

# COMMUNITY UNIT SCHOOL DISTRICT 200

## Elementary Math Grade 1

### 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.**

<b>Essential Learning 1 (Learning Standard A) (Learning Standard D)</b>	<b>Understand numbers, ways of representing numbers, relationships among numbers, and number systems</b>
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| Critical Content | 6.A.1a        | a. represent, order and compare whole numbers to demonstrate an understanding of the base ten number system <ul style="list-style-type: none"><li>• represent teen numbers in multiple ways</li><li>• recognize the numbers eleven through nineteen as one group of ten and a particular number of ones</li></ul>   |
|                  | 6.A.1a        | b. count with understanding including skip counting by 2s, 5s, and 10s from any number up to at least 100   |
|                  | 6.A.1a, 6.D.1 | c. recognize and compare how many in sets of objects  |
|                  | 6.A.1a        | d. demonstrate the concept of odd and even numbers using manipulatives  |
|                  | 6.A.1a        | e. develop initial understanding of place value and the base-ten number system with models up to tens place   |
|                  | 6.A.1a        | f. describe numeric relationships using the symbols $<$ , $>$ , or $=$ and words  |
|                  | 6.A.1a        | g. use cardinal and ordinal numbers appropriately   |
|                  | 6.A.1a        | h. connect number words and numerals to the quantities they represent for zero through nineteen and base ten numbers ten, twenty, and thirty  |
|                  | 6.A.1a        | i. write all the numbers to 100 in consecutive order  |
|                  | 6.A.1b        | j. recognize the relationship between the whole and its fractional parts <ul style="list-style-type: none"><li>• recognize when a whole or set is divided into two or four equal parts</li><li>• describe parts of a whole using terms like one whole, one-half and explore one-quarter</li><li>• use concrete materials and pictorial representations to model the whole to part relationships</li></ul> |
|                  | 6.A.1b        | k. recognize and represent equal parts in everyday situations <i>such as</i> our class of twenty is divided into five equal table groups in everyday situations   |

Grade 1

*such as* = an example used for clarification but not a mandatory concept  
including = a mandatory concept

\* = exceeds state standards

Board Approved 8-12-09

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<b>Essential Learning 2 (Learning Standard B)</b>	<b>Investigate, represent and solve problems using number facts, operations (addition, subtraction, multiplication, division) and their properties, algorithms and relationships</b>
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| Critical Content | 6.B.1 | a. understand the effects of adding and subtracting whole numbers <ul style="list-style-type: none"> <li>• describe that numbers get larger when adding and smaller when subtracting whole numbers using appropriate symbols and vocabulary</li> </ul>   |
|                  | 6.B.1 | b. demonstrate and describe the relationship between addition and subtraction  |
|                  | 6.B.1 | c. identify fact families up through 12  |
|                  | 6.B.1 | d. solve one-step addition and subtraction number sentences and word problems by identifying the appropriate problem type including the four basic types of addition and subtraction story problems including join, separate, part-part-whole, and compare problems <ul style="list-style-type: none"> <li>• join problems that take place over time and include a starting quantity, a change quantity (add or remove), and the result</li> <li>• separate problems that take place over time and include a starting quantity, a change quantity (add or remove), and the result made its own bullet</li> <li>• part-part-whole involves asking the solver to figure out one of the parts</li> <li>• compare problems involve relationships between two different sets</li> </ul> |
|                  | *     | e. construct number sentences to match word problems   |

<b>Essential Learning 3 (Learning Standard C)</b>	<b>Compute using a variety of methods and make reasonable estimates</b>
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| Critical Content | 6.C.1a | a. develop and use strategies for whole number computation with a focus on addition and subtraction                          |
|                  | 6.C.1a | b. use mental math counting strategies   |
|                  | 6.C.1b | c. describe reasonable and unreasonable sums and differences   |
|                  | 6.C.1b | d. demonstrate fluency with basic addition and subtraction facts using fact families up to 12                                |
|                  | 7.A.1c | e. solve problems including making change involving the value of a collection of coins whose total value is 25 cents or less |

