Grade 5

CONTENTS

The Learner at This Level

THE FIFTH-GRADE CHILD:

- Likes order and a harmonious environment.
- Finds comfort in themselves, their parents and siblings and teachers.
- Learns factual information easily.
- Knows the rules.
- Works well with others.
- Enjoys group games and projects.
- Concentrates on completing projects and tasks.
- Needs breaks and rest periods.
- Is a good problem solver.

Source: *Yardsticks: Children in the Classroom Ages 4-14* by Chip Woods, pages 105-115

ALGEBRAIC REASONING

- Performs complex classification and seriation tasks.
- Thinks based on rules and logic.
- Can articulate the rules embedded in a function, relationship, or pattern.
- Represents patterns in words, tables, graphs and equations.
- Describes how the change in one variable affects another variable in everyday situations.
- Models equivalence and solves one step equations using manipulatives

NUMERICAL AND PROPORTIONAL REASONING

- Selects, uses, and explains various meanings and models for multiplication and division.
- Computes efficiently and accurately in all four operations.
- Solves computation problems using the order of operations.
- Comprehends the relationship between fractions, decimals and percentages.
- Realizes that a percent means part of 100.
- Identifies and represents decimals, fractions, mixed numbers, and positive and negative integers on a number line.
- Uses drawings, number patterns or models to explain solutions for fraction and decimal problems.
- Converts improper fractions to mixed numbers.

- Makes efficient use of technology when precision is necessary in complex computation.
- Demonstrates an understanding of a ratio of whole numbers as a fraction.
- Recognizes classes to which a number may belong, including odd, even, prime, composite or square numbers.
- Explores integers using models and coordinate grids.

GEOMETRY AND MEASUREMENT

- Solves problems involving computation with measurements.
- Uses combinations of attributes to describe phenomena.
- Utilizes tools like a compass and protractor.
- Uses ratio and proportion to solve practical problems.
- Explores the relationship between changes in the area and perimeter of a polygon.
- Develops formulas to describe area and perimeter of squares, rectangles, and triangles.
- Selects and uses appropriate tools and units for attributes being measured.
- Determines when precision or estimation in measurement is appropriate.
- Uses models and drawings of shapes to make and test hypotheses and make generalizations about geometry.
- Explains and illustrates spatial relationships using coordinate geometry.
- Describes and analyzes the results of combining and subdividing shapes.
- Creates and uses formulas to solve problems.

WORKING WITH DATA

- Recognizes the impact a variable has on data collection and analysis.
- Evaluates how well a display represents the features of the data.
- Recognizes the significance of probability and fairness and represents the data in multiple ways.

Mathematics Background for Teachers

MATHEMATICS BACKGROUND FOR GRADE 5 TEACHERS

ALGEBRAIC REASONING: PATTERNS AND FUNCTIONS:

Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools and technologies.

Central Understanding: Numerical relationships can be represented using symbols.

Background: Functional relationships are represented by: describing a pattern, using a chart or table, using a graph, and by using descriptive language. Functions in their most abstract form are written as equations. Equations apply the rules of arithmetic and algebra to determine equivalence and calculate values. A value can be represented as a number, a numerical expression, an algebraic expression, or an equation. Different symbols in an equation can have the same, or different, values. In mathematical situations and structures, using letters as variables facilitates generalizations and the exploration of numbers and their operations.

NUMERICAL AND PROPORTIONAL REASONING

Quantitative relationships can be expressed numerically in multiple ways in order to make connections and simplify calculations using a variety of strategies, tools and technologies.

Central Understanding: Numerical relationships are not changed when rational numbers are represented in different ways.

Background: Rational numbers are numbers which can be expressed as ratios and operated upon as division problems. The equivalence of fractions, decimals and percent allows for translation among different representations for the same quantity. Context and efficiency dictate the appropriate representation when solving problems. Operations involving rational numbers are consistent with whole number operations. Familiar situations can also be described using , which are positive numbers, negative numbers that represent quantities less than zero and zero.

GEOMETRY AND MEASUREMENT

Shapes and structures can be analyzed, visualized, measured and transformed using a variety of strategies, tools and technologies.

Central Understanding: Geometric relationships can be represented spatially and generalized through formulas.

