

Missouri Mathematics

Algebra 1 - Expanded

Seeing Structure in Expressions **SSE**

A Interpret and use structure **SSE.A**

- 1** Interpret the contextual meaning of individual terms or factors from a given problem that utilizes formulas or expressions. **SSE.A.1**
 - a** interpret the contextual meaning of individual terms from a given problem that utilizes formulas **SSE.A.1.A**
 - b** interpret the contextual meaning of individual factors from a given problem that utilizes formulas **SSE.A.1.B**
 - c** interpret the contextual meaning of individual terms from a given problem that utilizes expressions **SSE.A.1.C**
 - d** interpret the contextual meaning of individual factors from a given problem that utilizes expressions **SSE.A.1.D**
 - e** interpret the meaning of individual terms based on the mathematics structures of a given problem that utilizes formulas **SSE.A.1.E**
 - f** interpret the meaning of individual factors based on the mathematics structures of a given problem that utilizes formulas **SSE.A.1.F**
 - g** interpret the meaning of individual terms based on the mathematics structures of a given problem that utilizes expressions **SSE.A.1.G**
 - h** interpret the meaning of individual factors based on the mathematics structures of a given problem that utilizes expressions **SSE.A.1.H**
- 2** Analyze the structure of polynomials to create equivalent expressions or equations. **SSE.A.2**
 - a** identify a polynomial **SSE.A.2.A**
 - b** analyze the structures of polynomials **SSE.A.2.B**
 - c** factor a polynomial expression **SSE.A.2.C**
 - d** factor a polynomial equation **SSE.A.2.D**
 - e** analyze the structure of polynomials to determine an appropriate method for decomposing and composing to create equivalent expressions **SSE.A.2.E**
 - f** analyze the structure of polynomials to determine an appropriate method for decomposing and composing to create equivalent equations **SSE.A.2.F**
- 3** Choose and produce equivalent forms of a quadratic expression or equations to reveal and explain properties. **SSE.A.3**
 - a** identify a quadratic expression **SSE.A.3.A**
 - b** identify a quadratic equation **SSE.A.3.B**
 - c** choose equivalent forms of a quadratic expression to reveal properties **SSE.A.3.C**
 - d** choose equivalent forms of a quadratic expression to explain properties **SSE.A.3.D**
 - e** choose equivalent forms of a quadratic equation to reveal properties **SSE.A.3.E**

- f** choose equivalent forms of a quadratic equation to explain properties **SSE.A.3.F**
 - g** produce equivalent forms of a quadratic expression to reveal properties **SSE.A.3.G**
 - h** produce equivalent forms of a quadratic expression to explain properties **SSE.A.3.H**
 - i** produce equivalent forms of a quadratic equation to reveal properties **SSE.A.3.I**
 - j** produce equivalent forms of a quadratic equation to explain properties **SSE.A.3.J**
 - k** factor a quadratic function **SSE.A.3.K**
 - l** find the zeros of a quadratic function by rewriting it in factored form **SSE.A.3.L**
 - m** find the maximum value of a quadratic function by completing the square **SSE.A.3.M**
 - n** find the minimum value of a quadratic function by completing the square **SSE.A.3.N**
 - o** understand that the vertex of an equation in the form $y=a(x-h)^2 + k$ is (h,k) . **SSE.A.3.O**
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A Create equations that describe linear, quadratic and exponential relationships. CED.A

