

# Maryland Math Standards

## Correlated to *Bridges to Algebra and Geometry*, 2<sup>nd</sup> edition, Grades 6-12

**1.0 Knowledge of Algebra, Patterns, and Functions – Students will algebraically represent, model, analyze, and solve mathematical and real-world problems involving patterns and functional relationships.**

### *Rationale*

Algebra provides the means of operating with mathematical concepts symbolically. Through the application of algebra, students are able to interpret and represent relationships in order to solve mathematical and real world problems. The study of algebra enables all students to develop their ability to reason abstractly. Students will be able to demonstrate a knowledge of algebra, patterns, and functions in conjunction with the process standards: problem solving (page 20), communication (page 21), reasoning (page 22), and connections (page 23).

STANDARD	PAGE REFERENCES
By the end of <b>grade 8</b> , students know and are able to do everything required at earlier grades and:	
1.8.1a <i>recognize, describe, and extend patterns and functional relationships</i> <ul style="list-style-type: none"> <li>• identify and extend a simple <b>arithmetic</b> or <b>geometric sequence</b> (MLO 1.1)</li> <li>• describe the <b>recursive relationship</b> of simple arithmetic and geometric sequences <i>verbally</i>, in a table, or a <b>graph</b> (MLO 1.2)</li> </ul>	<b>Bridges:</b> 52, 449-450, 484, 578-583
1.8.1b <i>produce rules that explain how a change in one <b>variable</b> in a relationship affects the other variable</i> (MLO 1.3)	<b>Bridges:</b> 446, 593-597, 599-602, 668, 680-684
1.8.1d <i>determine whether <b>functions</b> are linear or nonlinear when given graphic examples</i>	<b>Bridges:</b> 439-446

### 1.0 Knowledge of Algebra, Patterns, and Functions

By the end of <b>grade 8</b> , students know and are able to do everything required at earlier grades and:	
<p>1.8.2 <i>simplify <b>expressions</b> by combining like terms and applying order of operations</i></p> <ul style="list-style-type: none"> <li>• <i>use mathematical properties to justify the steps in simplifying algebraic expressions</i></li> </ul>	<b>Bridges:</b> 16-23, 24-28, 36-41, 203-208, 526
<p>1.8.3a evaluate <b>algebraic expressions</b> and apply <b>formulas</b> (MLO 1.4)</p> <p>1.8.3b solve linear <b>equations and inequalities</b> in one variable <i>using mathematical properties</i> (MLO 1.5)</p> <p>1.8.3c <i>describe a real-world situation represented by an algebraic expression or equation</i></p> <p>1.8.3d <i>solve problems involving direct and inverse variation</i></p> <p>1.8.3e <i>determine the slope of a <b>linear function</b> represented graphically, numerically, or algebraically</i></p>	<p><b>Bridges:</b> 16-21, 37, 162-167, 168-173, 217-221, 557-562, 605-613, 622-628, 657-661, 664-670, 671-677</p> <p><b>Bridges:</b> 186-191, 192-196, 198-202, 203-208, 211-216, 273-277, 278-282</p> <p><b>Bridges:</b> Pages throughout. See, for example, 16-21, 223-234</p> <p><b>Bridges:</b> 16-17, 20-21, 186-191, 192-202, 211-216, 228-232</p> <p><b>Bridges:</b> 413-425, 426-431, 451-452</p>

### 1.0 Knowledge of Algebra, Patterns, and Functions

By the end of <b>grade 8</b> , students know and are able to do everything required at earlier grades and:	
1.8.4 <i>represent and interpret quantitative relationships in a table or graph</i>	<b>Bridges:</b> 76-125, 128-133, 357-359, 400-450, 470-472, 502-503, 506-510
1.8.4a <i>graph ordered pairs in the four quadrants of a <b>coordinate plane</b></i> <ul style="list-style-type: none"><li>graph linear equations on a coordinate plane (MLO 1.6)</li></ul>	<b>Bridges:</b> 400-457
1.8.4b <i>solve inequalities and graph the solutions on a number line</i>	<b>Bridges:</b> 273-284, 433-438

**2.0 Knowledge of Geometry – Students will apply the properties of one-, two-, and three- dimensional geometric figures to describe, reason, and solve problems about shape, size, position, and motion of objects.**

***Rationale***

Geometry helps students represent and make sense of the world. Geometry provides a perspective from which students can analyze and solve problems and understand abstract representations. Students will be able to demonstrate a knowledge of geometry in conjunction with the process standards: problem solving (page 20), communication (page 21), reasoning (page 22), and connections (page 23).

