



Grade 7 Mathematics

Performance Level Descriptors

Introduction

The federal government requires states to adopt and assess standards and report assessment results using three or more levels. Federal guidance specifies that state’s academic performance levels must include descriptions of the content-based competencies associated with each level. The descriptions, referred to as **Performance Level Descriptors (PLDs)**, convey the degree of student achievement at each level. The Maryland Comprehensive Assessment Program (MCAP) Policy, Content, and Range PLDs are included in this document.

MCAP Policy Performance Level Descriptors

The MCAP Policy PLDS provide high-level descriptions of a student’s ability to apply the knowledge and skills defined by the Maryland Content Standards for English Language Arts (ELA), Mathematics, Science, and Social Studies as demonstrated by their performance on MCAP assessments. Maryland elected to use the four performance levels, described below, when reporting assessment results.

Performance Level	MCAP Policy Performance Level Descriptors
4	Distinguished Learners demonstrate advanced proficiency. The students are well prepared for the next grade level or course and are well prepared for college and career readiness.
3	Proficient Learners demonstrate proficiency. The students are prepared for the next grade level or course and are on track for college and career readiness.
2	Developing Learners demonstrate partial proficiency. The students need additional academic support to ensure success in the next grade level or course and to be on track for college and career readiness.
1	Beginning Learners do not yet demonstrate proficiency. The students need substantial academic support to be prepared for the next grade level or course and to be on track for college and career readiness.

MCAP Mathematics Content Performance Level Descriptors

The results from each MCAP Mathematics assessment are reported using four performance levels. Mathematics Content PLDs for Grade 7 provide broad descriptions of what a student performing at each level means in terms of the mathematics content for the course.

Grade 7

Performance Level	MCAP Mathematics Content Performance Level Descriptors for Grade 7
4	<p>Distinguished Learners demonstrate advanced proficiency in solving complex problems involving ratios, proportional relationships, the number system, equations, expressions, geometry, statistics, and probability, and demonstrates an ability to connect multiple grade-level concepts to conceptualize and apply mathematics to model, reason through, and solve problems efficiently, and relate mathematics to the real world.</p>
3	<p>Proficient Learners demonstrate proficiency in solving problems involving ratios, proportional relationships, the number system, equations, expressions, geometry, statistics, and probability, and demonstrates an ability to conceptualize and apply mathematics to model, reason through, and solve problems efficiently, and relate mathematics to the real world.</p>
2	<p>Developing Learners demonstrate partial proficiency in solving problems involving ratios, proportional relationships, the number system, equations, expressions, geometry, statistics, and probability, and may need some support in conceptualizing and applying mathematics to model, reason through, and solve problems efficiently, and in relating mathematics to the real world.</p>
1	<p>Beginning Learners do not yet demonstrate proficiency in solving problems involving ratios, proportional relationships, the number system, equations, expressions, geometry, statistics, and probability where the required mathematics is either directly indicated or uses common grade level procedures, and typically needs support in conceptualizing and applying mathematics to model, reason through, and solve problems efficiently, and in relating mathematics to the real world.</p>

MCAP Mathematics Range Performance Level Descriptors

Range PLDs are grade/course specific descriptors of the cognitive and content level rigor expected at each performance level. The individual grade-level/course PLD documents provide robust descriptions associated with specific content. To show proficiency of the Maryland College and Career Readiness Standards, students must demonstrate their knowledge and skills as described by the Level 3 and Level 4 PLDs.

7.RP Ratio and Proportional Relationships

7.RP.A Analyze proportional relationships and use them to solve real-world problems.

- 7.RP.A.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.
- 7.RP.A.2 Recognize and represent proportional relationships between quantities.
 - a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.
 - b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.
 - c. Represent proportional relationships by equations.
 - d. Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points $(0, 0)$ and $(1, r)$ where r is the unit rate.
- 7.RP.A.3 Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.

