

COMMUNITY UNIT SCHOOL DISTRICT 200

Elementary Gifted Math Grade 4

Subject Expectation 1 (State Goal 6)

The student will be able to demonstrate and apply an understanding of numbers and their operations including meaning and relationships.

Essential Learning 1 (Learning Standard A) (Learning Standard D)	Understand numbers, ways of representing numbers, relationships among numbers, and number systems
---	--

- | | | |
|------------------|--------|---|
| Critical Content | 6.A.2 | a. represent, order, and compare numbers to demonstrate an understanding of the base-ten number system <ul style="list-style-type: none">• whole numbers to the billions place• decimals to the thousandths place• fractions, including fractions in simplest form*• mixed numbers• percents• integers* |
| | 6.A.2 | b. read, write, order, translate and compare whole numbers, fractions, decimals and mixed numbers in different notation systems, including standard, expanded, word, and number-and-word |
| | 6.A.2 | c. use the place-value structure of the base-ten number system <ul style="list-style-type: none">• identify the repeating place-value pattern (ones, tens, hundreds) within the periods• interpret expanded notation |
| | 6.A.2 | d. recognize equivalent representations for the same whole numbers and decimals and generate them by decomposing and composing numbers <i>such as</i> $0.15 = 0.1 + 0.05$ <ul style="list-style-type: none">• the relationship between fractions and decimals as tenths and hundredths |
| | 6.A.3* | e. find the approximate location of any rational number including negatives on a number line |
| | 6.A.2* | f. represent fractions as parts of wholes, as parts of a collection, as locations on number lines, and as divisions of whole numbers <ul style="list-style-type: none">• judge the size of fractions using models, benchmarks, and equivalent forms• estimate, identify and locate whole numbers, fractions, decimals* and mixed numbers* on a number line• recognize and calculate equivalent forms of commonly used fractions (halves, thirds, quarters, fifths, sixths, eighths, tenths) as decimals and percents <i>such as</i> 0.5 equals $\frac{1}{2}$ and 50% |

NOTE: *such as* = an example used for clarification, but not a mandatory concept
including = a mandatory concept
* = exceeds state standards

- express and use the relationship between the whole and its fractional parts to understand the size of the other
 - analyze how the size of the whole affects the size of the fraction *such as* $\frac{1}{2}$ of a large pizza is not the same as $\frac{1}{2}$ of a small pizza
- 6.A.2* g. read, write, recognize, and model any percent up to 100%
- * h. read, write, and translate square numbers and (explore) powers of 10 between exponential and standard notation
- 6.A.2 i. find simple fractions and positive and negative integers on a number line and through familiar applications *such as* the thermometer and above/below sea level
- 6.A.2 j. describe classes of numbers according to characteristics *such as* multiples, factors and square numbers
- 6.A.2 k. distinguish between prime and composite numbers
- 6.A.2* l. determine all the factors of both prime and composite numbers
- discover that square numbers have an odd number of factors
 - explore finding factor strings for composite numbers, including prime factorization as factor strings or product of exponents
- 6.D.2 m. describe the relationship between two sets of data using ratios and appropriate notations, *such as* a/b , a to b, and a:b
- 6.D.2 n. solve problems involving proportional relationships relating to money, including unit pricing, such as 1 apple costs \$0.20, so 4 apples cost \$0.80
- 6.A.3* o. explore irrational numbers as non-repeating and non-terminating decimals

Essential Learning 2 (Learning Standard B)	Investigate, represent and solve problems using number facts, operations (addition, subtraction, multiplication, and division) and their properties, algorithms and relationships
---	--

- Critical Content 6.B.2 a. solve one and two step problems involving whole numbers fractions, and decimals (including currency) using addition, subtraction, multiplication, and division
- 6.B.2* b. demonstrate the accurate use of mathematical symbols and vocabulary*
- multiplication: \times , $*$, $(a)(b)$, ab , \cdot
 - division: \div , a/b , ab
 - vocabulary such as sum, addend, difference, product, quotient, factors, divisor, dividend, numerator, denominator
- 6.B.2 c. create and use groups, arrays, repeated addition, repeated subtraction and other strategies or representations to represent multiplication and division concepts, including fractions and decimals
- 6.B.2 d. explore and use rules of divisibility *such as* 2,3,4,5,6,9, and 10
- 6.B.2 e. apply partial-products/quotients algorithms to show an understanding of multi-digit multiplication and division
- 6.B.2 f. use properties of numbers including
- commutative

NOTE: *such as* = an example used for clarification, but not a mandatory concept
including = a mandatory concept
* = exceeds state standards

Grade 4 gifted

- associative
 - property of zero
 - property of one
 - distributive property, such as $27 \times 5 = (20 \times 5) + (7 \times 5)$
 - equality
 - transitive
- 6.B.2 g. apply the order of operations, including brackets, parentheses, exponents, multiplication/division and addition/subtraction
- 6.C.2a h. demonstrate ways to interpret a remainder including
- rounding up or down
 - ignoring
 - convert to a fraction or a commonly used decimal, *such as* $43/10 = 4 \frac{3}{10}$ and $\$10/4 = \2.50
- 6.B.2 i. demonstrate and describe the effects of multiplying and dividing numbers, including decimals
- 6.B.2* j. explore the effects of multiplying fractions
- 6.B.2 k. identify and use relationships between operations to solve problems, such as multiplication and divisions are inverse operations
- 6.B.2 l. describe a real situation in which multiplication and division are used and explain its solution

