Grade 6 Mathematics Standards

Comparison Tool for Standards Transition

Updated March 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 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 which 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) | 4th and 5th Grade 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 6 Overview**

|  |  |
| --- | --- |
| **Ratios and Proportional Relationships (RP)*** Understand ratio concepts and use ratio reasoning to solve problems.

**The Number System (NS)*** Apply and extend previous understandings of multiplication and division to divide fractions by fractions.
* Compute fluently with multi-digit numbers and find common factors and multiples.
* Apply and extend previous understandings of numbers to the system of rational numbers.

**Expressions and Equations (EE)** * Apply and extend previous understandings of arithmetic to algebraic expressions.
* Reason about and solve one-variable equations and inequalities.
* Represent and analyze quantitative relationships between dependent and independent variables.

**Geometry (G)** * Solve real-world and mathematical problems involving area, surface area, and volume.

**Statistics and Probability (SP)** * Develop understanding of statistical variability.
* Summarize and describe distributions.
 | **In Grade 6, instructional time should focus on four critical areas:**1. connecting ratio and rate to whole number multiplication and division and using concepts of ratio and rate to solve problems;
2. completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers;
3. writing, interpreting, and using expressions and equations; and
4. developing understanding of statistical thinking.
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| **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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**Ratio and Proportional Relationships - Alaska New Mathematics Standards**

| **New Math Standards** | **Grade Level Expectations** | **Comment** |
| --- | --- | --- |
| **Understand ratio concepts and use ratio reasoning to solve problems.** |  |  |
| 6.RP.1. Write and describe the relationship in real life context between two quantities using ratio language. *For example, “The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak.” “For every vote candidate A received, candidate C received nearly three votes.”* | NEW – not addressed in the GLEs  | **[7] E&C-6** solving proportions using a given scale**[8] E&C-5** using ratio and proportion |
| 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 | 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 |
| 6.RP.3. Use ratio and rate reasoning to solve real-world and mathematical problems (e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations).a. Make tables of equivalent ratios relating quantities with whole number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios, and understand equivalencies.b.Solve unit rate problems including those involving unit pricing and constant speed. *For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?*c. Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent. d. Use ratio reasoning to convert measurement units between given measurement systems (e.g., convert kilometers to miles); manipulate and transform units appropriately when multiplying or dividing quantities. | a. **The student demonstrates conceptual understanding of functions, patterns, or sequences by****[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**[6] F&R-2** using rules to express generalization of a pattern using words, lists or tables, with or without variables.**The student demonstrates understanding of position and direction by** **[6] G-10** graphing a vertical or horizontal line segment (given whole number coordinates for its end points) on a coordinate grid or identifying its length or midpoint (e.g., using a map to trace a route and calculate distance) b. NEW – not addressed in the GLEsc. NEW – not addressed in the GLEsd. **[6] MEA-2** identifying equivalent measure within systems (English and Metric)**[6] MEA-6** converting and using equivalent measurements within the same system | The proposed standard expands the methods used for ratio and rate reasoning. b. **The student accurately solves problems (including real-world situations) involving** **[9] E&C-4** determining rate by using ratio and proportionc. **[8] E&C-3** using percents and percentages (e.g., tax, discount) |

