Grade 4 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** |
| --- | --- | --- |
| 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** |
| --- | --- |
| **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 4 Overview**

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| --- | --- |
| **Operations and Algebraic Thinking**  • Use the four operations with whole numbers to solve problems.  • Gain familiarity with factors and multiples.  • Generate and analyze patterns.  **Number and Operations in Base Ten**  • Generalize place value understanding for multi-digit whole numbers.  • Use place value understanding and properties of operations to perform multi-digit arithmetic.  **Number and Operations—Fractions**  • Extend understanding of fraction equivalence and ordering.  • Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.  • Understand decimal notation for fractions, and compare decimal fractions.  **Measurement and Data**  • Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.  • Represent and interpret data.  • Geometric measurement: understand concepts of angle and measure angles.  **Geometry**  • Draw and identify lines and angles, and classify shapes by properties of their lines and angles. | **In Grade 4, instructional time should focus on four critical areas:**  (1) developing understanding and fluency with multi-digit multiplication, and developing understanding of dividing to find quotients involving multi-digit dividends;  (2) developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers; and  (3) understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry. |
| **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** |
| --- | --- | --- |
| **Use the four operations with whole numbers to solve problems.** |  |  |
| 4.OA.1. Interpret a multiplication equation as a comparison (e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 groups of 7 and 7 groups of 5 (Commutative property). Represent verbal statements of multiplicative comparisons as multiplication equations. | NEW – not addressed in the GLEs | Interpreting a multiplication equation as a comparison is not addressed in the GLEs. |
| 4.OA.2. Multiply or divide to solve word problems involving multiplicative comparison (e.g., by using drawings and equations with a symbol for the unknown number to represent the problem or missing numbers in an array). Distinguish multiplicative comparison from additive comparison. | NEW – not addressed in the GLEs | These GLEs do not specify multiplicative comparisons (see Glossary, Table 2).  **[4] E&C-4** multiplying two-digit numbers by single-digit numbers  **[4] F&R-4** using an open number sentence (addition, subtraction or multiplication) to solve for an unknown represented by a box or circle (e.g.,  9 • ⬚ = 36, ⬚ • 8 = 56, 3 • 6 = ⬚) ‬‬ |
| 4.OA.3. Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding. | **[4] F&R-4** using an open number sentence (addition, subtraction or multiplication) to solve for an unknown represented by a box or circle  (e.g., 9 • ⬚ = 36, ⬚ • 8 = 56, 3 • 6 = ⬚)‬‬‬‬  **[4] 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 whole number addition or subtraction computations to 10,000, or simple multiplication or division | The proposed standard requires all four operations, division beyond recall of basic division facts is addressed in the grade 5 GLES and do not address interpreting remainders.  **[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 = ‬‬‬‬‬‬‬‬‬⬚)  Additionally, the standard specifies multistep word problems which are formally addressed in Grade 9 GLEs. Using a letter standing for the unknown quantity is found in the Grade 6 GLE. |
| **Gain familiarity with factors and multiples.** |  |  |
| 4.OA.4.   * Find all factor pairs for a whole number in the range 1–100. * Explain the correlation/differences between multiples and factors. * Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. * Determine whether a given whole number in the range 1–100 is prime or composite. | **[4] N-12** identifying or listing factors and multiples of a number | The proposed standard is more specific and includes skills in Grades 5, 6 and 7 GLEs. The GLEs do not include the correlation or differences.  **[5] N-10** identifying or listing factors and multiples common to a pair or set of numbers  **[6] F&R-1** extending patterns (found in the number system, formed by multiples, factors, perfect squares up to 100, powers of ten), up to 10 terms,represented in tables, sequences, or in problem situations  **[7] N-8** identifying prime and composite numbers |
| **Generate and analyze patterns.** |  |  |
| 4.OA.5. Generate a number, shape pattern, table, t-chart, or input/output function that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. Be able to express the pattern in algebraic terms. *For example, given the rule “Add 3” and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.* | **[4] F&R-2** [using rules to express the generalization of a pattern using words, lists, or tables **L**] | The proposed standard specifies to be able to express the pattern in algebraic terms, which is addressed in the Grade 6 GLE.  **[6] F&R-2** using rules to express the generalization of a pattern using words, lists, or tables, with or without variables |
| 4.OA.6. Extend patterns that use addition, subtraction, multiplication, division or symbols, up to 10 terms, represented by models (function machines), tables, sequences, or in problem situations. (L) | **[4] F&R-1** extending patterns that use addition, subtraction, multiplication, or symbols, up to 10 terms, represented by models (function machines), tables, sequences, or in problem situations |  |