Background: The exploration and analysis of shapes, structures, and properties leads to generalizations that can be expressed as formulas. Measures of attributes provide numerical data which summarize what is typical for a specific situation and condition.

WORKING WITH DATA: PROBABILITY AND STATISTICS

Data can be analyzed to make informed decisions using a variety of strategies, tools and technologies.

Central Understanding: Organized data can be used to summarize what is typical for a specific situation and condition.

Background: Measures of central tendency are descriptors of what is typical for a specific situation or condition. Data from a sample that is representative of a larger population are used to identify trends, make generalizations and make predictions, providing the foundation for further investigations of conjectures and conclusions.

Correlated Grade-Level Expectations

Click here to access correlated grade-level expectations for Grade 5 on the State Department of Education Web site.

Sequenced Grade-Level Expectations

GRADE 5 SEQUENCED GLES

Grade-Level Expectations	Fall	Winter	CMT	Spring
ALGEBRAIC REASONING				
1.1 Understand and describe patterns and functional relationships.				
1. Represent, extend and compare geometric and numeric patterns using words, tables, graphs and equations.				
2. Analyze patterns and data to make generalizations, make predictions and to identify trends.				
1.2 Represent and analyze quantitative relationships in a variety of ways.				
3. Represent and describe mathematical relationships using variables or symbols in expressions, equations and inequalities.				
4. Describe how a change in one variable relates to a change in a second variable in context. For example: If a recipe requires two cups of flour for eight servings, the flour must be doubled for 16 servings or increased by ½ for 12 servings).				
1.3 Use operations, properties and algebraic symbols to determine equivalence and solve problems.				
5. Replace variables or symbols in algebraic expressions with given values and evaluate or simplify the expression e.g., If = 5, find the value of 4 *x* +7.				
6. Model, write and solve one-step equations by using appropriate concrete materials that model equivalence, e.g., if 4 x Δ = 36, then Δ equals 9.				
NUMERICAL AND PROPORTIONAL REASONING				
2.1 Understand that a variety of numerical representations can be used to describe quantitative relationships.				
1. Compare, order and round whole numbers to 1,000,000 using number patterns, number lines and diagrams.				
2. Represent whole numbers up to 1,000,000 in expanded and regrouped forms and use the forms to support computation.				

Grade-Level Expectations	Fall	Winter	CMT	Spring
3. Construct and use models, number patterns and pictorial representations to extend place value concepts and patterns to decimals, e.g., 0.1 is one-tenth of 1 and 0.01 is one one-hundredth of 1 and one-tenth of 0.1.				
4. Investigate negative integers (values less than zero) using place value models, diagrams and number lines and represent negative integers in practical applications, e.g., temperatures, money and locations below sea level.				
5. Classify numbers as prime, composite or perfect squares and identify factor pairs using rectangular arrays.				
6. Represent equivalent fractions, decimals, ratios and percents using models, pictures, number patterns and common factors.				
7. Choose and use benchmarks to approximate locations, of fractions, mixed numbers and decimals, on number lines and coordinate grids.				
8. Write division problems in fraction form and round the fraction form to estimate an answer to a division problem, e.g., $^{14}/_{3} = 4\ ^{2}/_{3} \approx 5$.				
9. Use models and pictures to identify and compare ratios and represent ratios in equivalent fraction and decimal forms.				
2.2 Use numbers and their properties to compute flexibly and fluently and to reasonably estimate measures and quantities.				
10. Solve practical problems involving 10, 100, 1000 and *10,000* more or less than a number.				
11. Estimate products and missing factors using multiples of 10, 100 and 1000.				
12. Develop and use strategies involving place value relationships, inverse operations and algebraic properties (commutative, associative and distributive) to simplify addition, subtraction and multiplication problems with three-, four- and five-digit numbers and money amounts and division by one-digit factors.				
13. Multiply and divide decimals and money amounts by whole numbers				
14. Write and solve multistep problems for all four operations involving multidigit whole numbers and money amounts and explain how answers were determined, orally and in writing.				
15. Find fractional parts of a set by using estimation, counting, grouping of objects, number patterns, equivalent ratios and division.				

