Grade 7 Mathematics Standards

Comparison Tool for Standards Transition

Updated June 2012

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

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

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

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

| **New Math Standards** | **Grade Level Expectations** | **Comment** |
| --- | --- | --- |
| 6.RP.2. Understand the concept of a unit rate (*a*/*b* associated with a ratio *a:b* with *b ≠* 0, and use rate language in the context of a ratio relationship) and apply it to solve real world problems (e.g., unit pricing, constant speed).*For example, “This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar.” “We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger.”* | **[6] E&C-5** developing and interpreting scale 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.

**Grade 7 Overview**

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| **Ratios and Proportional Relationships (RP)*** Analyze proportional relationships and use them to solve real-world and mathematical problems.

**The Number System (NS)*** Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

**Expressions and Equations (EE)** * Use properties of operations to generate equivalent expressions.
* Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

**Geometry (G)** * Draw, construct, and describe geometrical figures and describe the relationships between them.
* Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

**Statistics and Probability (SP)** * Use random sampling to draw inferences about a population.
* Draw informal comparative inferences about two populations.
* Investigate chance processes and develop, use, and evaluate probability models.
 | **In Grade 7, instructional time should focus on four critical areas:**1. developing understanding of and applying proportional relationships;
2. developing understanding of operations with rational numbers and working with expressions and linear equations;
3. solving problems involving scale drawings and informal geometric constructions, and working with two- and three-dimensional shapes to solve problems involving area, surface area, and volume; and
4. drawing inferences about populations based on samples.
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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** |
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| **Analyze proportional relationships and use them to solve real-world and mathematical problems.** |  |  |
| 7.RP.1. Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. *For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction 1/2/1/4 miles per hour, equivalently 2 miles per hour or* *apply a given scale factor to find missing dimensions of similar figures.* | **[7] E&C-6** solving proportions using a given scale**[7] G-3** using a scale factor to solve problems involving similar shapes (e.g., scale drawings, maps) | The new standard includes ratio, which is specifically mentioned in the Grade 8 GLE.**[8] E&C-5** using ratio and proportion  |
| 7.RP.2. Recognize and represent proportional relationships between quantities. Make basic inferences or logical predictions from proportional relationships. a. Decide whether two quantities are in a proportional relationship (e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin).b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships in real world situations.c. Represent proportional relationships by equations and multiple representations such as tables, graphs, diagrams, sequences, and contextual situations. *For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn*.d. Understand the concept of unit rate and show it on a coordinate plane. Explain what a point *(x, y)* on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, *r)* where *r* is the unit rate. | a. & b. **[7] E&C-6** solving proportions using a given scale**[7] F&R-2** generalizing relationships (linear) using a table of ordered pairs, a function or an equationc. **[7] F&R-1** describing or extending patterns (linear) up to 10 terms, represented in tales, sequences or in problem situations**[7] F&R-2** generalizing relationships using a table of ordered pairs, a function or an equationd. NEW – not addressed in the GLEs  | The new standard includes ratios and rate, which are addressed in the Grades 8 and 9 GLEs.**[8] E&C-5** using ratio and proportion**[9] E&C-4** determining rate by using ratio and proportiond. The new standard is a component of functional relationships. The GLEs do not address this aspect of a functional relationship specifically. |
| 7.RP.3. Use proportional relationships to solve multistep ratio and percent problems. *Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.* | NEW – not addressed in the GLEs  | The examples in the new standard are addressed in the Grades 8 and 10 GLEs.**The student accurately solves problems (including real-world situations) by** **[8] E&C-3** percents and percentages (e.g., tax, discount) **[10] E&C-3** solving problems involving percent increase or decrease |