Evidence Statement Code	Level 4 – Distinguished <i>A student performing at this level should be able to:</i>	Level 3 – Proficient <i>A student performing at this level should be able to:</i>	Level 2 – Developing <i>A student performing at this level should be able to:</i>	Level 1 – Beginning <i>A student performing at this level should be able to:</i>
7.RP.A.1 7.RP.A.2	solve ratio and percent problems that require connecting multiple grade-level concepts.	solve ratio and percent problems, by identifying, representing , computing, explaining , and comparing unit rates and proportional relationships between quantities using equivalent ratios , tables, graphs, equations and/or diagrams, within a real-world situation.	solve ratio and percent problems by identifying proportional relationships and computing unit rates, involving ratios of fractions , when given an equation , or a partially completed table, graph, or diagram, within a real-world situation .	solve explicit ratio problems, with little or no context, by identifying a unit rate, a constant of proportionality, or a proportional relationship between quantities given tables, graphs, or diagrams.
7.RP.A.3	use proportional relationships to solve multifaceted , multistep ratio and/or percent problems .	use proportional relationships to solve multistep ratio problems or multistep percent problems .	use proportional relationships to solve multistep ratio problems or percent problems, with prompting embedded .	

7.NS The Number System

7.NS.A Apply and extend previous understandings of operations with fractions.

- 7.NS.A.1 Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.
- Describe situations in which opposite quantities combine to make 0.
 - Understand $p+q$ as the number located a distance $|q|$ from p , in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.
 - Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.
 - Apply properties of operations as strategies to add and subtract rational numbers.
- 7.NS.A.2 Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.
- Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as $(-1)(-1) = 1$ and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.
 - Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then $-(p/q) = (-p)/q = p/(-q)$. Interpret quotients of rational numbers by describing real-world contexts.
 - Apply properties of operations as strategies to multiply and divide rational numbers.
 - Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.
- 7.NS.A.3 Solve real-world and mathematical problems involving the four operations with rational numbers.

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7.NS.A.1 7.NS.A.1a	describe and represent complex situations in which quantities combine to make zero.	describe and represent situations in which quantities combine to make zero.	describe situations (i.e. temperature, elevation, credit/debt) in which quantities combine to make zero.	recognize situations (i.e. temperature, elevation, credit/debt) in which quantities combine to make zero.
7.NS.A.1 7.NS.A.2 7.NS.A.3	apply mathematical properties or operations with rational numbers using mathematical models and/or symbols to solve multi-step mathematical problems and one-step real-world problems, making multiple grade-level connections.	apply mathematical properties or operations with rational numbers using mathematical models and/or symbols to solve multi-step mathematical problems and one-step real-world problems and interpret solutions.	apply mathematical properties or operations with rational numbers using mathematical models and/or symbols to solve one step real-world and mathematical problems.	perform an operation involving integers using provided mathematical models and symbols to solve one step real-world and mathematical problems.

7.EE Expressions and Equations

7.EE.A Use properties of operations to generate equivalent expressions.

- 7.EE.A.1 Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.
- 7.EE.A.2 Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related.

7.EE.B Use properties of operations to generate equivalent expressions.

- 7.EE.B.3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.
- 7.EE.B.4 Use variables to represent quantities in a real-world or mathematical problem and construct simple equations and inequalities to solve problems by reasoning about the quantities.
 - a. Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p , q , and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.
 - b. Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p , q , and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem.

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7.EE.A.1 7.EE.A.2	apply properties of operations as strategies to generate or determine multiple equivalent forms of linear expressions involving rational numbers in any form and to express how quantities are related in real world situations, assessing the reasonableness of answers.	apply properties of operations involving addition, subtraction, multiplication, and/or factoring to generate or determine multiple equivalent forms of linear expressions with rational coefficients and to express how quantities are related in real world situations , assessing the reasonableness of answers.	apply properties of operations involving addition, subtraction, and/or multiplication to identify equivalent forms of linear expressions with rational coefficients, assessing the reasonableness of answers .	apply properties of operations involving addition, subtraction, and/or multiplication to write an equivalent form of a linear expression with integer coefficients.

