Grade 5 Mathematics Standards

Comparison Tool for Standards Transition

Updated June 2012

This document can be used to assist educators in analyzing the commonalities and differences between the new Alaska mathematics standards and the Fourth Edition (Grade Level Expectations). This document is a first start toward a transition and districts may choose to augment with more detail.

The first column contains the new math standards. The second column shows the Grade Level Expectations (GLEs) that align to the new standards. The third column provides comments, usually highlighting differences between the new standards and GLEs that align in higher grades. Additionally, the comments may include a notation about an increase in rigor. Rigor may be defined as a standard that requires deeper understanding, higher-order thinking, expanded analytical processes, or simply a skill introduced at an earlier grade.

Note that some GLEs are coded with an L. This signifies that the GLE was not assessed on the statewide assessment; it was to be assessed at the local level. No new standards are identified as being for local assessment. Students advancing through the grades are expected to meet each year’s grade-specific standards and retain or further develop skills and understandings mastered in preceding grades.

In most cases there are not complete matches between the two sets of standards, and it should not be assumed that either the content or skills found in one set of standards will match completely with those of the other set.

| **New Math Standards** | **Grade Level Expectations** | **Comment** |
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| 6.RP.2. Understand the concept of a unit rate (*a*/*b* associated with a ratio *a:b* with *b ≠* 0, and use rate language in the context of a ratio relationship) and apply it to solve real world problems (e.g., unit pricing, constant speed).  *For example, “This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar.” “We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger.”* | **[6] E&C-5** developing and interpreting scale models  Any aligned GLE found in the higher grades will need to be absorbed in the lower grade as part of the transition. | Grade 6 GLE provides a specific real-world model for understanding unit rate.  **[7] E&C-6** solving proportions using a given scale  **[8] E&C-5** using ratio and proportion |

The new standards represent a shift in the purpose of the standards. They are more instructional in nature, intended to guide classroom curriculum. The new standards do not serve as an assessment document, unlike the GLEs. The Department with the support of stakeholders will prepare an assessment framework that will guide the development of the new assessments. The new standards will be assessed starting spring 2016. Until then, all districts will continue administering the Standards Based Assessments aligned to the GLEs through spring 2015.

A table at the end shows the GLEs not matched to the new standards. The comment column indicates where the GLE may be matched to a new standard in a lower or higher grade. Although some GLEs will be taught at other grade levels, teachers must provide opportunities for these GLEs to be reviewed in preparation for the spring Standards Based Assessments through spring 2015.

| **Grade 6 Math GLEs not matched by new standards** | **Comments** |
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| **The student demonstrates conceptual understanding of fractions (proper or mixed numbers), decimals, percents (whole number), or integers by**  **[6] N-2** identifying place value positions from thousandths to millions (L) | Grade 4 and 5 Standards  **(4.NF.6, 4.NF.7, 5.NBT.3)** |

This GLE must be reviewed prior to the SBA through spring 2015.

Finally, the new standards for each grade level define what students should understand and be able to do by the end of each grade which includes the Standards for Mathematical Practice. The Standards for Mathematical Practice describe characteristics and traits that mathematics educators at all levels should seek to develop in their students. They describe ways that students should be engaging with mathematics as they progress through school. The integration of these standards into classroom instruction is a key strategy for increasing cognitive demand and conceptual learning. The Standards for Mathematical Practice are included at the end of the document.

The next page provides an overview of this grade level.

**Grade 5 Overview**

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| **Operations and Algebraic Thinking**  • Write and interpret numerical expressions.  • Analyze patterns and relationships.  **Number and Operations in Base Ten**  • Understand the place value system.  • Perform operations with multi-digit whole numbers and with decimals to hundredths.  **Number and Operations—Fractions**  • Use equivalent fractions as a strategy to add and subtract fractions.  • Apply and extend previous understandings of multiplication and division to multiply and divide fractions.  **Measurement and Data**  • Convert like measurement units within a given measurement system.  • Represent and interpret data.  • Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.  **Geometry**  • Graph points on the coordinate plane to solve real-world and mathematical problems.  • Classify two-dimensional figures into categories based on their properties. | **In Grade 5, instructional time should focus on four critical areas:**  (1) developing fluency with addition and subtraction of fractions, and developing understanding of the multiplication of fractions and of division of fractions in limited cases (unit fractions divided by whole numbers and whole numbers divided by unit fractions);  (2) extending division to 2-digit divisors, integrating decimal fractions into the place value system and developing understanding of operations with decimals to hundredths, and developing fluency with whole number and decimal operations; and  (3) developing understanding of volume. |
| **Mathematical Practices (MP)**   1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning. |