Grade-Level Expectations	Fall	Winter	CMT	Spring
16. Add and subtract fractions, decimals and mixed numbers using a variety of strategies (e.g., models, mental math, equivalence and substitution: ½ + ¾ can also be solved using 0.5 + 0.75).				
17. Construct and use models and pictorial representations to multiply common fractions and mixed numbers by whole numbers.				
18. Use ratios and proportions to solve practical problems, e.g., interpreting scale drawings and maps, and determining the probability of an event.				
19. Use estimation to predict results and to recognize when an answer is or is not reasonable, or will result in an overestimate or underestimate and explain the reasoning used orally and in writing.				
GEOMETRY AND MEASUREMENT				
3.1 Use properties and characteristics of two- and three-dimensional shapes and geometric theorems to describe relationships, communicate ideas and solve problems.				
1. Represent the surface of three-dimensional solids using two-dimensional nets.				
2. Develop formulas for finding the perimeter and area of squares, rectangles and triangles and use them to solve problems.		Squares, rectangles		Triangles
3. Use the attributes of parallel sides, perpendicular sides, congruent sides/angles, number and length of sides or faces and number and kinds of angles (right, acute or obtuse) to describe, classify and sort polygons and solids (cube, prism, pyramid and sphere).				
4. Make and test conjectures about polygons using geometric relationships.				
3.2 Use spatial reasoning, location and geometric relationships to solve problems.				
5. Use an *x*, *y* coordinate system to plot points, to estimate the distance between points and to determine the horizontal or vertical distance between two points.				
6. Analyze and describe the effect that changing the dimensions (perimeter) of a polygon has on its area and vice versa.				
3.3 Develop and apply units, systems, formulas and appropriate tools to estimate and measure.				
7. Use calendars and clocks to plan and sequence events and to solve problems involving the conversion of measures of time and elapsed time using days, hours, minutes and seconds.				

Grade-Level Expectations	Fall	Winter	CMT	Spring
8. Estimate and measure to solve a variety of problems that involve angles, length, area, weight, mass, temperature, capacity and volume in either metric or customary units and explain the reasoning used orally and in writing.				
9. Use cubic inch or cubic centimeter models to find the volume of rectangular solids.				
10. Solve length problems involving conversions of measure within the customary (inches, feet, yards, and miles) or metric systems (millimeters, centimeters, meters and kilometers).				
WORKING WITH DATA				
4.1 Collect, organize and display data using appropriate statistical and graphical methods.				
1. Represent sets of data using line plots, bar graphs, double bar graphs, pictographs, simple circle graphs, stem and leaf plots and *scatter plots*.				
2. Compare different representations of the same data set and evaluate how well each kind of display represents the features of the data.				
4.2 Analyze data sets to form hypotheses and make predictions				
3. Design and conduct surveys of a representative sample of a population and use the data collected to begin to make inferences about the general population.				
4. Determine the mean, mode and median of a data set and explain in writing, how they are affected by a change in the data set.				
4.3 Understand and apply basic concepts of probability				
5. Design and conduct probability experiments and simple games of chance to test predictions about outcomes and fairness.				
6. Determine and describe possible outcomes and express the likelihood of events as a fraction.				
7. Determine and describe possible outcomes using permutations, where order does matter, e.g., when there is a choice of vanilla (V), chocolate (C) or strawberry (S) ice cream for a three scoop cone, there are two possible ways to have the chocolate scoop on top CVS or CSV.				

Correlated GOALS 2000 Criterion Referenced Test

GRADE 5 CORRELATED GOALS 2000 CRT

The Goals 2000 Mathematics Curriculum was written as a companion to the 1998 Mathematics Framework. The Goals 2000 resources cited in this 2008 Model for Mathematics Curriculum are aligned to the 2005 Mathematics Curriculum Framework, 2007 Curriculum Standards and the fourth generation Connecticut Mastery Test.

The Grade 5 Criterion Referenced Test Part A from the Goals 2000 Mathematics Curriculum is aligned to the Grade 5 sequenced GLEs and can be used for pre- and post-assessment.

Please use the link below to access the electronic version of the complete document, which includes other activities, such as opportunities for open-ended and challenge experiences that must be examined for alignment prior to use.

http://www.sde.ct.gov/sde/cwp/view.asp?a=2618&q=321084

Grade 5 Correlated Mathematics CRT

GLE 2.2.19

Mr. Lopez is redoing his kitchen. The following list shows the cost of new appliances.