<b>Essential Learning 4</b>	*	<b>Choose appropriate technology/tools</b>
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| Critical Content | * | a. use technology and tools <i>such as</i> <ul style="list-style-type: none"> <li>• manipulatives</li> <li>• computer</li> <li>• number lines</li> <li>• hundreds charts</li> <li>• base-ten blocks</li> <li>• paper and pencil</li> <li>• math dictionary or reference books</li> </ul> |
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Grade 1  
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<b>Essential Learning 5</b>	<b>* Recognize the connections between number sense, other math strands, and other curricular areas</b>
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- Critical Content
- \* a. know how to read a math story problem
  - \* b. compare how reading a math story problem differs from reading expository and narrative text
  - \* c. identify different types of problems including the four basic types of addition and subtraction story problems including join, separate, part-part-whole, and compare problems
    - join problems that take place over time and include a starting quantity, a change quantity (add or remove), and the result
    - separate problems that 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
  - \* d. use the comprehension strategies of inferring, connecting, determining important information, questioning, and visualizing to solve math problems

<b>Essential Learning 6</b>	<b>* Construct and communicate convincing arguments to solve problems</b>
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- Critical Content
- \* a. use the language of numbers and their operations to express mathematical ideas precisely, both verbally and in writing
  - \* b. draw conclusions and communicate verbally understanding of numbers *such as*
    - 12 is one ten and two ones and not 21 which is two tens and one one
    - describe that the numbers get larger when adding and smaller when subtracting whole numbers using appropriate vocabulary and symbols
  - \* c. demonstrate an initial understanding of place value and the base-ten system using multiple models *such as* concrete objects, kinesthetic actions, written language, pictures, graphs, or diagrams

<b>Essential Learning 7</b>	<b>* Build mathematical knowledge by using a variety of appropriate strategies to solve a problem</b>
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- Critical Content
- \* a. explore 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 his/her 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 his/her use of the strategy
  - change strategies as necessary
- reviewing
  - judge the reasonableness of his/her answer
- \* b. explore metacognitive processes to solve a problem
  - activate prior knowledge about information in the problem
  - develop various ways to represent information
  - check for understanding

**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 level of accuracy.**

<b>Essential Learning 1 (Learning Standard A)</b>	<b>Understand measurable attributes of objects and the units, systems, and process of measurement</b>
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| Critical Content | * | a. explain the need for standard and non-standard units in measurement  |
| 7.A.1a           |   | b. determine the attributes of an object that are measurable <i>such as</i> length and weight are measurable whereas color and texture are not measurable |
| 7.A.1b           |   |   |
| 7.A.1c,          |   | c. describe the type of measurement for each attribute including weight, temperature, money, and length   |
| 7.A.1d           |   |   |
| 7.A.2a           | * | d. compare and order objects according to measurable attributes   |
| 7.A.1b           | * | e. explore and describe chronological events using calendars, timelines, and seasons  |
| 7.A.1c           |   | f. identify units of money and the value of each including penny, nickel, dime and quarter  |
| 7.A.1c           |   | g. count like sets of coins   |

<b>Essential Learning 2 (Learning Standard B) (Learning Standard C)</b>	<b>Apply appropriate techniques, tools, and formulas to determine measurement</b>
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| Critical Content | 7.A.Ka | a. measure objects using nonstandard units   |
|                  | 7.C.1  | b. estimate standard and nonstandard measurements of length, weight and capacity*  |
|                  | 7.B.1a | c. estimate time for a given task  |
|                  | 7.B.1b | d. compare estimated measures to actual measures taken   |
|                  | 7.A.1a | e. measure objects using standard units including  |
|                  | 7.A.1b | • length: inches, feet   |
|                  | 7.A.1c | • money: cents, dollars  |
|                  | 7.A.1d | • temperature: °F  |
|                  |        | • time: half hour, hour, days, weeks, months, seasons  |
|                  |        | • weight: pounds   |
|                  | *      | f. select an appropriate unit and tool for measurement   |
|                  | 7.A.1b | g. order events chronologically including times of the day, days of the week and months of the year  |
|                  | 7.A.1b | h. tell time using an analog clock to the hour and half hour   |
|                  | 7.A.1c | i. identify units of money and the value of each including penny, nickel, dime and quarter   |
|                  | 7.A.1c | j. count, compare, and order sets of like and unlike coins   |
|                  | 7.A.1c | k. show equivalent amounts of money  |
|                  | 7.A.1c | l. describe relationships within units of time, money, and length including 12 inches are in a foot, 60 minutes are in an hour, and 10 dimes are in a dollar |
|                  | 7.C.1  | m. explore perimeter and area of real objects  |