**Operations and Algebraic Thinking - Alaska New Mathematics Standards**

| **New Math Standards** | **Grade Level Expectations** | **Comment** |
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| **Write and interpret numerical expressions.** |  |  |
| 5.OA.1. Use parentheses to construct numerical expressions, and evaluate numerical expressions with these symbols. | NEW – not addressed in the GLEs | Parentheses are not mentioned in the GLEs but are included in rules for order of operations.  **[8] N-8** applying the rules for order of operations to rational numbers  The new standard includes constructing and evaluating numerical expressions. |
| 5.OA.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 x (8 + 7). Recognizing that 3 x (18932 + 921) is three times as large as 18932 + 921, without having to calculate the indicated sum or product.* | NEW – not addressed in the GLEs | **[8] F&R-5** translating a written phrase to an algebraic expression |
| **Analyze patterns and relationships.** |  |  |
| 5.OA.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.* | **[5] F&R-1** extending patterns that use addition, subtraction, multiplication, division or symbols, up to 10 terms,represented by models (function machines), tables, sequences, or in problem situations  **[5] F&R-2** using rules to express the generalization of a pattern using words, lists, or tables | GLEs do not require generating two numerical patterns and identifying apparent relationships between corresponding terms.  The new standard requires graphing an ordered pairs on a coordinate plane.  **[8] F&R-2** generalizing relationships (linear) using a table of ordered pairs, a graph, or an equation |

**Number and Operations in Base Ten - Alaska New Mathematics Standards**

| **New Math Standards** | **Grade Level Expectations** | **Comment** |
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| **Understand the place value system.** |  | GLEs do not have the equivalent focus of the Number and Operations in Base Ten. |
| 5.NBT.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 1/10 of what it represents in the place to its left. | **[5] N-2** identifying place value positions from tenths to millions  **[5] E&C-1** identifying or using [a variety of L] strategies (e.g., rounding to appropriate place value, multiplying by powers of ten, using front-end estimation) to estimate the results of addition or subtraction computations from tenths to 100,000, including money, or simple multiplication or division) | The new standard defines place value in terms of the relationship between the digits in a number. |
| 5.NBT.2. Explain and extend the patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain and extend the 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. | NEW – not addressed in the GLEs |  |
| 5.NBT.3. Read, write, and compare decimals to thousandths.  a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form [e.g., 347.392 = 3 x 100 + 4 x 10 + 7 x 1 + 3 (1/10) + 9 (1/100) + 2 (1/1000)].  b. Compare two decimals to thousandths place based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons. | * of whole numbers to millions by   **[5] N-1** reading, writing, ordering, or [counting L]  **[5] N-2** identifying place value positions from tenths to millions  **[5] N-3** converting between whole numbers written in expanded notation and standard form | Grade 5 GLEs include place value positions to tenths only.  **[6] N-2** [identifying place value positions from thousandths to millions **L**]  **[6] N-3** converting between whole numbers written in expanded notation and standard form |

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| 5.NBT.4. Use place values understanding to round decimals to any place. | **[5] E&C-1** identifying or using [a variety of L] strategies (e.g., rounding to appropriate place value, multiplying by powers of ten, using front-end estimation) to estimate the results of addition or subtraction computations from tenths to 100,000, including money, or simple multiplication or division | Proposed standard states round decimals to any place. Grade 5 GLE is limited to tenths. Grade 6 GLE includes thousandths.  **[6] E&C-1** identifying or using [a variety of L] strategies (e.g., truncating, rounding to compatible numbers) to estimate the results of addition, subtraction or multiplication from thousandths to millions or simple division |
| **Perform operations with multi-digit whole numbers and with decimals to hundredths.** |  |  |
| 5.NBT.5. Fluently multiply multi-digit whole numbers using a standard algorithm. | **[5] E&C-4** multiplying two-digit whole numbers by two-digit numbers or dividing three-digit whole numbers by single-digit numbers | GLE limits the number of digits and does not specify a specific algorithm  **[6] E&C-4** multiplying whole numbers by two- or three-digit numbers, dividing three-digit numbers by one- or two-digit numbers, or multiplying or dividing decimals that represent money by whole numbers, or multiplying or dividing proper fractions |

