Grade 5 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 (MACP) 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 5 provide broad descriptions of what a student performing at each level means in terms of the mathematics content for the grade.

Grade 5

Performance Level	MCAP Mathematics Content Performance Level Descriptors for Grade 5
4	**Distinguished Learners** demonstrate advanced proficiency in solving complex problems involving mathematical operations, fractions, measurement, data, and geometry, 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.
3	**Proficient Learners** demonstrate proficiency in solving problems involving mathematical operations, fractions, measurement, data, and geometry, and demonstrates an ability to conceptualize and apply mathematics to model, reason through, and solve problems efficiently, and relate mathematics to the real world.
2	**Developing Learners** demonstrate partial proficiency in solving problems involving mathematical operations, fractions, measurement, data, and geometry, 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.
1	**Beginning Learners** do not yet demonstrate proficiency in solving problems involving mathematical operations, fractions, measurement, data, and geometry 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.

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.

5.OA   Operations and Algebraic Thinking

5.OA.A   Write and interpret numerical expressions.

5.OA.A.1   Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.

5.OA.A.2   Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. *For example, express the calculation "add 8 and 7, then multiply by 2" as 2 × (8 + 7). Recognize that 3 × (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product.*

5.OA.B   Analyze patterns and relationships.

5.OA.B.3   Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane. *For example, given the rule "Add 3" and the starting number 0, and given the rule "Add 6" and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so.*

Evidence Statement Codes	Level 4 - Distinguished *A student performing at this level should be able to:*	Level 3 - Proficient *A student performing at this level should be able to:*	Level 2 - Developing *A student performing at this level should be able to:*	Level 1 - Beginning *A student performing at this level should be able to:*
5.OA.A.1 5.OA.A.2	interpret and write numerical expressions and determine when and where grouping symbols are needed to solve problems that require multiple grade-level concepts.	evaluate or write expressions with grouping symbols involving fractions, decimals, or whole numbers involving three or more terms, and multiple operations.	evaluate or write expressions with grouping symbols involving whole numbers, three or more terms, and multiple operations.	evaluate or write expressions with grouping symbols using whole numbers, three terms, the same operation, and one set of parentheses.
5.OA.B.3	generate and analyze two numerical patterns using two given rules to solve problems that require multiple grade-level concepts.	generate two numerical patterns using two given rules and identify the relationships between the corresponding terms.	continue two given numerical patterns when given the rules.	apply a rule beginning at different starting points.

5.NBT   Numbers and Operations in Base Ten

5.NBT.A Understand the place value system.

5.NBT.A.1 Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and $\frac{1}{10}$ of what it represents in the place to its left.

5.NBT.A.2 Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole number exponents to denote powers of 10.

5.NBT.A.3 Read, write, and compare decimals to the thousandths.

   a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g.

   $347.392 = 3 \times 100 + 4 \times 10 + 7 \times 1 + 3 \times (\frac{1}{10}) + 9 \times (\frac{1}{100}) + 2 \times (\frac{1}{1000})$

   b. Compare two decimals to the thousandths based on meanings of the digits in each place, using >, =, < symbols to record the results of comparisons.

5.NF.A.4 Use place value understanding to round decimals to any place.

Evidence Statement Codes	Level 4 - Distinguished *A student performing at this level should be able to:*	Level 3 - Proficient *A student performing at this level should be able to:*	Level 2 - Developing *A student performing at this level should be able to:*	Level 1 - Beginning *A student performing at this level should be able to:*
5.NBT.A.1	apply an understanding of place value, including the relationship between digits, to solve problems that require multiple grade-level concepts.	recognize how the value of a digit relates to place values (right or left) through thousandths.	use models, tables and/or diagrams to recognize how the value of a digit relates to place values (right or left) through thousandths.	recognize how the value of a digit relates to adjacent (right or left) place values through thousandths.
5.NBT.A.2	apply an understanding of place value, including the patterns when multiplying a number by the powers of ten and the placement of the decimal point to solve problems that require multiple grade-level concepts.	use patterns in the number of zeros or decimal point placement when multiplying or dividing by a power of ten with whole number exponents.	use patterns for decimal point placement in the product when multiplying by a power of ten with whole number exponents.	use patterns in the number of zeros in the product when multiplying by a power of ten with whole number exponents.
5.NBT.A.3	apply an understanding of place value to read, write, and compare decimals in various forms to solve problems that require multiple grade-level concepts.	read and/or write decimals to thousandths using a variety of decimal notations. Compare multiple decimals using <, >, =.	read and/or write decimals to thousandths using a variety of decimal notations. Compare two decimals using <, >, =.	use place value charts or pictorial representations to read, write, and compare decimals (using <, >, =) with decimals to thousandths.

