

COMMUNITY UNIT SCHOOL DISTRICT 200

Elementary Gifted Math Grade 5

DRAFT

**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
- whole numbers to the trillions place*
 - decimals to the thousandths place*
 - fractions
 - mixed numbers
 - integers*
 - percents
- 6.A.2 b. read, write, order, translate and compare whole numbers, fractions, decimals and mixed numbers in different notation systems, including standard, exponential powers of 10, expanded, word, and number-and-word
- 6.A.2 c. use the place-value structure of the base-ten number system
- identify the repeating place-value pattern (ones, tens, hundreds) within the periods
 - interpret expanded notation using powers of ten
 - use the place-value structure of the base-ten number system
- 6.A.2 d. show equivalent representations of a number by
- recognize, translate within and between, and model multiple representations of commonly used decimals, fractions, mixed numbers* and percents, *such as* $\frac{1}{8} = 0.125 = 12.5\%$
 - decomposing and composing numbers
- 6.A.2 e. represent fractions as parts of unit wholes, as parts of a collection, as locations on number lines, and as divisions of whole numbers
- identify and locate integers, fractions, and decimals on a number line
 - 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 f. use least common multiple and greatest common factor to generate equivalent fractions, including simplest form

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

Grade 5 gifted

- 6.B.3b* g. determine whether given number sets are relatively prime through various exploratory strategies
- 6.A.2 h. represent percents smaller than 1% and larger than 100% in fraction or decimal form
- 6.A.2 i. read, write, recognize, and model percents
- 6.A.2 j. apply positive and negative integers in familiar applications *such as* the thermometer and above/below sea level
- 6.B.3b* k. classify numbers according to characteristics *such as* prime and composite numbers to 100, squares, multiples, and factors
- 6.B.3b* l. determine the prime factorization of a number and express it in expanded and exponential notation
- 6.A.3 * m. recognize irrational numbers as non-repeating and non-terminating decimals
- 6.D.2 n. describe the relationship between two sets of data using ratios and appropriate notations *such as* a/b , a to b , $a:b$
- 6.D.2 o. apply ratio and proportions to solve practical problems

**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. use groups/arrays/repeated addition/repeated subtraction to represent multiplication/division concepts, including fractions and decimals
 - 6.B.2 b. identify and use relationships between operations *such as* division as the inverse of multiplication to solve problems
 - 6.B.2 c. apply operations and number properties including commutative, associative, distributive, equality, and transitive and use them to compute with whole numbers, fractions and decimals
 - 6.B.2* d. create representations that show the various meanings of multiplication and division of whole numbers, fractions, decimals and mixed numbers
 - equal groups
 - arrays
 - missing factors
 - areas of rectangles with whole numbers, fractions*, decimals* and mixed numbers* including the use of partial products *such as* $1/2$ of $2/3$
 - 6.B.2 e. recognize and use zero property in multiplication and division
 - 6.B.2 f. apply order of operations including nested parentheses*, brackets*, parentheses, exponents multiplication, division, addition, and subtraction
 - 6.C.3a g. apply the appropriate operations to real situations
 - 6.B.2 h. apply rules of divisibility *such as* by 2, 3, 4, 5, 6, 8, 9, and 10

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

- 6.B.2 i. solve multi-step (real-world) problems involving whole numbers, fractions, and decimals, using addition, subtraction, multiplication, and division
- 6.D.3* j. use proportional reasoning to
 - solve problems such as similar figures, discount, sales tax, percent, percent increase/decrease, scale drawings and other proportions
 - calculate unit rates
- 6.D.3* k. know equivalent percent, decimal and fraction forms (families of eighths, sixths as well as halves, thirds, fourths, fifths, tenths) and work flexibly within to solve problems
- 6.D.3* l. solve problems using the percent equation *such as*
 - discount, sales tax
 - percent increase/decrease
- 6.B.3c m. calculate square roots of perfect squares and squares of any number*

