

Achievement Level Descriptors (ALDs)

Mathematics

Grade 9

# Achievement Level Descriptors (ALDs) Mathematics Grade 9

The achievement level descriptors describe what a typical student scoring at each achievement level can do. A student who scores at a level would be expected to also be able to demonstrate the skills described in previous levels. A student would not necessarily demonstrate all the skills listed at a particular achievement level on a particular test in order to score at that level.

## Achievement Level Definitions

**Far Below Proficient** - Student may partially meet the standards but has significant gaps in knowledge and skills of current grade-level content.

**Below Proficient** - Student partially meets the standards and may have gaps in knowledge and skills but is capable of most grade-level content.

**Proficient** - Student meets the standards at a proficient level, demonstrating knowledge and skills of current grade-level content.

**Advanced** - Student meets the standards at an advanced level, demonstrating knowledge and skills of complex grade-level content.

## Number and Quantity—The Real Number System

| Alaska Standard | **Far Below Proficient** | **Below Proficient** | **Proficient** | **Advanced** |
| --- | --- | --- | --- | --- |
| N.RN.1 – N.RN.3 | A student at this level identifies rational and irrational numbers. | A student at this level determines whether the sums or products of rational and irrational numbers are rational or irrational.  A student at this level translates between simple expressions written with radicals and rational exponents. | A student at this level determines whether the sums and products of rational and irrational numbers are rational or irrational.  A student at this level uses the properties of exponents to rewrite expressions containing radicals and rational exponents. | A student at this level interprets and understands the properties of rational and irrational numbers. |

## Number and Quantity - Quantities

| Alaska Standard | **Far Below Proficient** | **Below Proficient** | **Proficient** | **Advanced** |
| --- | --- | --- | --- | --- |
| N.Q.1 – N.Q.3 | A student at this level uses units consistently in formulas. | A student at this level chooses a unit scale appropriate to a graphical display. | A student at this level chooses the quantities, units, and level of accuracy appropriate for a problem situation. | A student at this level explains how units can be used to guide the solution to multistep problems. |

## Algebra – Seeing Structure in Expressions

| Alaska Standard | **Far Below Proficient** | **Below Proficient** | **Proficient** | **Advanced** |
| --- | --- | --- | --- | --- |
| A.SSE.1 – A.SSE.3 | A student at this level identifies terms, factors, variables, and coefficients in a linear expression.  A student at this level uses the distributive property to factor common factors out of a linear expression. | A student at this level identifies the coefficient as a constant rate of change in a linear expression.  A student at this level identifies the equivalent forms of a given linear, quadratic, or exponential expression based on the structure of the expression. | A student at this level identifies how a given problem can be written as a complicated expression.  A student at this level determines equivalent forms of a given quadratic or exponential expression to reveal a property of the expression. | A student at this level explains how portions of a complicated expression relate to a given context.  A student at this level interprets a complex quadratic or exponential expression by viewing one or more parts as a single entity. |

## Algebra – Arithmetic with Polynomials and Rational Expressions

| Alaska Standard | **Far Below Proficient** | **Below Proficient** | **Proficient** | **Advanced** |
| --- | --- | --- | --- | --- |
| A.APR1 – A.APR.3 | A student at this level identifies a polynomial.  A student at this level identifies the zeros of a quadratic equation given a graph of the quadratic equation. | A student at this level adds, subtracts, or multiplies polynomials.  A student at this level sketches a graph of a quadratic equation given the zeros of the quadratic equation. | A student at this level adds, subtracts, and multiplies polynomials.  A student at this level determines the zeros of a quadratic equation and uses the zeros to sketch a graph of the quadratic equation. | A student at this level understands that polynomials are closed under addition, subtraction, and multiplication.  A student at this level interprets the relationships among factors, graphs, and zeros of quadratic equations. |