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| 5.NBT.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, number lines, real life situations, and/or area models. | **[5] N-6** [using models, explanations, number lines, or real-life situations L] describing or illustrating the process of division and its relationship to subtraction or to multiplication  **[5] E&C-4** multiplying two-digit whole numbers by two-digit numbers or dividing three-digit whole numbers by single-digit numbers | GLE limits operation to division of three-digit numbers by single-digit numbers.  **[6] E&C-4** multiplying whole numbers by two- or three-digit numbers, dividing three-digit numbers by one- or two-digit numbers, or multiplying or dividing decimals that represent money by whole numbers, or multiplying or dividing proper fractions  Proposed standard specifies illustrate and explain by “using equations, rectangular arrays, number lines, real life situations, and/or area models.” |
| 5.NBT.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 the operations. Relate the strategy to a written method and explain their reasoning in getting their answers. | **[5] N-8** [using models, explanations, number lines, or real-life situations L] describing or illustratingthe process of adding or subtracting decimals that represent money  **[5] E&C-3** adding or subtracting four-digit whole numbers, fractions with like denominators to 12, or decimals involving money | Grade 5 GLEs require only addition or subtraction of decimals involving money. Multiplication and division of decimals is a Grade 7 GLE.  **[7] E & C-4** multiplying or dividing decimals to hundredths, or multiplying or dividing by powers of ten, or multiplying or dividing fractions or mixed numbers |

**Number and Operations—Fractions - Alaska New Mathematics Standards**

| **New Math Standards** | **Grade Level Expectations** | **Comment** |
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| **Use equivalent fractions as a strategy to add and subtract fractions.** |  |  |
| 5.NF.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,  2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)* | NEW – not addressed in the GLEs | **The student accurately solves problems**  **(including real-world situations) involving**  **[6] E&C-3** adding or subtracting whole numbers, fractions with unlike denominators to 12, or decimals to the hundredths place |
| 5.NF.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 check the reasonableness of answers.  *For example, recognize an incorrect result 2/5 + 1/2 = 3/7, by observing that  3/7 < 1/2.* | **[5] E&C-3** adding or subtracting four-digit whole numbers, fractions with like denominators to 12, or decimals involving money | Adding and subtracting fractions with unlike denominators is a Grade 6 GLE  The proposed standard specifies the use of benchmark fractions to check the reasonableness of an answer.  **The student determines reasonable answers to real-life situations, paper/pencil computations, or calculator results by**  **[5] E&C-1** identifying or using [a variety of L] strategies (e.g., rounding to appropriate place value, multiplying by powers of ten, using front-end estimation to estimate the results of addition or subtraction computations from tenths to 100,000, including money, or simple multiplication or division |

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| **Apply and extend previous understandings of multiplication and division to multiply and divide fractions.** |  |  |
| 5.NF.3. Interpret a fraction as division of the numerator by the denominator  (*a*/*b* = *a* ÷ *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 3/4 as the result of dividing 3 by 4, noting that 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 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?* | NEW – not addressed in the GLEs |  |
| 5.NF.4. Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.  a. Interpret the product (*a*/*b*) × *q* as *a* parts of a partition of *q* into *b* equal parts; equivalently, as the result of a sequence of operations *a* × *q* ÷ *b*. *For example, use a visual fraction model to show  (2/3) × 4 = 8/3, and create a story context for this equation. Do the same with (2/3) × (4/5) = 8/15. (In general, (a/b) × (c/d) = ac/bd.)*  b. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas. | NEW – not addressed in the GLEs |  |
| 5.NF.5. Interpret multiplication as scaling (resizing), by:  a. Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.  b. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence *a*/*b* = (*n*×*a*)/(*n*×*b*) to the effect of multiplying *a*/*b* by 1. (Division of a fraction by a fraction is not a requirement at this grade.) | NEW – not addressed in the GLEs |  |
| 5.NF.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). | NEW – not addressed in the GLEs | The new standard includes using visual models or equations.  **[7] E&C-4** multiplying or dividing decimals to hundredths, or multiplying or dividing by powers of ten, or multiplying or dividing fractions or mixed numbers |