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5.NBT.A.4	apply an understanding of place value to round decimals to solve problems that require multiple grade-level concepts.	use place value understanding to round decimals in any place.	use place value understanding to round decimals in any place using pictorial representations.	use place value understanding to round decimals to the nearest whole number using pictorial representations.

5.NBT.B Perform operations with multi-digit whole number and with decimals to hundredths.

5.NBT.B.5   Fluently multiply multi-digit whole numbers using the standard algorithm.

5.NBT.B.6   Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

5.NBT.B.7   Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

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5.NBT.B.5	accurately multiply multi-digit whole numbers to solve problems that require connecting multiple grade-level concepts.	accurately multiply multi-digit whole numbers using the standard algorithm with two-digit by three-digit factors and two- digit by four-digit factors.	accurately multiply multi-digit whole numbers with two-digit by two-digit factors.	accurately multiply multi-digit whole numbers up to three-digit by one-digit factors.
5.NBT.B.6	apply an understanding of place value, properties of operations, and the relationship between multiplication and division to solve problems that require connecting multiple grade-level concepts.	find whole-number quotients of whole numbers with up to four- digit dividends and two-digit divisors.	find whole-number quotients of whole numbers with up to three-digit dividends and two-digit divisors.	find whole-number quotients using whole numbers with two- digit dividends and two-digit divisors.
5.NBT.B.7	apply an understanding of decimal operations to solve problems that require connecting multiple grade-level concepts.	solve mathematical problems using the four operations with decimals to hundredths.	solve mathematical problems involving the addition and subtraction with decimals to hundredths.	solve mathematical problems involving addition with decimals to hundredths using pictorial representations.

5.NF   Number and Operations – Fractions

5.NF.A   Use equivalent fractions as a strategy to add and subtract fractions.

5.NF.A.1   Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. *For example,* $\frac{2}{3} + \frac{5}{4} = \frac{8}{12} + \frac{15}{12} = \frac{23}{12}$. *In general,* $\frac{a}{b} + \frac{c}{d} = \frac{(ad+bc)}{bd}$.

5.NF.A.2   Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. *For example, recognize an incorrect result* $\frac{2}{5} + \frac{1}{2} = \frac{3}{7}$ *by observing that* $\frac{3}{7} < \frac{1}{2}$.

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5.NF.A.1	add and subtract fractions and mixed numbers to solve problems that require connecting multiple grade-level concepts.	add and subtract fractions and mixed numbers with unlike denominators.	add and subtract fractions, less than one, with unlike denominators.	add and subtract fractions, less than one, with unlike denominators where one denominator is a multiple of the other denominator.
5.NF.A.2	add and subtract fractions and mixed numbers to solve problems that require connecting multiple grade-level concepts.	use addition and subtraction to solve word problems with mixed numbers and fractions with unlike denominators.	use addition and subtraction to solve word problems with fractions, less than one, with unlike denominators.	use addition and subtraction to solve word problems with fractions, less than one, with unlike denominators where one denominator is a multiple of the other denominator.

5.NF   Number and Operations – Fractions

5.NF.B   Apply and extend previous understanding of multiplication and division to multiply and divide fractions.

5.NF.B.3   Interpret a fraction as division of the numerator by the denominator ($\frac{a}{b} = a \div b$). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem. *For example, interpret $\frac{3}{4}$ as the result of dividing 3 by 4, noting that $\frac{3}{4}$ multiplied by 4 equals 3, and that when 3 wholes are shared equally among 4 people each person has a share of size $\frac{3}{4}$. If 9 people want to share a 50- pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?*

5.NF.B.4   Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.

a.   Interpret the product $\frac{a}{b} \times q$ as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations $a \times q \div b$. *For example, use a visual fraction model to show $\frac{2}{3} \times 4 = \frac{8}{2}$, and create a story context for this equation. Do the same with $\frac{2}{3} \times \frac{4}{5} = \frac{8}{15}$. In general, $\frac{a}{b} \times \frac{c}{d} = \frac{ac}{bd}$*

5.NF.B.6   Solve real-world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.