- 1 Create equations and inequalities in one variable and use them to model and/or solve problems. CED.A.1
 - a create linear equations in one variable CED.A.1.A
 - b create linear inequalities in one variable CED.A.1.B
 - c use linear equations in one variable to model problems CED.A.1.C
 - d use linear equations in one variable to solve problems CED.A.1.D
 - e use linear inequalities in one variable to model problems CED.A.1.E
 - f use linear inequalities in one variable to solve problems CED.A.1.F
 - g create quadratic equations in one variable CED.A.1.G
 - h use quadratic equations in one variable to model problems CED.A.1.H
 - i use quadratic equations in one variable to solve problems CED.A.1.I
 - j create exponential equations in one variable CED.A.1.J
 - k use exponential equations in one variable to model problems CED.A.1.K
 - l use exponential equations in one variable to solve problems CED.A.1.L
- 2 Create and graph linear, quadratic and exponential equations in two variables. CED.A.2
 - a create linear equations in two variables CED.A.2.A
 - b create quadratic equations in two variables CED.A.2.B
 - c create exponential equations in two variables CED.A.2.C
 - d graph linear equations in two variables with labels and scales CED.A.2.D
 - e graph quadratic equations in two variables with labels and scales CED.A.2.E
 - f graph exponential equations in two variables with labels and scales CED.A.2.F
- 3 Represent constraints by equations or inequalities and by systems of equations or inequalities, and interpret the data points as a solution or non-solution in a modeling context. CED.A.3
 - a identify a system of equations CED.A.3.A
 - b identify a system of inequalities CED.A.3.B
 - c identify a system of mixed equations and inequalities CED.A.3.C
 - d represent constraints by equations CED.A.3.D
 - e represent constraints by inequalities CED.A.3.E
 - f represent constraints by systems of equations CED.A.3.F
 - g represent constraints by systems of inequalities CED.A.3.G
 - h interpret data points as a solution to an equation in a modeling context CED.A.3.H

- i** interpret data points as a solution to an inequality in a modeling context **CED.A.3.I**
 - j** interpret data points as a solution to a system of equations in a modeling context **CED.A.3.J**
 - k** interpret data points as a solution to a system of inequalities in a modeling context **CED.A.3.K**
 - l** interpret data points as a non-solution to an equation in a modeling context **CED.A.3.L**
 - m** interpret data points as a non-solution to an inequality in a modeling context **CED.A.3.M**
 - n** interpret data points as a non-solution to a system of equations in a modeling context **CED.A.3.N**
 - o** interpret data points as a non-solution to a system of inequalities in a modeling context **CED.A.3.O**
 - 4** Solve literal equations and formulas for a specified variable that highlights a quantity of interest. **CED.A.4**
 - a** solve literal equations for a specified variable **CED.A.4.A**
 - b** solve literal formulas for a specified variable **CED.A.4.B**
 - c** in literal equations, determine which variable highlights a quantity of interest **CED.A.4.C**
 - d** in literal formulas, determine which variable highlights a quantity of interest **CED.A.4.D**
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Reasoning with Equations and Inequalities **REI**

A Understand solving equations as a process, and solve equations and inequalities in one variable. **REI.A**

- 1** Explain how each step taken when solving an equation or inequality in one variable creates an equivalent equation or inequality that has the same solution(s) as the original. **REI.A.1**
 - a** explain how each step taken when solving an equation in one variable creates an equivalent equation that has the same solution(s) as the original **REI.A.1.A**
 - b** explain how each step taken when solving an inequality in one variable creates an equivalent inequality that has the same solution(s) as the original **REI.A.1.B**
- 2** Solve problems involving quadratic equations. **REI.A.2**
 - a** identify a quadratic equation **REI.A.2.A**
 - b** identify a quadratic expression **REI.A.2.B**
 - c** use the method of completing the square to create an equivalent quadratic equation **REI.A.2.C**
 - d** solve a standard quadratic equation for a certain value using the completing the square method **REI.A.2.D**
 - e** derive the quadratic formula from the standard quadratic equation **REI.A.2.E**
 - f** explain the relationship between the quadratic formula and the standard quadratic equation **REI.A.2.F**
 - g** analyze the factoring method of solving quadratic equations **REI.A.2.G**
 - h** solve quadratic equations using the factoring method **REI.A.2.H**
 - i** analyze the completing the square method of solving quadratic equations **REI.A.2.I**
 - j** solve quadratic equations using the completing the square method **REI.A.2.J**
 - k** analyze the quadratic formula method of solving quadratic equations **REI.A.2.K**
 - l** solve quadratic equations using the quadratic formula method **REI.A.2.L**
 - m** analyze the graphing method of solving quadratic equations **REI.A.2.M**
 - n** solve quadratic equations using the graphing method **REI.A.2.N**
 - o** determine when a quadratic equation has no real solution **REI.A.2.O**
 - p** determine the most efficient way to solve a given quadratic equation **REI.A.2.P**