STANDARD	PAGE REFERENCES
By the end of <b>grade 8</b> , students know and are able to do everything required at earlier grades and:	
<p>2.8.1 <i>apply properties of two- and three- dimensional figures to problem situations</i></p> <ul style="list-style-type: none"> <li>• describe <b>two-</b> and <b>three-dimensional</b> geometric figures using number of sides, <b>faces</b>, <b>vertices</b>, <b>angles</b>, and sums of angles (MLO 2.1)</li> <li>• <i>identify <b>parallel</b>, <b>perpendicular</b>, <b>intersecting</b> and <b>skew lines</b> and apply properties of <b>parallelism</b> and <b>perpendicularity</b> to problem situations</i></li> </ul>	<b>Bridges:</b> 430, 460-472, 473-487, 501, 642, 650-656, 657-663, 664-670, 671-679, 680-684
<p>2.8.2a <i>use the properties of angles and triangles</i></p> <ul style="list-style-type: none"> <li>• <i>classify triangles by sides and by angles</i></li> <li>• <i>determine missing <b>angle measures</b></i></li> <li>• determine angle measure using <b>estimation</b>, direct, and <b>indirect measurements</b> (MLO 2.2)</li> <li>• use the <b>Pythagorean theorem</b> to solve problems <i>by determining the missing side of a right triangle</i> (MLO 2.3)</li> <li>• <i>identify and determine missing angle measures for adjacent, vertical, complimentary, and supplementary angles</i></li> <li>• <i>identify and determine the missing angle measures for corresponding, alternate interior, and alternate exterior angles when parallel lines are cut by a transversal</i></li> </ul>	<b>Bridges:</b> 466-472, 473-479, 482-486, 488-489, 517, 520-521, 557-565

## 2.0 Knowledge of Geometry

By the end of <b>grade 8</b> , students know and are able to do everything required at earlier grades and:	
2.8.3 <i>construct or draw geometric figures using tools and technology</i> <ul style="list-style-type: none"><li>• use a compass and straightedge to construct angles, rectangles, circles, <i>and other geometric figures</i> (MLO 2.4)</li><li>• <i>draw and analyze geometric figures on a coordinate plane</i></li></ul>	<b>Bridges:</b> 400-404, 430-434, 460-473, 477-479, 488-489, 495-512, 515-519, 594-595, 605-608, 635-637, 642-648
2.8.4 draw and describe the results of <b>translations, reflections, rotations, dilations</b> , and combinations of <b>transformations</b> (MLO 2.5)	<b>Bridges:</b> 495-500, 501-505, 506-512, 593-598
2.8.5 apply properties of congruence and <b>similarity</b> to solve problems (MLO 2.6)	<b>Bridges:</b> 473-478, 488-494, 584-592, 599-602, 615-621, 680-685, 691-692

**3.0 Knowledge of Measurement – Students will identify attributes, units, and systems of measurements and apply a variety of techniques, formulas, tools and technology for determining measurements.**

***Rationale***

Measurement allows students to quantify the world around them. An understanding of the processes of measurement and the concept of a unit, as well as a familiarity with the tools and common units of measurement, are critical. Students will be able to demonstrate a knowledge of measurement in conjunction with the process standards: problem solving, (page 20), communication (page 21), reasoning (page 22), and connections (page 23).