**Number System - Alaska New Mathematics Standards**

| **New Math Standards** | **Grade Level Expectations** | **Comment** |
| --- | --- | --- |
| **Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.** |  |  |
| 7.NS.1. Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram. a. Show that a number and its opposite have a sum of 0 (additive inverses). Describe situations in which opposite quantities combine to make 0. *For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.*b. Understand addition of rational numbers (*p* + *q* as the number located a distance |*q*| from *p*, in the positive or negative direction depending on whether *q* is positive or negative). Interpret sums of rational numbers by describing real-world contexts.c. Understand subtraction of rational numbers as adding the additive inverse, *p* – *q* = *p* + (–*q*). Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.d. Apply properties of operations as strategies to add and subtract rational numbers. | a. & c. **[7] N-5** [using models, explanations, number lines, real-life situations L], describing or illustrating the effects of arithmetic operations on rational numbers (fractions, decimals)b. NEW – not addressed in the GLEs d. **[7] N-6** using commutative, [associative L], inverse, or identity properties with rational numbers | a. & c. The new standard is implied but not specifically addressed by the GLEs.b. **[8] E&C-2** adding, subtracting, multiplying or dividing integers or positive rational numbersc. The new standard includes the concept of absolute value; the 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 *n*th 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 |

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| 7.NS.2. Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers and use equivalent representations.a. Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (–1)(–1) = 1 and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If *p* and *q* are integers, then –(*p*/*q*) = (–*p*)/*q* = *p*/(–*q*). Interpret quotients of rational numbers by describing real-world contexts.c. Apply and name properties of operations used as strategies to multiply and divide rational numbers.d. Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.e. Convert between equivalent fractions, decimals, or percents. | a. **[7] N-5** using models, explanations, number lines, real life situations, describing or illustrating the effect of arithmetic operations on rational numbers (fractions, decimals)**[7] N-6** using commutative, associative, inverse or identity properties with rational numbers**[7] N-7** applying rules of divisibility to whole numbers**[7] N-9** using distributive property with rational numbersb. NEW – not addressed in the GLEs c. **[7] N-6** using commutative, associative, inverse or identity properties with rational numbers**[7] N-9** using distributive property with rational numbersd. **[7] N-7** Applying rules of divisibility to whole numbers**[7] E&C-4** multiplying or dividing decimals to hundredths, or multiplying or dividing by powers of ten, or multiplying or dividing fractions or mixed numbere. **[7] E&C-5** converting between equivalent fractions, terminating decimals, or percents  | b. **[8] E&C-2** adding, subtracting, multiplying or dividing integers or positive rational numbers. d. The new standard specifies knowing that a rational number terminates in 0 or eventually repeats.e. The new standard includes all decimals addressed in the Grade 8 GLE.**[8] E&C-4** converting between equivalent fractions, decimals, or percents |
| 7.NS.3. Solve real-world and mathematical problems involving the four operations with rational numbers. (Computations with rational numbers extend the rules for manipulating fractions to complex fractions.) *For example, use models, explanations, number lines, real life situations, describing or illustrating the effect of arithmetic operations on rational numbers (fractions, decimals).* | **[7] N-5** using models, explanations, number lines, real life situations, describing or illustrating the effect of arithmetic operations on rational numbers (fractions, decimals) |  |