B Solve systems of equations. REI.B

- 3 Solve a system of linear equations algebraically and/or graphically. REI.B.3
 - a identify a system of linear equations REI.B.3.A
 - b solve a system of linear equations algebraically REI.B.3.B
 - c solve a system of linear equations graphically REI.B.3.C
- 4 Solve a system consisting of a linear equation and a quadratic equation algebraically and/or graphically. REI.B.4
 - a identify a system consisting of a linear equation and a quadratic equation REI.B.4.A
 - b solve a system consisting of a linear equation and a quadratic equation algebraically REI.B.4.B
 - c solve a system consisting of a linear equation and a quadratic equation graphically REI.B.4.C
- 5 Justify that the technique of linear combination produces an equivalent system of equations. REI.B.5
 - a justify that the technique of linear combination produces an equivalent system of equations REI.B.5.A
 - b identify when to use linear combination REI.B.5.B

C Represent and solve linear and exponential equations and inequalities graphically REI.C

- 6 Explain that the graph of an equation in two variables is the set of all its solutions plotted in the Cartesian coordinate plane. REI.C.6
 - a explain that the graph of a linear equation in two variables is the set of all its solutions plotted in the Cartesian coordinate plane REI.C.6.A
 - b explain that the graph of an exponential equation in two variables is the set of all its solutions plotted in the Cartesian coordinate plane REI.C.6.B
 - c explain that any point not on the graph of a linear equation in the Cartesian coordinate plane is not a solution REI.C.6.C
 - d explain that any point not on the graph of an exponential equation in the Cartesian coordinate plane is not a solution REI.C.6.D
 - 7 Graph the solution to a linear inequality in two variables. REI.C.7
 - a find the solution to a linear inequality in two variables REI.C.7.A
 - b graph the solution to a linear inequality in two variables REI.C.7.B
 - 8 Solve problems involving a system of linear inequalities. REI.C.8
 - a identify a system of linear inequalities REI.C.8.A
 - b solve problems involving a system of linear inequalities REI.C.8.B
 - c given a context, interpret the solution to a system of linear inequalities REI.C.8.C
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**Arithmetic with
Polynomials and
Rational
Expressions** APR

A Perform operations on polynomials. APR.A

- 1 Add, subtract and multiply polynomials, and understand that polynomials follow the same general rules of arithmetic and are closed under these operations. APR.A.1
 - a add polynomials APR.A.1.A
 - b subtract polynomials APR.A.1.B
 - c multiply polynomials APR.A.1.C
 - d given a context, determine whether to add, subtract, or multiply polynomials APR.A.1.D
 - e understand that polynomials follow the general rules of arithmetic APR.A.1.E
 - f understand that polynomials are closed under the operation of addition APR.A.1.F
 - g understand that polynomials are closed under the operation of subtraction APR.A.1.G
 - h understand that polynomials are closed under the operation of multiplication APR.A.1.H
 - 2 Divide polynomials by monomials. APR.A.2
 - a divide polynomials by monomials APR.A.2.A
 - b given a context, determine when to divide polynomials by monomials APR.A.2.B
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Interpreting Functions IF

A Understand the concept of a function and use function notation. IF.A

- 1 Understand that a function from one set (domain) to another set (range) assigns to each element of the domain exactly one element of the range. IF.A.1
 - a understand domain IF.A.1.A
 - b understand range IF.A.1.B
 - c understand that a function assigns to each element of the domain exactly one element of the range IF.A.1.C
 - d understand that $f(x)$ denotes the elements of the range of a function f that correspond to the elements of the domain (x) . IF.A.1.D
 - e identify function notation IF.A.1.E
 - f represent a function using function notation IF.A.1.F
 - g understand that the input and output values of a function correspond to (x,y) values on the Cartesian coordinate plane IF.A.1.G
 - h understand that the graph of a function labeled f is the set of all ordered pairs (x, y) that satisfy the equation $y=f(x)$ IF.A.1.H
 - i graph an equation presented using functional notation IF.A.1.I
- 2 Use function notation to evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. IF.A.2
 - a use function notation to evaluate functions for inputs in their domains IF.A.2.A
 - b interpret statements that use function notation in terms of a context IF.A.2.B
 - c interpret statements involving inputs of a function in terms of a context IF.A.2.C
 - d interpret statements involving outputs of a function in terms of context IF.A.2.D
 - e solve problems presented in function notation IF.A.2.E

B Interpret linear, quadratic and exponential functions in terms of the context. IF.B