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| 5.NF.7. Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.  a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. *For example, create a story context for (1/3) ÷ 4, and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that (1/3) ÷ 4 = 1/12 because (1/12) × 4 = 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 ÷ (1/5), and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that 4 ÷ (1/5) = 20 because 20 × (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 1/2 lb of chocolate equally? How many 1/3-cup servings are in 2 cups of raisins?* | NEW – not addressed in the GLEs | The proposed standard specifically addresses division involving whole numbers and fractions including creating context and a visual model.  **The student accurately solves problems (including real-world situations) involving**  **[6] E&C-4** multiplying whole numbers by two- or three-digit numbers, dividing three-digit numbers by one- or two-digit numbers, or multiplying or dividing decimals that represent money by whole numbers, or multiplying or dividing proper fractions |

**Measurement and Data - Alaska New Mathematics Standards**

| **New Math Standards** | **Grade Level Expectations** | **Comment** | |
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| **Convert like measurement units within a given measurement system and solve problems involving time.** |  |  | |
| 5.MD.1. Identify, estimate measure, and convert equivalent measures within systems English length (inches, feet, yards, miles), weight (ounces, pounds, tons), volume (fluid ounces, cups, pints, quarts, gallons), and temperature (Fahrenheit) Metric length (millimeters, centimeters, meters, kilometers), volume (milliliters, liters), and temperature (Celsius), (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems using appropriate tools. | **[5] MEA-3** identifying or using equivalent measures for weight/mass (16 oz. = 1 pound or 1000 grams = 1 kilogram), length (1000 millimeters = 1 meter), or time | GLEs do not address multi-step problems involving measurement conversion.  The new standard requires additional measures and conversion, which are addressed in the Grade 6 GLEs.  **[6] MEA-2** identifying equivalent measures within systems  English   * length (inches, feet, yards, miles) * weight (ounces, pounds, [tons L]) * volume (fluid ounces, cups, pints, quarts, gallons)   Metric   * length (millimeters, centimeters, meters, kilometers) * volume (milliliters, liters)   **[6] MEA-6** converting and using equivalent measurements within the same system | |
| 5.MD.2. Solve real-world problems involving elapsed time between world time zones. (L) | NEW – not addressed in the GLEs | **[7] MEA-6** solving real-world problems involving elapsed time between world time zones |

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| **Represent and interpret data.** |  |  |
| 5.MD.3. Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). 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.* | NEW – not addressed in the GLEs | GLEs do not address displaying fractions on line plots.  **The student demonstrates** **an ability to analyze data (comparing, explaining, interpreting, evaluating; or drawing or justifying conclusions) by**  **[5] S&P-2** using information from a variety of displays (tables, bar graphs, line graphs, or Venn diagrams) |
| 5.MD.4. Explain the classification of data from real-world problems shown in graphical representations including the use of terms mean and median with a given set of data. (L) |  | Mode and range are covered in Grade 4 (4.MD.6)  **[6] S&P-3** using mean, median, mode, or range |
| **Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.** |  |  |
| 5.MD.5. Recognize volume as an attribute of solid figures and understand concepts of volume measurement.  a. A cube with side length 1 unit, called a “unit cube,” is said to have “one cubic unit” of volume, and can be used to measure volume.  b. A solid figure that can be packed without gaps or overlaps using *n* unit cubes is said to have a volume of *n* cubic units. | NEW – not addressed in the GLEs | The new standards require a deeper understanding of volume concept including the unit cube as a measure.  The student demonstrates understanding of measurable attributes by  **[7] MEA-1** estimating length to the nearest sixteenth of an inch or millimeter, volume to the nearest cubic centimeter or milliliter or angle to the nearest 30 degrees (L) |

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| 5.MD.6. Estimate and measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and non-standard units. | NEW – not addressed in the GLEs | **[6] G-9** [estimating or determining the volume of a right rectangular prism using manipulatives and formulas (e.g., cereal box, sand box, planter) **L**] |
| 5.MD.7. Relate volume to the operations of multiplication and addition and solve real-world and mathematical problems involving volume.  a. Estimate and 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. Demonstrate the associative property of multiplication by using the product of three whole numbers to find volumes (length x width x height).  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. | NEW – not addressed in the GLEs | The new standards emphasize making explicit connections between volume and both multiplication and addition.  **The student solves problems (including real-world situations) by**  **[7] G-5** determining the volume of cubes and rectangular prisms |

