ABOUT EUREKA MATH

Created by the nonprofit Great Minds, *Eureka Math* helps teachers deliver unparalleled math instruction that provides students with a deep understanding and fluency in math. Crafted by teachers and math scholars, the curriculum carefully sequences the mathematical progressions to maximize coherence from Prekindergarten through Precalculus—a principle tested and proven to be essential in students’ mastery of math.

Teachers and students using *Eureka Math* find the trademark “Aha!” moments in *Eureka Math* to be a source of joy and inspiration, lesson after lesson, year after year.

ALIGNED

*Eureka Math* is the only curriculum found by EdReports.org to align fully with the Common Core State Standards for Mathematics for all grades, Kindergarten through Grade 8. Great Minds offers detailed analyses that demonstrate how each grade of *Eureka Math* aligns with specific state standards. Access these free alignment studies at greatminds.org/state-studies.

DATA

Schools and districts nationwide are experiencing student academic growth and impressive test scores after using *Eureka Math*. See their stories and data at greatminds.org/data.

FULL SUITE OF RESOURCES

As a nonprofit, Great Minds offers the *Eureka Math* curriculum as PDF downloads for free, noncommercial use. Access the free PDFs at greatminds.org/math/curriculum.

The teacher–writers who created the curriculum have also developed essential resources, available only from Great Minds, including the following:

- Printed material in English and Spanish
- Digital resources
- Professional development
- Classroom tools and manipulatives
- Teacher support materials
- Parent resources
PRECALCULUS AND ADVANCED TOPICS

Many of the Precalculus Indiana Academic Standards for Mathematics will require the use of Eureka Math content from other courses or supplemental materials. A detailed analysis of alignment is provided in the table below. With strategic placement of supplemental materials, Eureka Math can ensure students are successful in achieving the proficiencies of the Indiana Academic Standards for Mathematics while still benefiting from the coherence and rigor of Eureka Math.

INDICATORS

- **GREEN** indicates the Indiana standard is addressed in Eureka Math.
- **YELLOW** indicates the Indiana standard may not be completely addressed in Eureka Math.
- **RED** indicates the Indiana standard is not addressed in Eureka Math.
- **BLUE** indicates there is a discrepancy between the grade level at which this standard is addressed in Indiana and in Eureka Math.
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<thead>
<tr>
<th>Process Standards for Mathematics</th>
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<tr>
<td><strong>PS.1: Make sense of problems and persevere in solving them.</strong></td>
<td>Lessons in every module engage students in making sense of problems and persevering in solving them as required by this standard. This process standard is analogous to the CCSSM Standards for Mathematical Practice 1, which is specifically addressed in the following modules:</td>
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<tr>
<td>Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway, rather than simply jumping into a solution attempt. They consider analogous problems and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” and “Is my answer reasonable?” They understand the approaches of others to solving complex problems and identify correspondences between different approaches. Mathematically proficient students understand how mathematical ideas interconnect and build on one another to produce a coherent whole.</td>
<td>Precalculus and Advanced Topics M1: Complex Numbers and Transformations</td>
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<td>Precalculus and Advanced Topics M4: Trigonometry</td>
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### Process Standards for Mathematics

**PS.2: Reason abstractly and quantitatively.**

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

### Aligned Components of Eureka Math

Lessons in every module engage students in reasoning abstractly and quantitatively as required by this standard. This process standard is analogous to the CCSSM Standards for Mathematical Practice 2, which is specifically addressed in the following modules:

- Precalculus and Advanced Topics M1: Complex Numbers and Transformations
- Precalculus and Advanced Topics M2: Vectors and Matrices
- Precalculus and Advanced Topics M5: Probability and Statistics
### Process Standards for Mathematics

**PS.3: Construct viable arguments and critique the reasoning of others.**

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They analyze situations by breaking them into cases and recognize and use counterexamples. They organize their mathematical thinking, justify their conclusions and communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose.

Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. They justify whether a given statement is true always, sometimes, or never. Mathematically proficient students participate and collaborate in a mathematics community. They listen to or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

### Aligned Components of Eureka Math

Lessons in every module engage students in constructing viable arguments and critiquing the reasoning of others as required by this standard. This process standard is analogous to the CCSSM Standards for Mathematical Practice 3, which is specifically addressed in the following modules:

- Precalculus and Advanced Topics M1: Complex Numbers and Transformations
- Precalculus and Advanced Topics M3: Rational and Exponential Functions
- Precalculus and Advanced Topics M4: Trigonometry
- Precalculus and Advanced Topics M5: Probability and Statistics
### Process Standards for Mathematics

**PS.4: Model with mathematics.**

Mathematically proficient students apply the mathematics they know to solve problems arising in everyday life, society, and the workplace using a variety of appropriate strategies. They create and use a variety of representations to solve problems and to organize and communicate mathematical ideas. Mathematically proficient students apply what they know and are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

### Aligned Components of *Eureka Math*

Lessons in every module engage students in modeling with mathematics as required by this standard. This process standard is analogous to the CCSSM Standards for Mathematical Practice 4, which is specifically addressed in the following modules:

- Precalculus and Advanced Topics M1: Complex Numbers and Transformations
- Precalculus and Advanced Topics M2: Vectors and Matrices
- Precalculus and Advanced Topics M4: Trigonometry
- Precalculus and Advanced Topics M5: Probability and Statistics
### Process Standards for Mathematics

**PS.5: Use appropriate tools strategically.**

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Mathematically proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. Mathematically proficient students identify relevant external mathematical resources, such as digital content, and use them to pose or solve problems. They use technological tools to explore and deepen their understanding of concepts and to support the development of learning mathematics. They use technology to contribute to concept development, simulation, representation, reasoning, communication, and problem solving.

### Aligned Components of *Eureka Math*

Lessons in every module engage students in using appropriate tools strategically as required by this standard. This process standard is analogous to the CCSSM Standards for Mathematical Practice 5, which is specifically addressed in the following modules:

- Precalculus and Advanced Topics M2: Vectors and Matrices
- Precalculus and Advanced Topics M4: Trigonometry
- Precalculus and Advanced Topics M5: Probability and Statistics
### Process Standards for Mathematics

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<th><strong>PS.6: Attend to precision.</strong></th>
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| Mathematically proficient students communicate precisely to others. They use clear definitions, including correct mathematical language, in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They express solutions clearly and logically by using the appropriate mathematical terms and notation. They specify units of measure and label axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently and check the validity of their results in the context of the problem. They express numerical answers with a degree of precision appropriate for the problem context. | Lessons in every module engage students in attending to precision as required by this standard. This process standard is analogous to the CCSSM Standards for Mathematical Practice 6, which is specifically addressed in the following modules:  
- Precalculus and Advanced Topics M1: Complex Numbers and Transformations  
- Precalculus and Advanced Topics M2: Vectors and Matrices  
- Precalculus and Advanced Topics M3: Rational and Exponential Functions |