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7.EE.B.3, 7.EE.B.4a	solve real-world and mathematical problems that require connecting multiple grade-level concepts by constructing and solving two-step equations involving rational constants and rational coefficients. Interpret solutions.	write and solve two-step equations, involving rational constants and rational coefficients, that represent real world situations.	identify two-step equations that represent a real world situation, or solve two-step equations involving rational constants and rational coefficients.	solve two-step equations involving integer constants and integer coefficients.
7.EE.B.4, 7.EE.B4.b	solve real-world and mathematical problems that require connecting multiple grade-level concepts by constructing and solving two-step inequalities involving rational constants and rational coefficients. Graph and interpret solution sets.	write and solve two-step inequalities involving rational constants and rational coefficients. Graph the solution set.	identify a two-step inequality that represents a real world situation or solve two-step inequalities involving integer constants and integer coefficients, and choose the graph of the solution set.	solve two-step inequalities involving positive integer constants and positive coefficients and choose the graph of the solution set.

7.G Geometry

7.G.A Draw construct, and describe geometrical figures and describe the relationships between them.

- 7.G.A.1: Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.
- 7.G.A.2: Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.
- 7.G.A.3: Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.

7.G.B Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

- 7.G.B.4: Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.
- 7.G.B.5: Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.
- 7.G.B.6: Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

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7.G.A.1	solve problems involving reproducing a scale drawing at a different scale.	solve problems involving scale drawings of geometric figures, including finding lengths and computing area with scale drawings.	solve problems involving scale drawings of geometric figures with positive rational dimensions, including finding actual lengths from a scale drawing.	solve proportion problems involving scale drawings of non-composite geometric figures that contain whole number dimensions.
7.G.A.2	use technology and/or mathematical tools to construct geometric shapes with given conditions. Identify when conditions determine a unique triangle, more than one triangle, or no triangle.	use technology and/or mathematical tools to construct triangles given conditions. Identify when conditions determine a unique triangle, more than one triangle, or no triangle.	draw composite geometric shapes on a grid with given conditions. Identify when conditions determine a triangle or no triangle.	draw non-composite geometric shapes on a grid with given conditions.

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7.G.A.3	describe how to slice a three-dimensional figure so that the cross section yields a particular result.	describe the two-dimensional figures that result from slicing plane sections of three-dimensional figures where the slice is parallel, perpendicular, or oblique to the base of the figure.	identify the two-dimensional figures that result from slicing plane sections of right rectangular prisms and right rectangular pyramids where the slice is perpendicular to the base of the figure.	identify the two-dimensional figures that result from slicing plane sections of right rectangular prisms and right rectangular pyramids where the slice is parallel to the base of the figure.
7.G.B.4; 7.G.B.6	apply the formulas for area, volume, and surface area for two and three-dimensional objects composed of triangles, quadrilaterals, polygons, and right prisms, and apply the formulas for circumference and area of a circle, in order to solve real world problems that require connecting multiple grade level concepts.	apply the formulas for area, volume, and surface area for two and three-dimensional objects composed of triangles, quadrilaterals, polygons, and right prisms, and apply the formulas for circumference and area of a circle, in order to solve real world and mathematical problems.	apply the formulas for area, volume, and surface area for two and three-dimensional objects composed of triangles, quadrilaterals, polygons, and right prisms, and apply the formulas for circumference and area of a circle, in order to solve mathematical problems.	apply the formulas for area, volume, and surface area for two and three-dimensional objects composed of right triangles, rectangles, and right prisms, and apply the formulas for circumference and area of a circle, in order to solve mathematical problems.
7.G.B.5	use facts about supplementary, complementary, vertical, and adjacent angles to write and solve equations for unknown angles in a situation in which a figure may or may not be given.	use facts about supplementary, complementary, vertical, or adjacent angles to write and solve equations for an unknown angle in a situation in which a figure may or may not be given.	use facts about supplementary, complementary, vertical, and/or adjacent angles to find the measure of unknown angles in a given figure.	use facts about complementary angles or vertical angles to find the measure of an unknown angle in a given figure.

