

Anchorage School District Middle School Math Performance Standards

PROGRAM STATEMENT

Mathematical literacy is essential for every individual in today's technological society. A working knowledge of mathematics is needed to deal with the qualitative, quantitative, and spatial relationships that are encountered in everyday life. Therefore, the overall goal of the Mathematics Program for the Anchorage School District is to provide the opportunity for all students to learn, use, communicate, apply, appreciate, and enjoy the mathematics appropriate for their age, needs and ambitions.

GENERAL PROGRAM GOALS

Students will be able to:

1. Use problem-solving approaches to investigate and understand mathematical content.
2. Formulate problems from everyday and mathematical situations.
3. Develop and apply strategies to solve a wide variety of problems.
4. Verify and interpret results with respect to the original problem.
5. Acquire confidence in using mathematics meaningfully.
6. Relate physical materials, pictures, and diagrams to mathematical ideas.
7. Reflect on and clarify thinking about mathematical ideas and situations.
8. Relate everyday language to mathematical language and symbols.
9. Realize that representing, discussing, reading, writing, and listening are vital parts of learning math.
10. Formulate logical conclusions.
11. Use models, known facts, properties, and relationships to explain thinking.
12. Use patterns and relationships to analyze mathematical situations.
13. Relate various representations of concepts or procedures to one another.
14. Make and evaluate mathematical conjectures; justify answers and solutions; validate thinking.
15. Appreciate the pervasive use and power of reasoning as a part of mathematics.
16. Link conceptual and procedural knowledge; recognize relationships among different topics in mathematics; see mathematics as an integrated whole.
17. Explore problems and describe results using graphical, numerical, physical, and verbal models or representations.
18. Use mathematical ideas to further understanding of other mathematical ideas.
19. Use and apply mathematics in other curriculum areas; use mathematics in daily life.
20. Value the role of mathematics in culture and society.

SEVENTH MATH PERFORMANCE STANDARDS

Each ASD mathematics course reflects the program statement and incorporates the general program goals. In addition, each course consists of a specific set of standards that determine the course content and a set of performance standards that delineate what a student should be able to do after successfully completing the course. After satisfactorily completing the ASD Seventh Grade mathematics curriculum, a student will be proficient in the fourteen strands of mathematics which comprise the mathematics curriculum. As evidence of proficiency, the student will be able to:

7:1 Estimation:

- .1 Decide when an estimate is appropriate and when an exact answer is needed.
- .2 Estimate real and scale distances on maps and globes.
- .3 Estimate solutions to problems involving fractions, decimals and percents.
- .4 Estimate the total expenses of a real life experience (e.g, a shopping trip).
- .5 Use estimation to check the reasonableness of calculator or computer results.
- .6 Estimate solutions to problems to check reasonableness of results.
- .7 Apply, explain, and assess the appropriateness of a variety of estimation strategies.

7:2 Number Sense:

- .1 Use exponents to write the prime factorization of a number.
- .2 Convert between fractions, decimals, and percents, and select the most appropriate form.
- .3 Convert between standard notation and scientific notation, and select the more appropriate form.
- .4 Use rules of divisibility to determine if one number is a factor or a multiple of another.
- .5 Use prime factors to find GCF's and LCM's.
- .6 Compare and order whole numbers, fractions, decimals and integers using $>$, $<$, or $=$.
- .7 Use models or diagrams to explain place value relations of decimals.
- .8 Explain the representations of scientific notation, exponents, and percents.

7:3 Concepts of Number Operations:

- .1 Use the commutative, associative, and distributive properties.
- .2 Use inverse operations to solve problems.
- .3 Use the properties of zero and 1.
- .4 Use manipulatives, diagrams, symbols, and words to model addition, subtraction, multiplication and division of rational numbers.
- .5 Use manipulatives, diagrams, symbols and words to describe addition and subtraction of integers.
- .6 Write and solve word problems involving multiple operations.