Essential Learning 3 (Learning Standard C)	Compute using a variety of methods and make reasonable estimates
---	---

- Critical Content *
- a. demonstrate automatic recall of basic facts through twelve
- addition
 - subtraction
 - multiplication
 - division
- * b. develop fluency in mentally computing multiplication and division problems involving powers of 10, *such as* $3 \times 5 = 15$, so $30 \times 50 = 1500$
- 6.C.2b* c. develop and use strategies to estimate the results of whole number computations and to judge the reasonableness of such results
- rounding
 - front end
 - compatible numbers
 - clustering
- 6.C.2b d. evaluate estimates to judge their reasonableness and degree of accuracy
- 6.C.2a e. demonstrate fluency* in computing with basic number operations:
- addition and subtraction of numbers, including decimals and fractions*, with three* or more digits
 - addition and subtraction of fractions and mixed numbers* with like and simple unlike denominators
 - multiplication with multi-digit factors, including decimals*

NOTE: *such as* = an example used for clarification, but not a mandatory concept
including = a mandatory concept
* = exceeds state standards

- division with multi-digit dividends, including decimals* and one- and two-digit divisors*, resulting whole number quotients or with remainders
 - express remainders in a variety of ways such as rounding up or expressing as a decimal or a fraction*
- 6.B.2* f. demonstrate the accurate use of mathematical symbols and vocabulary*, including
- multiplication: \times , $*$.
 - division: \div , a/b , ab
 - terms: addend, sum, difference, factors, product, divisor, dividend, quotient, numerator, denominator
- 7.A.2b g. solve multi-step problems, including making change involving the value of a collection of bills and coins

Essential Learning 4 * Choose appropriate technology and tools

- Critical Content *
- a. select appropriate methods and tools for computing with whole numbers from among mental computation, estimation, calculators, manipulatives, and paper and pencils according to the context and nature of the computation and use the selected method or tool
- 6.A.2 b. use visual models, benchmarks, and equivalent forms to add and subtract commonly used fractions and decimals
- * c. use language tools *such as* a math dictionary to determine meaning

Essential Learning 5 * Recognize the connections between number sense, other math strands, and other curricular areas

- Critical Content *
- a. compare how the text structure of a math story problem differs from reading expository and narrative text

- four basic types of addition and subtraction story problems including join, separate, part-part-whole, and compare problems
 - join and separate problems take place over time and include a starting quantity, a change quantity (add or remove), and the result
 - part-part-whole involves asking the solver to figure out one of the parts
 - compare problems involve relationships between two different sets
 - multiplication and division problems involve grouping or partitioning collections of countable objects
 - problems involving areas, arrays, or combinations have completely different structures called rate, price, and multiplicative comparison problems
 - in multiplicative comparison problems, the relationship between the two quantities is described in terms of how many times larger one is than the other (three times as much)
- * b. use the reading comprehension strategies of connecting, inferring, visualizing, and questioning to analyze information in a given mathematical situation
 - * c. apply number properties, *such as* distributive property of multiplication over addition when using partial-products or distributive property of division over addition when using partial-quotients
 - * d. explore, find and apply rules for finding equivalent fractions
 - * e. apply formulas for calculating measurements with accuracy and precision
 - * f. apply ratios and proportions to problem-solving situations

Essential Learning 6 * **Construct and communicate convincing arguments and proofs to solve problems**

- Critical Content
- * a. use the language of numbers and their operations to express mathematical ideas precisely, both verbally and in writing
 - * b. make and test conjectures about mathematical properties and relationships and develop logical arguments to justify conclusions *such as*
 - lining up numbers and moving over numbers in multiplication is related to the distributive property and differs from lining up in addition
 - in the place value system each place is related to the other and a single place value does have an independent meaning
 - explore describing the relationship between two sets of data using ratios and appropriate notations *such as* a/b , a to b , $a:b$
 - * c. write a symbolic equation to solve a one or two step word problem
 - * d. write a word problem from a symbolic equation

NOTE: *such as* = an example used for clarification, but not a mandatory concept
 including = a mandatory concept
 * = exceeds state standards

Grade 4 gifted

- * e. write an extended response for a one step problem including
 - the answer
 - the process
 - the strategy(ies)
 - the explanation including how and why
- * f. demonstrate the accurate use of mathematical symbols
- * g. translate among and within representations *such as* concrete materials, spoken language, written language, pictures, diagrams and graphs, lists and tables
- * h. show evidence that computational results using whole numbers are correct and/or that estimates are reasonable
- * i. use rectangular arrays to solve problems, *such as* determining composite and prime numbers

Essential Learning 7 * Build mathematical knowledge by using a variety of appropriate strategies to solve a problem