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

| **New Math Standards** | **Grade Level Expectations** | **Comment** |
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| **Use properties of operations to generate equivalent expressions.** |  |  |
| 7.EE.1. Apply properties of operations as strategies to add, subtract, factor, expand and simplify linear expressions with rational coefficients. | **[7] F&R-5** evaluating algebraic expressions |  |
| 7.EE.2. Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. *For example, a + 0.05a = 1.05a means that “increase by 5%” is the same as “multiply by 1.05.”* | NEW – not addressed in the GLEs  |  |
| **Solve real-life and mathematical problems using numerical and algebraic expressions and equations.** |  |  |
| 7.EE.3. Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form and assess the reasonableness of answers using mental computation and estimation strategies. *For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.* | **[7] E&C-1** identifying or using a variety of strategies, including truncating, rounding, front-end estimation, compatible numbers, to check for reasonableness of solutions. **[7] E&C-5** converting between equivalent fractions, terminating decimals, or percents (10% = 1/10 = 0.1) | The new standard examples suggest content that appears in Grade 8 GLEs. **[8] E&C-2** adding, subtracting, multiplying or dividing integers or positive rational numbers**[8] E&C-3** using percents and percentages (e.g., tax, discount) |
| 7.EE.4. Use variables to represent quantities in a real-world or mathematical problem, and construct multi-step equations and inequalities to solve problems by reasoning about the quantities.a. Solve word problems leading to equations of the form *px* + *q* = *r* and *p*(*x* + *q*) = *r*, where *p*, *q*, and *r* are specific rational numbers. *For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?*b. Solve word problems leading to inequalities of the form *px* + *q* > *r* or *px* + *q* < *r*, where *p*, *q*, and *r* are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. *For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions.* | a. **[7] F&R-6** solving or identifying solutions to one-step linear equation of the form *x* + *a* = *b* or *ax* = *b*, where *a* and *b* are whole numbers; translating a story problem into an equation of similar for; or translating a story problem into and equation of similar form and solving it.b. NEW – not addressed in the GLEs  | a. The new standard involves multi-step equations, which are more fully addressed in the Grade 8 GLE.**The student demonstrates algebraic thinking by** **[8] F&R-6** solving or identifying solutions to two-step linear equations of the form *ax ± b =c*, where *a, b* and *c* are rational numbers, and *a* ≠ 0, translating a story problem into an equation of similar form, or translating a story problem into an equation of similar form and solving itb. Inequalities are not addressed until the Grade 10 GLEs.**[10] F&R-5** modeling (graphically or algebraically) or solving situations using systems of linear equations or inequalities (including real-world applications) |

**Geometry - Alaska New Mathematics Standards**

| **New Math Standards** | **Grade Level Expectations** | **Comment** |
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| **Draw, construct, and describe geometrical figures and describe the relationships between them.** |  |  |
| 7.G.1. Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale. | **[7] MEA-3** applying a given scale factor to find missing dimensions of similar figures**[7] E&C-6** solving proportions using a given scale**[7] G-3** using a scale factor to solve problem involving similar shapes (e.g. scale drawings, maps) |  |
| 7.G.2. Draw (freehand, with ruler and protractor, and with technology) geometric shapes including polygons and circles with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle. | **[7] G-1** using the attributes and properties of polygons to identify and classify regular or irregular polygons. **[7] G-9** [drawing or measuring polygons with given dimensions and angles or circles with given dimensions L] | The new standard has a specific focus on triangles. |
| 7.G.3. Describe the two-dimensional figures, i.e., cross-section, that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids. | NEW – not addressed in the GLEs  | The GLEs do not address creating cross-sections of three-dimensional figures. |

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| **Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.** |  |  |
| 7.G.4. Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle. | **[7] G-7** determining the circumference of a circle | Determining the area of a circle is a Grade 8 GLE. The GLEs do not ask for an informal derivation of the relationship between the circumference and area of a circle.**[8] G-8** determining the circumference and area of a circle |
| 7.G.5. Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure. | NEW – not addressed in the GLEs  | The new standard is addressed in Grade 9 and Grade 10 GLEs.**[9] G-1** identifying, analyzing, comparing, or using properties of angles (including supplementary or complementary) or circles (degrees in a circle)**[10] G-1** identifying, analyzing, comparing, or using properties of plane figures:* supplementary, complementary or vertical angles
* angles created by parallel lines with a transversal
* sum of interior or exterior angles of a polygon
* central angles, chords, inscribed angles or arcs of a circle
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| 7.G.6. Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms. | **The student solves problems (including real-world situations) by****[7] G-5** determining the volume of cubes and rectangular prisms**[7] G-6** determining the surface area of rectangular prisms | The new standard includes more three-dimensional objects, which are referenced in the Grade 9 GLE.**[9] G-4** determining the volume or surface area of prisms, cylinders, cones or pyramids |