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

- Critical Content * a. demonstrate automatic recall of all basic facts through twelve
- 6.A.3 b. demonstrate automatic recall of equivalent percents, decimals, and fractions, including families of thirds, sixths, and eighths
- 6.B.2 c. mentally compute with 10, 100, 1000, and other powers of 10, *such as* $3 \times 5 = 15$, so $30 \times 50 = 1500$
- * d. apply extended multiplication facts, place-value concepts and other strategies to multiply by powers of 10, including whole numbers and decimals in exponential notation, *such as* $5 \times 10^3 = 5,000$
- * e. apply powers of 10 concepts and other strategies to explore translating small and large numbers in scientific notation to standard notation
- 6.C.2b f. apply strategies to estimate the results of whole number, fraction, and decimal computations and to judge the reasonableness of such results
- 6.B.2* g. demonstrate the accurate use of mathematical symbols and vocabulary* including
 - multiplication: \times , $*$, $(a)(b)$, ab , \cdot
 - division: \div , a/b , $\frac{a}{b}$
 - vocabulary including sum, addend, difference, product, quotient, factors, divisor, dividend, numerator, denominator
- * h. demonstrate fluency with basic number operations
- 6.A.3 i. determine simplest form of a fraction or mixed number
- 6.C.2a j. compute with whole numbers, fractions and decimals
 - add/subtract whole numbers to the billions, fractions with like and unlike denominators including mixed number with any denominator* and decimals to thousandths*

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

Grade 5 gifted

- multiply whole numbers with multi-digit factors, fractions*, mixed numbers*, and decimals
 - divide numbers, including decimals, by one and two digit whole number divisors with remainders
 - express remainders in a variety of ways, including rounding up, rounding down, or expressing as a decimal or a fraction
- * k. apply exploratory strategies *such as* the inverse relationship to add, subtract, multiply and divide positive and negative* integers
- * l. apply decimal multiplication, use of a fraction, use of a unit percent or other strategy to calculate the percent of any whole number or decimal in dollar-and-cent notation *such as* 20% of \$15 = $0.2 \times 15 = \$3$ or $1/5 * 15 (15/5) = \$3$ or 10% = \$1.50, so 20% = \$3
- 6.B.3b m. generate least common multiples and greatest common factors through exploratory use of prime factorization and other strategies

Essential Learning 4	*	Choose appropriate technology and tools
-----------------------------	----------	--

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

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 *such as*
- 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 that involve relationships between two different sets

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

- 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 to analyze information in a given situation including determining important information, synthesizing, questioning, visualizing, making connections, and inferring
 - * c. constructing circle graphs with percent circle using percent, decimal, fraction calculations and with a protractor using percent, fraction, decimal and degree calculations from data set
 - * d. create a written algebraic equation as a rule for multiplying fractions
 - * e. calculate perimeter, area and volume of 1-, 2-, and 3-dimensional objects through application of operations
 - * f. use experimental probability activities to apply fraction and decimal skills
 - * g. use a variable to represent a missing quantity in a percent proportion or equation
 - * h. predict theoretical probability outcomes using ratios and proportions

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 and form generalizations about number sense *such as*
 - the larger the divisor, the smaller the quotient and vice versa
 - if multiply a whole number by a fraction, the product is smaller
 - if you divide a whole number by a fraction, the quotient is greater
 - justify the rules of divisibility for 2,5, and 10
 - * c. write a symbolic equation to solve a two or three step word problem
 - * d. write a word problem from a symbolic equation
 - * e. show evidence that computational results using whole numbers, fractions and decimals are correct and/or that estimates are reasonable
 - * f. write an extended response for a multi-step problem including

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

Grade 5 gifted

- the answer
 - the process
 - the strategy(ies)
 - the explanation including how and why
- * g. demonstrate the accurate use of mathematical symbols
- * h. translate among and within representations *such as* concrete materials, spoken language, written language, pictures, diagrams and graphs, lists and tables
- 6.C.3b i. show evidence that computational results using whole numbers, fractions, and decimals are correct and/or that estimates are reasonable