Appliance	Cost
Stove	$479.29
Refrigerator	$649.89
Dishwasher	$329.59
Microwave	$269.29
Toaster	$ 39.95

a. ABOUT how much will Mr. Lopez spend on the stove and the refrigerator together?

Estimate _____

b. Write a number sentence that shows how you would use estimation to figure how much more expensive the dishwasher is then the microwave.

_____

c. Mr. Lopez has budgeted $1500 for appliances for the kitchen. Explain how he can use estimation to find out if he has enough money to buy all five appliances.

_____

_____

_____

GLE 2.1.1

Consider the number 247,954.

a. Write the number that is 10,000 more _____

b. Write the number that is 1000 less _____

c. Write the number that is 1000 more _____

d. Write the number that is 100,000 less _____

e. Write the number that is 10 times greater _____

Darlene's new stereo cost $485. Before she bought the stereo she had about $1000 in the bank. ABOUT how much does she have left in the bank?

a. A little less then $500

b. A little more then $500

c. A little less then $600

d. A little more then $600

GLE 3.3.7

Evan can type at a rate of about 30 words per minute. About how many words can he type in an hour and a half? Explain

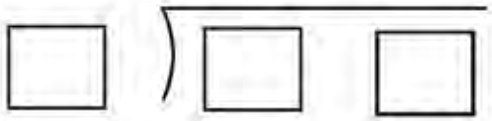
_____

_____

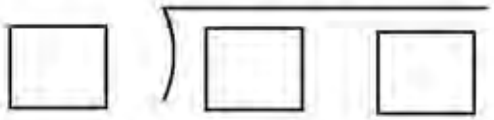
GLE 2.2.12

Use each of the digits 3, 4 and 6.

a. Put one digit in each box to get the greatest possible quotient.



b. Now rearrange the digits to get the least possible quotient.

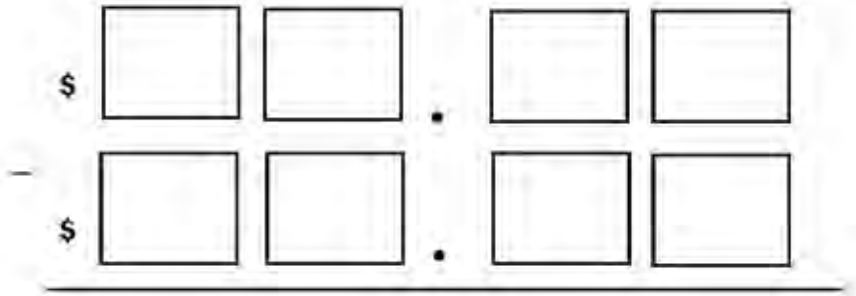


c. Explain how you decided where to place the digits in the problems above.

GLE 2.2.12

Show how you can arrange 8 of the 10 numbers below in the boxes below to get a difference close to $10. Use each number only once.

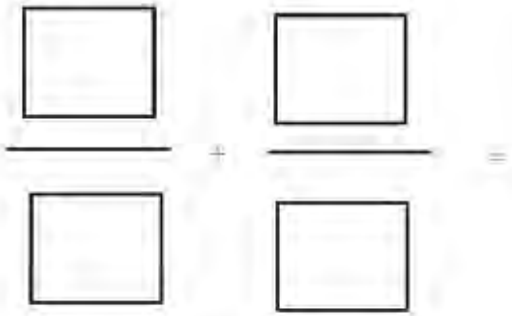
0 1 2 3 4 5 6 7 8 9



GLE 2.2.16

Place four different digits in the boxes below so that the sum of the two fractions is about one.

a.



Explain why you think the sum is about one.

GLE 2.1.7

Place the following on the number line: 2/3, 7/8, 0.6, 1.25, 1 3/4, 0.78, 1.09, 1 9/10

GLE 2.2.19

Maria needs to estimate the difference between 3867 and 8129. Her estimate could either be 4000 or 4300.

a. When would 4000 be the most reasonable estimate?

b. When would 4300 be the most reasonable estimate?

