Grade 3 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 modelsAny 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 3 Overview**

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| **Operations and Algebraic Thinking*** Represent and solve problems involving multiplication and division.

• Understand properties of multiplication and the relationship between multiplication and division.• Multiply and divide up to 100.• Solve problems involving the four operations, and identify and explain patterns in arithmetic.**Number and Operations in Base Ten**• Use place value understanding and properties of operations to perform multi-digit arithmetic.**Number and Operations—Fractions**• Develop understanding of fractions as numbers.**Measurement and Data**• Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.* Represent and interpret data.

• Geometric measurement: understand concepts of area and relate area to multiplication and to addition.• Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.**Geometry*** Reason with shapes and their attributes.
 | **In Grade 3, instructional time should focus on four critical areas:**(1) developing understanding of multiplication and division and strategies for multiplication and division within 100;(2) developing understanding of fractions, especially unit fractions (fractions with numerator 1); (3) developing understanding of the structure of rectangular arrays and of area; and (4) describing and analyzing two-dimensional shapes. |
| **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.
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**Alaska New Mathematics Standards – Operations and Algebraic Thinking**

| **New Math Standards** | **Grade Level Expectations** | **Comment** |
| --- | --- | --- |
| **Represent and solve problems involving multiplication and division.** |  |  |
| 3.OA.1. Interpret products of whole numbers (e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each). *For example, show objects in rectangular arrays or describe a context in which a total number of objects can be expressed as 5 × 7.*  | **[3] E&C-5** using repeated addition to model multiplication with whole numbers with products to 25  | The proposed standard does not specify product limit. |
| 3.OA.2. Interpret whole-number quotients of whole numbers (e.g., interpret 56 ÷ 8 as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each). *For example, deconstruct rectangular arrays or* *describe a context in which a number of shares or a number of groups can be expressed as 56 ÷ 8.* | **[3] E&C-6** using grouping or “sharing equally” to model division with whole numbers to 25  | The proposed standard does not specify quotient limit. |
| 3.OA.3. Use multiplication and division numbers up to 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities (e.g., by using drawings and equations with a symbol for the unknown number to represent the problem). | NEW – not addressed in the GLEs | Multiplication and division are addressed in higher grades in the GLEs. Common multiplication and division situations can be found in the Glossary, Table 2.**[4] E&C-2** recalling basic multiplication facts, products to 100, and corresponding division facts efficiently (L)**[4] E&C-4** multiplying two-digit numbers by single-digit numbers **[5] E&C-2** recalling basic multiplication facts, products to 144**,** and corresponding division facts efficiently (L) **[5] E&C-4** multiplying two-digit whole numbers by two-digit numbers or dividing three-digit whole numbers by single-digit numbers  |
| 3.OA.4Determine the unknown whole number in a multiplication or division equation relating three whole numbers. *For example, determine the unknown number that makes the equation true in each of the equations 8 x ? = 48, 5 = ?* *÷ 3, 6 x 6 = ?* | NEW – not addressed in the GLEs | **[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 = ⬚) **[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 = ⬚⁭)  |
| **Understand properties of multiplication and the relationship between multiplication and division.** |  |  |
| 3.OA.5. Make, test, support, draw conclusions and justify conjectures about properties of operations as strategies to multiply and divide. (Students need not use formal terms for these properties.)* Commutative property of multiplication: If 6 × 4 = 24 is known, then 4 × 6 = 24 is also known.
* Associative property of multiplication: 3 × 5 × 2 can be found by 3 × 5 = 15, then 15 × 2 = 30, or by 5 × 2 = 10, then 3 × 10 = 30.
* Distributive property: Knowing that 8 × 5 = 40 and 8 × 2 = 16, one can find 8 × 7 as 8 × (5 + 2) = (8 × 5) + (8 × 2) = 40 + 16 = 56.
* Inverse property (relationship) of multiplication and division.
 | NEW – not addressed in the GLEs | **[4] N-11** [modeling (with manipulatives) and explaining commutative property of multiplication **L**] **[6] N-8** describing or illustrating commutative, [associative, inverse **L**] or identity properties of addition or multiplication using models or explanations **[6] N-10** modeling (base 10 blocks) distributive property (L) **[7] N-9** [using distributive property with rational numbers L]  |
| 3.OA.6. Understand division as an unknown-factor problem. *For example, find 32 ÷ 8 by finding the number that makes 32 when multiplied by 8.* | NEW – not addressed in the GLEs | Common multiplication and division situations can be found in the Glossary, Table 2. |
| **Multiply and divide up to 100.** |  |  |
| 3.OA.7. Fluently multiply and divide numbers up to 100, using strategies such as the relationship between multiplication and division (e.g., knowing that 8 × 5 = 40, one knows 40 ÷ 5 = 8) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.  | NEW – not addressed in the GLEs | **[4] E&C-2** [recalling basic multiplication facts, products to 100, and corresponding division facts efficiently (L) **[4] E&C-4** multiplying two-digit numbers by single-digit numbers **[5] E&C-2** recalling basic multiplication facts, products to 144**,** and corresponding division facts efficiently (L) **[5] E&C-4** multiplying two-digit whole numbers by two-digit numbers or dividing three-digit whole numbers by single-digit numbers  |
| **Solve problems involving the four operations, and identify and explain patterns in arithmetic.** |  |  |
| 3.OA.8. Solve and create two-step word problems using the any of the four operations. Represent these problems using equations with a symbol (box, circle, question mark) standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding. | **[3] F&R-4** using an open number sentence (addition or subtraction) to solve for an unknown represented by a box or circle (e.g., 5 + ⬚ = 16, ⬚ - 7 = 4, 5 + 2 = ⬚)  | The proposed standard requires all four operations; multiplication and division are addressed in the Grade 4 and 5 GLES as shown above. Additionally, the new standard specifies two-step word problems, which are formally addressed in Grade 8 GLEs. This standard is limited to problems posed with whole numbers and having whole-number answers.  |
| 3.OA.9. Identify arithmetic patterns (including patterns in the addition table or multiplication table) and explain them using properties of operations. *For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.* | NEW – not addressed in the GLEs | **[4] F&R-2** [using rules to express the generalization of a pattern using words, lists, or tables **L**]  |