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
 - make a table
 - 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
 - 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 the 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

Grade 5 gifted

**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, weight, time, temperature, money, perimeter, area, angle, surface area, capacity, volume, radius, diameter, chord, and circumference |
| | 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 the relationships among the various units within a system |
| | 7.A.3a | d. use strategies for estimating areas and volume of irregular shapes |
| | 7.A.3b | |
| | 7.A.3b | e. relate two different units of measure as a rate, <i>such as</i> miles per hour |
| | 7.A.3b | f. recognize and convert between practical benchmarks of customary and metric systems, <i>such as</i> mile and kilometer, pound and kilogram, and quart and liter |
| | 7.A.3b | g. recognize and apply appropriate benchmarks for an attribute <i>such as</i> the boiling point and freezing point |
| | 7.A.3b | h. compute unit conversions within metric and customary system of measurement, <i>such as</i> millimeters to kilometers |
| | 7.A.3b | i. convert parts of units within a measurement system, <i>such as</i> 1.25 hours = 1 hour 15 minutes or 1 foot 6 inches = 1.5 feet |
| | 7.A.3b | j. investigate relationships between measurement and similarity <ul style="list-style-type: none"> • corresponding angles of similar figures • corresponding side lengths of similar figures are proportional |

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.3 | b. select appropriate units and tools for the attribute to be measured |
| | 7.B.2b | c. estimate, compare, and measure objects in length using standard units in the U.S. customary and metric systems including inches to the 1/16 inch, feet, yard, millimeter, centimeter, and meter |
| | 7.B.2b | d. estimate and calculate simple unit conversions within the same system of measurement for time, length, and weight/mass, including compound units, <i>such as</i> 5 ft 5 in and 2 lbs 2 oz |
| | 7.B.2a | e. explore the concept that measurements are approximations and differences in the units used affect precision |

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

Grade 5 gifted

- 7.C.1 f. apply strategies for estimating and finding perimeters and
- 7.B.2b areas of regular and irregular shapes, using diagrams, models, and grids or by measuring or using given formulas
- 7.C.1 g. develop and apply strategies to determine the surface area and
- 7.A.2a volumes of rectangular solids, using diagrams, models, and grids or by measuring or using given formulas
- * h. explore what happens to measurements of two dimensional shapes *such as* perimeter and area when the shape is changed in some way
- 7.C.2a i. estimate, compare, and measure angles
- 7.C.2a j. estimate, compare, and measure radius and diameter
- 7.A.2a k. compare two or more objects according to weight and choose appropriate unit of measurement including ounces, pounds, tons, grams, and kilograms
- 7.A.2a l. estimate, compare, and measure objects for capacity using standard units in the U.S. customary and metric systems including ounces, cups, pints, quarts, gallons, milliliters, and liters
- 7.B.2b m. estimate and calculate elapsed time to the nearest minute increment
- 7.B.2b n. estimate and calculate actual distance from a map, using a
- 7.C.2a given scale, such as one inch represents five miles, so two inches represent ten miles
- 7.B.3* o. select appropriate units and tools for the attribute to be measured
- * p. demonstrate an accurate use of tools to determine measurements
 - geometric attributes: ruler, meter stick, yardstick, tape measure, protractor, trundle wheel
 - weight: metric scale, customary scale
 - temperature: thermometers
 - capacity: measuring cups, graduated cylinders, and beakers
 - math dictionary
- 7.C.3b* q. use formulas to find the area of rectangles, $A = lw$ and volume of rectangular prisms, $V = lwh$
- * r. use measurement concepts to solve real world problems

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 reading strategies of inferring, questioning, synthesizing, and visualizing to solve measurement problems
- * c. apply measurement in science and social studies situations
- * d. use measurement to solve problems in other areas of mathematics, *such as* geometry and data collection
- 7.C.2a e. describe relationships in a simple scale drawing
- 7.C.2b f. construct or draw figures with given perimeters and area