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<th><strong>PS.7: Look for and make use of structure.</strong></th>
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| Mathematically proficient students look closely to discern a pattern or structure. They step back for an overview and shift perspective. They recognize and use properties of operations and equality. They organize and classify geometric shapes based on their attributes. They see expressions, equations, and geometric figures as single objects or as being composed of several objects. | Lessons in every module engage students in looking for and making use of structure as required by this standard. This process standard is analogous to the CCSSM Standards for Mathematical Practice 7, which is specifically addressed in the following module:  
- Precalculus and Advanced Topics M3: Rational and Exponential Functions |
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<tr>
<td><strong>PS.8: Look for and express regularity in repeated reasoning.</strong>&lt;br&gt;Mathematically proficient students notice if calculations are repeated and look for general methods and shortcuts. They notice regularity in mathematical problems and their work to create a rule or formula. Mathematically proficient students maintain oversight of the process, while attending to the details as they solve a problem. They continually evaluate the reasonableness of their intermediate results.</td>
<td>Lessons in every module engage students in looking for and expressing regularity in repeated reasoning as required by this standard. This process standard is analogous to the CCSSM Standards for Mathematical Practice 8, which is specifically addressed in the following modules:&lt;br&gt;Precalculus and Advanced Topics M3: Rational and Exponential Functions&lt;br&gt;Precalculus and Advanced Topics M5: Probability and Statistics</td>
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| Functions | **PC.F.1**<br>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. | Algebra II M1 Lessons 16–17: Modeling with Polynomials—An Introduction  
Algebra II M2 Lesson 12: Ferris Wheels—Using Trigonometric Functions to Model Cyclical Behavior  
Algebra II M2 Lesson 13: Tides, Sound Waves, and Stock Markets  
Algebra II M3 Lesson 18: Graphs of Exponential Functions and Logarithmic Functions  
Algebra II M3 Lesson 20: Transformations of the Graphs of Logarithmic and Exponential Functions  
Algebra II M3 Lesson 21: The Graph of the Natural Logarithm Function  
Precalculus and Advanced Topics M3 Topic B: Rational Functions and Composition of Functions |
<p>| Functions | <strong>PC.F.2</strong>&lt;br&gt;Find linear models by using median fit and least squares regression methods. Decide which among several linear models gives a better fit. Interpret the slope and intercept in terms of the original context. | Algebra I M2 Topic D: Numerical Data on Two Variables |</p>
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| PC.F.3 | Compose functions and find the domain of composite functions. | Precalculus and Advanced Topics M3 Lesson 16: Function Composition  
Precalculus and Advanced Topics M3 Lesson 17: Solving Problems by Functions Composition |
<p>| PC.F.4 | Determine if a graph or table has an inverse, and justify if the inverse is a function, relation, or neither. Identify the values of an inverse function/relation from a graph or a table, given that the function has an inverse. Derive the inverse equation from the values of the inverse. | Precalculus and Advanced Topics M3 Topic C: Inverse Functions |
| PC.F.5 | Produce an invertible function from a non-invertible function by restricting the domain. | Precalculus and Advanced Topics M3 Lesson 19: Restricting the Domain |</p>
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| PC.F.6 | Recognize even and odd functions from their graphs and algebraic expressions. | Algebra II M1 Lesson 15: Structure in Graphs of Polynomial Functions  
Algebra II M2 Lesson 11: Transforming the Graph of the Sine Function  
Algebra II M2 Lesson 12: Ferris Wheels—Using Trigonometric Functions to Model Cyclical Behavior  
Algebra II M3 Lesson 20: Transformations of the Graphs of Logarithmic and Exponential Functions  
Precalculus and Advanced Topics M1 Lesson 3: Which Real Number Functions Define a Linear Transformation?  
Precalculus and Advanced Topics M3 Lesson 15: Transforming Rational Functions  
Precalculus and Advanced Topics M4 Lesson 11: Revisiting the Graphs of the Trigonometric Functions |
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| Quadratic, Polynomial, and Rational Equations and Functions | PC.QPR.1  
Use the method of completing the square to transform any quadratic equation into an equation of the form \((x - p)^2 = q\) that has the same solutions. Derive the quadratic formula from this form. | Algebra I M4 Lesson 13: Solving Quadratic Equations by Completing the Square  
Algebra I M4 Lesson 14: Deriving the Quadratic Formula |
| | PC.QPR.2  
Understand and use addition, subtraction, multiplication, and conjugation of complex numbers. | Precalculus and Advanced Topics M1: Complex Numbers and Transformations  
Precalculus and Advanced Topics M2 Lesson 4: Linear Transformations Review |
| | PC.QPR.3  
Calculate the distance between numbers in the complex plane as the modulus of the difference, and the midpoint of a segment as the average of the numbers at its endpoints. | Precalculus and Advanced Topics M1 Lessons 11–12: Distance and Complex Numbers |
| | PC.QPR.4  
Know and apply the Remainder Theorem and the Factor Theorem. | Algebra II M1 Lesson 19: The Remainder Theorem |
| | PC.QPR.5  
Understand the Fundamental Theorem of Algebra. Find a polynomial function of lowest degree with real coefficients when given its roots. | Algebra II M1 Lesson 40: Obstacles Resolved—A Surprising Result |
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<td><strong>PC.QPR.6</strong></td>
<td>Precalculus and Advanced Topics M3 Topic B: Rational Functions and Composition of Functions</td>
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<td>Graph rational functions with and without technology. Identify and describe features such as intercepts, domain and range, and asymptotic and end behavior.</td>