7.SP Statistics and Probability

7.SP.A Use random sampling to draw inferences about a population.

- 7.SP.A.1 Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.
- 7.SP.A.2 Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.

7.SP.B Draw informal comparative inferences about two populations.

- 7.SP.B.3 Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability.
- 7.SP.B.4 Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.

7.SP.C Investigate chance processes and develop, use, and evaluate probability models.

- 7.SP.C.5 Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around $\frac{1}{2}$ indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.
- 7.SP.C.6 Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability.
- 7.SP.C.7 Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.
- Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events.
 - Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process.
- 7.SP.C.8 Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.
- Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.
 - Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., "rolling double sixes"), identify the outcomes in the sample space which compose the event.
 - Design and use a simulation to generate frequencies for compound events.

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7.SP.A	justify inferences used to make informed predictions and decisions about a population.	design random sampling to obtain representative samples, use precise vocabulary, and explain variability in multiple random samples to draw formal inferences about a population.	identify an appropriate method of random sampling for a population and distinguish between bias and unbiased samples.	draw informal inferences about a population.
7.SP.B	model and compare data sets using a visual display and appropriate measures of center and measures of variability to make informal comparative statements about two populations involving situations that require connecting multiple grade level concepts.	model and compare data sets using a visual display and appropriate measures of center and measures of variability to make informal comparative statements about two populations.	compare data sets, given in a visual display, using appropriate measures of center and measures of variability, to select an informal comparative statement about two populations.	make a direct comparison of two data sets, given a graphical representation of the data, using appropriate measures of center.
7.SP.C	find probabilities and interpret the likelihood of simple and compound events by designing and using probability models, including simulations, to predict the approximate relative frequency.	find probabilities and interpret the likelihood of simple and compound events by designing and/or using probability models, including simulations, and predict the approximate relative frequency given the probability.	find probabilities and interpret the likelihood of simple events, distinguishing between theoretical and experimental probabilities.	find the probability of simple events, knowing that probabilities are between 0 and 1.

Reasoning Performance Level Descriptors

All reasoning assessment items connect to both the Grade 7 reasoning evidence statements and the content evidence statements.

Students must provide evidence of their ability to reason mathematically by responding to:

- one-point machine scored items. For one-point reasoning items, refer to the associated content PLDs.
- four-point constructed response items. For four-point reasoning items, refer to both the reasoning PLDs below and the associated content PLDs.

Reasoning Evidence Statements

7.R.1 Reasoning with Ratios and Proportional Relationships

- 7.R.1a: Base explanations and reasoning on a coordinate plane diagram.
- 7.R.1b: Construct chains of reasoning that will justify or refute propositions or conjectures.
- 7.R.1c: Present solutions to multi-step problems in the form of valid chains of reasoning, adhering to precision. Identify or describe errors in solutions to multi-step problems and present corrected solutions.

7.R.2 Reasoning with Number Systems

- 7.R.2a: Base explanations and reasoning on the properties of operations.
- 7.R.2b: Base explanations and reasoning on the relationship between addition and subtraction or the relationship between multiplication and division.
- 7.R.2c: Base explanations and reasoning on a number line diagram.
- 7.R.2d: Present solutions to multi-step problems in the form of valid chains of reasoning, adhering to precision. Identify or describe errors in solutions to multi-step problems and present corrected solutions.
- 7.R.2e: Present solutions to multi-step problems in the form of valid chains of reasoning, adhering to precision. Identify or describe errors in solutions to multi-step problems and present corrected solutions.

7.R.3 Reasoning with Expressions and Equations

- 7.R.3a: Base explanations and reasoning on the properties of operations.
- 7.R.3b: Given an equation, present the solution steps as a logical argument that concludes with a set of solutions, if any.
- 7.R.3c: Present solutions to multi-step problems in the form of valid chains of reasoning, adhering to precision. Identify or describe errors in solutions to multi-step problems and present corrected solutions.