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

Grade 5 gifted

- * g. connect the etymology of prefixes with computer terminology *such as* megahertz, gigabyte, kilobyte
- * h. compare money values among countries *such as* the value of a dollar compared to the value of a peso or lire
- * i. add, subtract, multiply and divide with mixed units of measure *such as* minutes/hours, inches/feet/yards, ounces/pounds, months/years
- * j. show the relationship between shapes *such as* parallelograms and rectangles, triangles and parallelograms and their areas
- * k. compute the change in temperature between positive and negative degrees
- * l. compute the average temperature over time
- * m. understand the concept of the constant π as the ratio of the circumference to the diameter of a circle

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

- | | |
|------------------|--|
| Critical Content | <ul style="list-style-type: none"> * 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) • every measurement is an approximation with its precision related to the size of the unit • for any triangle, the sum of the length of any two sides must be greater than the third side * c. 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 * d. translate among and within representations <i>such as</i> concrete materials, spoken language, written language, pictures, diagrams and graphs, lists and tables * e. develop logical arguments to justify conclusions about topics, such as formulas for area, surface area, and volume |
|------------------|--|

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

- | | |
|------------------|---|
| Critical Content | <ul style="list-style-type: none"> * a. know the four phases in the process of problem solving including <ul style="list-style-type: none"> • understanding the problem • determine the conditions of the situation |
|------------------|---|

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

Grade 5 gifted

- 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
 - make a table
 - 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
 - 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 the 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

Grade 5 gifted

**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.B.2 8.B.2 8.A.2b 8.A.2a 8.A.2b *	<ul style="list-style-type: none"> a. analyze, extend, and create geometric and numeric patterns including input and output combining two operations <i>such as</i> $2n-1$ b. represent and translate between geometric and numeric rules and patterns of whole number relationships, using words, pictures, tables, graphs, and when appropriate, symbolic rules c. form generalizations about geometric and numeric patterns d. determine a missing term in a sequence and identify errors in a sequence, when given a description or sequence e. construct and solve number sentences using a variable to represent an unknown quantity, <i>such as</i> $2 + n = 20$ and $n/2 = 6$ f. express mathematical relationships using equations and inequalities, <i>such as</i> Hakim is 10 years older than Gertrude (G years old), so Hakim's age equals $G + 10$ years old g. evaluate algebraic expressions with a whole number variable value, <i>such as</i> evaluate $m + m + 3$, when $m = 4$ h. relate and compare different forms of representation for a relationship
------------------	---	---

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

Critical Content	8.C.2 8.A.2a 8.A.3a 8.A.3b 8.D.2 8.D.2 8.D.3a 8.A.3	<ul style="list-style-type: none"> a. identify the properties of numbers as they relate to algebraic situations including commutative, associative, equality, transitive, properties of zero and one, and order of operations, as well as use them to compute algebraic expressions and equations b. develop initial conceptual understanding of different uses of variables <ul style="list-style-type: none"> • unknown, <i>such as</i> $10x - 4 = 5x + 6$ • properties, <i>such as</i> $a + b = b + a$ • formulas, <i>such as</i> $a = L - W$ • co-variation, <i>such as</i> $5x + 2y = 37$ c. demonstrate how to solve and check one- and multi-step equations with rational numbers d. explore using two or more variables to construct and solve algebraic equations, representing an unknown quantities e. explore finding the common factors when dividing polynomials, <i>such as</i> when using Algebra Lab gear f. express mathematical relationships using equations and inequalities g. check equations using substitution
------------------	--	---

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

Grade 5 gifted

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

- | | | |
|------------------|---|--|
| Critical Content | * | a. model problem situations that involve all operations of whole numbers with objects and use representations including pictures, graphs, symbols, tables, and equations to draw conclusions |
| | * | b. make connections between the multiple representations for a given problem |

