

# Bridge Math | B

Bridge Math is a course intended to build upon concepts taught in previous courses to allow students to gain a deeper knowledge of the real and complex number systems as well as the structure, use, and application of equations, expressions, and functions. Functions emphasized include linear, quadratic and polynomial. Students continue mastery of geometric concepts such as similarity, congruence, right triangles, and circles. Students use categorical and quantitative data to model real life situations and rules of probability to compute probabilities of compound events.

Bridge Math includes the following domains and clusters:

- **The Real Number System**
  - Use properties of rational and irrational numbers.
- **Quantities**
  - Reason quantitatively and use units to solve problems.
- **The Complex Number System**
  - Perform arithmetic operations with complex numbers.
- **Seeing Structure in Expressions**
  - Write expressions in equivalent forms to solve problems.
- **Arithmetic with Polynomials and Rational Expressions**
  - Perform arithmetic operations on polynomials.
  - Understand the relationship between zeros and factors of polynomials.
- **Creating Equations**
  - Create equations that describe numbers or relationships.
- **Reasoning with Equations and Inequalities**
  - Understand solving equations as a process of reasoning and explain the reasoning.
  - Solve equations and inequalities in one variable.
  - Solve systems of equations.
  - Represent and solve equations and inequalities graphically.
- **Interpreting Functions**
  - Understand the concept of a function and use function notation.
  - Interpret functions that arise in applications in terms of the context.
  - Analyze functions using different representations
- **Similarity, Right Triangles, and Trigonometry**
  - Understand similarity in terms of similarity transformations.
  - Define trigonometric ratios and solve problems involving right triangles.
- **Circles**
  - Find arc lengths and areas of sectors of circles.
- **Geometric Measurement and Dimension**
  - Visualize relationships between two-dimensional and three-dimensional objects.
- **Modeling with Geometry**
  - Apply geometric concepts in modeling situations.
- **Interpreting Categorical and Quantitative Data**
  - Summarize, represent, and interpret data on a single count or measurement variable.
  - Summarize, represent, and interpret data on two categorical and quantitative variables.
  - Interpret linear models.
- **Conditional probability and the Rules of Probability**
  - Use the rules of probability to compute probabilities of compound events in a uniform probability model.

## Mathematical Modeling

Mathematical Modeling is a Standard for Mathematical Practice (MP4) and a Conceptual Category. Specific modeling standards appear throughout the high school standards indicated with a star (★). Where an entire domain is marked with a star, each standard in that domain is a modeling standard.

## Standards for Mathematical Practice

Being successful in mathematics requires the development of approaches, practices, and habits of mind that need to be in place as one strives to develop mathematical fluency, procedural skills, and conceptual understanding. The Standards for Mathematical Practice are meant to address these areas of expertise that teachers should seek to develop in their students. These approaches, practices, and habits of mind can be summarized as “processes and proficiencies” that successful mathematicians have as a part of their work in mathematics. Additional explanations are included in the main introduction of these standards.

<b>Standards for Mathematical Practice</b>
<ol style="list-style-type: none"><li>1. Make sense of problems and persevere in solving them.</li><li>2. Reason abstractly and quantitatively.</li><li>3. Construct viable arguments and critique the reasoning of others.</li><li>4. Model with mathematics.</li><li>5. Use appropriate tools strategically.</li><li>6. Attend to precision.</li><li>7. Look for and make use of structure.</li><li>8. Look for and express regularity in repeated reasoning.</li></ol>

## Literacy Standards for Mathematics

Communication in mathematics employs literacy skills in reading, vocabulary, speaking and listening, and writing. Mathematically proficient students communicate using precise terminology and multiple representations including graphs, tables, charts, and diagrams. By describing and contextualizing mathematics, students create arguments and support conclusions. They evaluate and critique the reasoning of others, analyze, and reflect on their own thought processes. Mathematically proficient students have the capacity to engage fully with mathematics in context by posing questions, choosing appropriate problem-solving approaches, and justifying solutions. Further explanations are included in the main introduction.