**Geometry - Alaska New Mathematics Standards**

| **New Math Standards** | **Grade Level Expectations** | **Comment** |
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| **Graph points on the coordinate plane to solve real-world and mathematical problems.** |  |  |
| 5.G.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-8** [locating points of given coordinates on a grid or identifying coordinates for a given point (e.g., items on a treasure map) **L**] | The new standard specifies defining and understanding the coordinate plane. |
| 5.G.2. Represent real world and 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. | **[5] G-8** [locating points of given coordinates on a grid or identifying coordinates for a given point (e.g., items on a treasure map) **L**] | Proposed standard includes “interpret coordinate values of points in the context of the situation.” |

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| **Classify two-dimensional figures into categories based on their properties.** |  |  |
| 5.G.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-1** using the attributes and properties of angles and the number, length, and orientation of sides to identify or compare triangles (scalene, isosceles, or equilateral) or quadrilaterals (parallelograms, trapezoids, rhombi) |  |
| 5.G.4. Classify two-dimensional (plane) figures in a hierarchy based on attributes and properties. | **[5] G-1** using the attributes and properties of angles and the number, length, and orientation of sides to identify or compare triangles (scalene, isosceles, or equilateral) or quadrilaterals (parallelograms, trapezoids, rhombi) | Grade 6 GLE specifies classification and does not limit shapes to triangles and quadrilaterals.  **[6] G-1** using the attributes and properties (sides and angles) of regular polygons to identify, classify, or compare regular or irregular polygons |

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| **Grade 5 Math GLEs not matched by the new standards** | **Comments** |
| **The student demonstrates conceptual understanding of positive fractions with denominators 1 through 12 and 100 with proper and mixed numbers and benchmark percents (10%, 25%, 50%, 75%, 100%) by**  **N-4** modeling, identifying, describing with explanations, or illustrating equal parts of a whole, a region, or a set |  |
| **The student demonstrates conceptual understanding of positive fractions with denominators 1 through 12 and 100 with proper and mixed numbers and benchmark percents (10%, 25%, 50%, 75%, 100%) by**  **N-5** modeling, identifying, describing with explanations, or illustrating equivalent fractions or mixed numbers | New Grade 4 Standard **(4.NF.5)** |
| **The student demonstrates conceptual understanding of mathematical operations by**  **N-7** [using models, explanations, number lines, or real-life situations L] describing or illustrating the process of adding and subtracting proper fractions or mixed numbers (like denominators) | New Grade 4 Standard **(4.NF.3)** |
| **The student demonstrates conceptual understanding of number theory by**  **N-9** describing or illustrating commutative or identity properties of addition or multiplication using models or explanations |  |
| **The student demonstrates conceptual understanding of number theory by**  **N-10** identifying or listing factors and multiples common to a pair or set of numbers | New Grade 4 Standard **(4.OA.4)** |
| **The student demonstrates understanding of measurable attributes by**  **MEA-1** estimating length to the nearest one-fourth inch or centimeter (L) |  |
| **The student demonstrates understanding of measurable attributes by**  **MEA-2** estimating temperature (degree Celsius or Fahrenheit, plus or minus 5 degrees) or weight (halfpounds or kilograms) to the nearest unit (L) | New Grade 3 Standard **(3.MD.2)** |
| **The student demonstrates ability to use measurement techniques by**  **MEA-4** measuring temperature or weight using appropriate tools (L) |  |
| **The student demonstrates ability to use measurement techniques by**  **MEA-5** telling time using analog clocks to the nearest minute and using AM or PM | New Grade 2 Standard **(2.MD.6)**  New Grade 3 Standard **(3.MD.1)** |
| **The student demonstrates ability to use measurement techniques by**  **MEA-6** determining possible combinations of coins and bills to given amounts |  |
| **The student demonstrates ability to use measurement techniques by**  **MEA-7** simulating multiple purchases and calculating the amount of change from given bills up to $100.00 (L |  |