5.NF.B.7   Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions. Interpret division of a unit fraction.

a.   Interpret division of a unit fraction by a non-zero whole number and compute such quotients. *For example, create a story context for $\frac{1}{3} \div 4$ and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that $\frac{1}{3} \div 4 = \frac{1}{12}$ because $\frac{1}{12} \times 4 = \frac{1}{3}$.*

b.   Interpret division of a whole number by a unit fraction and compute such quotients. *For example, create a story context for $4 \div \frac{1}{5}$ and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that $4 \div \frac{1}{5} = 20$ because $20 \times \frac{1}{5} = 4$.*

c.   Solve real-world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, how much chocolate will each person get if 3 people share $\frac{1}{2}$ lb. of chocolate equally? How many $\frac{1}{3}$-cup servings are in 2 cups of raisins?*

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5.NF.B.3	apply an understanding of interpreting fractions as multiplying and dividing fractions to solve problems that require connecting multiple grade-level concepts.	solve problems that require interpreting fractions as division.	solve problems that require interpreting fractions as division when provided a visual model.	solve problems that require interpreting fractions as division (quotients are unit fractions).
5.NF.B.4a	apply an understanding of interpreting fractions as multiplying and dividing fractions to solve problems that require connecting multiple grade-level concepts.	interpret the product of a whole number times a fraction or fraction times a fraction.	interpret the product of two unit fractions.	interpret the product of a fraction times a whole number (fractions are not unit fractions).
5.NF.B.6	apply an understanding of interpreting fractions as multiplying and dividing fractions to solve problems that require connecting multiple grade-level concepts.	solve real-world problems involving multiplication of fractions and mixed numbers.	solve real-world problems involving multiplication of mixed numbers by a fraction.	solve real-world problems involving multiplication of mixed numbers by whole numbers.
5.NF.B.7	apply an understanding of interpreting fractions as multiplying and dividing fractions to solve problems that require connecting multiple grade-level concepts.	solve problems and interpret a whole number divided by a unit fraction and a unit fraction divided by a whole number.	solve problems and interpret a whole number (two to five) divided by a unit fraction (½ or ¼) and a unit fraction divided by a whole number.	solve problems involving division of whole numbers (two to five) by a unit fraction (½ and ¼) using visual fraction models and/or equations to represent the problem.

5.MD Measurement and Data

5.MD.A Convert like measurement units within a given measurement system.

5.MD.A.1 Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m) and use these conversions in solving multi-step problems.

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5.MD.A.1	apply an understanding of converting measurement units to solve problems that require connecting multiple grade-level concepts.	Solve multi-step problems that involve the conversion of standard measurement units.	solve two-step problems that involve converting a measurement from a smaller unit to a larger unit.	convert measurements from a smaller unit to a larger unit (for example, 36 inches equals how many feet, 2000 cubic cm equals how many liters).

5.MD.B Represent and interpret data.

5.MD.B.2 Make a line plot to display a data set of measurements in fractions of a unit $(\frac{1}{2}, \frac{1}{4}, \frac{1}{8})$. Use operations for this grade to solve problems involving information presented in line plots. *For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.*

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5.MD.B.2	apply understanding of the data using a line plot to solve problems that require connecting multiple grade-level concepts.	complete and/or interpret a line plot with a given data set of fractions with different denominators. Use the data from the line plot to solve problems using any of the four operations.	complete and/or interpret a line plot with a given data set; of fractions with like denominators with some tick marks missing labels. Use the data from the line plot to solve problems using any of the four operations.	complete and/or interpret a line plot given a data set of fractions with like denominators with all tick marks labeled. Use the data from the line plot to solve problems using any of the four operations.

5.MD.C Geometric measurement: Understand concepts volume and relate volume to multiplication and to addition.

5.MD.C.5   Relate volume to the operations of multiplication and addition, and solve real-world and mathematical problems involving volume

a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication

b. Apply the formulas $V = (l)(w)(h)$ and $V = (b)(h)$ for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real-world and mathematical problems.

c. Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non- overlapping parts, applying this technique to solve real-world problems.

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5.MD.C.5	apply an understanding of volume for one and two rectangular prisms to solve problems that require connecting multiple grade- level concepts.	apply the formulas $V =(l)(w)(h)$ and $V = (B)(h)$ for rectangular prisms to find volumes of single right rectangular prisms and of two non-overlapping right rectangular prisms.	Determine the volume of a right rectangular prism using the formula for volume when provided the three dimensions.	determine the volume of aright rectangular prism filled with unit cubes.

5.G   Geometry

5.G.A   Graph points on the coordinate plane to solve real-world and mathematical problems.