<b>Literacy Skills for Mathematical Proficiency</b>
<ol style="list-style-type: none"><li>1. Use multiple reading strategies.</li><li>2. Understand and use correct mathematical vocabulary.</li><li>3. Discuss and articulate mathematical ideas.</li><li>4. Write mathematical arguments.</li></ol>

# Number and Quantity

## The Real Number System (N.RN)

### Cluster Headings

### Content Standards

<b>A. Use properties of rational and irrational numbers.</b>	<b>B.N.RN.A.1.</b> Use rational and irrational numbers in calculations and in real-world context.
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## Quantities\* (N.Q)

### Cluster Headings

### Content Standards

<b>A. Reason quantitatively and use units to solve problems.</b>	<b>B.N.Q.A.1</b> Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. <b>B.N.Q.A.2</b> Define appropriate quantities for the purpose of descriptive modeling. <b>B.N.Q.A.3</b> Solve problems involving squares, square roots of numbers, cubes, and cube roots of numbers.
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## The Complex Number System (N.CN)

### Cluster Headings

### Content Standards

<b>A. Perform arithmetic operations with complex numbers.</b>	<b>B.N.CN.A.1</b> Know there is a complex number $i$ such that $i^2 = -1$ , and every complex number has the form $a + bi$ with $a$ and $b$ real. <b>B.N.CN.A.2</b> Know and use the relation $i^2 = -1$ and the commutative, associative, and distributive properties to add, subtract, and multiply complex numbers.
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# Algebra

## Seeing Structure in Expressions (A.SSE)

### Cluster Headings

### Content Standards

<b>A. Write expressions in equivalent forms to solve problems.</b>	<b>B.A.SSE.A.1</b> Use properties of multiplication and division to solve problems containing scientific notation.  <b>B.A.SSE.A.2</b> Use algebraic structures to solve problems involving proportional reasoning in real-world context.
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## Arithmetic with Polynomials and Rational Expressions (A.APR)

### Cluster Headings

### Content Standards

<b>A. Perform arithmetic operations on polynomials.</b>	<b>B.A.APR.A.1</b> 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.
<b>B. Understand the relationship between zeros and factors of polynomials.</b>	<b>B.A.APR.B.2</b> 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.

## Creating Equations\* (A.CED)

### Cluster Headings

### Content Standards

<b>A. Create equations that describe numbers or relationships.</b>	<b>B.A.CED.A.1</b> Create equations and inequalities in one variable and use them to solve real-world problems.  <b>B.A.CED.A.2</b> Create equations in two or more variables to represent relationships between quantities.  <b>B.A.CED.A.3</b> Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
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## Reasoning with Equations and Inequalities (A.REI)

Cluster Headings	Content Standards
<b>A. Understand solving equations as a process of reasoning and explain the reasoning.</b>	<b>B.A.REI.A.1</b> Build functions and write expressions, equations, and inequalities for common algebra settings leading to a solution in context (e.g., rate and distance problems and problems that can be solved using proportions).
<b>B. Solve equations and inequalities in one variable.</b>	<b>B.A.REI.B.2</b> Solve quadratic equations in one variable. Solve quadratic equations by inspection (e.g., for $x^2 = 49$ ), taking square roots, completing the square, knowing and applying the quadratic formula, and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers $a$ and $b$ .
<b>C. Solve systems of equations.</b>	<b>B.A.REI.C.3</b> Solve and explain the solutions to a system of equations using a variety of representations including combinations of linear and non-linear equations.
<b>D. Represent and solve equations and inequalities graphically.</b>	<b>B.A.REI.D.4</b> Use algebra and geometry to solve problems involving midpoints and distances. <b>B.A.REI.D.5</b> Solve a linear inequality using multiple methods and interpret the solution as it applies to the context.