- Critical Content
- * a. know the four phases in the process of problem solving including
 - understanding the problem
 - determine the conditions of the situation
 - comprehend the language and terms used
 - identify the desired goal and understand the constraints
 - form a representation
 - examine the assumptions
 - devising a plan of attack and selecting the appropriate problem solving strategy
 - organized list
 - guess and check
 - act out/use problem and show reasoning
 - justify an answer by using manipulatives
 - draw a picture
 - use/find a pattern
 - work backwards
 - use logical reasoning
 - make a table
 - carrying out the plan
 - work through the problem
 - monitor use of the strategy
 - change strategies as necessary
 - reviewing
 - reconsider the initial conditions, constraints, and goals to make sure the solution fits
 - judge the reasonableness of the answer
 - * b. rely on metacognitive processes to solve a problem
 - activate prior knowledge about information in the problem
 - develop various ways to represent information
 - question effectiveness and reasonableness

NOTE: *such as* = an example used for clarification, but not a mandatory concept
 including = a mandatory concept
 * = exceeds state standards

**Subject Expectation 2
(State Goal 7)**

The student will be able to estimate, make, and use measurements of objects, quantities, and relationships, and determine acceptable levels of accuracy.

Essential Learning 1 (Learning Standard A)	Understand measurable attributes of objects and the units, systems, and process of measurement
---	---

- | | | |
|------------------|--------|--|
| Critical Content | 7.A.1a | a. recognize measurable attributes, including length, capacity, weight, time, temperature, money, perimeter, area, volume, radius, diameter, circumference, and chord of circles |
| | 7.A.1b | |
| | 7.A.1c | |
| | 7.A.1d | |
| | 7.A.2a | b. compare and order objects according to measurable attributes |
| | 7.A.2a | c. compare angles to right and straight angles to determine if acute, obtuse, or reflex |
| | 7.A.2a | d. compare the relationships among the various units within a system |
| | 7.A.1d | e. measure temperature using the Fahrenheit scale and the Celsius scale |

Essential Learning 2 (Learning Standard B) (Learning Standard C)	Apply appropriate techniques, tools, and formulas to determine measurements
---	--

- | | | |
|------------------|--------|---|
| Critical Content | 7.B.2a | a. select and use benchmarks to estimate measurements |
| | 7.B.2b | b. estimate, compare, and measure the length of objects using standard units in the U.S. customary and metric systems, including to the nearest 1/16 inch*, foot, yard or millimeter, centimeter, meter |
| | 7.B.2b | c. estimate and perform simple unit conversions within a system of measurement, <i>such as</i> 12 inches = 1 foot |
| | 7.B.2a | d. explore the concept that measurements are approximations and differences in the units used affect precision |
| | 7.C.2a | e. estimate and calculate actual distance using a given scale, <i>such as</i> 1/2 inch represents 5 miles, so 1 inch represents 10 miles |
| | 7.C.2a | f. demonstrate strategies for finding perimeters and areas of regular and irregular shapes, including using |
| | 7.B.2b | <ul style="list-style-type: none"> • diagrams • models, • grids • measuring (may including sketching a figure from its description) • formulas |
| | 7.C.1 | g. solve problems involving estimating and finding the perimeter of a polygon with given side lengths |
| | 7.C.2a | h. solve problems involving estimating and finding the area of a triangle and quadrilaterals |
| | 7.C.2a | i. estimate, compare, and measure angles |
| | 7.A.2a | j. estimate and compare two or more objects according to weight and choose appropriate unit of measurement including ounces, pounds, tons, grams, and kilograms |

NOTE: *such as* = an example used for clarification, but not a mandatory concept
including = a mandatory concept
* = exceeds state standards

- 7.A.2a k. estimate, compare and measure the capacity of an object using cups, pints, quarts, gallons, milliliters, and liters
- 7.B.2b l. estimate and calculate elapsed time to the nearest minute and/or in compound units, *such as* hours, minutes, days
- 7.C.2a m. select appropriate units and tools for the attribute to be measured
- 7.B.3* n. demonstrate an accurate use of tools to determine measurement
 - geometry: ruler, meter stick, yardstick, tape measure, half-circle and full-circle protractors
 - weight: gram scale, customary scale
 - capacity: graduated cylinders, measuring cups
 - temperature: Fahrenheit thermometer, Celsius thermometer
 - time: digital clock, analog clock, calendar
 - math dictionary
- 7.C.2a o. develop and use strategies for finding area of parallelograms and triangles culminating in the determination of appropriate formulas
- 7.C.2a p. develop strategies to determine the surface area of rectangular solids culminating in the determination of appropriate formulas
- 7.C.3* q. develop strategies to determine the volume of rectangular solids culminating in the determination of appropriate formulas
- 7.C.2b r. construct or draw figures with given perimeters and areas
- * s. explore use of decimals in real-world situations

Essential Learning 3 * Recognize the connections between measurement, other math strands, and other curricular areas

- Critical Content * a. compare how the text structure of a math story problem differs from reading expository and narrative text
- * b. use the reading comprehension strategies of inferring, questioning, synthesizing, visualizing, and determining important ideas to solve measurement problems
- * c. explore the understanding of fractions using measuring cups *such as* $\frac{1}{4}$ and $\frac{1}{3}$
- * d. explore what happens to measurements of a two-dimensional shape, *such as* its perimeter and area, when the shape is changed in some way
- * e. show the relationship between shapes *such as* parallelograms and rectangles, triangles and parallelograms and their areas
- * f. compute the change in temperature between positive and negative degrees
- * g. compute the average temperature over time