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

| **New Math Standards** | **Grade Level Expectations** | **Comment** |
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| **Generalize place value understanding for multi-digit whole numbers.** |  | GLEs do not have the equivalent focus of the Number and Operations in Base Ten |
| 4.NBT.1. Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. *For example, recognize that 700 ÷ 70 = 10 by applying concepts of place value and division.* | **The student demonstrates conceptual understanding of whole numbers to ten thousands by**  **[4] N-2** modeling (base ten blocks) or identifying place value positions to ten thousands | The proposed standard is limited to whole numbers less than or equal to 1,000,000. |
| 4.NBT.2. Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on the value of the digits in each place, using >, =, and < symbols to record the results of comparisons. | **The student demonstrates conceptual understanding of whole numbers to ten thousands by**  **[4] N-1** reading, writing, ordering, or [counting **L**]  **[4] N-3** converting between whole numbers expressed in expanded notation and standard form | The proposed standard specifies using symbols to record comparison results, which is implied in ordering in the GLE. |
| 4.NBT.3. Use place value understanding to round multi-digit whole numbers to any place using a variety of estimation methods; be able to describe, compare, and contrast solutions. | **[4] 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 whole number addition or subtraction computations to 10,000, or simple multiplication or division | The proposed math standard focuses on rounding numbers and explaining the solution. |
| **Use place value understanding and properties of operations to perform multi-digit arithmetic.** |  |  |
| 4.NBT.4. Fluently add and subtract multi-digit whole numbers using any algorithm. Verify the reasonableness of the results. | **[4] 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 whole number addition or subtraction computations to 10,000, or simple multiplication or division  **[4] E&C-3** adding or subtracting three-digit whole numbers | The GLE is restricted to three-digit whole numbers instead of multi-digits. |
| 4.NBT.5. Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models. | **[4] E&C-4** multiplying two-digit numbers by single-digit numbers  **[4] N-6** describing or illustratingthe processes of multiplication | The Grade 4 GLE is limited to two-digit by one-digit multiplication and the GLEs do not specify beyond three digit numbers.  **[5] E&C-4** multiplying two-digit whole numbers by two-digit numbers or dividing three-digit whole 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 |
| 4.NBT.6. Find whole-number quotients and remainders with up to four-digit dividends and one-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. | **[4] N-8** [using models, explanations, number lines, or real-life situations L] describing or illustratingthe relationship between multiplication and division | The proposed standard includes division which beyond recall of basic facts is addressed in the grade 5 GLE. GLEs do not specify use of remainders.  **[5] E&C-4** multiplying two-digit whole numbers by two-digit numbers or dividing three-digit whole numbers by single-digit numbers |

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

| **New Math Standards** | **Grade Level Expectations** | **Comment** |
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| **(limited in this grade to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100)** | * of fractions with denominators 2 through 12 by | GLE denominators match except the proposed standards also include 100. |
| **Extend understanding of fraction equivalence and ordering.** |  |  |
| 4.NF.1. Explain why a fraction *a*/*b* is equivalent to a fraction (*n* × *a*)/(*n* × *b*) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions. | **[4] N-5** identifying, describing with explanations, or illustrating equivalent fractions or mixed numbers | The GLE does not ask students to generate equivalent fractions. |
| 4.NF.2. Compare two fractions with different numerators and different denominators (e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2). Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions (e.g., by using a visual fraction model). | NEW – not addressed in the GLEs | The proposed standard requires the comparison of fractions including using benchmark fractions and recording with symbols the results which is implied in ordering in the Grade 6 GLE.  The student demonstrates conceptual understanding   * of fractions (proper or mixed numbers), decimals, percents (whole number), or integers by   **[6] N-1** reading, writing, ordering, or [counting L] |