## Functions

### Interpreting Functions (F.IF)

Cluster Headings	Content Standards
<b>A. Understand the concept of a function and use function notation.</b>	<b>B.F.IF.A.1</b> Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If $f$ is a function and $x$ is an element of its domain, then $f(x)$ denotes the output of $f$ corresponding to the input $x$ . The graph of $f$ is the graph of the equation $y = f(x)$ . <b>B.F.IF.A.2</b> Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

**Cluster Headings****Content Standards**

<b>B. Interpret functions that arise in applications in terms of the context.</b>	<b>B.F.IF.B.3</b> Recognize functions as mappings of an independent variable into a dependent variable. *
<b>C. Analyze functions using different representations.</b>	<p><b>B.F.IF.C.4</b> Graph linear, quadratic, absolute value, and piecewise functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated ones. *</p> <p><b>B.F.IF.C.5</b> Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.</p> <p><b>B.F.IF.C.6</b> Use the properties of exponents to interpret expressions for exponential functions.</p>

**Geometry****Similarity, Right Triangles and Trigonometry (G.SRT)****Cluster Headings****Content Standards**

<b>A. Understand similarity in terms of similarity transformations.</b>	<b>B.G.SRT.A.1</b> Apply similar triangles to solve problems, such as finding heights and distances.
<b>B. Define trigonometric ratios and solve problems involving right triangles.</b>	<p><b>B.G.SRT.B.2</b> Apply basic trigonometric ratios to solve right triangle problems.</p> <p><b>B.G.SRT.B.3</b> Apply properties of <math>30^\circ</math> <math>60^\circ</math> <math>90^\circ</math>, <math>45^\circ</math> <math>45^\circ</math> <math>90^\circ</math>, similar, and congruent triangles.</p> <p><b>B.G.SRT.B.4</b> Solve problems involving angles of elevation and angles of depression.</p>

**Circles (G.C)****Cluster Headings****Content Standards**

<b>A. Find arc lengths and areas of sectors of circles.</b>	<b>B.G.C.A.1</b> Apply a variety of strategies to determine the area and circumference of circles after identifying necessary information.
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## Geometric Measurement and Dimension (G.GMD)

### Cluster Headings

### Content Standards

<b>A. Visualize relationships between two-dimensional and three-dimensional objects.</b>	<b>B.G.GMD.A.1</b> Use relationships involving area, perimeter, and volume of geometric figures to compute another measure. <b>B.G.GMD.A.2</b> Use several angle properties to find an unknown angle measure. <b>B.G.GMD.A.3</b> Apply a variety of strategies using relationships between perimeter, area, and volume to calculate desired measures in composite figures (i.e., combinations of basic figures).
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## Modeling with Geometry (G.MG)

### Cluster Headings

### Content Standards

<b>A. Apply geometric concepts in modeling situations.</b>	<b>B.G.MG.A.1</b> Use appropriate technology to find the mathematical model for a set of non-linear data. <b>B.G.MG.A.2</b> Solve problems involving surface area and volume in real-world context.
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## Statistics and Probability

### Interpreting Categorical and Quantitative Data (S.ID)

### Cluster Headings

### Content Standards

<b>A. Summarize, represent, and interpret data on a single count or measurement variable.</b>	<b>B.S.ID.A.1</b> Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
<b>B. Summarize, represent, and interpret data on two categorical and quantitative variables.</b>	<b>B.S.ID.B.2</b> Interpret and use data from tables, charts, and graphs.

**Cluster Headings****Content Standards**

<b>B. Summarize, represent, and interpret data on two categorical and quantitative variables.</b>	<p><b>B.S.ID.B.3</b> Represent data on two quantitative variables on a scatter plot, and describe how the variables are related.</p> <p>a. Fit a function to the data; use functions fitted to data to solve problems in the context of the data. <i>Use given functions or choose a function suggested by the context. Emphasize linear, quadratic, and exponential models.</i></p>
<b>C. Interpret linear models.</b>	<p><b>B.S.ID.C.4</b> Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.</p>

### Conditional Probability and the Rules of Probability (S.CP)

**Cluster Headings****Content Standards**

<p><b>A. Use the rules of probability to compute probabilities of compound events in a uniform probability model.</b></p>	<p><b>B.S.CP.A.1</b> Understand and use basic counting techniques in contextual settings.</p> <p><b>B.S.CP.A.2</b> Compute a probability when the event and/or sample space are not given or obvious.</p> <p><b>B.S.CP.A.3</b> Recognize the concepts of conditional and joint probability expressed in real-world contexts.</p> <p><b>B.S.CP.A.4</b> Recognize the concept of independence expressed in real-world contexts.</p>
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