<b>STANDARD</b>	<b>PAGE REFERENCES</b>
By the end of <b>grade 8</b> , students know and are able to do everything required at earlier grades and:	
3.8.2 select tools and units to measure accurately <i>and determine the degree of precision</i> (MLO 2.7)	<b>Bridges:</b> 224-226, 466-472, 474-479, 482-487, 492-494, 568-570

### 3.0 Knowledge of Measurement

By the end of <b>grade 8</b> , students know and are able to do everything required at earlier grades and:	
3.8.3a estimate and determine the <b>circumference</b> and <b>area</b> of circles (MLO 2.8)	<b>Bridges:</b> 623-629
3.8.3b estimate and determine the area of figures by measuring, partitioning, and using formulas (MLO 2.9)	<b>Bridges:</b> 605-614
3.8.3c estimate and determine the <b>volume</b> and <b>surface area</b> of cylinders, triangular <b>prisms</b> , and <i>other solids</i> (MLO 2.10)	<b>Bridges:</b> 650-656, 657-663, 664-670, 671-679
3.8.3d <i>determine relationships between length, area, and volume and describe how a change in one measure affects the others</i>	<b>Bridges:</b> 615-621, 680-686, 689-694
3.8.4a use <b>proportions</b> , <b>rates</b> , and <b>scale drawings</b> to solve problems (MLO 2.11)	<b>Bridges:</b> 293-298, 299-303, 304-310, 338-339, 584-589, 593-598, 599-604, 615-621, 680-684

**4.0 Knowledge of Statistics – Students will collect, organize, display, analyze, and interpret data to make decisions and predictions.**

***Rationale***

The study of statistics gives students the ability to understand collection, organization, analysis, and presentation of data. The use of data for prediction and decision making is important in today’s society. The interpretation of data helps students become intelligent consumers and informed citizens. Students will be able to demonstrate a knowledge of statistics in conjunction with the process standards: problem solving (page 20), communication (page 21), reasoning (page 22), and connections (page 23).

STANDARD	PAGE REFERENCES
By the end of <b>grade 8</b> , students know and are able to do everything required at earlier grades and:	
4.8.1 <i>conduct and</i> use the results of a <b>statistical investigation</b> to answer a question (MLO 3.1)	<b>Bridges:</b> 70-121
4.8.2 organize, display, <i>and interpret</i> data using <b>frequency tables, circle graphs, box and whisker plots, scatter plots, and histograms</b> (MLO 3.2)	<b>Bridges:</b> 76-79, 85-90, 93-99, 117-125, 357-359, 470
4.8.3a analyze and interpret frequency tables, box and whisker plots, and scatter plots (MLO 3.3)  4.8.3.b make predictions about a set of linear data, given the line of best fit (MLO 3.4)  4.8.3c <i>fit a line to a set of linear data and make predictions about the data</i>	<b>Bridges:</b> 76-79, 85-90, 120-121  <b>Bridges:</b> 120-121  <b>Bridges:</b> 120-121

#### 4.0 Knowledge of Statistics

By the end of <b>grade 8</b> , students know and are able to do everything required at earlier grades and:	
4.8.4 select and justify <b>mean, median, mode</b> , or <b>range of a data set</b> as the best representation of data (MLO 3.5)	<b>Bridges:</b> 34, 70-74, 76-79
4.8.5 <i>examine the misinterpretation of statistics</i> <ul style="list-style-type: none"><li>• <i>identify factors leading to faulty representation or interpretation of data including choice of sample <b>population</b>, graphical display, <b>scale</b>, and use of statistical measures</i></li></ul>	<b>Bridges:</b> 108-116

**5.0 Knowledge of Probability – Students will use experimental methods and theoretical reasoning to determine probabilities to make predictions and solve problems about events whose outcomes involve random variation.**

***Rationale***

Probability provides concepts and methods for dealing with uncertainty and for interpreting predictions based on certainty. Experiences with probability allow students to make informed decisions about the likelihood of events and interpret and judge the validity of statistical claims. Students will be able to demonstrate a knowledge of probability in conjunction with the process standards: problem solving (page 20), communication (page 21), reasoning (page 22), and connections (page 23).