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

| **New Math Standards** | **Grade Level Expectations** | **Comment** |
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| Number and Operations in Base Ten 3.NBT |  | GLEs do not have the equivalent focus of the Number and Operations in Base Ten  |
| **Use place value understanding and properties of operations to perform multi-digit arithmetic.** |  |  |
| 3.NBT.1. Use place value understanding to round whole numbers to the nearest 10 or 100. | NEW – not addressed in the GLEs | **[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  |
| 3.NBT.2. Use strategies and/or algorithms to fluently add and subtract with numbers up to 1000, demonstrating understanding of place value, properties of operations, and/or the relationship between addition and subtraction. | **[3] E&C-4** adding or subtracting two-digit whole numbers  | GLEs specify two-digit numbers. The proposed standard specifies adding and subtracting numbers up to 1,000 with an emphasis on fluency. |
| 3.NBT.3. Multiply one-digit whole numbers by multiples of 10 in the range 10-90 (e.g., 9 x 80, 10 x 60) using strategies based on place value and properties of operations. | NEW – not addressed in the GLEs | The proposed standard specifies multiply by multiples of 10. **[4] E&C-4** multiplying two-digit numbers by single-digit numbers  |

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

| **New Math Standards** | **Grade Level Expectations** | **Comment** |
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| Number and Operations—Fractions 3.NF (limited in this grade to fractions with denominators 2, 3, 4, 6, and 8) |  |  |
| **Develop understanding of fractions as numbers.** |  |  |
| 3.NF.1. Understand a fraction 1/*b* (e.g., 1/4)as the quantity formed by 1 part when a whole is partitioned into *b* (e.g., 4)equal parts; understand a fraction *a*/*b* (e.g., 2/4)as the quantity formed by *a* (e.g., 2)parts of size 1/*b*. (e.g., 1/4) | * of simple fractions with denominators 2, 3, 4 or 10 by