5.G.A.1   Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., x-axis and x-coordinate, y- axis and y-coordinate).

5.G.A.2   Represent real-world mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

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5.G.A.1 5.G.A.2	apply an understanding of graphing points on a coordinate plane to solve problems that require connecting multiple grade-level concepts.	represent real-world problems by creating or identifying ordered pairs and plotting them in the coordinate plane. Interpret values of points in the context of the situation.	plot at least two points on the coordinate plane when given ordered pairs or name at least two points on the coordinate plane.	plot one point on the coordinate plane when given an ordered pair in problems without context.

5.G.B   Classify two-dimensional figures in a hierarchy based on properties.

5.G.B.3   Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.

5.G.B.4   Classify two-dimensional figures in a hierarchy based on properties.

Evidence Statement Codes	Level 4 - Distinguished *A student performing at this level should be able to:*	Level 3 - Proficient *A student performing at this level should be able to:*	Level 2 - Developing *A student performing at this level should be able to:*	Level 1 - Beginning *A student performing at this level should be able to:*
5.G.B.3 5.G.B.4	apply an understanding of the attributes of two-dimensional figures in order to classify two-dimensional figures in a hierarchy of groups. Solve problems that require connecting multiple grade-level concepts.	classify two-dimensional figures in a hierarchy based on properties.	identify two-dimensional figures by their attributes.	identify at wo-dimensional figure by appearance.

Reasoning Performance Level Descriptors

All reasoning assessment items connect to both the Grade 5 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.
- three-point constructed response items. For three-point reasoning items, refer to both the reasoning PLDs below and the associated content PLDs.

Reasoning Evidence Statements

5.R.1   Base reasoning or explanations on a given pictorial representation and explain how the pictorial model represents a mathematical concept or how it can be used to justify or refute a statement (with or without flaws) or how it can be used to make a generalization.

5.R.2   Identify flawed thinking/reasoning and explain how to correct the thinking or work.

5.R.3   Prove or disprove a statement, conjecture, or generalization, using correct and precise mathematical examples.

5.R.4   Reason mathematically to create or analyze a correct and precise solution to a real-world problem and be able to explain why the answer is mathematically correct.

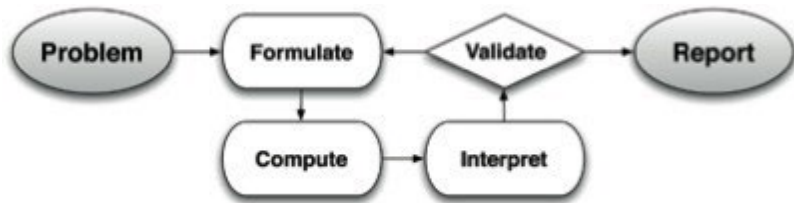| Level 4 - Distinguished *A student performing at this level should be able to provide evidence of mathematical reasoning by communicating:*	Level 3 - Proficient *A student performing at this level should be able to provide evidence of mathematical reasoning by communicating:*	Level 2 - Developing *A student performing at this level should be able to provide evidence of mathematical reasoning by communicating:*	Level 1 - Beginning *A student performing at this level should be able to provide evidence of mathematical reasoning by communicating:*
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 5 modeling evidence statements and the content evidence statements.

Students must provide evidence of their ability to use one or more steps of the modeling cycle by responding to:
- one-point machine scored items. For one-point modeling items, refer to the associated content PLDs.
- three-point constructed response items. For three-point modeling items, refer to both the modeling PLDs below and the associated content PLDs.

Modeling Cycle

Modeling Evidence Statements

5.M.1-1	Determine the problem that needs to be solved in a real-world situation.
5.M.1-2	Determine the information that is needed to solve a problem in a given real-world situation.
5.M.1-3	Identify the mathematics that is needed to create a solution path for a real-world situation.
5.M.1-4	Create a solution path that represents the mathematics needed to solve a real-world situation.
5.M.1-5	Evaluate a partial or complete solution path to a real-world situation.

Level 4 - Distinguished	Level 3 - Proficient	Level 2 - Developing	Level 1 - Beginning
A student performing at this level should be able to provide evidence of the ability to use the modeling cycle by:	*A student performing at this level should be able to provide evidence of the ability to use the modeling cycle by:*	*A student performing at this level should be able to provide evidence of the ability to use the modeling cycle by:*	*A student performing at this level should be able to provide evidence of the ability to use the modeling cycle by:*
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.