NOTE: *such as* = an example used for clarification, but not a mandatory concept
 including = a mandatory concept
 * = exceeds state standards

Essential Learning 4 * (Learning Standard C)	Construct and communicate convincing arguments and proofs to solve problems
---	--

- | | | |
|------------------|---|---|
| Critical Content | * | a. use the language of measurement to express mathematical ideas precisely, both verbally and in writing |
| | * | b. make and test conjectures about mathematical properties and relationships and develop logical arguments to justify conclusions <i>such as</i> <ul style="list-style-type: none"> • the relationship of length, width, and area of a rectangle is multiplicative; that of the length, width, and perimeter of a rectangle is additive (the perimeter of a rectangle can increase while two of the sides of the rectangle decrease in length) • explore the fundamental property of measurement <i>such as</i> the smaller the unit the more you need, the bigger the unit the fewer you need • the sum of the measure of any two sides must be greater than the third side |
| 7.A.2a | * | c. recognize the need for measuring with standard units |
| | * | d. express in written language the mathematical understanding of measurement |
| | * | e. write an extended response for a two or three step problem including <ul style="list-style-type: none"> • the answer • the process • the strategy(ies) • the explanation including how and why |
| | * | f. translate among and within representations <i>such as</i> concrete materials, spoken language, written language, pictures, diagrams and graphs, lists and tables |

Essential Learning 5 *	Build mathematical knowledge by using a variety of appropriate strategies to solve a problem
-------------------------------	---

- | | | |
|------------------|---|--|
| Critical Content | * | a. know the four phases in the process of problem solving including <ul style="list-style-type: none"> • understanding the problem <ul style="list-style-type: none"> • determine the conditions of the situation • comprehend the language and terms used • identify the desired goal and understand the constraints • form a representation • examine the assumptions • devising a plan of attack and selecting the appropriate problem solving strategy <ul style="list-style-type: none"> • organized list |
|------------------|---|--|

NOTE: *such as* = an example used for clarification, but not a mandatory concept
including = a mandatory concept
* = exceeds state standards

- guess and check
 - act out/use problem and show reasoning
 - justify an answer by using manipulatives
 - draw a picture
 - use/find a pattern
 - work backwards
 - use logical reasoning
 - make a table
 - carrying out the plan
 - work through the problem
 - monitor use of the strategy
 - change strategies as necessary
 - reviewing
 - reconsider the initial conditions, constraints, and goals to make sure the solution fits
 - judge the reasonableness of the answer
- * b. rely on metacognitive processes to solve a problem
- activate prior knowledge about information in the problem
 - develop various ways to represent information
 - question effectiveness and reasonableness

**Subject Expectation 3
(State Goal 8)**

The student will be able to use algebraic and analytical methods to identify and describe patterns and relationships in data, solve problems, and predict results.

Essential Learning 1 (Learning Standard A) (Learning Standard B)	Understand patterns, relations, and functions
---	--

- | | | |
|------------------|---|--|
| Critical Content | 8.A.2a
8.B.2
8.A.2a
8.B.2

*

8.A.2a
8.A.2a
8.A.2a

8.A.2b

8.A.2a

8.A.2b

8.A.2a | <ul style="list-style-type: none"> a. analyze, extend, and create geometric and numeric patterns, including input and output b. represent and translate between geometric and numeric rules and patterns of number relationships, using words, pictures, tables, and graphs c. relate and compare different forms of representation for a relationship d. analyze a geometric pattern and express the results numerically e. form generalizations about geometric and numeric patterns f. determine a missing term in a pattern (sequence) and identify errors in a sequence, when given a description or sequence g. construct and solve open sentences using a variable to represent an unknown quantity, <i>such as</i> $2 + n = 20$ and $n/2 = 6$ h. express mathematical relationships of whole numbers using equations with an unknown variable <i>such as</i> Hakim is 10 years older than Gertrude (G years old), so Hakim's age equals $G + 10$ years old i. evaluate algebraic expressions with a whole number variable value, <i>such as</i> evaluate $3 + m$, when $m = 4$ j. demonstrate equality of two expressions with variables <i>such as</i> $28 + 35 = 35 + n$, $9 \times 6 = 108 \div n$ |
|------------------|---|--|

Essential Learning 2 (Learning Standard C)	Represent and analyze mathematical situations and structures using algebraic symbols
---	---

- | | | |
|------------------|---------------------------------|--|
| Critical Content | 8.C.2

8.C.2

8.C.2 | <ul style="list-style-type: none"> a. identify the properties of numbers as they relate to algebraic situations including commutative, associative, and properties of zero and one b. explore the properties of numbers as they relate to distributive, associative and order of operations c. solve problems with whole numbers using order of operations. equality properties |
|------------------|---------------------------------|--|

Essential Learning 3 *	Use mathematical models to represent and understand quantitative relationships and solve problems
-------------------------------	--

