1. Use matrices to represent translations, reflections, rotations, dilations and their compositions.</u></p> <p><u>2. Derive and apply the basic trigonometric identities; i.e., angle addition, angle subtraction and double angle.</u></p> <p><u>3. Relate graphical and algebraic representations of lines, simple curves and conic sections.</u></p> <p><u>4. Recognize and compare specific shapes and properties in multiple geometries; e.g., plan, spherical and hyperbolic.</u></p>

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Standard 4	Standard 5	Standard 6
<i>Patterns, Functions and Algebra</i>	<i>Data Analysis and Probability</i>	<i>Mathematical Processes</i>
Benchmarks	Benchmarks	Benchmarks
<p>A. Analyze functions by investigating rates of change, intercepts, zeros, asymptotes, and local and global behavior.</p> <p>B. Use the quadratic formula to solve quadratic equations that have complex roots.</p> <p>C. Use recursive functions to model and solve problems; e.g., home mortgages, annuities.</p> <p>D. Apply algebraic methods to represent and generalize problem situations involving vectors and matrices.</p>	<p>A. Create and analyze tabular and graphical displays of data using appropriate tools, including spreadsheets and graphing calculators.</p> <p>B. Use descriptive statistics to analyze and summarize data, including measures of center, dispersion, correlation and variability.</p> <p>C. Design and perform a statistical experiment, simulation or study; collect and interpret data; and use descriptive statistics to communicate and support predictions and conclusions.</p> <p>D. Connect statistical techniques to applications in workplace and consumer situations.</p>	<p>A. Construct algorithms for multi-step and non-routine problems.</p> <p>B. Construct logical verifications or counter-examples to test conjectures and to justify or refute algorithms and solutions to problems.</p> <p>C. Assess the adequacy and reliability of information available to solve a problem.</p> <p>D. Select and use various types of reasoning and methods of proof.</p> <p>E. Evaluate a mathematical argument and use reasoning and logic to judge its validity.</p> <p>F. Present complete and convincing arguments and justifications, using inductive and deductive reasoning, adapted to be effective for various audiences.</p> <p>G. Understand the difference between a statement that is verified by mathematical proof, such as a theorem, and one that is verified empirically using examples or data.</p> <p>H. Use formal mathematical language and notation to represent ideas, to demonstrate relationships within and among representation systems, and to formulate generalizations.</p> <p>I. Communicate the mathematical ideas orally and in writing with a clear purpose and appropriate for a specific audience.</p> <p>J. Apply mathematical modeling to workplace and consumer situations, including problem formulation, identification of a mathematical model, interpretation of solution within the model, and validation to original problem situation.</p>
Grade Level Indicators	Grade Level Indicators	Grade Level Indicators
<p>1. Analyze the behavior of arithmetic and geometric sequences and series as the number of terms increases.</p> <p>2. Translate between the numeric and symbolic form of a sequence or series.</p> <p>3. Describe and compare the characteristics of transcendental and periodic functions; e.g., general shape.</p>	<p>1. Identify and use various sampling methods (voluntary response, convenience sample, random sample, stratified random sample, census) in a study.</p> <p>2. Transform bivariate data so it can be modeled by a function; e.g., use logarithms to allow nonlinear</p>	<p><i>Note: The benchmarks for mathematical processes articulate what students should demonstrate in problem solving, representation, communication, reasoning and connections at key points in their mathematical program. Specific grade-level indicators have not been included for the mathematical processes</i></p>

<p>number of roots, domain and range, asymptotic behavior, extrema, local and global behavior.</p> <p style="text-align: center;">Standard 4 <u>Patterns, Functions and Algebra</u></p> <p style="text-align: center;">Indicators (continued)</p> <p>4. Represent the inverse of a transcendental function symbolically.</p> <p>5. Set up and solve systems of equations using matrices and graphs, with and without technology.</p> <p>6. Make arguments about mathematical properties using mathematical induction.</p> <p>7. Make mathematical arguments using the concepts of limit.</p> <p>8. Compare estimates of the area under a curve over a bounded interval by partitioning the region with rectangles; e.g., make successive estimates using progressively smaller rectangles.</p> <p>9. Translate freely between polar and Cartesian coordinate systems.</p> <p>10. Use the concept of limit to find instantaneous rate of change for a point on a graph as the slope of a tangent at a point.</p>	<p>relationship to be modeled by linear function.</p> <p>3. Describe the shape and find all</p> <p style="text-align: center;">Standard 5 <u>Data Analysis and Probability</u></p> <p style="text-align: center;">Indicators (continued)</p> <p>summary statistics for a set of univariate data, and describe how a linear transformation affects shape, center and spread.</p> <p>4. Apply the concept of a random variable to generate and interpret probability distributions, including binomial, normal and uniform.</p> <p>5. Use sampling distributions as the basis for informal inference.</p> <p>6. Use theoretical or experimental probability, including simulations, to determine probabilities in real-world problem situations involving uncertainty, such as mutually exclusive events, complementary events, and conditional probability.</p>	<p><i>standard because content and processes should be interconnected at the indicator level. Therefore, mathematical</i></p> <p style="text-align: center;">Standard 6 <u>Mathematical Processes</u></p> <p style="text-align: center;">Indicators (continued)</p> <p><i>processes have been embedded within the grade-level indicators for the five content standards.</i></p>
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