**Number System - Alaska New Mathematics Standards**

| **New Math Standards** | **Grade Level Expectations** | **Comment** |
| --- | --- | --- |
| **Apply and extend previous understandings of multiplication and division to divide fractions by fractions.** |  |  |
| 6.NS.1. Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions (e.g., by using visual fraction models and equations to represent the problem). *For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3 (In general (a/b) ÷ (c/d) = ad/bc.) How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi?*  | **The student accurately solves problems (including real-world situations) involving** **[6] E&C-4** multiplying whole numbers by two- or three-digit numbers, dividing three digit numbers by one or two-digit numbers, or multiplying or dividing decimals that represent money by whole numbers, or multiplying or dividing proper fractions**The student demonstrates conceptual understanding of fractions, mixed numbers, or percents, by****[6] N-5** identifying, describing or illustrating equivalent fractions or mixed numbers**[6] N-6** describing or illustrating the relationships among the four basic operations | Grade 6 GLE specifies division of proper fractions. The proposed standard specifies “interpret” and compute quotients of fractions.**[7] E&C-4** multiplying and dividing decimals to hundredths, or multiplying or dividing by powers of 10 or multiplying or dividing fractions or mixed numbers |
| **Compute fluently with multi-digit numbers and find common factors and multiples.**  |  |  |
| 6.NS.2. Fluently multiply and divide multi-digit whole numbers using the standard algorithm. Express the remainder as a whole number, decimal, or simplified fraction; explain or justify your choice based on the context of the problem. | **The student accurately solves problems (including real-world situations) involving** **[6] E&C-4** multiplying whole numbers by two- or three-digit numbers, dividing three digit numbers by one or two-digit numbers, or multiplying or dividing decimals that represent money by whole numbers, or multiplying or dividing proper fractions | Grade 6 GLE limits the number of digits to be multiplied and does not address how to express remainders.**[8] E&C-2** adding, subtracting, multiplying or dividing integers or positive rational numbers  |
| 6.NS.3. Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation. Express the remainder as a terminating decimal, or a repeating decimal, or rounded to a designated place value. | **The student accurately solves problems (including real-world situations) involving** **[6] E&C-4** multiplying whole numbers by two- or three-digit numbers, dividing three digit numbers by one or two-digit numbers, or multiplying or dividing decimals that represent money by whole numbers, or multiplying or dividing proper fractions**[6] E&C-2** recalling basic addition, subtraction, multiplication and division facts efficiently**[6] E&C-3** adding or subtracting whole numbers, fractions with unlike denominators to 12 or decimals to the hundredths place | Grade 6 GLEs limit performing operations with decimals to the hundredths place and multiplying or dividing decimals by whole numbers. GLEs do not address how to express remainders.**[7] E&C-3** adding or subtracting fractions or mixed numbers with unlike denominators, or decimals to the thousandths place **[8] E&C-2** adding, subtracting, multiplying or dividing integers or positive rational numbers  |
| 6.NS.4. Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor. *For example, express 36 + 8 as 4 (9 + 2).* | **[6] N-9** identifying or describing factors and multiples common to a pair or set of numbers (e.g. LCM and GCF)**[6] N-10** modeling (base 10 blocks) distributive property | Proposed standard specifies using the distributive property.**[7] N-9** using distributive property with rational numbers**[8] N-10** using distributive property with real numbers |
| **Apply and extend previous understandings of numbers to the system of rational numbers.** |  |  |
| 6.NS.5. Understand that positive and negative numbers describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explain the meaning of 0 in each situation.  | NEW – not addressed in the GLEs | The proposed standard has explaining the meaning of 0 in each real-world situation.**The student accurately solves problems (including real-world situations) by****[8] E&C-2** adding, subtracting, multiplying or dividing integers or positive rational numbers. |
| 6.NS.6. Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; Recognize that the opposite of the opposite of a number is the number itself [e.g., –(–3) = 3] and that 0 is its own opposite. b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane. | a.NEW – not addressed in the GLEsb.&c. **[6] G-10** graphing a vertical or horizontal line segment on a coordinate grid and/or identifying its length or midpoint | a. The proposed standard is implied but not specifically addressed by the GLEs.b. Reflections across the axes are included in a grade 8 GLE.**[8] G-5** identifying the results of applying transformations (translations, rotations, reflections, dilations) to figures on a coordinate plane  |
| 6.NS.7. Understand ordering and absolute value of rational numbers.a. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. *For example, interpret –3 > –7 as a statement that –3 is located to the right of –7 on a number line oriented from left to right.*b. Write, interpret, and explain statements of order for rational numbers in real-world contexts. *For example, write –3 oC > –7 oC to express the fact that –3 oC is warmer than –7 oC.*c. Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. *For example, for an account balance of –30 dollars, write |–30| = 30 to describe the size of the debt in dollars.*d. Distinguish comparisons of absolute value from statements about order. *For example, recognize that an account balance less than -30 dollars represents a debt greater than 30 dollars.* | NEW – not addressed in the GLEs  | **[6] N-1** does not specifically address statements of inequality (a) or interpreting and explaining statements of order for rational numbers (b).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] GLEs reference absolute value in grade 9.**[9] F&R-1** describing or extending patterns (families of functions: linear quadratic, absolute value,), up to the nth term, represented in tables, sequences, graphs, or in problem situations **[9] F&R-2** generalizing relationships (linear, quadratic, absolute value,) using a table of ordered pairs, a graph, or an equation |
| 6.NS.8. Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.  | **The student demonstrates understanding of position and direction by** **[6] G-10** graphing a vertical or horizontal line segment (given whole number coordinates for its end points) on a coordinate grid or identifying its length or midpoint (e.g., using a map to trace a route and calculate distance)  | Proposed standard specifies “include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.”  |