STANDARD	PAGE REFERENCES
By the end of <b>grade 8</b> , students know and are able to do everything required at earlier grades and:	
5.8.1 determine <b>outcomes of events</b> using <b>counting techniques</b> including <i>permutations and combinations</i> (MLO 3.6)	<b>Bridges:</b> 316-321
5.8.2a find the <b>probability of an event</b> that does not <b>have equally likely outcomes</b> (MLO 3.7) <ul style="list-style-type: none"> <li>• express the probability of an event as a ratio, decimal, or <b>percent</b> (MLO 3.8)</li> </ul> 5.8.2b find the probability of simple dependent and independent events <i>using various methods including constructing a <b>sample space</b></i> (MLO 3.9)	<b>Bridges:</b> 312-326  <b>Bridges:</b> 316-319
5.8.3 <i>conduct and</i> predict the <b>probability of an event</b> based on the outcomes of an actual event or a <b>simulation</b> (MLO 3.10)	<b>Bridges:</b> 327-332, 339-343

**6.0 Knowledge of Number Relationships and Computation – Students will describe, represent, and apply numbers and their relationships and will estimate and compute using mental strategies, paper/pencil and technology.**

***Rationale***

Number relationships and computation skills establish a strong foundation for the study of mathematics. Students need to be able to use whole numbers, integers, rational numbers, and real numbers to count, measure, and order objects and events. Students will also use whole numbers, integers, rational numbers, and real numbers to perform arithmetic operations in order to solve problems in mathematics, other disciplines, and the real world. Students will be able to demonstrate a knowledge of number relationships and computation in conjunction with the process standards: problem solving (page 20), communication (page 21), reasoning (page 22), and connections (page 23).

STANDARD	PAGE REFERENCES
By the end of <b>grade 8</b> , students know and are able to do everything required at earlier grades and:	
6.8.1 read, write, and represent <b>rational numbers</b> in a variety of forms, including <b>exponents, scientific notation, and percents</b> (MLO 4.1)	<b>Bridges:</b> 4-10, 127-133, 154-159, 236-251, 294-310, 348-353, 524-529, 530-535, 536-542, 543-548
6.8.2 compare, order, and describe rational numbers in <b>equivalent</b> forms (MLO 4.2) <ul style="list-style-type: none"> <li>• <i>determine the <b>absolute value</b> of rational numbers</i></li> </ul>	<b>Bridges:</b> 4-10, 131, 134-139, 247-251, 348-353, 543-548

## 6.0 Knowledge of Number Relationships and Computation

By the end of <b>grade 8</b> , students know and are able to do everything required at earlier grades and:	
6.8.5 add, subtract, multiply, and divide rational numbers (MLO 4.3) <ul style="list-style-type: none"><li>• <i>calculate <b>powers</b> and square roots of numbers</i></li><li>• <i>use the rules of exponents to combine rational numbers</i></li><li>• <i>multiply and divide by powers of ten</i></li></ul>	<b>Bridges:</b> 24-28, 36-41, 140-181, 254-260, 261-265, 266-272, 524-529, 530-535, 536-542, 543-548, 551-556
6.8.6 <i>explain and apply number relationships using the mathematical properties of operations, including <b>distributive</b> and <b>additive inverse</b></i>	<b>Bridges:</b> 24-28, 36-41, 140-145, 157, 180-181, 199, 203-208, 266, 273-277, 278-282, 526

## 6.0 Knowledge of Number Relationships and Computation

<p>By the end of <b>grade 8</b>, students know and are able to do everything required at earlier grades and:</p>	
<p>6.8.7a <i>select and apply strategies and mathematical properties to solve problems with rational numbers</i></p> <ul style="list-style-type: none"> <li>• use <b>estimation</b> to solve problems with rational numbers (MLO 4.4)</li> <li>• <i>estimate powers and square roots to solve problems</i></li> <li>• <i>estimate the value of <b>radicals</b> and numbers expressed with exponents to solve problems</i></li> </ul> <p>6.8.7b apply <b>ratios, proportions</b>, and percents to solve problems (MLO 4.5)</p> <ul style="list-style-type: none"> <li>• <i>determine equivalent ratios, decimals, and percents</i></li> <li>• <i>determine ratios, rates, and unit rates in the context of a problem</i></li> <li>• <i>apply the concepts of ratios, rates, and percents to real-world problems including rate of increase/decrease, discount, commission, sales tax, and simple interest</i></li> </ul>	<p><b>Bridges:</b> 11-15, 29-32, 42-47, 51, 63-65, 102, 362-366</p> <p><b>Bridges:</b> 294-298, 299-303, 304-308, 348-353, 354-359, 367-371, 374-380, 381-385, 391-395, 553-556, 584-589, 593-598, 599-602, 680-684</p>

## 7.0 Process of Problem Solving – Students will demonstrate their ability to apply a wide variety of mathematical concepts, processes, and skills to solve a broad range of problems.