**[3] N-4** identifying, describing with explanations, or illustrating equal parts of a whole, a region, or a set (using models) (M1.1.5) | Specified denominators are different for GLE and proposed standard. |
| 3.NF.2. Understand a fraction as a number on the number line; represent fractions on a number line diagram.a. Represent a fraction 1/*b* (e.g., 1/4)on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into *b* (e.g., 4)equal parts. Recognize that each part has size 1/*b* (e.g., 1/4)and that the endpoint of the part based at 0 locates the number 1/*b* (e.g., 1/4)on the number line.b. Represent a fraction *a*/*b* (e.g., 2/8)on a number line diagram or ruler by marking off *a* lengths 1/*b* (e.g., 1/8)from 0. Recognize that the resulting interval has size *a*/*b* (e.g., 2/8)and that its endpoint locates the number *a*/*b* (e.g., 2/8)on the number line.  | NEW – not addressed in the GLEs | The proposed standards specify the use of number line for representing fractions. |

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| 3.NF.3. Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size.a. Understand two fractions as equivalent if they are the same size (modeled) or the same point on a number line.b. Recognize and generate simple equivalent fractions (e.g., 1/2 = 2/4, 4/6 = 2/3). Explain why the fractions are equivalent (e.g., by using a visual fraction model).c. Express and model whole numbers as fractions, and recognize and construct fractions that are equivalent to whole numbers. *For Example: Express 3 in the form 3 = 3/1; recognize that 6/1 = 6; locate 4/4 and 1 at the same point of a number line diagram.*d. Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions (e.g., by using a visual fraction model). | a & b. **[3] N-5** identifying, describing with explanations, or illustrating equivalent representation of fractions (using models) c. NEW – not addressed in the GLEsd. NEW – not addressed in the GLEs  |  |

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

| **New Math Standards** | **Grade Level Expectations** | **Comment** |
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| **Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.** |  |  |
| 3.MD.1. Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes or hours (e.g., by representing the problem on a number line diagram or clock). | **[3] MEA-7** telling time to the nearest ¼ hour using an analog clock or [distinguishing morning, afternoon, or evening L]  | Telling time to the nearest minute is a Grade 5 GLE and calculating elapsed time is a Grade 6 GLE.**[5] MEA-5** telling time using analog clocks to the nearest minute and using AM or PM **[6] MEA-4** calculating elapsed time (minutes, hours)  |
| 3.MD.2. Estimate and measure liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). (Excludes compound units such as cm3 and finding the geometric volume of a container.)Add, subtract, multiply, or divide to solve and create one-step word problems involving masses or volumes that are given in the same units (e.g., by using drawings, such as a beaker with a measurement scale, to represent the problem). (Excludes multiplicative comparison problems [problems involving notions of “times as much.”]) | NEW – not addressed in the GLEs | GLEs address mass in Grade 5 and volume in Grade 6.**[5] MEA-2** estimating temperature (degree Celsius or Fahrenheit, plus or minus 5 degrees) or weight (half-pounds or kilograms) to the nearest unit (L) **[6] MEA-2** identifying equivalent measures within systemsEnglish * 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)
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| 3.MD.3.Select an appropriate unit of English, metric, or non-standard measurement to estimate the length, time, weight, or temperature (L) | **[3] MEA-4** selecting an appropriate unit of English, metric, or non-standard measurement to estimate the length, time, weight, or temperature  |  |
| **Represent and interpret data.** |  |  |
| 3.MD.4. Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs. *For example, draw a bar graph in which each square in the bar graph might represent 5 pets.* | **[3] S&P-1** [designing an investigation and collecting, recording L], organizing, displaying, or explaining the classification of data in real-world problems (e.g., literature, self, or family), using bar graphs, and [Venn diagramsL] **[3] S&P-2** using information from a variety of displays(tallies, tables, pictographs, bar graphs, or [Venn diagrams L]  |  |
| 3.MD.5. Measure and record lengths using rulers marked with halves and fourths of an inch. Make a line plot with the data, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters. | **[3] MEA-6** measuring length to the nearest half-inch  | The proposed standards specify measuring to fourths and using a line (dot) plot. GLEs do not address line plots.**[5] MEA-8** measuring length to the nearest ¼ inch or centimeter  |
| 3.MD.6. Explain the classification of data from real-world problems shown in graphical representations. Use the terms minimum and maximum. (L) | **[3] S&P-1** [designing an investigation and collecting, recording L], organizing, displaying, or explaining the classification of data in real-world problems (e.g., literature, self, or family), using bar graphs, and [Venn diagramsL] **[3] S&P-3** using the terms “maximum” or “minimum”  |  |