- | | | |
|------------------|---|---|
| Critical Content | * | <ul style="list-style-type: none"> a. model problem situations with objects and use representations <i>such as</i> pictures, graphs, tables, and equations to draw conclusions <i>such as</i> there are 8 pigs and 4 chicken, if there are 12 animals and 40 legs on the farm yard |
|------------------|---|---|

NOTE: *such as* = an example used for clarification, but not a mandatory concept
including = a mandatory concept
* = exceeds state standards

Essential Learning 4 * (Learning Standard D)	Use problem solving to analyze change in real life situations
---	--

- | | | |
|------------------|--------|---|
| Critical Content | 8.D.2 | a. solve one-step linear equations with one missing value in problem solving situations using all four operations |
| | 8.D.2* | b. create* and solve linear equations involving whole numbers using a variety of methods and representations |
| | * | c. investigate how a change in one variable relates to a change in a second variable in simple situations |
| | * | d. solve a problem and find more than one solution |
| | 8.D.2 | e. demonstrate how to select and use an appropriate operation to solve problems involving patterns <i>such as</i> save one penny on day one, double that amount each day for ten days |

Essential Learning 5 *	Choose appropriate technology/tools for algebraic representations
-------------------------------	--

- | | | |
|------------------|---|---|
| Critical Content | * | a. select and use appropriate technology/tools <i>such as</i> <ul style="list-style-type: none"> • calculators • manipulatives, including Hands-On Equations • paper and pencil • computer programs |
| | * | b. select and use appropriate operations in combination with appropriate tools including to perform calculations on whole numbers, fractions, and decimals according to the context and nature of the computation |
| | * | c. use language tools <i>such as</i> a math dictionary to determine meaning |

Essential Learning 6 *	Recognize the connections between algebra, other math strands, and other curricular areas
-------------------------------	--

- | | | |
|------------------|---|---|
| Critical Content | * | a. compare how the text structure of a math story problem differs from reading expository and narrative text |
| | * | b. use the reading comprehension strategies of connecting and inferring to analyze information in a given mathematical situation |
| | * | c. apply the commutative, associative, and distributive properties for addition and multiplication |
| | * | d. explore ratio and proportion to solve problems |
| | * | e. use opposite operations to find missing numbers in equations |
| | * | f. observe patterns in our environment |
| | * | g. find, describe, extend and create patterns using manipulatives/numbers/letters/hundreds charts/arrays with an emphasis on number sense |
| | * | h. find, describe, extend and create geometric patterns using tessellations |
| | * | i. construct a data table looking for patterns |
| | * | j. identify and describe prime and composite numbers |

NOTE: *such as* = an example used for clarification, but not a mandatory concept
including = a mandatory concept
* = exceeds state standards

Grade 4 gifted

- * k. apply formulas for perimeter and area to 2-dimensional polygons, as well as explore other connections between algebra and geometry

Essential Learning 7	* Construct and communicate convincing arguments and proofs to solve algebraic problems
-----------------------------	--

- | | | |
|------------------|---|--|
| Critical Content | * | a. use the language of algebra to express mathematical ideas precisely, both verbally and in writing |
| | * | b. make and test conjectures about mathematical properties and relationships and develop logical arguments to justify conclusions <i>such as</i> <ul style="list-style-type: none"> • know the concept that in the commutative property order does not matter to achieve sameness with multiplication • explain the commutative property as it applies and relates to addition and multiplication • describe situations involving negative relationships <i>such as</i> more people/fewer cookies |
| | * | c. translate among and within representations in meaningful ways <i>such as</i> concrete materials, spoken language, written language, pictures, diagrams and graphs, lists and tables |
| | * | d. identify the rule used to generate a pattern |
| 8.C.2 | * | e. explain how and why you solved an algebraic problem |
| | * | f. write an extended response for a two or three step problem including <ul style="list-style-type: none"> • the answer • the process • the strategy(ies) • the explanation including how and why |

Essential Learning 8	* Build mathematical knowledge by using a variety of appropriate strategies to solve a problem
-----------------------------	---

- | | | |
|------------------|---|--|
| Critical Content | * | a. know the four phases in the process of problem solving including <ul style="list-style-type: none"> • understanding the problem <ul style="list-style-type: none"> • determine the conditions of the situation • comprehend the language and terms used • identify the desired goal and understand the constraints • form a representation • examine the assumptions • devising a plan of attack and selecting the appropriate problem solving strategy <ul style="list-style-type: none"> • organized list |
|------------------|---|--|

NOTE: *such as* = an example used for clarification, but not a mandatory concept
including = a mandatory concept
* = exceeds state standards

- guess and check
 - act out/use problem and show reasoning
 - justify an answer by using manipulatives
 - draw a picture
 - use/find a pattern
 - work backwards
 - use logical reasoning
 - make a table
 - carrying out the plan
 - work through the problem
 - monitor use of the strategy
 - change strategies as necessary
 - reviewing
 - reconsider the initial conditions, constraints, and goals to make sure the solution fits
 - judge the reasonableness of the answer
- * b. rely on metacognitive processes to solve a problem
- activate prior knowledge about information in the problem
 - develop various ways to represent information
 - question effectiveness and reasonableness

**Subject Expectation 4
(State Goal 9)**

The student will use geometric methods to analyze, categorize, and draw conclusions about points, lines, planes, and space.