- 3 Using tables, graphs and verbal descriptions, interpret key characteristics of a function that models the relationship between two quantities. IF.B.3
 - a using tables, interpret key characteristics of a linear function that models the relationship between two quantities IF.B.3.A
 - b using graphs, interpret key characteristics of a linear function that models the relationship between two quantities IF.B.3.B
 - c using verbal descriptions, interpret key characteristics of a linear function that models the relationship between two quantities IF.B.3.C
 - d using tables, interpret key characteristics of a quadratic function that models the relationship between two quantities IF.B.3.D
 - e using graphs, interpret key characteristics of a quadratic function that models the relationship between two quantities IF.B.3.E
 - f using verbal descriptions, interpret key characteristics of a quadratic function that models the relationship between two quantities IF.B.3.F
 - g using tables, interpret key characteristics of an exponential function that models the relationship between two quantities IF.B.3.G
 - h using graphs, interpret key characteristics of an exponential function that models the relationship between two quantities IF.B.3.H
 - i using verbal descriptions, interpret key characteristics of an exponential function that models the relationship between two quantities IF.B.3.I
- 4 Relate the domain and range of a function to its graph and, where applicable, to the quantitative relationship it describes. IF.B.4
 - a relate the domain of a linear function to its graph IF.B.4.A
 - b relate the range of a linear function to its graph IF.B.4.B
 - c describe how, within the context of a situation, the domain and range of a linear function affect the characteristics of the graph of the function IF.B.4.C
 - d relate the domain of a quadratic function to its graph IF.B.4.D
 - e relate the range of a quadratic function to its graph IF.B.4.E
 - f describe how, within the context of a situation, the domain and range of a quadratic function affect the characteristics of the graph of the function IF.B.4.F
 - g relate the domain of an exponential function to its graph IF.B.4.G
 - h relate the range of an exponential function to its graph IF.B.4.H
 - i describe how, within the context of a situation, the domain and range of an exponential function affect the characteristics of the graph of the function IF.B.4.I
- 5 Determine the average rate of change of a function over a specified interval and interpret the meaning. IF.B.5

- a determine the average rate of change of a linear function over a specified interval **IF.B.5.A**
 - b interpret the meaning of the average rate of change of a linear function over a specified interval in a given context **IF.B.5.B**
 - c determine the average rate of change of a quadratic function over a specified interval **IF.B.5.C**
 - d interpret the meaning of the average rate of change of a quadratic function over a specified interval in a given context **IF.B.5.D**
 - e determine the average rate of change of an exponential function over a specified interval **IF.B.5.E**
 - f interpret the meaning of the average rate of change of an exponential function over a specified interval in a given context **IF.B.5.F**
- 6** Interpret the parameters of a linear or exponential function in terms of the context. **IF.B.6**
- a identify the parameters of a linear function **IF.B.6.A**
 - b identify the parameters of an exponential function **IF.B.6.B**
 - c interpret the parameters of a linear function in terms of the context **IF.B.6.C**
 - d interpret the parameters of an exponential function in terms of the context **IF.B.6.D**

C Analyze linear, quadratic and exponential functions using different representations. IF.C

- 7 Graph functions expressed symbolically and identify and interpret key features of the graph. IF.C.7
- a by hand, graph linear equations expressed symbolically IF.C.7.A
 - b by hand, identify key features of the graph of a linear function IF.C.7.B
 - c by hand, interpret key features of the graph of a linear function IF.C.7.C
 - d by hand, graph quadratic equations expressed symbolically IF.C.7.D
 - e by hand, identify key features of the graph of a quadratic function IF.C.7.E
 - f by hand, interpret key features of the graph of a quadratic function IF.C.7.F
 - g by hand, graph exponential equations expressed symbolically IF.C.7.G
 - h by hand, identify key features of the graph of an exponential function IF.C.7.H
 - i by hand, interpret key features of the graph of an exponential function IF.C.7.I
 - j by hand, graph simple piecewise functions expressed symbolically IF.C.7.J
 - k by hand, identify key features of the graph of a simple piecewise function IF.C.7.K
 - l by hand, interpret key features of the graph of a simple piecewise function IF.C.7.L
 - m using technology, graph linear equations expressed symbolically IF.C.7.M
 - n using technology, identify key features of the graph of a linear function IF.C.7.N
 - o using technology, interpret key features of the graph of a linear function IF.C.7.O
 - p using technology, graph quadratic equations expressed symbolically IF.C.7.P
 - q using technology, identify key features of the graph of a quadratic function IF.C.7.Q
 - r using technology, interpret key features of the graph of a quadratic function IF.C.7.R
 - s using technology, graph exponential equations expressed symbolically IF.C.7.S
 - t using technology, identify key features of the graph of an exponential function IF.C.7.T
 - u using technology, interpret key features of the graph of an exponential function IF.C.7.U
 - v using technology, graph simple piecewise functions expressed symbolically IF.C.7.V
 - w using technology, identify key features of the graph of a simple piecewise function IF.C.7.W