GLE 2.2.16

Pasqual needs to add 3 7/8 and 7 1/9. Show the whole numbers he would use to ESTIMATE this sum. Then write one or two sentences to explain why you used these numbers.

GLEs 2.2.11; 2.2.13, 3.3.10

Place a decimal point in the last number to make each sentence correct.

a. 500¢ = $500

b. 374 ÷ 10 = 374

c. 134 x 100 = 13400000

d. 135 centimeters = 135 meters

e. 1000 millimeters = 1000 centimeters

GLEs 2.2.14, 4.2.4

The school store has the following price list:

Item	Cost
Pen	$0.85
Pen Set	$2.29
Pencil	$0.69
Lead Pencil	$3.29
Crayons	$2.75
Binder	$1.79
Hole Punch	$4.49
Stapler	$3.99
Envelopes (box)	$1.29
Pad	$1.69

a. What is the cost of 3 pens, 2 pencils and 5 binders? _____

b. Mary buys one hole punch and one stapler. She pays for them with a $20 bill. How much change should she receive?

_____

c. What is the average (mean) cost of the first 5 items on the list?

_____

GLE 2.1.1

Write each of the following in standard form:

a. 6 hundreds, 4 tens and 5 ones _____

b. 4 thousands, 8 hundreds and 1 one _____

c. 3 ones and 5 tenths _____

d. 2 tens, 5 ones and 6 hundredths _____

GLE 2.2.12

Round the following numbers to the stated place:

a. Round 72 to the nearest 10 _____

b. Round 2,578 the nearest hundred _____

c. Round 4.88 to the nearest whole number _____

d. Round 3.732 to the nearest tenth _____

GLE 2.2.13

A school bought 16 boxes of new colored pencils. Each box contains 24 pencils. If the new pencils were divided equally among 6 classes, how many pencils will each class receive? Show all of your work.

GLE 2.2.13

Five people split the $38.65 cost of dinner evenly. How much will each person have to pay? Show all of your work.

GLEs 2.1.1, 2.2.12, 4.1.1, 4.2.4

The 15 students in a class each count the number of pumpkin seeds in their pumpkins. The results are shown below.

Student	Number of Seeds
Thomas	381
Andy	325
Pierina	365
Olivia	410
Ginny	467
Kate	479
Mathieu	512
Geoffrey	494
Zachary	455
Elizabeth	367
Rachel	507
James	385
Elizabeth	545
Kristin	568
Lindsay	408

a. Which student found the greatest number of seeds?

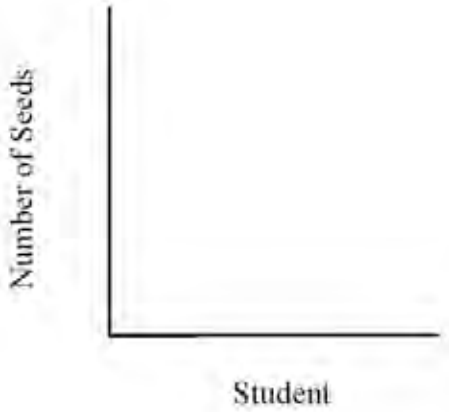
b. Which student found the fewest number of seeds?

c. Name three students who found about 500 seeds in their pumpkin?

d. Pick the students who found between 300 and 400 seeds in their pumpkins. What fractional part of the class did you pick?

e. Calculate the mean number of pumpkin seeds found and compare that to the median. Explain the reason for the difference, if any.

f. Use the first five students in the list and construct a bar graph showing how many seeds they each found in their pumpkin.



GLE 2.1.6

Draw a picture to show what 4/3 means.

GLE 2.1.6

Write two equivalent fractions for 4/5. _____ _____

GLE 2.1.7

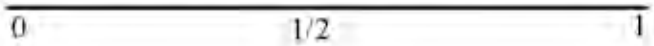
Consider the following fractions:

6/11 5/8 9/20 3/7 7/15 11/123/10

a. **Circle those fractions that are less than 1/2**

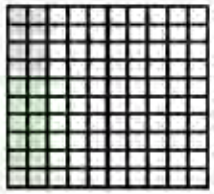
b. **Underline the largest fraction**

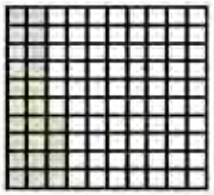
c. **Put an X on the number line to show where 3/10 is.**



GLE 2.1.3

If the large square represents one whole, what decimal is represented by the shaded part of the square?