Essential Learning 1 (Learning Standard A) (Learning Standard B)	Analyze characteristics and properties of two and three dimensional geometric shapes and develop mathematical arguments about geometric relationships
---	--

Critical Content	9.A.2c	a.	identify, describe, sketch, compare, classify and analyze two-dimensional shapes (triangles, quadrilaterals, pentagons, hexagons, and octagons) according to the number of sides, length of sides, number of vertices, and interior angle types (right, acute, obtuse and reflex)
	9.A.2c	b.	identify, describe, sketch, compare, and analyze three-dimensional shapes (cubes, spheres, cones, cylinders, prisms, and pyramids) according to their characteristics (faces, edges, vertices)
	9.B.2	c.	identify, describe, compare, measure and sketch angles (acute, right, obtuse, straight, and reflex)
	9.B.2	d.	explore properties of angles to investigate supplementary and vertical (opposite) angles
	9.B.2	e.	identify and describe types of triangles: scalene, equilateral, right, isosceles
	9.B.2	f.	identify congruent and similar figures
	9.A.2c	g.	identify and sketch points, lines, line segments, rays, planes, and parallel, perpendicular, and intersecting lines
	9.A.2c	h.	investigate and describe the results of subdividing and combining shapes
	9.B.2	i.	explore polyhedra using concrete models
	9.A.2c	j.	identify, describe, measure and draw the center, diameter, radius and chord of a circle using a straightedge, ruler, and compass
	9.B.2	k.	differentiate between polygons and non-polygons
	9.A.2b	l.	identify and describe how geometric figures are used in practical settings <i>such as</i> architecture, art, and advertising

Essential Learning 2 *	Specify locations and describe spatial relationships using coordinate geometry and (or) other representational systems
-------------------------------	---

Critical Content	*	a.	graph, locate, and identify points using order pairs
	*	b.	describe and predict paths using only positive numbered order pairs (first quadrant)
	*	c.	recognize the need for uniform interval units along an axis plot and determine the interval
	*	d.	use ordered pairs to create polygons
	*	e.	identify and use vocabulary associated with coordinate graphing, including horizontal, vertical, axis, origin, quadrant, x-axis, y-axis, x-coordinate, y-coordinate and ordered pairs

NOTE: *such as* = an example used for clarification, but not a mandatory concept
including = a mandatory concept
* = exceeds state standards

Essential Learning 3 *	Apply transformations and use symmetry to analyze mathematical situations
-------------------------------	--

- | | | |
|------------------|---------|---|
| Critical Content | * | a. identify, predict and describe the results of translating (sliding), reflecting (flipping) and rotating (turning) two-dimensional shapes |
| | 9A.2c * | b. identify, sketch, and describe line, as well as explore rotational* symmetry in two-dimensional shapes |
| | * | c. create an original tessellation that rotates |
| | 9.B.2 | d. determine whether two shapes are congruent |

Essential Learning 4 (Learning Standard A) (Learning Standard C)	Use visualization, spatial reasoning, and geometric modeling to solve problems
---	---

- | | | |
|------------------|---------|--|
| Critical Content | 9.A.2c | a. draw geometric objects with specific properties including side lengths and angle measurements |
| | 9.A.2a | b. identify a three-dimensional object from its net |
| | 9.A.2a | c. identify and build a 3-dimensional object from a 2-dimensional representation |
| | 9.A.2c | d. identify and draw a 2-dimensional representation of a 3-dimensional object |
| | 9.A.2a | e. construct models of three dimensional shapes |
| | 9.C.2 | f. from a two dimensional drawing of an object (such as a partially completed rectangular prism) made from cubes the student should determine things such as <ul style="list-style-type: none"> • number of cubes to complete it • number of exposed faces |
| | 9.C.2 | g. solve problems using properties of triangles, such as the sum of interior angles of a triangle is 180° |
| | 9.A.3c* | h. dilate a shape given the coordinates of the pre-image and image, such as expansion or contraction to produce congruent figure |
| | 9.A.3b* | i. describe the effects of reflections, translations, rotations, and dilations on the shape and size of two-dimensional shapes |
| | 9.A.3c* | such as location, perimeter and area |

Essential Learning 5 * (Learning Standard C)	Choose appropriate technology/tools for geometric representations
---	--

- | | | |
|------------------|---|--|
| Critical Content | * | a. select and use appropriate technology/tools <i>such as</i> <ul style="list-style-type: none"> • geoboards • grid paper • rulers • protractor • computer • pattern blocks • compasses |
|------------------|---|--|

NOTE: *such as* = an example used for clarification, but not a mandatory concept
including = a mandatory concept
* = exceeds state standards

- * b. select and use appropriate operations with appropriate tools to perform calculations on whole numbers, fractions, and decimals according to the context and nature of the computation
- * c. use language tools *such as* a math dictionary to determine meaning

Essential Learning 6	* Recognize the connections between geometry, other math strands, and other curricular areas
-----------------------------	---