## Algebra – Creating Equations and Inequalities

| Alaska Standard | **Far Below Proficient** | **Below Proficient** | **Proficient** | **Advanced** |
| --- | --- | --- | --- | --- |
| A.CED.1 – A.CED.4 | A student at this level solves problems by using linear equations in one variable.  A student at this level identifies the graphs of equations.  A student at this level identifies linear equations that describe a given problem situation. | A student at this level solves problems by using linear equations or inequalities in one variable.  A student at this level graphs equations in two variables.  A student at this level identifies equations or inequalities that describe a given problem situation.  A student at this level calculates a rewritten formula for specified values of the variables. | A student at this level solves problems by using linear, quadratic, or exponential equations or inequalities in one variable.  A student at this level writes and graphs equations that represent relationships between two quantities.  A student at this level writes or identifies a system of equations or inequalities to describe a given problem situation.  A student at this level identifies the rewritten form of a formula to highlight a variable of interest. | A student at this level interprets solutions to linear, quadratic, or exponential equations or inequalities based on the context of the problem.  A student at this level interprets graphs and equations in two-variables in a problem-solving situation.  A student at this level interprets problem solutions as viable or nonviable in a modeling context.  A student at this level determines from a context a variable of interest and rewrites a linear formula to solve the problem. |

## Algebra – Reasoning with Equations and Inequalities

| Alaska Standard | **Far Below Proficient** | **Below Proficient** | **Proficient** | **Advanced** |
| --- | --- | --- | --- | --- |
| A.REI.1 – A.REI.12 | A student at this level solves linear equations in one variable.  A student at this level adds and subtracts linear expressions.  A student at this level solves the quadratic equation *x*2 = *c* by inspection. | A student at this level solves a system of two linear equations graphically.  A student at this level solves linear inequalities in one variable.  A student at this level graphs a linear inequality.  A student at this level identifies the solution of a system of one linear equation and one quadratic equation graphically.  A student at this level solves a quadratic equation by inspection, by factoring, or by using the quadratic formula. | A student at this level solves a system of two linear equations algebraically.  A student at this level solves a system of two linear inequalities graphically.  A student at this level understands and explains how graphs relate to the solution to a linear equation or inequality.  A student at this level solves a system of one linear equation and one quadratic equation graphically.  A student at this level solves a quadratic equation by inspection, by factoring, and by using the quadratic formula. | A student at this level justifies solutions steps in solving an equation by referencing mathematical properties.  A student at this level understands and explains how graphs relate to the solution to a linear equation or inequality.  A student at this level understands and explains how graphs relate to the solution to a system of linear equations and inequalities.  A student at this level solves a system of one linear equation and one quadratic equation algebraically.  A student at this level rewrites a quadratic equation in the form  (*x* – *p*)2 = *q*. |

## Functions – Interpreting Functions

| Alaska Standard | **Far Below Proficient** | **Below Proficient** | **Proficient** | **Advanced** |
| --- | --- | --- | --- | --- |
| F.IF.1 – F.IF.9 | A student at this level identifies independent variables of a function.  A student as this level uses function notation to represent a function.  A student at this level identifies equivalent forms of a given linear or quadratic function. | A student at this level understands a function as including a domain and a range.  A student at this level evaluates functions (including sequences) for a given input.  A student at this level identifies equivalent forms of a given linear, quadratic, or exponential function.  A student at this level identifies key features of the graphical representations of functions. | A student at this level understands a function as a specific type of mapping from a domain onto a range.  A student at this level uses functions and sequence notation and evaluates functions and sequences for a given input.  A student at this level writes equivalent forms of a given quadratic or exponential function.  A student at this level compares properties or key features of two functions represented in the same way.  A student at this level interprets key features of the graphical representations of functions. | A student at this level places limits on a domain or range of a linear function based on context.  A student at this level uses function and sequence notation, evaluates functions and sequences for a given input, and interprets functions and sequence notation in terms of a context.  A student at this level interprets an exponential function’s properties by applying properties of exponents or rewriting the function.  A student at this level compares properties of two functions represented in different ways.  A student at this level graphs functions and analyzes key features of graphs and tables that represent functions. |