**Expressions and Equations – Alaska New Mathematics Standards**

| **New Math Standards** | **Grade Level Expectations** | **Comment** |
| --- | --- | --- |
| **Apply and extend previous understandings of arithmetic to algebraic expressions.** |  |  |
| 6.EE.1. Write and evaluate numerical expressions involving whole-number exponents *For example multiply by powers of 10 and products of numbers using exponents. (73 = 7•7•7).* | NEW – not addressed in the GLEs | **[8] N-5** expressing products of numbers using exponents  |
| 6.EE.2. Write, read, and evaluate expressions in which letters stand for numbers.a. Write expressions that record operations with numbers and with letters standing for numbers. *For example, express the calculation “Subtract y from 5” as 5 – y.*b. Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. *For example, describe the expression 2 (8 + 7) as a product of two factors; view (8 + 7) as both a single entity and a sum of two terms.*c. Evaluate expressions and formulas. Include formulas used in real-world problems. Perform arithmetic operations, including those involving whole number exponents, in the conventional order with or without parentheses. (Order of Operations)  | a. NEW – not addressed in the GLEsb. NEW – not addressed in the GLEsc. **The student demonstrates algebraic thinking by****[6] F&R-5** solving for an unknown represented by a letter, (addition, subtraction, multiplication, or division) (e.g., 3 • n = 15, n – 5 = 12)  | a. The proposed standard requires students to write an expression which is addressed in the following grade 8 GLE. **[8] F&R-5** translating a written phrase to an algebraic expression b. The proposed standard states to “identify parts” is implied but not specifically addressed by the GLEs.c. The language in c is more fully reflected in the following grade 7 GLE.**[7] F&R-5** evaluating algebraic expressionsOrder of operations and exponents in c is addressed in grade 8 GLEs.**[8] N-5** expressing products of numbers using exponents **[8] N-8** applying the rules for order of operations to rational numbers |
| 6.EE.3. Apply the properties of operations to generate equivalent expressions.Model (e.g., manipulatives, graph paper) and apply the distributive, commutative, identity, and inverse properties with integers and variables by writing equivalent expressions. *For example, apply the distributive property to the expression 3 (2 + x) to produce the equivalent expression 6 + 3x.* | **[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 | The grade 6 GLEs do not specify using properties of operations to generate equivalent expressions.**[7] N-9** using distributive property with rational numbers**[8] N-10** using distributive property with real numbers |
| 6.EE.4. Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). *For example, the expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for.* | NEW – not addressed in the GLEs | The proposed standard specifics to identify equivalent expressions which are not specifically addressed by the GLEs. |
| **Reason about and solve one-variable equations and inequalities.** |  |  |
| 6.EE.5. Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true. *For example: does 5 make 3x > 7 true?* | **[6] F&R-3** identifying or applying multiplication or division patterns to find missing values in a function**[6] F&R-5** solving for an unknown represented by a letter | Inequalities are implied in the GLEs but inequalities are not specifically mentioned in the GLEs until grade 10.**[10] F&R-2** generalizing equations and inequalities (linear, quadratic, absolute value) using a table of ordered pairs or a graph |
| 6.EE.6. Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. | **The student demonstrates conceptual understanding of functions, patterns, or sequences by** **[6] F&R-2** using rules to express thegeneralization of a pattern using words,lists, or tables, with or without variables | The proposed standard requires an understanding of variables to solve real-world or mathematical problems. |
| 6.EE.7. Solve real-world and mathematical problems by writing and solving equations of the form x + p = q and px = q for cases in which p, q and x are all nonnegative rational numbers. | **The student demonstrates algebraic thinking by****[6] F&R-5** solving for an unknown represented by a letter, (addition, subtraction, multiplication, or division) (e.g., 3 • n = 15, n – 5 = 12) | The proposed standard is more closely matched in the grade 7 GLE below.**[7] F&R-6** solving or identifying solutions to one-step linear equations of the form xa=b or ax=b, where a and b are whole numbers, translating a story problem into an equation of similar form, or translating a story problem into an equation of similar form and solving it  |
| 6.EE.8. Write an inequality of the form x > c or x < c to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form x > c or x < c have infinitely many solutions; represent solutions of such inequalities on number line diagrams. | NEW – not addressed in the GLEs | Inequalities are not specifically mentioned in the GLEs until grade 10.**[10] F&R-2** generalizing equations and inequalities (linear, quadratic, absolute value) using a table of ordered pairs or a graph |
| **Represent and analyze quantitative relationships between dependent and independent variables.** |  |  |
| 6.EE.9. Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. *For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation d = 65t to represent the relationship between distance and time.* | NEW – not addressed in the GLEs | There is no GLE language that specifically states independent and dependent variables. The following 7th and 8th grade GLEs are related in that they ask how a change in one variable affects another variable.**[7] F&R-3** describing in words how a change in one variable in a formula affects the remaining variables (how changing the length affects the area of a quadrilateral)**[8] F&R-3** describing in words how a change in one variable in a formula affects the remaining variables (how changing the length affects the area of quadrilaterals or volume of a rectangular prism)  |