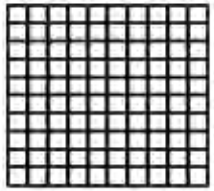
a.  _____

b.  _____

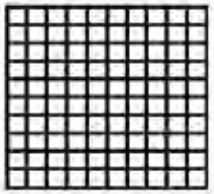
GLE 2.1.3

Shade in the squares to show:

a. .42



b. .3



GLEs 1.1.1, 1.1.2

Write the next three numbers in each sequence and explain the rule for the pattern.

a. 32 28 24 _____ _____ _____

Rule _____

b. 1 4 7 10 _____ _____ _____

Rule _____

c. 1 2 4 8 16 _____ _____ _____

Rule _____

d. 1 2 4 7 11 16 _____ _____ _____

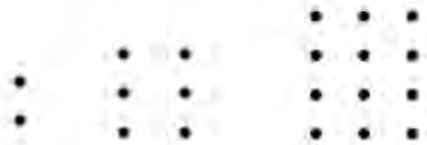
Rule _____

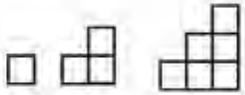
GLE 1.1.1

Draw the next figure in each of the following patterns.

a.  _____

b.  _____

c.  _____ _____

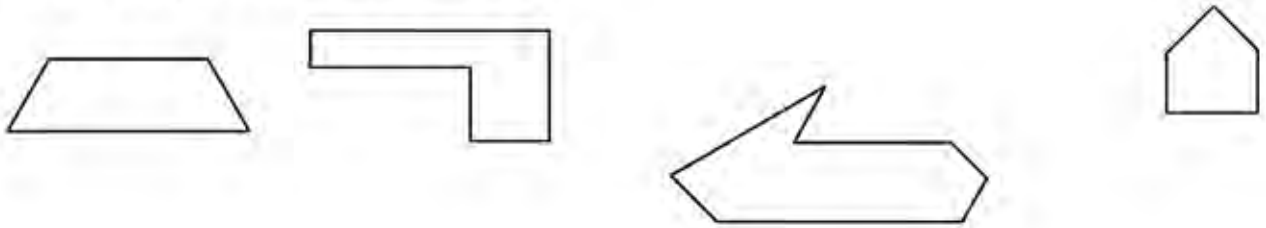
d.  _____ _____

GLE 3.1.2

Find the perimeter of this figure. Explain what you did to find the perimeter and show a generalized (formula) way to find perimeter.

GLE 3.1.3

Circle the shape below that is a hexagon.



GLE 3.1.3

Draw a rectangle below and identify two properties of all rectangles.

Property 1 _____

Property 2 _____

GLE 3.1.2

A square has a side 7 inches long.

a. What is the perimeter of this square? _____

b. What is the area of this square? _____

GLE 2.1.1

The table below shows the number of pizzas sold at Gino's last year.

Type of Pizza	Number Sold
Cheese	6428
Pepperoni	6249
Mushroom	7248
Sausage	6981
Onion	6212

a. Of the types of pizza sold, which type was the LEAST popular?

b. Of the types of pizza sold, which type had sales between 6500 and 7000?

c. Write one additional question this graph could answer.

GLE 4.1.1

Construct a graph that represents the data in the table below. Explain which representation is more useful and why.

Town	Population
Winterston	40,000
Tunxisville	60,000
Salisburg	70,000
Franklin	20,000
Marshlock	80,000

GLEs 2.1.6, 2.2.16, 4.1.2

Consider the data in the chart below regarding how the students in a class got to school one day.