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

- | | | |
|------------------|---|--|
| Critical Content | * | a. use a variety of strategies to find an answer to a problem |
| 8.D.2 | | b. create and solve linear equations involving whole numbers using multiple representations <i>such as</i> T-tables, diagrams, and formulas |
| | * | c. solve a problem and find more than one solution |
| 8.B.2 | | d. demonstrate, in simple situations, how a change in one quantity results in a change in another quantity, <i>such as</i> input-output tables |
| 8.D.2 | | e. identify and describe situations with constant rates of change and/or varying rates of change and compare them |

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

- | | | |
|------------------|---|---|
| Critical Content | * | a. select and use the appropriate tools and technologies <i>such as</i> <ul style="list-style-type: none"> • calculator (including graphing calculator) • manipulatives (Algebra Lab gear, Hands-On Equations) • computer programs • number lines • paper and pencil |
| | * | b. select and use appropriate operations and tools including mental math, pencil-and-paper, estimation, calculator, or computer 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 of terms |

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 reading strategies of inferring and making connections to analyze information in a given situation |
| | * | c. apply the commutative, associative, and distributive properties; apply the order of operations |

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

Grade 5 gifted

- * d. find, describe, extend and create geometric patterns, *such as* in tessellations and/or line designs
- * e. find and use patterns to create and extend transformations on a coordinate grid
- 6.D.2 f. use ratio and proportion to solve problems
- * g. observe patterns in our environment
- h. apply perimeter, area, volume and other formulas in real-world measurement situations

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, *such as* unknown quantities, transitives and varying rates of change
 - * c. describe situations involving inverse relationships *such as* more people/fewer cookies
 - * d. identify and test 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
 - the answer
 - the process
 - the strategy(ies)
 - the explanation including how and why
 - * g. 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
 - make a table

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

Grade 5 gifted

- 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
 - 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 the 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

Grade 5 gifted

**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. classify, describe, and sketch two-dimensional shapes (triangles, quadrilaterals, pentagons, hexagons, and octagons) according to their side and angle properties (number and length of sides, number and size of interior angles—right, acute, obtuse) |
| | 9.A.2c | b. identify, describe, and sketch circles, including radius and diameter |
| | 9.B.2 | c. identify, describe, and compare three-dimensional shapes (cubes, spheres, cones, cylinders, prisms, and pyramids) according to their characteristics (faces, edges, and vertices) |
| | 9.B.2 | d. identify and sketch points, lines, (parallel, perpendicular, intersecting, and skew lines) line segments, rays, and planes and use them to classify and compare relationships |
| | 9.B.2 | e. determine if figures are similar and/or congruent, and identify relationships between corresponding parts of similar figures |
| | 9.A.2b | f. identify and describe how geometric figures are used in practical settings <i>such as</i> construction, art, and architecture |
| | 9.B.2 | g. apply knowledge of obtuse, acute, right, and straight angles to identify complementary, supplementary, and vertical (opposite) angles |
| | 9.B.2* | h. apply the knowledge of parallel lines to investigate angles formed by a transversal |
| | 9.C.3a* | i. investigate the ratio of circumference to diameter and area to radius squared (π) |
| | 9.B.3* | j. explore and develop the relationship of interior angles measurements to the number of sides of a regular polygon and represent symbolically as a formula |

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

- | | | |
|------------------|---|--|
| Critical Content | * | a. identify and use vocabulary associated with coordinate graphing using horizontal, vertical, axis, origin, quadrant, x, y, and ordered pairs |
| | * | b. recognize the need for uniform interval units along an axis plot |
| | * | c. graph, locate, and identify points using ordered pairs on a four-quadrant graph |
| | * | d. describe and predict paths using ordered pairs |
| | * | e. find a distance between points along horizontal and vertical lines of a coordinate system |

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

Grade 5 gifted

- 9.A.3b* f. identify and describe the relationship between pre-images and images of transformations
- 9.A.3b* g. draw the reflection and translation of figures using coordinates
- 9.A.3c* h. use coordinate geometry to describe reflections and translations
- * i. use ordered pairs of non-convex/convex polygon pre- images to create and transform (translate, rotate, and reflect) images in and across quadrants
- * j. explore the use of coordinate representations in 3-dimensions *such as* an archeological dig and 3D Tic Tac Toe