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| **Geometric measurement: understand concepts of area and relate area to multiplication and to addition.** |  |  |
| 3.MD.7. Recognize area as an attribute of plane figures and understand concepts of area measurement.a. A square with side length 1 unit is said to have “one square unit” and can be used to measure area.b. Demonstrate that a plane figure which can be covered without gaps or overlaps by *n* (e.g., 6)unit squares is said to have an area of *n* (e.g., 6)square units. | NEW – not addressed in the GLEs |  |
| 3.MD.8. Measure areas by tiling with unit squares (square centimeters, square meters, square inches, square feet, and improvised units). | **[3] G-6** estimating or determining area or perimeter of rectangular or square shapes on grids | GLE addresses both perimeter and area. |

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| 3.MD.9. Relate area to the operations of multiplication and addition.a. Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths*. For example, after tiling rectangles, develop a rule for finding the area of any rectangle.*b. Multiply side lengths to find areas of rectangles with whole number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning. c. Use area models (rectangular arrays) to represent the distributive property in mathematical reasoning. Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths *a* and *b* + *c* is the sum of *a* × *b* and *a* × *c*. d. Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems. *For example, the area of a 7 by 8 rectangle can be determined by decomposing it into a 7 by 3 rectangle and a 7 by 5 rectangle.* | NEW – not addressed in the GLEs | a & b. The proposed standard are addressed in part in Grade 5 and 6 GLEs.**[5] G-6** estimating or determining area or perimeter of rectangles using a key, ruler, or given measures c. **[6] N-10** [modeling (base 10 blocks) distributive property **L**] d. Not addressed by GLEs. |
| **Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.** |  |  |
| 3.MD.10. Solve real world and mathematical problems involving perimeters of polygons, including:• finding the perimeter given the side lengths, •finding an unknown side length, • exhibiting rectangles with the same perimeter and different areas• exhibiting rectangles with the same area and different perimeters. | NEW – not addressed in the GLEs | The proposed standard includes all polygons and the connection between area and perimeter.**[6] G-7** estimating or determining area or perimeter of polygons (parallelograms, trapezoids, triangles) using a key, ruler, or given measures  |

**Alaska New Mathematics Standards – Geometry**

| **New Math Standards** | **Grade Level Expectations** | **Comment** |
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| **Reason with shapes and their attributes.** |  |  |
| 3.G.1. Categorize shapes by different attribute classifications and recognize that shared attributes can define a larger category. Generalize to create examples or non-examples. | **[3] G-1** using the number or length of sides to identify, describe, [model L], or compare triangles or rectangles (including squares) **[3] G-2** using the attributes and properties of plane figures to [model L], identify, compare, or describe plane figures (circles, rectangles, squares, and triangles)[and solid figures (cubes, cylinders, or spheres) L]  | Proposed standard asks students to categorize (classify) shapes by attribute and to generalize with examples**[6] G-1** using the attributes and properties (sides and angles) of regular polygons to identify, classify, or compare regular or irregular polygons |
| 3.G.2. Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. *For example, partition a shape into 4 parts with equal area, and describe the area of each part as 1/4 of the area of the shape.* | NEW – not addressed in the GLEs |  |

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| **Grade 3 Math GLEs Not Matched by New Standards** | **Comments** |
| **The student demonstrates conceptual understanding of whole numbers to one thousand by****[3] N-1** reading, writing, ordering, or [counting L]) |   |
| **[3] N-2** modeling (base ten blocks) or identifying place value positions to thousands | New Grade 2 Standard **(2.NBT.1)** |
| **[3] N-3** using appropriate representations of ordinal or cardinal numbers  |   |
| **The student demonstrates conceptual understanding of mathematical operations by****[3] N-6** [using models, explanations, number lines, or real-life situations L] describing or illustrating the processes of addition and subtraction of whole numbers and their relationships |   |