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<tr>
<td>Exponential and Logarithmic Functions and Equations</td>
<td><strong>PC.EL.1</strong></td>
<td>Algebra II M3 Topic B: Logarithms</td>
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<td>Use the definition of logarithms to convert logarithms from one base to another and prove simple laws of logarithms.</td>
<td>Algebra II M3 Topic C: Exponential and Logarithmic Functions and their Graphs</td>
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<td><strong>PC.EL.2</strong></td>
<td>Algebra II M3 Lesson 28: Newton’s Law of Cooling, Revisited</td>
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<td>Use the laws of logarithms to simplify logarithmic expressions, approximate the value of a logarithmic expression, and solve logarithmic equations.</td>
<td>Precalculus and Advanced Topics M3 Topic C: Inverse Functions</td>
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<td><strong>PC.EL.3</strong></td>
<td>Precalculus and Advanced Topics M3 Lesson 21: Logarithmic and Exponential Problem Solving</td>
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<td>Graph and solve real-world and other mathematical problems that can be modeled using exponential and logarithmic functions; interpret the solution and determine whether it is reasonable. Identify and describe features such as intercepts, domain, range, asymptotes, and end behavior.</td>
<td><em>Note: Supplemental material may be necessary to completely address exponential and logarithmic inequalities.</em></td>
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| PC.EL.4                | Use technology to find a quadratic, exponential, logarithmic, or power function that models a relationship for a bivariate data set to make predictions.                                                                                                                                                                                                                                                                                   | Algebra I M2 Lesson 13: Relationships Between Two Numerical Variables  
Algebra I M2 Lesson 19: Interpreting Correlation  
Algebra I M2 Lesson 20: Analyzing Data Collected on Two Variables  
Algebra I M5 Lesson 7: Modeling a Context from Data  
Algebra II M3 Lesson 23: Bean Counting  
Algebra II M3 Lesson 27: Modeling with Exponential Functions  
Precalculus and Advanced Topics M3 Topic C: Inverse Functions                                                                                                                                                                                                                                                                                             |
| Sequences and Series   | PC.SS.1  
Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.                                                                                                                                                                                                                                                                                                                  | Algebra I M3 Lesson 2: Recursive Formulas for Sequences  
Algebra I M3 Lesson 3: Arithmetic and Geometric Sequences  
Algebra I M3 Lesson 4: Why Do Banks Pay YOU to Provide Their Services?  
Algebra II M3 Lesson 26: Percent Rate of Change  
Precalculus and Advanced Topics M3 Lesson 11: Rational Functions                                                                                                                                                                                                                                                                                            |
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| PC.SS.2 | Write arithmetic and geometric sequences both recursively and with an explicit formula; use them to model situations and translate between the two forms. | Algebra I M3 Topic A: Linear and Exponential Sequences  
Algebra II M3 Lesson 25: Geometric Sequences and Exponential Growth and Decay  
Algebra II M3 Lesson 26: Percent Rate of Change |
| PC.SS.3 | Find partial sums of arithmetic and geometric series and represent them using sigma notation. | Algebra II M3 Topic E: Geometric Series and Finance |
| PC.SS.4 | Model and solve real-world problems involving applications of sequences and series, interpret the solutions and determine whether the solutions are reasonable. | Algebra II M1 Lesson 1: Successive Differences in Polynomials  
Algebra II M3 Lesson 25: Geometric Sequences and Exponential Growth and Decay  
Algebra II M3 Topic E: Geometric Series and Finance |
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<td>Conics</td>
<td><strong>PC.CO.1</strong> Construct the equation of a parabola given a focus and directrix.</td>
<td>Algebra II M1 Lesson 33: The Definition of a Parabola</td>
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<td></td>
<td><strong>PC.CO.2</strong> Construct the equation of a circle of given center and radius. Complete the square to find the center and radius of a circle given by an equation.</td>
<td>Geometry M5 Lesson 17: Writing the Equation for a Circle Geometry M5 Lesson 18: Recognizing Equations of Circles</td>
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<td><strong>PC.CO.3</strong> Construct the equations of ellipses and hyperbolas given at least two of the following: foci, vertices, length of an axis, or point on the curve.</td>
<td>Precalculus and Advanced Topics M3 Lesson 6: Curves in the Complex Plane Precalculus and Advanced Topics M3 Lesson 7: Curves from Geometry Precalculus and Advanced Topics M3 Lesson 8: Curves from Geometry</td>
</tr>
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<td></td>
<td><strong>PC.CO.4</strong> Graph conic sections. Identify and describe features like center, vertex or vertices, focus or foci, directrix, axis of symmetry, major axis, minor axis, and eccentricity.</td>
<td>Precalculus and Advanced Topics M3 Lesson 7: Curves from Geometry Precalculus and Advanced Topics M3 Lesson 8: Curves from Geometry</td>
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