- x using technology, interpret key features of the graph of a simple piecewise function IF.C.7.X
- 8 Translate between different but equivalent forms of a function to reveal and explain properties of the function and interpret these in terms of a context. IF.C.8
- a translate between different but equivalent forms of a linear function IF.C.8.A
 - b use equivalent forms of a linear function to reveal properties of the function IF.C.8.B
 - c use equivalent forms of a linear function to explain properties of the function IF.C.8.C
 - d interpret different but equivalent forms of a linear function in terms of a context IF.C.8.D
 - e translate between different but equivalent forms of a quadratic function IF.C.8.E
 - f use equivalent forms of a quadratic function to reveal properties of the function IF.C.8.F
 - g use equivalent forms of a quadratic function to explain properties of the function IF.C.8.G
 - h interpret different but equivalent forms of a quadratic function in terms of a context IF.C.8.H
 - i translate between different but equivalent forms of an exponential function IF.C.8.I
 - j use equivalent forms of an exponential function to reveal properties of the function IF.C.8.J
 - k use equivalent forms of an exponential function to explain properties of the function IF.C.8.K
 - l interpret different but equivalent of an exponential function in terms of a context IF.C.8.L
- 9 Compare the properties of two functions given different representations. IF.C.9
- a compare the properties of two linear functions given different representations IF.C.9.A
 - b compare the properties of two quadratic functions given different representations IF.C.9.B
 - c compare the properties of two exponential functions given different representations IF.C.9.C
 - d possible representations IF.C.9.D
 - i function table IF.C.9.D.I
 - ii graph IF.C.9.D.II
 - iii equations in various forms IF.C.9.D.III
 - e possible properties of linear functions IF.C.9.E

- i graph is a straight line IF.C.9.E.I
 - ii graph is not vertical IF.C.9.E.II
 - iii variables are raised to the 1st power IF.C.9.E.III
 - iv rate of change is constant IF.C.9.E.IV
 - f possible properties of quadratic functions IF.C.9.F
 - i graph is a parabola IF.C.9.F.I
 - ii parabola opens up if coefficient $a > 0$ IF.C.9.F.II
 - iii parabola opens down if coefficient $a < 0$ IF.C.9.F.III
 - iv coefficient a cannot be 0 IF.C.9.F.IV
 - v coefficients a , b , and c are real numbers IF.C.9.F.V
 - vi the discriminant is $b^2 - 4ac$ IF.C.9.F.VI
 - vii variable is raised to the 2nd power IF.C.9.F.VII
 - g possible properties of exponential functions IF.C.9.G
 - i graph crosses the y-axis at $(0,1)$ IF.C.9.G.I
 - ii when $b > 1$, the graph increases IF.C.9.G.II
 - iii when $0 < b < 1$, the graph decreases IF.C.9.G.III
 - iv the domain is all real numbers IF.C.9.G.IV
 - v the range is all positive real numbers IF.C.9.G.V
 - vi graph is asymptotic to the x-axis IF.C.9.G.VI
 - h compare the properties of a linear and a quadratic function given different representations IF.IC.9.H
 - i compare the properties of a quadratic and an exponential function given different representations IF.C.9.I
 - j compare the properties of a linear and an exponential function given different representations IF.C.9.J
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Building Functions **BF**

A Build new functions from existing functions (limited to linear, quadratic and exponential). **BF.A**

- 1** Analyze the effect of translations and scale changes on functions. **BF.A.1**
 - a** analyze the effect of translations on linear functions **BF.A.1.A**
 - b** analyze the effect of translations on quadratic functions **BF.A.1.B**
 - c** analyze the effect of translations on exponential functions **BF.A.1.C**
 - d** analyze the effect of scale changes on linear functions **BF.A.1.D**
 - e** analyze the effect of scale changes on quadratic functions **BF.A.1.E**
 - f** analyze the effect of scale changes on exponential functions **BF.A.1.F**
 - g** find the specific value of change (k) given before and after graphs of a translation **BF.A.1.G**
 - h** find the specific value of change (k) given before and after graphs of a scale change **BF.A.1.H**
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Linear, Quadratic, and Exponential Models LQE