- | | |
|------------------|--|
| Critical Content | <ul style="list-style-type: none"> * a. compare how the text structure of a math story problem differs from reading expository and narrative text * b. use the reading comprehension strategies of inferring, visualizing, making connections, questioning, and determining important ideas to analyze geometric representations in a given situation * c. describe and find area and perimeter in a two dimensional polygon * d. find locations on a coordinate grid <i>such as</i> latitude and longitude * e. explore the relationship between number and shape including square numbers arrays * f. describe and find the volume of three dimensional figure <i>such as</i> rectangular prisms and cubes * g. use sketches of 2-dimensional shapes to generate algebraic equations, <i>such as</i> square and triangular numbers * h. recognize and apply the relationship among a data table, ordered pairs and a coordinate graph * i. use data tables to create the ordered pairs and plot on a coordinate graph * j. use geometric models to solve problems in other areas of mathematics, such as number and measurement * k. recognize geometric ideas and relationships and apply them to other disciplines and to problems that arise in the classroom or in everyday life * l. express pattern in any representation to state rule from pre-image to image in transformational geometry |
|------------------|--|

Essential Learning 7 (Learning Standard C)	Construct and communicate convincing arguments and proofs to solve problems involving geometry
---	---

- | | |
|------------------|--|
| Critical Content | <ul style="list-style-type: none"> * a. use the language of geometry to express mathematical ideas precisely, both verbally and in writing |
| 9.C.2 | <ul style="list-style-type: none"> b. make and test conjectures about geometric properties and relationships and develop logical arguments to justify conclusions <i>such as</i> <ul style="list-style-type: none"> • recognize and defend the need for uniform interval units • the results of subdividing and combining shapes • the minimum and maximum number of blocks used to construct a building from a 2-dimensional or 3-dimensional plan |

NOTE: *such as* = an example used for clarification, but not a mandatory concept
 including = a mandatory concept
 * = exceeds state standards

Grade 4 gifted

- explore the relationships between the 3 types of quadrilaterals (squares subset of rectangles subset of parallelograms)
- explore the relationships among the number of faces, edges, and vertices of solids
- describe a motion or a series of motions that will show that two shapes are congruent
- * c. express in written language the mathematical understanding of geometry
- * d. write an extended response for a two or three step problem including
 - the answer
 - the process
 - the strategy(ies)
 - the explanation including how and why
- * e. translate among and within representations *such as* concrete materials, spoken language, written language, pictures, diagrams and graphs, lists and tables

Essential Learning 8 * **Build mathematical knowledge by using a variety of appropriate strategies to solve a problem**

- Critical Content
- * a. know the four phases in the process of problem solving including
 - understanding the problem
 - determine the conditions of the situation
 - comprehend the language and terms used
 - identify the desired goal and understand the constraints
 - form a representation
 - examine the assumptions
 - devising a plan of attack and selecting the appropriate problem solving strategy
 - organized list
 - guess and check
 - act out/use problem and show reasoning
 - justify an answer by using manipulatives
 - draw a picture
 - use/find a pattern
 - work backwards
 - use logical reasoning
 - make a table
 - carrying out the plan
 - work through the problem
 - monitor use of the strategy
 - change strategies as necessary
 - reviewing
 - reconsider the initial conditions, constraints, and goals to make sure the solution fits

NOTE: *such as* = an example used for clarification, but not a mandatory concept
 including = a mandatory concept
 * = exceeds state standards

- judge the reasonableness of the answer
- * b. rely on metacognitive processes to solve a problem
 - activate prior knowledge about information in the problem
 - develop various ways to represent information
 - question effectiveness and reasonableness

**Subject Expectation 5
(State Goal 10)**

The student will select, organize, and analyze data using statistical methods, predict results, and interpret uncertainty-using concepts of probability.

Essential Learning 1 (Learning Standard A) (Learning Standard B)	Develop concepts of data collection and analysis
---	---

Critical Content	10.B.3	a. investigate to address a question
	10.B.2a	<ul style="list-style-type: none"> • identify the problem (question)
	10.B.2b	<ul style="list-style-type: none"> • consider how data-collection methods affect the nature of the data set
	10.B.2c	
	10.B.2d	<ul style="list-style-type: none"> • collect/gather data using observations, questionnaires, surveys, and experiments • organize data using tally charts, tables, and line plots • display data using pictographs, bar graphs, line graphs, and circle graphs • analyze the data, including • finding the maximum, minimum, range, median, mode, and mean of a data set • drawing conclusions
	10.B.2c	b. read and interpret data represented on pictographs, tally charts, tables, line plots, stem-and-leaf plot, bar graphs, circle, pie graphs, and Venn diagrams
	10.B.2d	
	*	c. describe the shape and important features of a set of data
	*	d. distinguish between categorical and numerical data
	10.B.2a	e. choose appropriate representations of data <i>such as</i> knowing to use a line graph to show change over time
	*	f. compare different representations of the same data-and evaluate how well each representation shows important aspects of the data
	10.A.2c	g. recognize and explain misleading displays of data due to incorrect display of data
	10.C.2c	h. discuss the effect of size and demographics of sample on soundness of conclusions <i>such as</i> sampling one grade level versus all grade levels
	10.A.3c	i. explore and discuss which measure of central tendency best describes a given data set
	10.A.2c	j. propose and justify conclusions and predictions that are based on data
	10.B.2d	

Essential Learning 2 (Learning Standard C)	Develop the concept of probability
---	---