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

| **New Math Standards** | **Grade Level Expectations** | **Comment** |
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| **Use random sampling to draw inferences about a population.** |  |  |
| 7.SP.1. Understand that statistics can be used to gain information about a population by examining a reasonably sized sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences. | **The student demonstrates** **a conceptual understanding of probability and counting techniques by** **[7] S&P-6** designing and conducting a simulation to study a problem and communicate the results (L) | GLEs have no specific language regarding random sampling, although it is implied within the standard. |
| 7.SP.2. Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. *For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.* | **The student demonstrates a conceptual understanding of probability and counting techniques****[7] S&P-4** by determining the experimental and theoretical probability of a simple event **[7] S&P-5** using a systematic approach to finding sample spaces or to making predictions about the probability of independent events |  |

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| **Draw informal comparative inferences about two populations.** |  |  |
| 7.SP.3. Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. *For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable.* | **The student demonstrates an ability to analyze data (comparing, explaining, interpreting, evaluating or making predictions; or drawing or justifying conclusions) by****[7] S&P-2** using information from a variety of displays (e.g., as found in graphical displays in newspapers and magazines)**[7] S&P-3** determining range, mean, median, or mode | The new standard involves other measures of variability beyond range.  **[9] S&P-3** using range and measures of central tendency to determine the best representation of the data for a practical situation |
| 7.SP.4. Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. *For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.* | 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 **The student demonstrates** **an ability to analyze data (comparing, explaining, interpreting, evaluating or making predictions; or drawing or justifying conclusions) by** **[7] S&P-2** using information from a variety of displays (e.g., as found in graphical displays in newspapers and magazines)**[7] S&P-3** determining range, mean, median, or mode | GLEs do not address all measures of variability and do not specify making comparative inferences about two populations.**[9] S&P-1** [designing, collecting L], organizing, displaying, or explaining the classification of data in real-world problems (e.g., science or humanities, peers, community, or careers) using information from tables or graphs that display two sets of data [or with technology L] **[10] S&P-3** using and justifying range and measures of central tendency to determine the best representation of the data for a practical situation |
| **Investigate chance processes and develop, use, and evaluate probability models.** |  |  |
| 7.SP.5. Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring.Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event. | **The student demonstrates a conceptual understanding of probability and counting techniques****[7] S&P-4** by determining the experimental and theoretical probability of a simple event **[7] S&P-5** using a systematic approach to finding sample spaces or to making predictions about the probability of independent events |  |
| 7.SP.6. Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. *For example, when rolling a number cube 600 times, predict* *that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.* | **The student demonstrates a conceptual understanding of probability and counting techniques by****[7] S&P-4** determining the [experimental L] and theoretical probability of a simple event**[7] S&P-6** designing and conducting a simulation to study a problem and communicate the results |  |

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| 7.SP.7. Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.a. Design a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. *For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected.* b. Design a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. *For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?* | a. & b. **[7] S&P-4** by determining the experimental and theoretical probability of a simple event**[7] S&P-5** using a systematic approach to finding sample spaces or to making predictions about the probability of independent events**[7] S&P-6** designing and conducting a simulation to study a problem and communicate the results |  |

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| 7.SP.8. Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.a. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.b. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., “rolling double sixes”), identify the outcomes in the sample space which compose the event.c. Design and use a simulation to generate frequencies for compound events. *For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?* |  | The probabilities of compound events are addressed by Grade 9 and 10 GLEs.**[9] S&P-1** [designing, collecting L], organizing, displaying, or explaining the classification of data in real-world problems (e.g., science or humanities, peers, community, or careers) using information from tables or graphs that display two sets of data [or with technology L]**[9] S&P-5** determining or comparing the experimental and/or theoretical probability of independent or dependent events**[10] S&P-1** [designing, collecting L], organizing, displaying, or explaining the classification of data in real-world problems (e.g., science or humanities, peers, community, or careers), using information from tables or graphs that display two or more sets of data [or with technology L]**[10] S&P-5** explaining in words or identifying the difference between experimental and theoretical probability of independent or dependent events**[10] S&P-7** designing, conducting, analyzing, and communicating the results of a multi-stage probability experiment (L) |

| **Grade 7 Math GLEs not matched by the new standards** | **Comments** |
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| **The student demonstrates understanding*** **of rational numbers (fractions, decimals, percents, or integers) by**