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| **Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.** |  |  |
| 4.NF.3. Understand a fraction *a*/*b* with *a* > 1 as a sum of fractions 1/*b*.  a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.  b. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions (e.g., by using a visual fraction model). *For example:  3/8 = 1/8 + 1/8 + 1/8; 3/8 = 1/8 + 2/8;  2 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8.*  c. Add and subtract mixed numbers with like denominators (e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction).  d. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators (e.g., by using visual fraction models and equations to represent the problem). | a. NEW – not addressed in the GLEs  b. NEW – not addressed in the GLEs  c. NEW – not addressed in the GLEs  d. **[4] N-9** [using models, explanations, number lines, or real-life situations L] describing or illustratingthe process of adding or subtracting fractions with like denominators (2 to 12)  **The student accurately solves problems (including real-world situations) by**  **[4] E&C-5** adding fractions with like denominators to 12 | a.-c. The proposed standard is addressed in the Grade 5 GLEs. The GLEs do not use the terminology of unit fractions and fraction decomposition.  **[5] E&C-3** adding or subtracting four-digit whole numbers, fractions with like denominators to 12, or decimals involving money  **[5] 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) |

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| 4.NF.4. Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.  a. Understand a fraction *a*/*b* as a multiple of 1/*b*. *For example, use a visual fraction model to represent 5/4 as the product 5 × (1/4), recording the conclusion by the equation  5/4 = 5 × (1/4).*  b. Understand a multiple of *a*/*b* as a multiple of 1/*b*, and use this understanding to multiply a fraction by a whole number. *For example, use a visual fraction model to express 3 × (2/5) as 6 × (1/5), recognizing this product as 6/5. (In general, n × (a/b) = (n × a)/b.)*  c. Solve word problems involving multiplication of a fraction by a whole number (e.g., by using visual fraction models and equations to represent the problem). Check for the reasonableness of the answer. *For example, if each person at a party will eat 3/8 of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?* | NEW – not addressed in the GLEs | Multiplication of a fraction by a whole number and writing equations is not specifically addressed by the GLEs.  **[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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| **Understand decimal notation for fractions, and compare decimal fractions.** |  |  |
| 4.NF.5. Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100. *For example, express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.* | NEW – not addressed in the GLEs | The proposed standard specifically addresses adding fractions with denominators of 10 and 100.  The student demonstrates conceptual understanding   * of positive fractions with denominators 1 through 12 and 100 with proper and mixed numbers . . .   **[5] N-5** by modeling, identifying, describing with explanations, or illustrating equivalent fractions or mixed numbers |
| 4.NF.6. Use decimal notation for fractions with denominators 10 or 100. *For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram.* | NEW – not addressed in the GLEs | The proposed standard requires the converting of decimals to fractions which are specifically addressed in Grade 7 GLEs.   * The student demonstrates understanding of positive fractions, decimals, or percents by   **[7] N-4** identifying or representing equivalents of numbers  **[7] E&C-5** converting between equivalent fractions, terminating decimals, or percents (10% = 1/10 = 0.1) |
| 4.NF.7. Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions (e.g., by using a visual model). | NEW – not addressed in the GLEs | The proposed standard requires the comparison of decimals and recording with symbols the results which is implied in ordering of decimals to the hundredths place which is addressed in Grade 6 GLEs.  The student demonstrates conceptual understanding   * of fractions (proper or mixed numbers), decimals, percents (whole number), or integers by   **[6] N-1** reading, writing, ordering, or [counting L]  **[6] N-2** [identifying place value positions from thousandths to millions **L**] |