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<b>Essential Learning 3</b>	<b>* Recognize the connections between measurement, other math strands, and other curricular areas</b>
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| Critical Content | * a. explore use of thermometers in weather                      |
|                  | * b. explore use of a timeline to order events in social studies |
|                  | * c. explore use of balancing in science                         |
|                  | * d. use ordinal words when comparing up to ten objects          |

<b>Essential Learning 4</b>	<b>* Construct and communicate convincing arguments and proofs to solve problems</b>
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| Critical Content | * a. use the language of measurement to express mathematical ideas precisely, both verbally and in writing   |
|                  | * b. solve a measurement problem and show reasoning/justify answer by using manipulatives, drawing a picture, or acting it out                         |
|                  | * c. make and test conjectures about mathematical properties and relationships and develop logical arguments to justify conclusions <i>such as</i>     |
| 7.B.1a           | • inches are not used to measure miles   |
|                  | * d. explore understanding using multiple models <i>such as</i> concrete objects, kinesthetic actions, written language, pictures, graphs, or diagrams |

<b>Essential Learning 5</b>	<b>* Build mathematical knowledge by using a variety of appropriate strategies to solve a problem</b>
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| Critical Content | * a. explore 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 his/her 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 his/her use of the strategy  |

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- change strategies as necessary
  - reviewing
  - judge the reasonableness of his/her answer
- \* b. explore metacognitive processes to solve a problem
- activate prior knowledge about information in the problem
  - develop various ways to represent information
  - check for understanding

**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.**

<b>Essential Learning 1 (Learning Standard A) (Learning Standard B)</b>	<b>Understand patterns, relations, and functions</b>
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| Critical Content | 8.A.1a | a. describe common and uncommon attributes (all, some, none) in a set                                       |
|                  | 8.A.1a | b. recognize, describe, extend, and create patterns <i>such as</i> sequences of sounds, shapes, and motions |
|                  | 8.A.1a | c. create rules for sorting   |
|                  | 8.A.1a | d. explore numeric patterns and growing patterns  |
|                  | *      | e. translate from one representation to another <i>such as</i> red-blue translates to AB                    |
|                  | 8.B.1  | f. create patterns to match a given letter description <i>such as</i> AAB and make predictions              |
|                  | 8.B.1  | g. describe qualitative change, <i>such as</i> today is colder than yesterday                               |

<b>Essential Learning 2 (Learning Standard C) (Learning Standard D)</b>	<b>Represent and analyze mathematical situations and structures using algebraic symbols</b>
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| Critical Content | 8.C.1  | a. illustrate the commutative property of operations with and without manipulatives  |
|                  | 8.A.1a | b. solve simple number sentences with variables <i>such as</i>   |
|                  | 8.D.1  | $2 + \underline{\quad} = 5$  |
|                  | 8.C.1  | c. explore the operations of addition and subtraction orally, in drawings, using manipulatives, and in writing using symbols (+, -, =) |
|                  | 8.C.2* | d. identify the concept of equality in a balanced equation <i>such as</i> $4 + 4 = 6 + 2$ or $8 = 5 + 3$                               |