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| **The student demonstrates conceptual understanding of number theory by****[3] N-7** describing or illustrating identity property of addition (L) |   |
|  **[3] N-8** modeling (with manipulatives) and explaining commutative property of addition (L)  |   |
|  **[3] N-9** identifying or using patterns in the number system (skip count by 2’s, 5’s, or 10’s; add or subtract by 10; even or odd numbers) |   |
| **The student demonstrates understanding of measurable attributes by****[3] MEA-1** estimating length to the nearest inch or foot (L) | New Grade 2 Standard **(2.MD.3)** |
|  **[3] MEA-2** comparing and ordering objects according to measurable attribute (calendar, length, [temperature, weight, area, or volume L]) |   |
|  **[3] MEA-3** identifying or describing objects that are greater than, less than, or equal to a unit of measure (standard or non-standard)  |   |
|  **[3] MEA-5** identifying coins, their value, or the value of a set of coins  |   |
| **The student demonstrates ability to use measurement techniques using pictorial representations [or manipulatives L] in real-world contexts by****[3] MEA-8** determining elapsed time using a calendar  |   |
|  **[3] MEA-9** counting back change from $1.00 (L) |   |
| **The student determines reasonable answers to real-life situations, paper/pencil computations, or calculator results by****[3] E&C-1** finding “how many” or “how much” to 50  |   |
|  **[3] E&C-2** estimating the results of simple addition and subtraction problems up to 1,000  |   |
| **The student accurately solves problems (including real-world situations) by****[3] E&C-3** recalling basic addition and subtraction facts, sums to 20, and corresponding subtraction facts efficiently (L)  |  |
| **The student demonstrates conceptual understanding of functions by****[3] F&R-1** identifying a missing element in a pattern up to the next three terms (identifying a number using addition or subtraction or objects); or explaining how missing elements could be found  |   |
| **[3] F&R-2** expressing a generalization of a pattern using words (L) |   |
| **[3] F&R-3** using manipulatives, including a calculator, as tools when describing, extending, or representing patterns (L) |   |
| **The student demonstrates algebraic thinking by****[3] F&R-5** using appropriate vocabulary or symbols for greater than, less than, or equal to |   |
| **The student demonstrates conceptual understanding of similarity, congruence, symmetry, or transformations of shapes by****[3] G-3** identifying, creating, or drawing lines of symmetry for real-world objects (e.g., block letters, flags, insects)  |   |
|  **[3] G-4** comparing or describing shapes (circles, triangles, or rectangles) as “larger than,” “smaller than,” or “congruent to,” a given shape  |   |
|  **[3] G-5** illustrating or identifying the results of transformations (slides) of polygons  |   |
| **The student demonstrates understanding of position and direction by****[3] G-7** using directional terms (inside, outside, right, left, horizontal, vertical) to describe relative location of objects in a picture (L)  |   |
| **The student demonstrates a conceptual understanding of geometric drawings or constructions by****[3] G-8** drawing real-world objects that consist of geometric shapes (squares, rectangles, triangles, or circles) (L) |   |
| **The student demonstrates a conceptual understanding of probability by****[3] S&P-4** explaining the differences between chance and certainty or recognizing events that may be certain or chance events (L)  |   |
|  **[3] S&P-5** [finding and recording L] and making predictions about the likelihood of outcomes of a simple probability experiment (e.g., spinner, tossing a coin)  |   |
| **The student demonstrates an ability to problem solve by****[3] PS-1** selecting and applying an appropriate strategy (e.g., guess and check, draw a picture, make a model, extend a pattern) 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.
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| **The student communicates his or her mathematical thinking by****[3] PS-2** representing mathematical problems using manipulatives, models, pictures, and/or everyday language; or using everyday language to explain thinking about the problem-solving strategies and solutions to problems  |
| **The student demonstrates an ability to use logic and reason by****[3] PS-3** drawing conclusions about mathematical problems; or finding examples that support or refute mathematical statements |
| **[3] PS-4** explaining whether or not a prediction, estimation, or solution is reasonable |
| **The student demonstrates the ability to apply mathematical skills and processes across the content strands by****[3] PS-5** using real-world contexts such as literature, self, and family |

**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:**1. represent a situation symbolically
2. create a coherent representation of the problem have the ability to show how problem has a realistic meaning
3. reflect during the manipulation process in order to probe into the meanings for the symbols involved
4. 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
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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
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