Student	Time (minutes)	Distance (miles)	Mode of Travel
TC	60	4.7	Bus
RC	30	1.9	Bus
DD	15	1.5	Car
MR	20	0.4	Walk
LS	15	1.3	Bus
SW	8	0.9	Car
MB	45	3.9	Bus
SL	25	2.2	Bus
DH	30	4.2	Car
RT	10	1.0	Bus
GT	35	1.6	Walk

a. Name the students who traveled close to 3 miles. _____ _____

b. Name the students who traveled less than 1 mile. _____ _____

c. Name the student who traveled 1 1/2 miles. _____

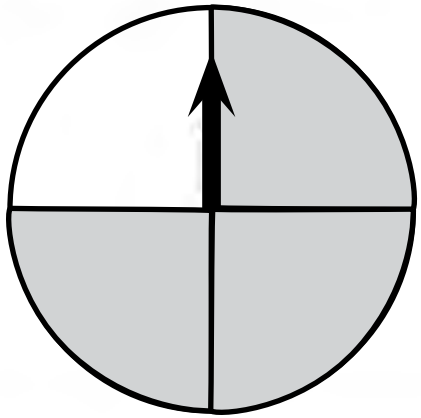
d. How many miles did the two students who walked travel all together? _____

GLE 4.3.6

The spinner below is spun 100 times. How many times would you predict the arrow will land on the shaded section? Explain your answer.

Prediction _____

Explanation _____

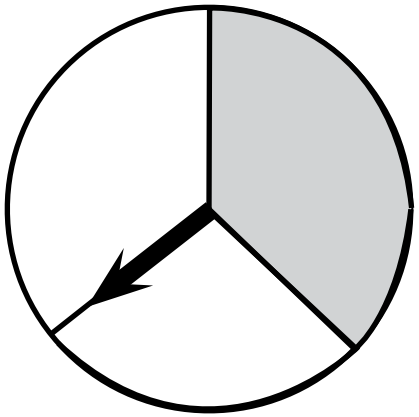


GLE 4.3.6

The spinner below is spun 500 times. How many times would you predict the arrow will land on the shaded section? Explain your answer.

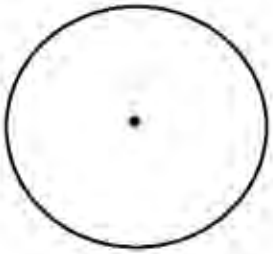
Prediction _____

Explanation _____



GLE 4.3.5

Draw a spinner that you think will give the following results if the spinner is spun 1000 times. 600 A's 300 B's and 100 C's



GLE 3.3.10

Arrange the units of length below in order from shortest to longest. Write a problem for a classmate to solve that involves converting from one of the units to another.

meter centimeter kilometer millimeter

_____ _____ _____ _____

GLE 3.3.10

Arrange these units of capacity in order from smallest to largest. Write a problem for a classmate to solve that involves converting from one of the units to another.

quart pint cup gallon

_____ _____ _____ _____

GLE 3.3.8

a. Using a standard ruler, draw a line segment that is 2 1/2 inches long. Label the segment XY.

b. Use a metric ruler and draw a line that is 3 cm, 4 mm long. Label the segment AB.

GLE 3.1.3

Draw two different quadrilaterals and label them with their correct names.

GLE 3.3.7

Bobby exercises for 20 minutes every morning except Saturday. How many hours does he spend exercising in one week?

_____

The movie started at 7:10 and ended at 9:00 p.m. How long was the movie? _____

GLE 3.3.10

Measure this line segment using centimeters:

GLE 3.3.7

Megan left for a soccer game at 4:15 and got home at 6:10. How long was she gone?

_____

A new Jeep Cherokee cost $31,540 and a new PT Cruiser cost $25,400. If P = the cost of the Cruiser, which equation below can be used to find how much more the Jeep is than the Cruiser?

a. 31,540 + P

b. 31,540 – P

c. 31,540 x P

d. 31,540 / P

GLE 3.3.8

The large stick figure is ABOUT HOW MANY TIMES TALLER than the small figure?

_____

GLE 3.1.3

Use a PROTRACTOR to draw a 75 degree angle.

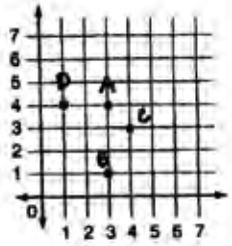
GLE 2.2.12

To ESTIMATE the product of 412 and 625, Jason multiplied 400 x 600. Will Jason's estimate be MORE or LESS than the actual sum?

a. More because he rounded both numbers up.
b. More because he rounded both numbers down.
c. Less because he rounded both numbers up.
d. Less because he rounded both numbers down.