**[7] N-1** ordering rational numbers |  |
| **[7] N-2** modeling (place value blocks) or identifying place value positions of whole numbers and decimals (L) |  |
| **[7] N-3** converting between expanded notation (multiples of ten) and standard form for decimal numbers |  |
| **The student demonstrates understanding*** **of positive fractions, decimals, or percents by**

**[7] N-4** identifying or representing equivalents of numbers | New Grade 4 Standard **(4.NF.6)** |
| **The student demonstrates conceptual understanding of number theory by****[7] N-8** identifying prime and composite numbers | New Grade 4 Standard **(4.OA.4)** |
| **The student demonstrates understanding of measurable attributes by** **[7] MEA-1** estimating length to the nearest sixteenth of an inch or millimeter, volume to the nearest cubic centimeter or milliliter or angle to the nearest 30 degrees (L) | New Grade 5 Standard **(5.MD.4)** |
| **[7] MEA-2** identifying or using equivalent English (square inches, square feet, square yards) or metric systems (square centimeters, square meters) |  |
| **The student demonstrates understanding of measurement techniques by** **[7] MEA-3** applying a given scale factor to find missing dimensions of similar figures |  |
| **[7] MEA-4** measuring various dimensions to one-sixteenth of an inch or millimeter |  |
| **[7] MEA-5** accurately measuring a given angles using a protractor to the nearest plus or minus 2 degrees | New Grade 4 Standard **(4.MD.8)** |
| **[7] MEA-6** solving real-world problems involving elapsed time between world time zones | New Grade 5 Standard **(5.MD.2)** |

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| **The student solves problems (including real-world situations) using estimation by** **[7] E & C-2** comparing results of different strategies (L) |  |
| **The student accurately solves problems (including real-world situations) by****[7] E&C-3** adding or subtracting fractions or mixed numbers with unlike denominators, or decimals to the thousandths place | New Grade 6 Standard **(6.NS.3)** |
| **The student demonstrates conceptual understanding of functions, patterns, or sequences including those represented in real-world situations by** **[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) | New Grade 6 Standard **(6.EE.9)** |
| **[7] F&R-4** using a calculator as a tool when describing, extending, or representing patterns (L) |  |
| **The student demonstrates an understanding of geometric relationships by** **[7] G-2** using the attributes and properties of prisms (vertices, length and alignment of edges, shape and number of bases, shape of faces) to identify and describe triangular or rectangular pyramids |  |
| **The student demonstrates conceptual understanding of similarity, congruence, symmetry, or transformations of shapes by****[7] G-4** drawing or describing the results of applying transformations such as translations, rotations, reflections, or dilations to figures (L) |  |
| **The student demonstrates understanding of position and direction by** **[7] G-8** graphing or identifying values of variables on a coordinate grid |  |

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| **The student demonstrates an ability to problem solve by** **[7] PS-1** selecting, modifying, and applying a variety of problem-solving strategies (e.g., working backwards, drawing a picture, Venn diagrams and verifying the results) | The GLE math process skills are incorporated in to the Standards for Mathematical Practice. 1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

 Descriptions of the Standards for Mathematical Practice follow this chart as well as the grade-span descriptors appropriate to this grade level. |
| **[7] PS-2** evaluating, interpreting, and justifying solutions to problems |
| **The student communicates his or her mathematical thinking by****[7] PS-3** representing mathematical problems numerically, graphically, and/or symbolically; or using appropriate vocabulary, symbols, or technology to explain, justify, and defend strategies and solutions |
| **The student demonstrates an ability to use logic and reason by****[7] PS-4** using informal deductive and inductive reasoning in concrete contexts or stating counterexamples to disprove statements; or justifying and defending the validity of mathematical strategies and solutions using examples |
| **The student demonstrates the ability to apply mathematical skills and processes across the content strands by****[7] PS-5** using real-world contexts such as science, humanities, peers, 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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