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

Creating Equations CED

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

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

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

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

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

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

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

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