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

| **New Math Standards** | **Grade Level Expectations** | | **Comment** | |
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| **Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit, and involving time.** |  | |  | |
| 4.MD.1. Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. Record measurement equivalents in a two-column table. *For example, know that 1 ft is 12 times as long as 1 in. Express the length of a 4-ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36).* | **[4] MEA-3** identifying or using equivalent measures for length (inch, foot, yard: 12 inches = 1 foot, 3 feet = 1 yard, 36 inches = 1 yard; centimeter, meter: 100 centimeters = 1 meter) | | GLE does not require students to record measurement equivalents in a two-column table.  Grade 5 GLE is more comprehensive and a closer match to the proposed standard.  **[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 | |
| 4.MD.2. Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale. | GLE stems frequently refer to solving problems using real-world situations.  **[4] MEA-3** identifying or using equivalent measures for length (inch, foot, yard: 12 inches = 1 foot, 3 feet = 1 yard, 36 inches = 1 yard; centimeter, meter: 100 centimeters = 1 meter) **[4] MEA-7** counting back change from $5.00 (L)**[4] MEA-8** determining possible combinations of coins and bills to given amounts**[4] MEA-9** simulating multiple purchases and calculating the amount of change from a given bill(s) up to $50.00 (L) | | Decimals to the tenths place and adding and subtracting fractions with like denominators are Grade 5 GLEs. Volume is a Grade 6 GLE.  **[5] E&C-3** adding or subtracting four-digit whole numbers, fractions with like denominators to 12, or decimals involving money  Solving problems involving elapsed time is Grade 6 GLEs.  **[6] MEA-4** calculating elapsed time (minutes, hours)  **[6] MEA-5** solving real-world problems involving elapsed time between U.S. time zones (including Alaska Standard time)  GLEs do not require representing measurement quantities using diagrams. | |
| 4.MD.3. Apply the area and perimeter formulas for rectangles in real world and mathematical problems. *For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.* | NEW – not addressed in the GLEs | | Using a formula for perimeter or area is a Grade 5 GLE.  **[5] G-6** estimating or determining area or perimeter of rectangles using a key, ruler, or given measures | |
| 4.MD.4. Solve real-world problems involving elapsed time between U.S. time zones (including Alaska Standard time) (L) | | NEW – not addressed in the GLEs | **[6] MEA-5** solving real-world problems involving elapsed time between U.S. time zones (including Alaska Standard time) | | |
| **Represent and interpret data.** | |  |  |
| 4.MD.5. 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 addition and subtraction of fractions by using information presented in line plots. *For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.* | | 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) |
| 4.MD.6. Explain the classification of data from real-world problems shown in graphical representations including the use of terms range and mode with a given set of data. (L) | | **The student demonstrates** **an ability to analyze data (comparing, explaining, interpreting, evaluating or drawing or justifying conclusions) by**  **[4] S&P-2** using information from a variety of displays(tables, bar graphs, or Venn diagrams*)*  **[4] S&P-3** using mode or range with up to 5 pieces of data with a value of 10 or less each | **[6] S&P-3** using mean, median, mode, or range |
| **Geometric measurement: understand concepts of angle and measure angles.** | |  |  |
| 4.MD.7. Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand the following concepts of angle measurement:  a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through 1/360 of a circle is called a “one-degree angle,” and can be used to measure angles.  b. An angle that turns through *n* one-degree angles is said to have an angle measure of *n* degrees. | | NEW – not addressed in the GLEs |  |
| 4.MD.8. Measure and draw angles in whole-number degrees using a protractor. Estimate and sketch angles of specified measure. | | NEW – not addressed in the GLEs | **[7] MEA-5** accurately measuring a given angle using a protractor to the nearest plus or minus 2 degrees |
| 4.MD.9. Recognize angle measure as additive. When an angle is divided into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems (e.g., by using an equation with a symbol for the unknown angle measure). | | NEW – not addressed in the GLEs |  |