## Functions – Building Functions

| Alaska Standard | **Far Below Proficient** | **Below Proficient** | **Proficient** | **Advanced** |
| --- | --- | --- | --- | --- |
| F.BF.1a – F.BF.4a | A student at this level identifies a linear equation from a context.  A student at this level distinguishes between an equation and a sequence. | A student at this level adds and subtracts linear and exponential functions.  A student at this level writes linear function for a given context.  A student at this level identifies a sequence as either arithmetic or geometric. | A student at this level adds, subtracts, multiplies, or divides linear, quadratic, and exponential functions.  A student at this level writes a given arithmetic or geometric sequence as an equation.  A student at this level identifies the effects on a graph of *f*(*x*) + *k* and *f*(*x* + *k*).  A student at this level finds the inverse of a given linear function. | A student at this level combines functions to solve a problem where the needed combination must be inferred from a context.  A student at this level translates between different explicit and recursive formulas representing the same arithmetic or geometric sequence.  A student at this level identifies the effects on a graph of *kf*(*x*) and *f*(*kx*).  A student at this level finds the inverse of a given nonlinear function. |

## Functions – Linear, Quadratic, and Exponential Models

| Alaska Standard | **Far Below Proficient** | **Below Proficient** | **Proficient** | **Advanced** |
| --- | --- | --- | --- | --- |
| F.LE.1 – F.LE.5 | A student at this level identifies linear functions given a description of the numerical relationship. | A student at this level identifies the constant difference for a given linear functional relationship or the constant growth factor (ratio) for a given exponential functional relationship.  A student at this level constructs linear functions given a description of the numerical relationship. | A student at this level identifies contexts that can be represented with linear or exponential functions including observing that exponential functions eventually exceed linear and quadratic functions.  A student at this level constructs linear or exponential functions given a description of the numerical relationship.  A student at this level interprets the parameters of a linear or exponential function in terms of a context. | A student at this level analyzes contexts that can be described with linear or exponential functions including analyzing the end behavior of the functions.  A student at this level interprets the parameters of a linear, quadratic, or exponential function in terms of a context. |

## Statistics and Probability – Interpreting Categorical and Quantitative Data

| Alaska Standard | **Far Below Proficient** | **Below Proficient** | **Proficient** | **Advanced** |
| --- | --- | --- | --- | --- |
| S.ID.1 – S.ID.9 | A student at this level represents data with dot plots.  A student at this level identifies the center or spread of a data set.  A student at this level identifies relevant data in two-way frequency tables.  A student at this level identifies relevant data on scatter plots.  A student at this level identifies the intercept of a linear model. | A student at this level represents data with dot plots, histograms, or box plots.  A student at this level compares the center or spread of two or more data sets.  A student at this level identifies differences in the distributions of data sets.  A student at this level summarizes two-variable data by using two-way frequency table.  A student at this level represents two-variable data with scatter plots.  A student at this level identifies the slope or intercept of a linear model. | A student at this level represent data with dot plots, histograms, and box plots.  A student at this level compares the center and spread of two or more data sets.  A student at this level interprets differences in the distributions of data sets based on context.  A student at this level summarizes and interprets two-variable data by using two-way frequency tables.  A student at this level represents two-variable data with scatter plots and describes how the variables are related.  A student at this level interprets the slope and intercept of a linear model based on context.  A student at this level interprets the correlation coefficient of a linear fit.  A student at this level distinguishes correlation and causation. | A student at this level represents and interprets data with dot plots, histograms, and box plots.  A student at this level interprets and analyzes differences in the distributions of data sets based on context.  A student at this level represents and interprets two-variable data with scatter plots and describes how the variables are related.  A student at this level interprets and analyzes elements of linear models, including slope, intercept, correlation, and causation. |