**Geometry - Alaska New Mathematics Standards**

| **New Math Standards** | **Grade Level Expectations** | **Comment** |
| --- | --- | --- |
| **Solve real-world and mathematical problems involving area, surface area, and volume.** |  |  |
| 6.G.1. Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing or decomposing into other polygons (e.g., rectangles and triangles). Apply these techniques in the context of solving real-world and mathematical problems. | **The student solves problems (including real-world situations) by using perimeter, area, or volume by****[6]G-1** using the attributes and properties of regular polygons to identify, classify, or compare regular or irregular polygons**[6] G-7** estimating or determining area or perimeter of polygons (parallelograms, trapezoids, triangles) using a key, ruler, or given measures  | The proposed standard specifically list composing and decomposing polygons while the GLEs allowed multiple methods. |
| 6.G.2. Apply the standard formulas to find volumes of prisms. Use the attributes and properties (including shapes of bases) of prisms to identify, compare or describe three-dimensional figures including prisms and cylinders.  | **The students solves problems (including real-world situations) by using perimeter, area, or volume by****[6]G-3** using the attributes and properties of prisms to identify, compare or describe triangular or rectangular prisms**[6] G-9** [estimating or determining the volume of a right rectangular prism using manipulatives and formulas (e.g., cereal box, sand box, planter) L] | The proposed standard includes all prisms and cylinders which are included in the 8th and 9th grade GLEs below.**[8] G-6** determining the volume of right triangular prisms or cylinders**[9] G-4** determining the volume or surface area of prisms, cylinders, cones or pyramids |
| 6.G.3. Draw polygons in the coordinate plane given coordinates for the vertices; determine the length of a side joining the coordinates of vertices with the same first or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.  | **[6] G-10** graphing a vertical or horizontal line segment on a coordinate grid and/or identifying its length or midpoint.**[6] G-11** drawing or measuring quadrilaterals with given dimensions or angles. | The proposed standard states polygons (not limited to quadrilaterals) which is included in the 7th grade GLE below.**[7] G-9** drawing or measuring polygons with given dimensions and angles or circles with given dimensions (L)  |
| 6.G.4. Represent three-dimensional figures (e.g., prisms) using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems. | **[6] G-4** identifying a 3-dimensional shape from the 2-dimensional drawing of the shape**[6] G-7** estimating or determining area or perimeter of polygons (parallelograms, trapezoids, triangles) using a key, ruler, or given measures | The proposed standard includes finding the surface area of rectangular and triangular prisms which is addressed in the 7th and 8th grade GLEs below.**[7] G-6** determining the surface area of rectangular prisms**[8] G-7** determining the surface area of cylinders or triangular prisms |
| 6. G.5. Identify, compare or describe attributes and properties of circles (radius, and diameter). L | **[6] G-2** identifying, comparing or describing attributes and properties of circles (radius, and diameter) |  |