Critical Content	10.C.2a	a. calculate the probability (chance) based on the results from a series of simple experiments that are recorded and analyzed including coin toss, spinners, dice, and computer games
	*	b. represent probability as a fraction, decimal, and/or percent
	*	c. explore and discuss that the sum of all probabilities equals one

NOTE: *such as* = an example used for clarification, but not a mandatory concept
including = a mandatory concept
* = exceeds state standards

Grade 4 gifted

- * d. associate the meaning of percent as it relates to probability *such as* 100% probability equals certainty
- 10.C.2b e. interpret probability results using appropriate vocabulary *such as* likely, least likely, most likely, equally likely, impossible, possible, certain, and 50/50
- 10.C.2b f. make a connection between theoretical probability and experimental probability through repetition of each of the experiments
- 10.C.2a g. make predictions based on the results received from a probability experiment and test the predictions
- 10.C.2b h. understand that the measure of the likelihood of an event can be represented by a number on a scale from 0, meaning impossible, to 1, meaning certain
- * i. list all possible outcomes of an event using various strategies
 - explore tree diagrams
- 10.C.2c j. determine the probability of an event involving exploring “and,” “or,” or “not”

Essential Learning 3	* Choose appropriate technology/tools for data collection and representation
-----------------------------	---

- | | |
|------------------|--|
| Critical Content | <ul style="list-style-type: none"> * a. select and use appropriate technology and tools to represent and analyze data <i>such as</i> <ul style="list-style-type: none"> • computer software, <i>such as</i> Excel • graph paper • manipulatives, <i>such as</i> coins, dice, spinners • calculators • paper and pencil * b. select and use appropriate operations along with tools to perform calculations on whole numbers, fractions, and decimals according to the context and nature of the computation * c. use language tools <i>such as</i> a math dictionary to determine meaning |
|------------------|--|

Essential Learning 4	* Recognize the connections between data collection and probability, other math strands, and other curricular areas
-----------------------------	--

- | | |
|------------------|--|
| Critical Content | <ul style="list-style-type: none"> * a. compare how the text structure of a math story problem differs from reading expository and narrative text * b. use the reading comprehension strategies of inferring, questioning, and determining important ideas to analyze data in a given situation <ul style="list-style-type: none"> • recognize that drawing conclusions is implicit information * c. connect the concept of the scale of probability to percent * d. connect number scale 0-1 to fractions and decimals * e. recognize when to round calculations to report conclusions about a set of data, <i>such as</i> the mean of household size = 2.3 people, but better to state average size of house equals about 2 people * f. apply measurement skills to create data sets |
|------------------|--|

NOTE: *such as* = an example used for clarification, but not a mandatory concept
 including = a mandatory concept
 * = exceeds state standards

Grade 4 gifted

Essential Learning 5	*	Construct and communicate convincing arguments and proofs to solve problems involving probability
-----------------------------	----------	--

- | | | |
|------------------|---|--|
| Critical Content | * | a. use the language of data and probability to express mathematical ideas precisely, both verbally and in writing |
| | * | b. demonstrate correct usage of the language related to data collection and probability including mean, median, mode, range, cluster, gap, interval, outliers and extrapolate |
| | * | c. make and test conjectures about mathematical properties and relationships and develop logical arguments to justify conclusions, <i>such as</i> <ul style="list-style-type: none"> • the shape of data • different measures of central tendency reveal different aspects of data distribution • the reason for a random sample • the reason for a prediction |
| | * | d. express in written language the mathematical understanding of data and probability |
| | * | e. write an extended response for a two or three step problem including <ul style="list-style-type: none"> • the answer • the process • the strategy(ies) • the explanation including how and why |
| | * | f. translate among and within representations <i>such as</i> concrete materials, spoken language, written language, pictures, diagrams and graphs, lists and tables |

Essential Learning 6	*	Build mathematical knowledge by using a variety of appropriate strategies to solve a problem
-----------------------------	----------	---

- | | | |
|------------------|---|--|
| Critical Content | * | a. know the four phases in the process of problem solving including <ul style="list-style-type: none"> • understanding the problem <ul style="list-style-type: none"> • determine the conditions of the situation • comprehend the language and terms used • identify the desired goal and understand the constraints • form a representation • examine the assumptions • devising a plan of attack and selecting the appropriate problem solving strategy <ul style="list-style-type: none"> • organized list |
|------------------|---|--|

NOTE: *such as* = an example used for clarification, but not a mandatory concept
including = a mandatory concept
* = exceeds state standards

- guess and check
- act out/use problem and show reasoning
- justify an answer by using manipulatives
- draw a picture
- use/find a pattern
- work backwards
- use logical reasoning
- make a table
- carrying out the plan
 - work through the problem
 - monitor use of the strategy
 - change strategies as necessary
- reviewing
 - reconsider the initial conditions, constraints, and goals to make sure the solution fits
 - judge the reasonableness of the answer
- * b. rely on metacognitive processes to solve a problem
 - activate prior knowledge about information in the problem
 - develop various ways to represent information
 - question effectiveness and reasonableness
- * c. use problem solving strategies to determine probability *such as* an organized list, make a table or chart, guess, check, and adjust