A Construct and compare linear, quadratic and exponential models and solve problems. LQE.A

- 1 Distinguish between situations that can be modeled with linear or exponential functions. LQE.A.1
 - a determine that linear functions change by equal differences over equal intervals LQE.A.1.A
 - b identify situations that can be modeled with linear functions LQE.A.1.B
 - c determine that exponential functions change by equal factors over equal intervals LQE.A.1.C
 - d determine that situations in which a quantity grows by a constant percent rate per unit interval are exponential functions LQE.A.1.D
 - e determine that situations in which a quantity decays by a constant percent rate per unit interval are exponential functions LQE.A.1.E
 - f identify situations that can be modeled with exponential functions LQE.A.1.F
 - g distinguish between situations that can be modeled with linear or exponential functions LQE.A.1.G
- 2 Describe, using graphs and tables, that a quantity increasing exponentially eventually exceeds a quantity increasing linearly or quadratically. LQE.A.2
 - a using a graph, describe that a quantity increasing exponentially eventually exceeds a quantity increasing linearly LQE.A.2.A
 - b using a graph, describe that a quantity increasing exponentially eventually exceeds a quantity increasing quadratically LQE.A.2.B
 - c using a table, describe that a quantity increasing exponentially eventually exceeds a quantity increasing linearly LQE.A.2.C
 - d using a table, describe that a quantity increasing exponentially eventually exceeds a quantity increasing quadratically LQE.A.2.D
- 3 Construct linear, quadratic and exponential equations given graphs, verbal descriptions or tables. LQE.A.3
 - a construct a linear equation given a graph LQE.A.3.A
 - b construct a linear equation given a verbal description LQE.A.3.B
 - c construct a linear equation given a table LQE.A.3.C
 - d construct a quadratic equation given a graph LQE.A.3.D
 - e construct a quadratic equation given a verbal description LQE.A.3.E
 - f construct a quadratic equation given a table LQE.A.3.F
 - g construct an exponential equation given a graph LQE.A.3.G
 - h construct an exponential equation given a verbal description LQE.A.3.H
 - i construct an exponential equation given a table LQE.A.3.I
 - j given a graph, determine whether to construct a linear, quadratic, or exponential equation LQE.A.3.J

- k given a verbal description, determine whether to construct a linear, quadratic, or exponential equation **LQE.A.3.K**
- l given a table, determine whether to construct a linear, quadratic, or exponential equation **LQE.A.3.L**

B Use arithmetic and geometric sequences. LQE.B

- 4 Write arithmetic and geometric sequences in recursive and explicit forms, and use them to model situations and translate between the two forms. LQE.B.4
 - a determine whether a sequence is arithmetic or geometric LQE.B.4.A
 - b use arithmetic sequences in recursive form LQE.B.4.B
 - c use arithmetic sequences in explicit form LQE.B.4.C
 - d connect arithmetic sequences to linear functions LQE.B.4.D
 - e use geometric sequences in recursive form LQE.B.4.E
 - f use geometric sequences in explicit form LQE.B.4.F
 - g connect geometric sequences to exponential functions LQE.B.4.G
 - h write recursive form of an arithmetic sequence to model a situation given graphically LQE.B.4.H
 - i write recursive form of an arithmetic sequence to model a situation given by verbal description LQE.B.4.I
 - j write recursive form of an arithmetic sequence to model a situation given in a table LQE.B.4.J
 - k write explicit form of an arithmetic sequence to model a situation given graphically LQE.B.4.K
 - l write explicit form of an arithmetic sequence to model a situation given by verbal description LQE.B.4.L
 - m write explicit form of an arithmetic sequence to model a situation given in a table LQE.B.4.M
 - n write recursive form of a geometric sequence to model a situation given graphically LQE.B.4.N
 - o write recursive form of a geometric sequence to model a situation given by verbal description LQE.B.4.O
 - p write recursive form of a geometric sequence to model a situation given in a table LQE.B.4.P
 - q write explicit form of a geometric sequence to model a situation given graphically LQE.B.4.Q
 - r write explicit form of a geometric sequence to model a situation given by verbal description LQE.B.4.R
 - s write explicit form of a geometric sequence to model a situation given in a table LQE.B.4.S
 - t translate between recursive and explicit forms of arithmetic sequences LQE.B.4.T
 - u translate between recursive and explicit forms of geometric sequences LQE.B.4.U
 - v model situations with arithmetic sequences LQE.B.4.V