### *Rationale*

The process of problem solving should permeate the entire mathematics instructional program and provide the authentic context in which mathematical concepts and skills are learned. Problem solving must go beyond performing simple and complex computations. It should involve challenging, thought provoking questions, speculations, investigations and explorations.

### **In order to solve problems, students will be able to:**

- use information to identify and define the question(s) within a problem (MLO 5.1, SFS 2.2, SFS 2.4)
- make a plan and decide what information *is needed or missing* and steps needed to solve the problem (MLO 5.2, SFS 2.4)
- choose the appropriate operation(s) for a given problem situation (MLO 5.3)
- *create or* select and then apply appropriate problem-solving strategies to solve a problem from **visual** (draw a picture, create a **graph**), **numerical** (guess and check, look for a pattern), and **symbolic** (write an **equation**) **perspectives** (MLO 5.4, SFS 2.4)
- *analyze multi-step problem-solving situations* (SFS 2.4)
- organize, interpret, and use relevant information (MLO 5.5, SFS 2.2, SFS 2.4)
- select and use appropriate tools and technology (MLO 5.6, SFS 2.4)
- *persevere through to a solution*
- *verify the conclusion based on the data and the processes used* (SFS 2.4)
- *communicate the conclusion with appropriate mathematical justification* (SFS 3.2)
- show that no solution or multiple solutions may exist (MLO 5.7, SFS 3.2)
- *ascribe a meaning to the solution in the context of the problem*
- identify alternate ways to find a solution (MLO 5.8, SFS 2.4)
- apply what was learned to a new *and/or more complex* problem (MLO 5.9, SFS 2.4)

**Bridges** contains ample opportunities for problem solving within each chapter. For example:

**Bridges:** 8-10, 14-15, 20-21, 27-28, 31-35, 40-41, 46-53, 54-65, 66-67, 73-74, 78-79, 82-84, 89-90, 94-97, 103-107, 112-116, 117-125, 132-133, 137-138, 144-147, 152-153, 158-161, 165-167, 172-183, 190-191, 195-197, 200-202, 207-210, 215-216, 220-231, 232-233, 239-240, 245-246, 251-253, 258-260, 264-265, 270-272, 276-277, 281-291, 297-298, 301-303, 306-310, 313-315, 318-321, 325-326, 331-332, 334-345, 352-353, 358-361, 365-366, 369-373, 377-380, 383-395, 396-397, 403-404, 408-412, 416-418, 422-427, 431-432, 436-438, 444-455, 456-457, 464-465, 471-472, 476-479, 485-486, 491-494, 499-500, 504-505, 508-519, 520-521, 528-529, 533-535, 540-541, 546-550, 555-556, 561-573, 574-575, 581-582, 587-592, 596-598, 601-604, 609-614, 618-621, 625-637, 638-639, 647-648, 652-656, 659-663, 668-670, 675-679, 684-694

**8.0 Process of Communication – Students will demonstrate their ability to organize and consolidate their mathematical thinking in order to analyze and use information, and will present ideas with words, symbols, visual displays, and technology.**

***Rationale***

Communication plays an important role in helping students make the connections between previously learned and newly acquired knowledge. Explaining, justifying, predicting, and defending ideas orally and in writing can clarify understanding of concepts and principles and can provide opportunities to assess understanding and thinking.