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| **The student demonstrates ability to use measurement techniques by**  **MEA-8** measuring length to the nearest 1/4 inch or centimeter | New Grade 3 Standard **(3.MD.5)** |
| **The student accurately solves problems (including real-world situations) by**  **E&C-2** recalling basic multiplication facts, products to 144, and corresponding division facts efficiently (L | New Grade 3 Standards **(3.OA.3, 3.OA.6)** |
| **The student demonstrates conceptual understanding of functions, patterns, or sequences by**  **F&R-3** identifying or applying addition or subtraction patterns to find missing values in a function |  |
| **The student demonstrates conceptual understanding of functions, patterns, or sequences by**  **F&R-4** using manipulatives, including a calculator, as tools when describing, extending, or representing a number sequence (L) |  |
| **The student demonstrates algebraic thinking by**  **[5] F&R-5** using an open number sentence (addition, subtraction, multiplication, or division) to solve for an unknown represented by a box or circle (e.g., 256 ÷‬ ⬚‬ = 8,‬‬ ⬚⁭‬ ÷‬ ‬8 = 56, 36 ÷‬ 3 = ‬‬‬‬‬‬‬‬‬⬚) | New Grade 3 Standard **(3.OA.4)**  New Grade 4 Standard **(4.OA.3)** |
| **The student demonstrates an understanding of geometric relationships by**  **G-2** using the attributes and properties of solid figures (edges, vertices, number of faces) to [model L], identify, compare, or describe (cubes, cylinders, cones, spheres, pyramids, or rectangular prisms) (e.g., boxes, buildings, packages) |  |
| **The student demonstrates conceptual understanding of similarity, congruence, symmetry, or transformations of shapes by**  **G-3** illustrating or identifying the results of transformation (slides, turns, or flips of polygons) (e.g., pictures of cultural art, fabric designs, architecture, logos) |  |
| **The student demonstrates conceptual understanding of similarity, congruence, symmetry, or transformations of shapes by**  **G-4** identifying, creating, or drawing geometric figures that are congruent, similar, or symmetrical |  |
| **The student demonstrates conceptual understanding of similarity, congruence, symmetry, or transformations of shapes by**  **G-5** modeling designs (e.g., tessellations) that contain a series of slides, flips, and/or turns (L) |  |
| **The student solves problems (including real-world situations) using perimeter or area by**  **G-6** estimating or determining area or perimeter of rectangles using a key, ruler, or given measures | New Grade 3 Standard **(3.MD.9)**  New Grade 4 Standard **(4.MD.3)** |
| **The student solves problems (including real-world situations) using perimeter or area by**  **G-7** estimating or determining the area and circumference of a circle using a grid or manipulatives (L |  |
| **The student demonstrates a conceptual understanding of geometric drawings or constructions by**  **G-9** identifying or drawing perpendicular line segments or midpoints (L) | New Grade 4 Standard **(4.G.1)** |
| **The student demonstrates an ability to classify and organize data by**  **S&P-1**[designing an investigation and collecting L], organizing, or displaying, using appropriate scale, data in real-world problems (e.g., social studies, friends, or school), using bar graphs, tables, charts, diagrams, or line graphs with whole numbers up to 50 |  |
| **The student demonstrates an ability to analyze data (comparing, explaining, interpreting, evaluating; drawing or justifying conclusions) by**  **S&P-2** using information from a variety of displays (tables, bar graphs, line graphs, or Venn diagrams) | New Grade 4 Standard **(4.MD.5)** |
| **The student demonstrates an ability to analyze data (comparing, explaining, interpreting, evaluating; drawing or justifying conclusions) by**  **S&P-3** using mode, median, or range with up to 10 pieces of data with a value of 10 or less each) |  |
| **The student demonstrates a conceptual understanding of probability and counting techniques by**  **S&P-4** predicting or explaining the probability of all possible outcomes in an experiment using ratios or fractions to describe the probability |  |
| **The student demonstrates a conceptual understanding of probability and counting techniques by**  **S&P-5** solving or identifying solutions to problems involving money combinations (e.g., how many ways can you make 25 cents using nickels, dimes, or quarters?) |  |