- i recognize LQE.B.4.V.I
 - ii generate LQE.B.4.V.II
 - w model situations with geometric sequences LQE.B.4.W
 - i recognize LQE.B.4.W.I
 - ii generate LQE.B.4.W.II
 - 5 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the set of integers. LQE.B.5
 - a recognize that arithmetic sequences are functions LQE.B.5.A
 - b recognize that arithmetic sequences are sometimes defined recursively LQE.B.5.B
 - c recognize that the domain of an arithmetic sequence is a subset of the set of integers LQE.B.5.C
 - d recognize that geometric sequences are functions LQE.B.5.D
 - e recognize that geometric sequences are sometimes defined recursively LQE.B.5.E
 - f recognize that the domain of a geometric sequence is a subset of the set of integers LQE.B.5.F
 - 6 Find the terms of sequences given an explicit or recursive formula. LQE.B.6
 - a find the terms of an arithmetic sequence given an explicit formula LQE.B.6.A
 - b find the terms of an arithmetic sequence given a recursive formula LQE.B.6.B
 - c find the terms of a geometric sequence given an explicit formula LQE.B.6.C
 - d find the terms of a geometric sequence given a recursive formula LQE.B.6.D
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Number and Quantity **NQ**

A Extend and use properties of rational exponents. **NQ.A**

- 1** Explain how the meaning of rational exponents extends from the properties of integer exponents. **NQ.A.1**
 - a** explain the meaning of rational exponents **NQ.A.1.A**
 - b** identify the properties of integer exponents **NQ.A.1.B**
 - i** product of powers property **NQ.A.1.B.I**
 - ii** power of a power property **NQ.A.1.B.II**
 - iii** power of a product property **NQ.A.1.B.III**
 - iv** quotient of powers property **NQ.A.1.B.IV**
 - v** power of a quotient property **NQ.A.1.B.V**
 - vi** zero power property **NQ.A.1.B.VI**
 - vii** negative power property **NQ.A.1.B.VII**
 - c** explain how the meaning of rational exponents extends from the properties of integer exponents **NQ.A.1.C**
- 2** Rewrite expressions involving radicals and rational exponents using the properties of exponents. Limit to rational exponents with a numerator of 1. **NQ.A.2**
 - a** identify the properties of exponents **NQ.A.2.A**
 - b** rewrite expressions involving radicals using the properties of exponents **NQ.A.2.B**
 - c** rewrite expressions involving rational exponents (limit to a numerator of 1) using the properties of exponents **NQ.A.2.C**

B Use units to solve problems. NQ.B

- 3 Use units of measure as a way to understand and solve problems involving quantities. NQ.B.3
- a use units of measure as a way to understand problems involving quantities NQ.B.3.A
 - b use units of measure as a way to solve problems involving quantities NQ.B.3.B
 - c identify appropriate units of measure within a problem NQ.B.3.C
 - d label appropriate units of measure within a problem NQ.B.3.D
 - e use appropriate units of measure within a problem NQ.B.3.E
 - f convert units NQ.B.3.F
 - g convert rates NQ.B.3.G
 - h use units with problems NQ.B.3.H
 - i choose a scale in a graph NQ.B.3.I
 - j interpret the scale in a graph NQ.B.3.J
 - k choose an origin in a graph NQ.B.3.K
 - l interpret an origin in a graph NQ.B.3.L
 - m choose a scale in a data display NQ.B.3.M
 - n interpret the scale in a data display NQ.B.3.N
 - o choose an origin in a data display NQ.B.3.O
 - p interpret an origin in a data display NQ.B.3.P
- 4 Define and use appropriate quantities for representing a given context or problem. NQ.B.4
- a define appropriate quantities for representing a given context NQ.B.4.A
 - b define appropriate quantities for representing a given problem NQ.B.4.B
 - c use appropriate quantities for representing a given context NQ.B.4.C
 - d use appropriate quantities for representing a given problem NQ.B.4.D
- 5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. NQ.B.5
- a choose a level of accuracy appropriate to limitations on measurement when reporting quantities NQ.B.5.A
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Data and Statistical Analysis DS