**In order to communicate mathematically, students will be able to:**

- *discuss, read, listen, and observe to obtain mathematical information from a variety of sources* (SFS 3.2)
- use multiple representations to express mathematical concepts and solutions (MLO 5.10, SFS 2.4)
- represent problem situations and express their solutions using **concrete**, pictorial, tabular, graphical, and algebraic methods (MLO 5.11, SFS 3.1)
- *clarify meaning by asking questions, supporting solutions with evidence, and explaining mathematical ideas in oral and written forms* (SFS 3.1)
- use mathematical language and symbolism appropriately (MLO 5.12, SFS 3.2)
- *organize, interpret, and describe situations mathematically by providing mathematical ideas and evidence in oral and written form* (MLO 5.13, SFS 3.1, SFS 3.2)
- *give and use feedback to revise mathematical thinking/presentations/solutions* (SFS 3.1, SFS 3.3)
- present results in written, oral, and visual forms (MLO 5.14, SFS 3.1, SFS 3.2)
- *describe the reasoning and processes used in order to reach the solution to a problem*

**Bridges** contains “Think and Discuss” sections in every lesson that allow students the opportunity to communicate orally about concepts in the chapter. For example:

**Bridges:** 8, 14, 20, 27, 31, 40, 46, 54, 66, 73, 78, 82, 89, 94, 103, 112, 117, 122, 132, 137, 144, 152, 158, 165, 172, 182, 190, 195, 201, 206, 215, 219, 232, 239, 245, 250, 259, 264, 269, 276, 280, 290, 296, 301, 307, 313, 318, 325, 330, 334, 344, 352, 358, 364, 369, 378, 383, 396, 403, 408, 416, 423, 430, 436, 444, 456, 463, 470, 477, 485, 491, 498, 504, 508, 520, 527, 533, 540, 547, 554, 560, 574, 581, 587, 596, 601, 610, 618, 625, 638, 647, 654, 659, 668, 675, 683, 693

**9.0 Process of Reasoning – Students will demonstrate their ability to reason mathematically, using inductive and deductive reasoning, and to evaluate mathematical situations. Students will justify and draw conclusions.**

***Rationale***

Reasoning, analyzing and thinking logically are essential to knowing and doing mathematics. Constructing **valid arguments** in problem settings and evaluating the arguments of others are important skills to be developed over time through a variety of experiences.

**In order to reason mathematically, students will be able to:**

- justify why an answer or approach to a problem is reasonable (MLO 5.15, SFS 2.2)
- make and test generalizations based upon investigation or observation (MLO 5.16, SFS 2.2)
- make predictions or draw conclusions from available information (MLO 5.17, SFS 2.2)
- analyze statements and provide examples which support or refute them (MLO 5.18, SFS 2.2)
- *follow and judge* the validity of arguments by applying inductive and deductive thinking (MLO 5.19, SFS 2.2)
- *use methods of proof including direct, indirect, paragraph, and/or contradiction*
- use supporting data to explain why a chosen method used and a solution are mathematically correct (MLO 5.20, SFS 2.2)
- *analyze mathematical situations using **manipulatives, technology, patterns, relationships, spatial and proportional reasoning*** (SFS 2.2)
- *use if...then statements to formulate **valid arguments** or proofs*
- *use manipulatives to model and justify solutions*

**Bridges** contains Lesson Activities, Critical Thinking questions in lessons, “Think and Discuss” sections in lesson assessments, and “Discussion” questions in each Math Lab Activity that allow students the opportunity to demonstrate their ability to reason mathematically and to evaluate mathematical situations.

**10.0 Process of Connections – Students will demonstrate their ability to relate and apply mathematics within the discipline, to other content areas, and to daily life.**

***Rationale***

Connections help students view mathematics as an integrated whole rather than an isolated set of topics. Connections also help students acknowledge the relevance and usefulness of mathematics, both in and out of school, because it is important for students to be able to link existing and future knowledge to understand mathematics.

**In order to make mathematical connections, students will be able to:**

- identify and use the relationships among mathematical concepts as a basis for learning additional concepts (MLO 5.21, SFS 1.3)
- identify the relationships among graphical, numerical, physical, and algebraic mathematical models and concepts (MLO 5.22, SFS 1.32)
- identify mathematical concepts and processes as they apply to other content areas (MLO 5.23, SFS 1.3)
- *move beyond a particular problem by making general conclusions, summary statements and posing new, related questions and comments* (SFS 1.3)
- use mathematical concepts and processes to translate personal experiences into mathematical language (MLO 5.24)
- *identify the contributions of men and women of diverse cultures to the development, understanding, and application of mathematical concepts and processes*

**Bridges:** Connections exist on almost every page of text. See correlations next to each chapter in Table of Contents.