7:4 Computation:

- .1 Select and use an appropriate method for computing addition, subtraction, multiplication and division of rational numbers (e.g., mental math, paper and pencil, calculator, computer).
- .2 Add, subtract, multiply, and divide fractions, and decimals with and without a calculator or computer.
- .3 Convert numbers from exponential form to standard notation.
- .4 Convert numbers between standard form and scientific notation using positive exponents.
- .5 Use proportions to solve practical problems including scale drawings that contain whole numbers, fractions, decimals, and percents.
- .6 Write and solve practical problems that use fractions or mixed numbers.
- .7 Convert fractions to equivalent mixed numbers and decimals.
- .8 Apply the rules for order of operations to rational numbers.
- .9 Use mental math to solve problems involving basic operations, powers of 10, and simple percents.

7:5 Geometry:

- .1 Identify, classify, and compare polygons and polyhedra.
- .2 Identify and use the vocabulary related to regular and irregular polygons, circles, polyhedra, and their components.
- .3 Name and classify angles formed by parallel, perpendicular and intersecting lines
- .4 Classify, construct and identify properties of angles.
- .5 Describe the relationship of angles in different types of triangles.
- .6 Find the sum of the angles in any polygon.
- .7 Calculate the measure of an angle in a regular polygon.
- .8 Use manipulatives to construct geometric figures in two and three dimensions.
- .9 Identify and describe congruent and similar figures.
- .10 Graph a figure and its image formed by a translation, reflection, or rotation, on a coordinate plane.
- .11 Identify and construct translations, rotations, reflections and dilations of plane figures.
- .12 Use characteristics of polygons to explain tessellations.
- .13 Use manipulatives to create a figure that tessellates and explain why it tessellates.

7:6 Measurement:

- .1 Measure length, weight/mass, area, and volume using the appropriate tool in metric and in standard units.
- .2 Use, compare, and convert between units in the metric system for length, area, and volume.
- .3 Use, compare, and convert between units in the standard system for length, time, weight, area and volume.
- .4 Explain the range of error that can be expected when measuring.

- .5 Find perimeter, circumference, and area of circles and polygons, and verify the solution using a different method.
- .6 Use ratios to solve problems about perimeters and areas of similar figures.
- .7 Write and solve rate problems and use appropriate units for the solutions.

7:7 Statistics:

- .1 Compute the mean, median, mode, and range for a given set of data and justify one as the best representation of the data.
- .2 Explain which measure of central tendency best represents a given data set.
- .3 Sample and record data systematically.
- .4 Present data as a scatter plot, stem & leaf, circle graph, line plot, and bar graph; make an argument for which graph best represents the data.
- .5 Use technology and a spread sheet or data table to create a graph.
- .6 Interpret a broken axis bar graph and use it to show how data can be misrepresented.
- .7 Identify and communicate trends based on statistics from data.
- .8 Analyze data for validity and misrepresentation.

7:8 Probability:

- .1 Express the probability of a single event as a fraction, decimal, or percent.
- .2 Predict the outcome of an independent event, design an experiment to test the probability, compute the actual outcome and compare the results to the prediction.
- .3 Explain why experimental (actual) results may be different from theoretical (expected) probabilities in 50 coin flips.
- .4 Explain how to determine probability if the odds are known.
- .5 Predict the probability of a future event, using a table of evidence from the past, and defend your conclusion.

7:9 Patterns:

- .1 Identify, describe, and extend arithmetic, geometric, or other patterns.
- .2 Use an arithmetic or geometric rational number pattern to find an unknown value.
- .3 Use symbols to describe number patterns.
- .4 Determine the n th term in a sequential pattern.
- .5 Explain the patterns found in tables, graphs, rules and formulas.
- .6 Use a pattern from a table or graph to predict an outcome.
- .7 Explain how to use patterns as a strategy for problem solving.