<b>Essential Learning 3 * (Learning Standard C)</b>	<b>Use mathematical models to represent and understand quantitative relationships and solve problems</b>
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| Critical Content | 8.C.1 | a. model situations that involve the operations of addition and subtraction orally, in drawings, using manipulatives, and in writing using symbols and drawings |
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<b>Essential Learning 4 * (Learning Standard C)</b>	<b>Use problem solving to analyze change in real life situations</b>
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| Critical Content | * | a. explore solving real life word problems using patterns                                 |
|                  | * | b. discuss predictable change such as students grow taller, not shorter as they get older |

Grade 1  
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<b>Essential Learning 5</b>	*	<b>Choose appropriate technology/tools for algebraic representations</b>
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| Critical Content | * | a. use appropriate tools <i>such as</i> a number balance to represent equations |
|                  | * | b. pencil and paper   |
|                  | * | c. math dictionary or reference books   |

<b>Essential Learning 6</b>	*	<b>Recognize the connections between algebra, other math strands, and other curricular areas</b>
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| Critical Content | * | a. compare how reading a math story problem differs from reading expository and narrative text       |
|                  | * | b. use the reading comprehension strategies of making connections and inferring in a given situation |
|                  | * | c. use balance scales in science   |
|                  | * | d. use patterns in reading for decoding (-an, -ake)  |
|                  | * | e. show different combinations to represent whole numbers <i>such as</i> $9 = 1 + 8, 2 + 7, 3 + 6$   |

<b>Essential Learning 7</b>	*	<b>Construct and communicate convincing arguments and proofs to solve problems</b>
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| 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 <ul style="list-style-type: none"><li>• explore the concept that in the commutative property, order does not matter to achieve equality</li><li>• explore the concept that an equal sign does not mean “answer,” instead it means a balanced equation</li></ul> |
|                  | * | c. form a generalization about a pattern  |
|                  | * | d. use oral or written communication to explain solutions derived by using patterns including shape pattern and numeric pattern   |
|                  | * | e. use symbols as a way to record thinking  |
|                  | * | f. explore understanding using multiple models <i>such as</i> concrete objects, kinesthetic actions, written language, pictures, graphs, or diagrams  |

<b>Essential Learning 8</b>	*	<b>Build mathematical knowledge by using a variety of appropriate strategies to solve a problem</b>
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|------------------|---|---|
| Critical Content | * | a. explore the four phases in the process of problem solving including <ul style="list-style-type: none"><li>• understanding the problem<ul style="list-style-type: none"><li>• determine the conditions of the situation</li><li>• comprehend the language and terms used</li><li>• identify the desired goal and understand the constraints</li></ul></li><li>• form a representation</li></ul> |
|------------------|---|---|

- 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 his/her 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 his/her use of the strategy
  - change strategies as necessary
- reviewing
  - judge the reasonableness of his/her answer
- \* b. explore metacognitive processes to solve a problem
  - activate prior knowledge about information in the problem
  - develop various ways to represent information
  - check for understanding

Grade 1

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including = a mandatory concept

\* = exceeds state standards

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

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

<b>Essential Learning 1 (Learning Standard A) (Learning Standard B)</b>	<b>Analyze characteristics and properties of two and three dimensional geometric shapes and develop mathematical arguments about geometric relationships</b>
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Critical Content	9.A.1b	a. name, build, compare, draw, and sort shapes including circle, oval/ellipse, square, triangle, rectangle, hexagon, rhombus, and trapezoid
	9.B.1a	
	9.B.1b	<ul style="list-style-type: none"> <li>• attributes, sides, and corners</li> </ul>
	9.B.1c	b. identify objects that are the same shape
	9.A.1a	c. recognize, build, draw, compare and sort three dimensional shapes including sphere, cube, pyramid, cylinder, cone, prism
		<ul style="list-style-type: none"> <li>• attributes, faces (curved and flat)</li> </ul>
	9.B.1b	d. compare/contrast two and three dimensional shapes using appropriate vocabulary including curved face, flat face
	*	e. investigate and predict the results of putting together and taking apart two- and three-dimensional shapes <i>such as</i> put two triangles together to make a quadrilateral
	9.A.2b	f. recognize geometric shapes and structures in the environment and specify their location