Level 4 – Distinguished <i>A student performing at this level should be able to provide evidence of mathematical reasoning by communicating:</i>	Level 3 – Proficient <i>A student performing at this level should be able to provide evidence of mathematical reasoning by communicating:</i>	Level 2 – Developing <i>A student performing at this level should be able to provide evidence of mathematical reasoning by communicating:</i>	Level 1 – Beginning <i>A student performing at this level should be able to provide evidence of mathematical reasoning by communicating:</i>
a sophisticated chain of reasoning.	a well-developed chain of reasoning.	a partially developed, valid chain of reasoning.	the beginning of a chain of reasoning.
a precise, logical solution pathway.	a logical solution pathway that may contain minor flaws.	a solution pathway that contains some correct processes yielding an incorrect solution.	an attempted solution pathway.
an extensive command of mathematical representations and vocabulary.	a proficient command of mathematical representations and vocabulary.	an understanding of some mathematical representations and vocabulary.	a developing understanding of some mathematical representations and vocabulary.

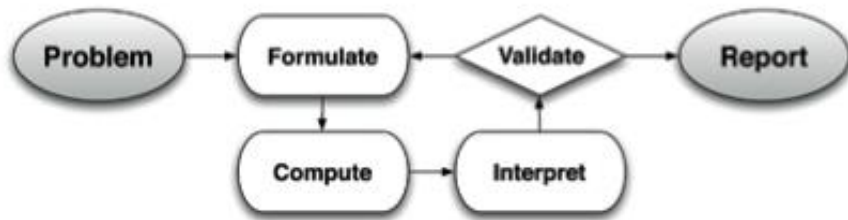
Modeling Performance Level Descriptors

All modeling assessment items connect to both the Grade 7 modeling evidence statements and the content evidence statements.

Students must provide _____ responding to:

- one-point machine scored items. For one-point modeling items, refer to the associated content PLDs.
- four-point constructed response items. For four-point modeling items, refer to both the modeling PLDs below and the associated content PLDs.

Modeling Cycle



Modeling Evidence Statements

7.M Modeling with Mathematics in Grade 7

- 7.M.1 Choose and produce appropriate mathematics to model quantities and mathematical relationships in order to analyze situations, make predictions, solve multi-step problems, and draw conclusions.
- 7.M.1a Given a real-world situation, identify the problem that needs to be solved, make necessary assumptions, and identify important information.
 - 7.M.1b Given a real-world situation, formulate a mathematical representation of the problem.
 - 7.M.1c Given a real-world situation, use mathematical models to compute and draw conclusions.
 - 7.M.1d Given a real-world situation, interpret what a solution means within the context of the situation.
 - 7.M.1e Given a real-world situation, evaluate and/or validate a partial or complete solution.

Level 4 – Distinguished <i>A student performing at this level should be able to provide evidence of the ability to use the modeling cycle by:</i>	Level 3 - Proficient <i>A student performing at this level should be able to provide evidence of the ability to use the modeling cycle by:</i>	Level 2 - Developing <i>A student performing at this level should be able to provide evidence of the ability to use the modeling cycle by:</i>	Level 1 - Beginning <i>A student performing at this level should be able to provide evidence of the ability to use the modeling cycle by:</i>
determining the information or mathematics needed to solve a problem that requires connecting multiple grade-level concepts.	determining needed information or mathematics.	identifying needed information or mathematics.	identifying some needed information or mathematics.
communicating an accurate, organized solution path aligned to the problem using appropriate, effective, and precise representations.	communicating an accurate, organized solution path aligned to the problem using appropriate, effective, and precise representations that may contain minor flaws.	communicating a partial solution path that may contain mathematical errors.	communicating the beginning of a solution path, containing mathematical errors.
evaluating or validating a solution path or showing how to improve a model or correct a given solution.	evaluating or validating a solution path or showing how to improve a model, but work may include minor flaws.	partially validating a solution path or incorrectly improving the model.	attempting to validate a solution path.