7:10 Algebra:

- .1 Translate word problems into symbolic expressions, equations, or inequalities.
- .2 Substitute values for a variable and evaluate the expression, equation, or inequality.
- .3 Combine like terms to simplify expressions.
- .4 Graph inequalities on a number line.
- .5 Describe linear data with tables, graphs, and lines of best fit.

- .6 Substitute values into a linear equation to make a table of ordered pairs; graph the points on a coordinate plane.
- .7 Use order of operations including grouping symbols and exponents to solve problems.
- .8 Solve one step equations using inverse operations and check the solutions.
- .9 Use ratios and proportions to solve problems.
- .10 Use equations to solve problems.
- .11 Write and solve real life problems that require the use of a variable.

7:11 Problem solving:

- .1 Select, modify, and apply a variety of problem-solving strategies.

7:12 Communication:

- .1 Explain the methods and results of various mathematical efforts, orally and in writing.

7:13 Reasoning:

- .1 Justify solutions or use counter examples to disprove statements.

7:14 Connections:

- .1 Apply mathematical skills and processes to other disciplines.

EIGHTH GRADE MATH PERFORMANCE STANDARDS

Each ASD mathematics course reflects the program statement and incorporates the general program goals. In addition, each course consists of a specific set of standards that determine the course content and a set of performance standards that delineate what a student should be able to do after successfully completing the course. After satisfactorily completing the ASD Eighth Grade mathematics curriculum, a student will be proficient in the fourteen strands of mathematics which comprise the mathematics curriculum. As evidence of proficiency, the student will be able to:

8:1 Estimation:

- .1 Estimate solutions to problems to check reasonableness of results.
- .2 Estimate probability of an event from random samples or experimental data.
- .3 Use estimation to compare metric and standard units.
- .4 Explain when an estimate is appropriate and when an exact answer is needed.
- .5 Use estimation to check calculator or computer accuracy.
- .6 Estimate the square root of a number by finding the two square numbers between which it lies.

8:2 Number Sense:

- .1 Solve problems using ratio, proportion, and percent.
- .2 Describe and model the relationship between equivalent fractions, decimals, percents, or ratios when solving problems.
- .3 Use manipulatives, diagrams, or symbols to explain how to solve different types of percent problems.
- .4 Use mental math to calculate discounts, taxes, interest, commissions and gratuities.
- .5 Compare and order real numbers using $>$, $<$, and $=$.
- .6 Write and solve problems that use primes, factors, and multiples .
- .7 Explain the relationship between the subsets of the real number system.
- .8 Model counting in a different base system.
- .9. Explain order of operations.

8:3 Concepts of Number Operations:

- .1 Use manipulatives or diagrams to explain how to approximate a square root.
- .2 Write and solve problems involving multiple operations.
- .3 Use manipulatives, diagrams, symbols, and words to describe addition, subtraction, multiplication and division of integers.
- .4 Use manipulatives or a diagram to explain absolute value.
- .5 Use the commutative, associative, and distributive properties to solve problems with variables and rational numbers.
- .6 Use inverse operations and the properties of zero and 1 to solve problems with variables and rational numbers.
- .7 Use and explain prime factorization.

8:4. Computation:

- .1 Use paper and pencil, mental math, or a calculator to efficiently and accurately solve problems with real numbers.
- .2 Apply order of operations to real numbers.
- .3 Use percent to create circle graphs.
- .4 Add, subtract, multiply and divide fractions, decimals and integers with and without a calculator.
- .5 Solve problems using percent of increase or decrease.
- .6 Write and solve practical problems that use real numbers.
- .7 Convert numbers between standard form and scientific notation using both positive and negative exponents.