<b>Essential Learning 2 (Learning Standard B)</b>	<b>* Specify locations and describe spatial relationships using coordinate geometry and (or) other representational systems</b>
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Critical Content	*	a. find and name locations and positions in space with relationships including over, under, near, far, between, left, right, above, below, next to
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<b>Essential Learning 3</b>	<b>* Apply transformations and use symmetry to analyze mathematical situations</b>
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Critical Content	9.B.1c	a. recognize and create shapes that have line symmetry <i>such as</i> folding a paper in half or drawing a line of symmetry
	*	b. perform transformations with two dimensional shapes (flips, slides, turns) by using manipulatives <i>such as</i> puzzles, pattern blocks, tangrams

<b>Essential Learning 4 (Learning Standard C)</b>	<b>Use visualizations, spatial reasoning, and geometric modeling to solve problems</b>
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Critical Content	9.C.1	a. create mental images of geometric shapes using spatial memory and spatial visualization
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<b>Essential Learning 5 (Learning Standard C)</b>	<b>*</b>	<b>Choose appropriate technology/tools for geometric representations</b>
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| Critical Content | 9.C.1c | a. use computer software where applicable         |
|                  | 9.C.1c | b. use geoboards to represent geometric shapes    |
|                  | 9.C.1c | c. rulers with centimeters and inches             |
|                  | 9.C.1c | d. mirrors  |
|                  | 9.C.1c | e. use solids to explore three dimensional shapes |
|                  | 9.C.1c | f. paper and pencil                               |
|                  | *      | g. math dictionary or reference books             |

<b>Essential Learning 6</b>	<b>*</b>	<b>Recognize the connections between geometry, other math strands, and other curricular areas</b>
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| Critical Content | *      | a. compare how reading a math story problem differs from reading expository and narrative text       |
|                  | *      | b. use the reading comprehension strategies of making connections and inferring in a given situation |
|                  | 9.B.1c | c. apply the concept of half to the area of a shape  |

<b>Essential Learning 7 (Learning Standard C)</b>	<b>*</b>	<b>Construct and communicate convincing arguments and proofs to solve problems involving geometry</b>
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| Critical Content | *      | a. use the language of geometry to express mathematical ideas precisely, both verbally and in writing <ul style="list-style-type: none"> <li>• explain what it means to cut a shape in half</li> </ul>  |
|                  | 9.C.1* | 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"> <li>• prove the picture or shape “square” is a square and not a circle</li> <li>• justify the extension of a pattern</li> </ul> |
|                  | *      | c. use oral or written communication to explain solutions derived   |
|                  | *      | d. explore understanding using multiple models <i>such as</i> concrete objects, kinesthetic actions, written language, pictures, graphs, or diagrams  |

<b>Essential Learning 8</b>	<b>*</b>	<b>Build mathematical knowledge by using a variety of appropriate strategies to solve a problem</b>
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|------------------|---|---|
| Critical Content | * | a. explore the four phases in the process of problem solving including <ul style="list-style-type: none"> <li>• understanding the problem <ul style="list-style-type: none"> <li>• determine the conditions of the situation</li> <li>• comprehend the language and terms used</li> <li>• identify the desired goal and understand the constraints</li> <li>• form a representation</li> <li>• examine the assumptions</li> </ul> </li> <li>• devising a plan of attack and selecting the appropriate problem solving strategy</li> </ul> |
|------------------|---|---|

- organized list
  - make a table
  - guess and check
  - act out/use problem and show his/her 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 his/her use of the strategy
    - change strategies as necessary
  - reviewing
    - judge the reasonableness of his/her answer
- \* b. explore metacognitive processes to solve a problem
- activate what a student already knows is needed to address the problem
  - develop various ways to represent information
  - check for understanding