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

- Critical Content 9.A.3c a. recognize geometric ideas and apply them to other disciplines such as architecture
- * b. identify, describe, and predict results of reflections, translations, and rotations of two-dimensional shapes, *such as* to identify congruent figures
 - * c. identify , sketch, and describe line and rotational symmetry
 - * d. explore the relationship between length and area, *such as* the effects on area after doubling the side length of a square
 - * e. explore the relationship between length and volume, such as the effects on volume after doubling the side length of a cube

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

- Critical Content 9.C.2 a. solve problems using geometric properties, *such as* finding a missing angle measure using the knowledge that the sum of interior angles of a triangle is 180°
- 9.A.2a b. identify, build, and sketch two and three dimensional shapes, *such as* using attribute clues
 - 9.A.2c
 - 9.B.2 • identify and build a three-dimensional object from two-dimensional representations of that object, including net*
 - identify and draw a two-dimensional representation of a three-dimensional object
 - 9.A.2c c. create a front, right side, and top view drawing of a three dimensional model
 - * d. discover differences and similarities between the two ways of representing buildings using coordinate grids and isometric paper

Essential Learning 5 * Choose appropriate technology/tools for geometric representations

- Critical Content * a. select and use the appropriate tools and technologies *such as*
- calculator
 - manipulatives
 - mental visualization

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

Grade 5 gifted

- computer programs
 - rulers
 - protractors
 - compasses
 - mirrors
 - paper and pencil
 - geo-boards
- * b. select and use appropriate operations and tools including mental math, pencil-and-paper, estimation, calculator, or computer 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 of terms

Essential Learning 6	* Recognize the connections between geometry, 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, visualizing, making connections, questioning, and determining important ideas to analyze geometric representations in a given situation |
| | * | c. use data tables to create the ordered pairs and plot on a coordinate graph |
| | * | d. use geometric models to solve problems in other areas of mathematics, such as number and measurement |
| 9.A.2b | | e. recognize geometric ideas and relationships and apply them to other disciplines and to problems that arise in the classroom or in everyday life |
| 7.A.2a | | f. measure volume of solid figures |
| 7.A.2a | | g. explore surface area of rectangular prisms |

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

- | | | |
|------------------|---|--|
| Critical Content | * | a. use the language of geometry 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> |
| 9.C.2 | | <ul style="list-style-type: none"> • 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 • the relationship between vertical angles • the sum of the measure of any two sides of a triangle must be greater than the third side |
| | * | c. write an extended response for a two or three step problem including |

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

Grade 5 gifted

- the answer
 - the process
 - the strategy(ies)
 - the explanation including how and why
- * d. translate among and within representations *such as* concrete materials, spoken language, written language, pictures, diagrams and graphs, lists and tables
- 9.C.3a e. develop logical arguments to justify conclusions about topics, *such as* maximizing area for a given perimeter

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
 - 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

Grade 5 gifted

**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 10.B.2a 10.B.2b 10.B.2c 10.B.2d	a. design an investigation using numerical data to address a question <ul style="list-style-type: none"> • identify the problem (question) • consider how data-collection methods affect the nature of the data set • choose the sample set that will appropriately represent the given population • collect/gather data using observations, questionnaires, surveys, and experiments • organize data using tally charts, tables, stem-and-leaf, and line plots • display data using pictographs, bar graphs, line graphs, and circle graphs • analyze the data, including <ul style="list-style-type: none"> • finding the median, mode, mean, and range of a data set (given or collected) • drawing conclusions
	10.B.2c 10.B.2d	b. read and interpret data represented on pictographs, bar graphs, circle/pie graphs, line plots, stem-and-leaf plots, line graphs, tables, charts, and Venn diagrams
	*	c. describe the shape and important features of a set of data
	10.A.3a	d. determine an appropriate interval that could be used to display a given set of data
	10.B.2c	e. recognize the differences in representing categorical and numerical data
	10.A.3c*	f. explain which measure of central tendency best describes a given data set, as well as explore which any measures of central tendency are inappropriate for the given data set, <i>such as</i> one can only calculate mode for categorical data (favorite colors)
	10.B.2a	g. choose appropriate representations of data <i>such as</i> knowing when to use a line graph
	*	h. compare different representations of the same data and evaluate how well each representation shows important aspects of the data
	10.A.2c	i. recognize and explain misleading displays of data due to inappropriate intervals on a scale and wrong display of data
	10.A.2c 10.B.2d	j. propose and justify conclusions and predictions that are based on data