8:5 Geometry:

- .1 Identify, classify, and compare polygons and polyhedra.
- .2 Identify and use the vocabulary related to regular and irregular polygons, circles, polyhedra, and their components.
- .3 Use the relationships of angles formed by parallel, perpendicular and intersecting lines to solve problems.
- .4 Describe the relationship of angles in different types of polygons.
- .5 Construct or draw geometric figures in three dimensions.
- .6 Identify corresponding parts in similar and congruent geometric figures using a scale factor.
- .7 Use similarity and congruence to find missing angles or sides of figures.
- .8 Graph translations, rotations, reflections and dilations of plane figures and describe the transformation in words and symbols.
- .9 Describe the use of translations, reflections and rotations in a tessellation (e.g., Escher drawing).
- .10 Draw a polygon that will not tessellate and explain why.
- .11 Model and apply the Pythagorean Theorem.

8:6 Measurement:

- .1 Use, compare, and convert between units in the metric system for length, mass, area, and volume.
- .2 Use, compare, and convert between units in the standard system for length, time, weight, area and volume.
- .3 Use multiple strategies, including formulas, to find rates and to find volume and surface area; use correct units.
- .4 Explain what precision can be expected when measuring.
- .5 Use indirect measurement to solve problems.
- .6 Explain what happens to ratios when changes are made to one or more dimensions of a figure.
- .7 Use manipulatives or diagrams to explain the Pythagorean Theorem.
- .8 Solve practical problems involving proportions, the Pythagorean Theorem, and ¹

8:7 Statistics:

- .1 Present data as a scatter plot, stem & leaf, circle graph, line graph, histogram, box & whiskers, and bar graph; make an argument for which graph best represents the data.
- .2 Find a line of best fit or trend line for a given set of data and use it to predict future outcomes.
- .3 Analyze data using patterns or trends and make decisions or defend a conclusion.
- .4 Explain or demonstrate how statistics are used to influence decisions.
- .5 Conduct an experiment or simulation that leads to a generalization or formula.
- .6 Identify rules and formulas, based on multiple experiments and observed outcomes.

8:8 Probability:

- .1 Express the theoretical and experimental probabilities of dependent, independent and multiple (compound) events as a ratio or percent.
- .2 Predict the probability of a dependent event occurring, design an experiment to test the probability, compute the outcome, and compare it to the original prediction.
- .3 Use a variety of strategies to determine the number of possible outcomes.

8:9 Patterns:

- .1 Identify and explain a classic pattern (e.g. Pascal's Triangle, Fibonacci Numbers, Pythagorean Triples, etc.).
- .2 Translate an arithmetic or geometric pattern into a rule.
- .3 Find a rule from a sequential pattern and translate it into symbolic form to determine the nth term.
- .4 Use patterns from tables or graphs to predict an outcome.
- .5 Use patterns as a strategy for solving problems.
- .6 Find a missing item in an arithmetic and geometric sequence, with and without a calculator, and predict the graph of each function.
- .7 Use tables of ordered pairs, graphs on coordinate planes, and linear equations as tools to represent and analyze patterns.

8:10 Algebra:

- .1 Translate word problems into numerical expression, inequalities, or equations.
- .2 Write word problems from symbolic statements.
- .3 Solve and graph two-step equations and inequalities.
- .4 Graph the equation of a line that is in slope/intercept form.
- .5 Identify slopes as positive, negative, zero, or undefined.
- .6 Combine like terms to simplify expressions.
- .7 Use order of operations including grouping symbols and exponents to solve problems.
- .8 Use the commutative, associative, and distributive and properties of 0 and 1 to solve two-step equations and check the solutions.
- .9 Represent a linear function as a table and a graph.

8:11 Problem Solving:

.1 Evaluate, interpret, and justify solutions to problems.

8:12 Communication:

.1 Explain and use a variety of problem solving strategies.

.2 Represent a problem numerically, graphically, symbolically, and translate between these alternative representations.

.3 Use math vocabulary, symbols, and notations to explain, justify, and defend mathematical ideas.

8:13 Reasoning:

.1 Recognize and apply deductive and inductive reasoning in both concrete and abstract contexts.

8:14 Connections:

.1 Use mathematical ideas from one area of mathematics to explain an idea from another area of mathematics (e.g., algebra to geometry).

.2 Translate between various representations of equivalent representations.