**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.**

<b>Essential Learning 1 (Learning Standard A) (Learning Standard B)</b>	<b>Develop concepts of data collection and analysis</b>
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| Critical Content | 10.A.1a | a. sort and classify objects according to their attributes and organize data about the objects   |
|                  | 10.B.1b | b. identify the rule used to sort  |
|                  | 10.A.1a | c. gather data to answer a simple question   |
|                  | 10.A.1a | d. represent data using concrete objects, pictures, tallies, and graphs  |
|                  | 10.A.1b | e. interpret simple data using pictographs, tallies, tables, and graphs <i>such as</i> how many more boys or girls or how many bus riders than those walking to school |
|                  | 10.A.1b | f. describe parts of data and the set of data as a whole to determine what the data show and make predictions  |

<b>Essential Learning 2 (Learning Standard C)</b>	<b>Develop the concept of probability</b>
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| Critical Content | 10.C.1a | a. explore likely, unlikely, and impossible outcomes that can be recorded and analyzed using objects <i>such as</i> coins, spinners, and objects with two outcomes <i>such as</i> red and blue |
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<b>Essential Learning 3</b>	<b>Choose appropriate technology/tools for data collection and representation</b>
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|------------------|---|--|
| Critical Content | * | a. use manipulatives for data collection <i>such as</i> coins, spinners, and objects |
|                  | * | b. use appropriate technology and tools  |
|                  | * | c. use paper and pencil  |
|                  | * | d. use math dictionary or reference books  |

<b>Essential Learning 4</b>	<b>Recognize the connections between data collection and probability, other math strands, and other curricular areas</b>
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|------------------|---|---|
| Critical Content | * | a. compare how reading a math story problem differs from reading expository and narrative text  |
|                  | * | b. use the reading strategies of inferring and questioning to analyze data in a given situation <ul style="list-style-type: none"><li>• recognize that some information is explicitly stated and other information is not</li></ul> |
|                  | * | c. interpret graphs and tables in social studies and science  |
|                  | * | d. apply how data is used in one-to-one correspondence, more than and less than, problem solving, and in basic operations of addition and subtraction   |

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<b>Essential Learning 5</b>	<b>*</b>	<b>Construct and communicate convincing arguments and proofs to solve problems</b>
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| Critical Content | *       | a. use the language of data or probability to express mathematical ideas precisely, both verbally and in writing                                     |
|                  | 10.B.1c | b. draw conclusions and communicate his/her understanding about graphs verbally  |
|                  | *       | c. use oral or written communication to explain solutions derived  |
|                  | *       | d. explore understanding using multiple models <i>such as</i> concrete objects, kinesthetic actions, written language, pictures, graphs, or diagrams |

<b>Essential Learning 6</b>	<b>*</b>	<b>Build mathematical knowledge by using a variety of appropriate strategies to solve a problem</b>
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| Critical Content | * | a. explore the four phases in the process of problem solving including <ul style="list-style-type: none"> <li>• understanding the problem           <ul style="list-style-type: none"> <li>• determine the conditions of the situation</li> <li>• comprehend the language and terms used</li> <li>• identify the desired goal and understand the constraints</li> <li>• form a representation</li> <li>• examine the assumptions</li> </ul> </li> <li>• devising a plan of attack and selecting the appropriate problem solving strategy           <ul style="list-style-type: none"> <li>• organized list</li> <li>• make a table</li> <li>• guess and check</li> <li>• act out/use problem and show his/her reasoning</li> <li>• justify an answer by using manipulatives</li> <li>• draw a picture</li> <li>• use/find a pattern</li> <li>• work backwards</li> <li>• use logical reasoning</li> </ul> </li> <li>• carrying out the plan           <ul style="list-style-type: none"> <li>• work through the problem</li> <li>• monitor his/her use of the strategy</li> <li>• change strategies as necessary</li> </ul> </li> <li>• reviewing           <ul style="list-style-type: none"> <li>• judge the reasonableness of his/her answer</li> </ul> </li> </ul> |
|                  | * | b. explore metacognitive processes to solve a problem <ul style="list-style-type: none"> <li>• activate prior knowledge about information in the problem</li> <li>• develop various ways to represent information</li> <li>• check for understanding</li> </ul>  |