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

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

- | | | | |
|------------------|---------|----|--|
| Critical Content | 10.C.2a | a. | calculate the probability based on the results from a series of experiments that are recorded and analyzed, including coins, spinners, dice, and computer games |
| | 10.C.2b | b. | make a connection between theoretical probability and experimental probability through repetition of each of the experiments |
| | 10.C.2a | c. | determine the probability of a simple and compound event involving “and,” “or,” or “not”(using two attributes) |
| | 10.C.2c | d. | list all possible outcomes using various strategies, including tree diagrams and the fundamental counting principle in a simple problem, <i>such as</i> how many different combinations of one-scoop ice cream cones can be made with 3 flavors and 2 types of cones |
| | * | e. | record probabilities as fractions, decimals, or percents |
| | * | f. | demonstrate that the sum of all probabilities equals one |
| | 10.C.2c | g. | discuss the effect of sample size and demographics on probability <i>such as</i> sampling one grade level versus all grade levels |
| | 10.C.2b | h. | compare the likelihood of events in terms of certain, more likely, equally likely, 50-50, less likely, or impossible |
| | 10.C.2b | i. | understand that the measure of the likelihood of an event can be represented by a number on a scale from 0 to 1 |
| | * | j. | distinguish between situations where order (permutations) matters or doesn’t matter |

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

- | | | | |
|------------------|---|----|--|
| Critical Content | * | a. | select and use the appropriate tools and technologies to represent and/or analyze data, <i>such as</i> <ul style="list-style-type: none">• dice• spinners• coins• probability meters• calculator• graph paper• percent circle and protractor• computer programs <i>such as</i> Excel• paper and pencil |
| | * | b. | select and use appropriate operations and tools including mental math, pencil-and-paper, estimation, calculator, or computer 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 of terms |

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

Essential Learning 4	*	Recognize the connections between data collection and probability, 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, visualizing, making connections, 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. represent data patterns in numerical sentences |
| | * | d. analyze and extrapolate conclusions from a coordinate graph |
| | * | e. connect number scale 0-1 to fractions and decimals |

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

- | | | |
|------------------|---|---|
| Critical Content | * | a. use the language of data and probability to express mathematical ideas precisely, both verbally and in writing including vocabulary listed in the glossary, including mean, median, mode, range, cluster, gap, interval, outliers and extrapolate |
| | * | b. make and test conjectures about mathematical properties and relationships and develop logical arguments to justify conclusions, <i>such as</i> different measures of central tendency reveal different aspects of data distribution develop logical arguments to justify conclusions |
| 10.A.3c | | c. analyze problem situations and make predictions about results, including fairness |
| | * | d. 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 |
| | * | e. translate among and within representations <i>such as</i> concrete materials, spoken language, written language, pictures, diagrams and graphs, lists and tables |
| | * | f. design studies to further investigate the conclusions or predictions |
| 10.A.3c* | | g. develop logical arguments to justify the reason for a prediction |

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 • determine the conditions of the situation • comprehend the language and terms used • identify the desired goal and understand the constraints |
|------------------|---|--|

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

Grade 5 gifted

- form a representation
- examine the assumptions
- devising a plan of attack and selecting the appropriate problem solving strategy
 - organized list
 - make a table
 - 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
- 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 the 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

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

Grade 5 gifted