**Geometry- Alaska New Mathematics Standards**

| **New Math Standards** | **Grade Level Expectations** | **Comment** |
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| **Draw and identify lines and angles, and classify shapes by properties of their lines and angles.** |  |  |
| 4.G.1. Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular, parallel, and intersecting line segments. Identify these in two-dimensional (plane) figures. | **[4] G-8** [identifying or drawing parallel or intersecting line segments L] | **[5] G-9** [identifying or drawing perpendicular line segments or midpoints L] |
| 4.G.2. Classify two-dimensional (plane) figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles. | **[4] G-1** using the attributes and properties of angles to identify and compare triangles (acute, right, or obtuse) and regular polygons | **[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) |
| 4.G.3. Recognize a line of symmetry for a two-dimensional (plane) figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry. | **[4] G-3** identifying or drawing all lines of symmetry to identify figures that are symmetrical |  |

| **Grade 4 Math GLEs not matched by the new standards** | **Comments** |
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| **The student demonstrates conceptual understanding of fractions with denominators 2 through 12 by**  **N-4** identifying, describing with explanations, or illustrating equal parts of a whole, a region, or a set (using models) |  |
| **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 relationship between multiplication and addition |  |
| **The student demonstrates conceptual understanding of number theory by**  **N-10** describing or illustrating identity property of multiplication (L) |  |
| **The student demonstrates conceptual understanding of number theory by**  **N-11** modeling (with manipulatives) and explaining commutative property of multiplication (L) | New Grade 3 standard **(3.OA.5).** |
| **The student demonstrates understanding of measurable attributes by**  **MEA-1** estimating length to the nearest half-inch or centimeter (L) | New Grade 2 standard **(2.MD.3)** |
| **The student demonstrates understanding of measurable attributes by**  **MEA-2** estimating temperature (degree Celsius or Fahrenheit) or weight (pounds or kilograms) to the nearest unit (L) |  |
| **The student demonstrates understanding of measurable attributes by**  **MEA-4** selecting an appropriate unit of metric measurement to estimate length, weight, or temperature |  |
| **The student demonstrates ability to use measurement techniques using pictorial representations [or manipulatives L] in real-world contexts by**  **MEA-5** measuring length to the nearest half-inch or [centimeter L] |  |
| **The student demonstrates ability to use measurement techniques using pictorial representations [or manipulatives L] in real-world contexts by**  **MEA-6** telling time in 5-minute increments using analog clocks | New Grade 2 standard **(2.MD.6)** |
| **The student accurately solves problems (including real-world situations) by**  **E&C-2** recalling basic multiplication facts, products to 100, 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** using manipulatives, including a calculator, as tools when describing, extending, or representing a number sequence (L) |  |

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| **The student demonstrates an understanding of geometric relationships by**  **G-2** using the attributes and properties of solid figures (edges, vertices, or the number or shape of faces) to [model L], identify, compare, or describe solid figures (cubes, cylinders, rectangular prisms, or spheres) (e.g., cans, dice, boxes, balls) |  |
| **The student demonstrates conceptual understanding of similarity, congruence, symmetry, or transformations of shapes by**  **G-4** identifying shapes that are congruent |  |
| **The student demonstrates conceptual understanding of similarity, congruence, symmetry, or transformations of shapes by**  **G-5** illustrating or identifying the results of transformations (turns) of polygons by continuing a given pattern |  |
| **The student solves problems using perimeter or area by**  **G-6** estimating or determining area or perimeter of rectangles, squares, and irregular shapes on grids with a key or ruler |  |
| **The student demonstrates understanding of position and direction by**  **G-7** describing the relative location of places or objects on a map using compass directions of north, south, east, or west (L) |  |
| **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, or diagrams with whole numbers up to 25 |  |
| **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 a simple experiment (e.g., spinners, dice, coins) |  |
| **The student demonstrates a conceptual understanding of probability and counting techniques by**  **S&P-5** determining possible combinations in a given situation involving up to 3 items (e.g., how many ways can you choose two fruits out of a basket containing oranges and bananas?) |  |

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| **The student demonstrates an ability to problem solve by**  **PS-1** selecting and applying appropriate strategy (e.g., lists, guess and check, extended patterns) to solve a variety of problems | 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 by organizing and communicating mathematical problem solving strategies and solutions to problems |
| **The student demonstrates an ability to use logic and reason by**  **PS-4** drawing conclusions about mathematical problems (given a rule or generalization, determining whether the example fits) or justifying answers and mathematical strategies |
| **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 |

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| **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 |
| **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 |