**Statistics and Probability – Alaska New Mathematics Standards**

| **New Math Standards** | **Grade Level Expectations** | **Comment** |
| --- | --- | --- |
| **Develop understanding of statistical variability.** |  |  |
| 6.SP.1 Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. *For example, “How old am I?” is not a statistical question, but “How old are the students in my school?” is a statistical question because one anticipates variability in students’ ages.* | NEW – not addressed in the GLEs  | The proposed standard asks students to evaluate a question. GLEs ask students to evaluate data. |
| 6.SP.2 Understand that a set of data has a distribution which can be described by its center (mean, median, or mode), spread (range), and overall shape and can be used to answer a statistical question. | **[6] S&P-3** using mean, median, mode, or range | The 6th grade GLE does not use the language center, spread, and overall shape. |
| 6.SP.3 Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation (range) describes how its values vary with a single number. | **[6] S&P-3** using mean, median, mode, or range |  |
| **Summarize and describe distributions.** |  |  |
| 6.SP.4. Display numerical data in plots on a number line, including dot or line plots, histograms and box (box and whisker) plots. | **[6] S&P-1** organizing or displaying using appropriate scale for data displays (tables, bar graphs, line graphs, or circle graphs) data in real world problems with whole number up to 100 | The proposed standard includes creating histograms and box and whisker plots which is addressed in the grade 8 GLE below.**The student demonstrates an ability to classify and organize data by** **[8] S&P-1** [designing, collecting **L**], organizing, displaying, or explaining the classification of data in real-world problems (e.g., science or humanities, peers or community), using histograms, scatter plots, or box and whisker plots with appropriate scale [or with technology L] |
| 6.SP.5. Summarize numerical data sets in relation to their context, such as by:a. Reporting the number of observations (occurrences).b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range), as well as describing any overall pattern and any outliners with reference to the context in which the data were gathered.d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered. | **The student demonstrates an ability to analyze data (comparing, explaining, interpreting, evaluating; drawing or justifying conclusions) by****[6] S&P-2** using information from a variety of displays (tables, bar graphs, line graphs, circle graphs, or Venn diagrams) | The proposed standards are more specify on how to summarize numerical data sets. The GLEs do not ask students to work with data (e.g., interquartile range, outliers, shape of the distribution) in the same way the proposed standards do. **The student demonstrates an ability to classify and organize data by** **[7] S&P-1** [collecting,L] displaying, organizing, or explaining the classification of data in real-world problems (e.g., science or humanities, peers or community), using circle graphs, frequency distributions, stem and leaf, [or scatter plots L] with appropriate scale **[7] S&P-3** determining range, mean, median, or mode |
| 6.SP.6 Analyze whether a game is mathematically fair or unfair by explaining the probability of all possible outcomes. L | **[6] S&P-4** [analyzing whether a game is mathematically fair or unfair by explaining the probability of all possible outcomes L] |  |
| 6.SP.7. Solve or identify solutions to problems involving possible combinations (e.g., if ice cream sundaes come in 3 flavors with 2 possible toppings, how many different sundaes can be made using only one flavor of ice cream with one topping?) L | **[6] S&P-5** solving or identifying solutions to problems involving possible combinations (e.g., if ice cream sundaes come in 3 flavors with 2 possible toppings, how many different sundaes can be made using only one flavor of ice cream with one topping?) |  |

| **Grade 6 Math GLEs not matched by the new standards** | **Comments** |
| --- | --- |
| 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]  | See note for 6.NS.7. |
| **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) | New 4th and 5th Grade Standards **(4.NF.6, 4.NF.7, 5.NBT.3)** |
| **[6] N-3** converting between whole numbers written in expanded notation and standard form | New 5th Grade Standard **(5.NBT.3)** |
| **The student demonstrates conceptual understanding of fractions, mixed numbers, or percents by** **[6] N-4** [modeling L], identifying, describing, or illustrating equal parts of a whole, a region, or a set |  |
| **The student demonstrates conceptual understanding of mathematical operations by****[6] N-7** [using models, explanations, number lines, or real-life situations L] describing or illustrating the process of adding and subtracting fractions with different denominators |  |
| **The student demonstrates understanding of measurable attributes by****[6] MEA-1** estimating length to the nearest eighth-inch or millimeter (L) |  |
| **The student demonstrates ability to use measurement techniques by****[6] MEA-3** using a scaled ruler to an eighth of an inch or millimeter on a map or drawing |  |
| **[6] MEA-4** calculating elapsed time (minutes, hours) | New 3rd and 4th Grade Standards **(3.MD.1, 4.MD.2)**  |
| **[6] MEA-5** solving real-world problems involving elapsed time between U.S. time zones (including Alaska Standard time)  | New 4th Grade Standard **(4.MD.2, 4.MD.4)** |
| **[6] MEA-7** measuring length to the nearest 1/8 of an inch or nearest millimeter |  |
| **The student determines reasonable answers to real-life situations, paper/pencil computations, or calculator results by****[6] E&C-1** identifying or using [a variety of L] strategies (e.g., truncating, rounding to compatible numbers) to estimate the results of addition, subtraction or multiplication from thousandths to millions or simple division | New 5th Grade Standard **(5.NBT.4)** |
| **The student demonstrates conceptual understanding of functions, patterns, or sequences by****[6] F&R-4** using manipulatives, including a calculator, as tools when describing, extending, or representing a number sequence (L) |  |
| **The student demonstrates conceptual understanding of similarity, congruence, symmetry, or transformations of shapes by****[6] G-5** identifying, creating, or drawing geometric figures that are congruent, similar, or symmetrical | New 8th Grade Standards **(8.G.1 – 8.G.4)** |
| **[6] G-6** drawing or describing the results of transformations of polygons such as slides, turns, or flips (L) | New 8th Grade Standards **(8.G.4)** |
| **The student solves problems (including real-world situations) by using perimeter, area, or volume by****[6] G-8** estimating the area and circumference of a circle using a grid or manipulatives and comparing the relationship of the diameter to the circumference (π) (L) | New 7th Grade Standard **(7.G.4)** |
| **The student demonstrates an ability to problem solve by** **[6] PS-1** selecting, modifying, and applying appropriate problem solving strategies (e.g., graphing, Venn diagrams, tables, lists, working backwards, guess and check, or extend a pattern) and verifying results | The GLE math process skills are incorporated in to the Standards for Mathematical Practice. 1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