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| **The student demonstrates an ability to problem solve by**  **PS-1** selecting and applying an appropriate strategy (e.g., tables, charts, lists, or graphs; guess and check; extended patterns; making a model) to solve a variety of problems and verify the results | The GLE math process skills are incorporated in to the Standards for Mathematical Practice.   1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure. 8. Look for and express regularity in repeated reasoning.     Descriptions of the Standards for Mathematical Practice follow this chart as well as the grade-span descriptors appropriate to this grade level. |
| **The student demonstrates an ability to problem solve by**  **PS-2** explaining and verifying results of an original problem and applying what was learned to new situations |
| **The student communicates his or her mathematical thinking by**  **PS-3** representing problems using mathematical language including concrete, pictorial, and/or symbolic representation; or organizing and communicating mathematical problem solving strategies and solutions using mathematical language |
| **The student demonstrates an ability to use logic and reason by**  **PS-4** drawing logical conclusions about mathematical situations (given a rule or generalization, determining whether the example fits); or justifying answers and mathematical strategies as reasonable |
| **The student demonstrates the ability to apply mathematical skills and processes across the content strands by**  **PS-5** using real-world contexts such as social studies, friends, and school |

**Alaska New Standards for Mathematical Practice**

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| **1. Make sense of problems and persevere in solving them.**  Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches. | **In grades 3-5 mathematically proficient students will**:   * explain correspondences between equations, verbal descriptions, tables, and graphs * draw diagrams of important features and relationships, graph data, and search for regularity or trends * use concrete objects or pictures to help conceptualize and solve a problem * understand the approaches of others to solving complex problems * identify correspondences between different approaches * check if the solution makes sense |

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| **2. Reason abstractly and quantitatively.**  Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to *decontextualize*—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to *contextualize*, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects. | **In grades 3-5 mathematically proficient students will:**   * represent a situation symbolically * create a coherent representation of the problem * have the ability to show how problem has a realistic meaning * reflect during the manipulation process in order to probe into the meanings for the symbols involved * use units consistently |
| **3. Construct viable arguments and critique the reasoning of others.**  Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments. | **In grades 3-5 mathematically proficient students will:**   * construct arguments using concrete referents such as objects, drawings, diagrams, and actions * justify conclusions, communicate conclusions, listen and respond to arguments, decide whether the argument makes sense, and ask questions to clarify the argument * reason inductively about data, making plausible arguments that take into account the context from which the data arose |

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| **4. Model with mathematics.**  Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two‐way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose. | **In grades 3-5 mathematically proficient students will:**   * apply mathematics to solve problems arising in everyday life * identify important quantities in a practical situation and model the situation using such tools as manipulatives, diagrams, two-way tables, graphs or pictures * interpret mathematical results in the context of the situation and reflect on whether the results make sense * apply mathematical knowledge, make assumptions and approximations to simplify a complicated situation |

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| **5. Use appropriate tools strategically.**  Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts. | **In grades 3-5 mathematically proficient students will:**   * select the available tools (such as pencil and paper, manipulatives, rulers, calculators, a spreadsheet, and available technology) when solving a mathematical problem * be familiar with tools appropriate for their grade level to make sound decisions about when each of these tools might be helpful * identify relevant external mathematical resources and use them to pose or solve problems * use technological tools to explore and deepen their understanding of concepts * detect possible errors by strategically using estimation and other mathematical knowledge * know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data |

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| **6. Attend to precision.**  Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions. | **In grades 3-5 mathematically proficient students will:**   * give carefully formulated explanations to each other * use clear definitions and reasoning in discussion with others * state the meaning of symbols, including using the equal sign consistently and appropriately * specify units of measure, and label axes to clarify the correspondence with quantities in a problem * calculate accurately and efficiently * express numerical answers with a degree of precision appropriate for the problem context |

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| **7. Look for and make use of structure.**  Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see  7 × 8 equals the well remembered 7 × 5 + 7 × 3, in preparation for learning about the distributive property. In the expression *x*2 + 9*x* + 14, older students can see the 14 as 2 × 7 and the 9 as 2 + 7. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see 5 – 3*(x* – *y*)2 as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers *x* and *y*. | **In all grade levels mathematically proficient students will:**   * discern a pattern or structure * understand complex structures as single objects or as being composed of several objects * check if the answer is reasonable |

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| **8. Look for and express regularity in repeated reasoning.**  Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation (*y* – 2)/(*x* – 1) = 3. Noticing the regularity in the way terms cancel when expanding (*x* – 1)(*x* + 1), (*x* – 1)(*x*2 + *x* + 1), and  (*x* – 1)(*x*3 + *x*2 + *x* + 1) might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results. | **In all grade levels mathematically proficient students will:**   * identify if calculations or processes are repeated * use alternative and traditional methods to solve problems * evaluate the reasonableness of their intermediate results, while attending to the details |