A Summarize, represent and interpret data. DS.A

- 1 Analyze and interpret graphical displays of data. DS.A.1
 - a analyze a dot plot DS.A.1.A
 - b interpret a dot plot DS.A.1.B
 - c analyze a histogram DS.A.1.C
 - d interpret a histogram DS.A.1.D
 - e analyze a box plot DS.A.1.E
 - f interpret a box plot DS.A.1.F
- 2 Use statistics appropriate to the shape of the data distribution to compare center and spread of two or more different data sets. DS.A.2
 - a determine statistics appropriate to the shape of a data distribution DS.A.2.A
 - b use statistics appropriate to the shape of a data distribution to compare median of two or more different data sets DS.A.2.B
 - c use statistics appropriate to the shape of a data distribution to compare mean of two or more different data sets DS.A.2.C
 - d use statistics appropriate to the shape of a data distribution to compare mode of two or more different data sets DS.A.2.D
 - e use statistics appropriate to the shape of a data distribution to compare interquartile range of two or more different data sets DS.A.2.E
 - f use statistics appropriate to the shape of a data distribution to compare standard deviation of two or more different data sets DS.A.2.F
 - g calculate statistics appropriate to the shape of a data distribution to compare standard deviation of two or more different data sets DS.A.2.G
- 3 Interpret differences in shape, center and spreads in the context of the data sets, accounting for possible effects of outliers. DS.A.3
 - a identify differences in shape of up to three data sets DS.A.3.A
 - b identify differences in center of up to three data sets DS.A.3.B
 - c identify differences in spreads of up to three data sets DS.A.3.C
 - d interpret differences in shape in the context of the data sets, accounting for possible effects of outliers DS.A.3.D
 - e interpret differences in center in the context of the data sets, accounting for possible effects of outliers DS.A.3.E
 - f interpret differences in spreads in the context of the data sets, accounting for possible effects of outliers DS.A.3.F
- 4 Summarize data in two-way frequency tables. DS.A.4
 - a identify frequencies in the data in two-way frequency tables DS.A.4.A
 - b interpret relative frequencies in the context of the data in a two-way frequency table DS.A.4.B

- c recognize possible associations in the data in a two-way frequency table [DS.A.4.C](#)
 - d recognize possible trends in the data in a two-way frequency table [DS.A.4.D](#)
- 5 Construct a scatter plot of bivariate quantitative data describing how the variables are related; determine and use a function that models the relationship. [DS.A.5](#)
 - a construct a scatter plot of bivariate quantitative data [DS.A.5.A](#)
 - b use the scatter plot to determine the type of function that models the relationship [DS.A.5.B](#)
 - c construct a linear function to model bivariate data on a scatter plot [DS.A.5.C](#)
 - i minimize residuals using calculation [DS.A.5.C.I](#)
 - ii minimize residuals using technology [DS.A.5.C.II](#)
 - d construct an exponential function to model bivariate data on a scatter plot [DS.A.5.D](#)
 - i minimize residuals using calculation [DS.A.5.D.I](#)
 - ii minimize residuals using technology [DS.A.5.D.II](#)
- 6 Interpret the slope (rate of change) and the y-intercept (constant term) of a linear model in the context of the data. [DS.A.6](#)
 - a identify the slope of a linear model [DS.A.6.A](#)
 - b interpret the slope of a linear model as rate of change [DS.A.6.B](#)
 - c interpret the slope of a linear model in the context of the data [DS.A.6.C](#)
 - d identify the y-intercept of a linear model [DS.A.6.D](#)
 - e interpret the y-intercept of a linear model as a constant term [DS.A.6.E](#)
 - f interpret the y-intercept of a linear model in the context of the data [DS.A.6.F](#)
- 7 Determine and interpret the correlation coefficient for a linear association. [DS.A.7](#)
 - a determine the correlation coefficient for a linear association [DS.A.7.A](#)
 - b interpret the correlation coefficient for a linear association [DS.A.7.B](#)
- 8 Distinguish between correlation and causation. [DS.A.8](#)
 - a distinguish between correlation and causation [DS.A.8.A](#)
 - b distinguish between strong correlation and causation [DS.A.8.B](#)