 Descriptions of the Standards for Mathematical Practice follow this chart as well as the grade-span descriptors appropriate to this grade level. |
| **[6] PS-2** evaluating and interpreting solutions to problems |
| **The student communicates his or her mathematical thinking by****[6] PS-3** representing problems using mathematical language including concrete, pictorial, and/or symbolic representation; or using appropriate vocabulary, symbols, and technology to explain mathematical solutions |
| **The student demonstrates an ability to use logic and reason by****[6] PS-4** using informal deductive reasoning in concrete contexts; or justifying answers and mathematical strategies using examples |
| **The student demonstrates the ability to apply mathematical skills and processes across the content strands by****[6] PS-5** using real world contexts such as social studies, friends, school and community |

**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 6‐8 mathematically proficient students will:** * explain correspondences between a new problem and previous problems
* represent algebraic expressions numerically, graphically, concretely/with manipulatives, verbally/written
* explain connections between the multiple representations
* determine the question that needs to be answered
* make a plan for attempting a problem
* choose a reasonable strategy
* identify the knowns and unknowns in a problem
* use previous knowledge and skills to simplify and solve problems
* break a problem into manageable parts or simpler problems
* solve a problem in more than one way
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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 6‐8 mathematically proficient students will:** * represent a situation symbolically and carry out its operations
* create a coherent representation of the problem
* translate an algebraic problem to a real world context
* explain the relationship between the symbolic abstraction and the context of the problem
* compute using different properties
* consider the quantitative values, including units, for the numbers in a problem
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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 6‐8 mathematically proficient students will:** * construct arguments using both concrete and abstract explanations
* justify conclusions, communicate conclusions, and respond to the arguments
* listen to arguments, critique their viability, and ask questions to clarify the argument
* compare effectiveness of two arguments by identifying and explaining both logical and/or flawed reasoning
* recognize general mathematical truths and use statements to justify the conjectures
* identify special cases or counter‐examples that don’t follow the mathematical rules
* infer meaning from data and make arguments using its context
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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 6‐8 mathematically proficient students will:** * apply mathematics to solve problems arising in everyday life and society
* identify important quantities in a practical situation and map their relationships using such tools as diagrams, two‐way tables, graphs, and formulas
* interpret their mathematical results in the context of the situation and reflect on whether the results make sense
* make assumptions and approximations to simplify a situation, realizing the final solution will need to be revised
* analyze quantitative relationships to draw conclusions
* reflect on whether their results make sense
* improve the model if it has not served its purpose
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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 6‐8 mathematically proficient students will:*** select and use tools appropriate to the task: pencil and paper, protractor, visual and physical fraction models, algebra tiles, geometric models, calculator, spreadsheet, and interactive geometry software.
* use estimation and other mathematical knowledge to confirm the accuracy
* identify relevant external and digital mathematical resources and use them to pose or solve problems
* represent and compare possibilities visually with technology when solving a problem
* explore and deepen their understanding of concepts through the use of technological tools
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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 6‐8 mathematically proficient students will:** * use clear definitions in explanations
* understand and use specific symbols accurately and consistently: equality, inequality, ratios, parenthesis, for multiplication and division, absolute value, square root
* 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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