GLE 3.2.5

Look at the grid below. Using horizontal and vertical lines only, determine which two points are the same distance from point A.



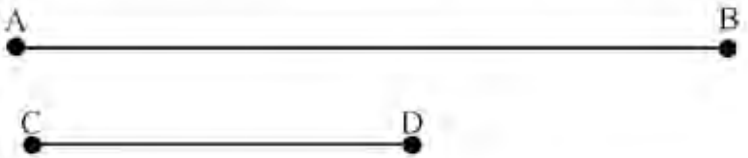
GLE 3.3.8

The amount of water in an eyedropper is best measured using: _____

a. milliliters b. liters c. kiloliters

GLE 3.3.8

Line segment AB is about_____ times as large as line segment CD



GLE 3.3.8

23 degrees Celsius is great weather for swimming. Mark this temperature on the thermometer with a heavy line.

GLE 2.2.11

Fill in the missing numbers on this grid and explain your thinking.

X	30	
	120	
7		350

GLE 3.1.3

Draw an octagon. How many obtuse angles does an octagon have? _____

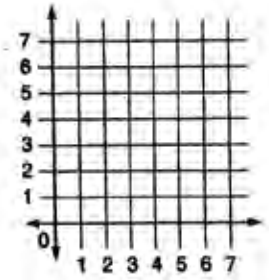
GLE 2.1.8, 2.1.9

Draw an array for 16 / 2

GLE 3.2.5

On the grid below, find each coordinate below and label A, B, or C. Compare the distance between point B and point A point with the distance between Point B and Point C. Write about your findings.

a. (2,1)
b. (2,4)
c. (3,7)



GLE 2.1.5

Solve the riddle:

I am a 2-digit prime number
I am greater than 14 and less than 36
The sum of my digits is 10
Who am I? _____

GLE 2.2.14

Jared has to give each horse 32 ounces of grain each day. There are 12 horses. How much grain will he need to be able to feed the horses for 1 week? Show your work.

GLE 2.2.12

Mrs. Naumac ordered 240 hamburgers for the school. What else do you need to know to find out how many hamburgers each student gets?

GLE 3.3.7

Savva got to his friend's house at 3:25. He left at 5:15. How long was he at his friend's?

GLE 2.1.6

Circle the larger quantity in each pair.

a. 1/4 0.75
b. 1/2 0.5
c. 2/3 0.23
d. 2/6 2/4

GLE 2.2.12

Crystal is going to put wall paper trim around her room. Her room is 10 ft. long and 12 ft. wide. If the trim cost $2.00 for each foot, how much will it cost her in all?

GLE 3.1.2

Jessica got home at 3:45. She asked her mom, "What time is supper?" Her mom said, "It will be in 1 hour and 45 minutes." What time is supper?

GLE 3.3.7

Circle the bigger decimal and explain your choice. 0.3 0.03

GLE 2.1.1, 2.2.10

If the 6 in 1,268 is changed to a 7, how will that change the value?

a. 1 more
b. 10 more
c. 100 more
d. 1000 more

GLE 2.1.1, 2.2.10

If the 6 in 46,821 is changed to a 5, how will that change the value? _____

Curriculum Standards Connections

ALGEBRAIC REASONING: PATTERNS AND FUNCTIONS. Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools and technologies.

COMPONENT STATEMENT: 1.1. UNDERSTAND AND DESCRIBE PATTERNS AND FUNCTIONAL RELATIONSHIPS

Grade-Level Expectations

1. **Represent, extend and compare geometric and numeric patterns using words, tables, graphs and equations**

2. **Analyze patterns and data to make generalizations, make predictions and to identify trends. (See also GLE 1.2.4.)**

    - Give children opportunities to create and play "Guess My Rule" games by utilizing different patterns (square numbers, doubles plus one, add the two preceding numbers, etc.).

COMPONENT STATEMENT: 1.2. REPRESENT AND ANALYZE QUANTITATIVE RELATIONSHIPS IN A VARIETY OF WAYS.

Grade-Level Expectations

3. **Represent and describe mathematical relationships using variables or symbols in expressions, equations and inequalities. (See also GLEs 1.3.5 and 1.3.6.)**

    - Have children develop numeric expressions for things that come in multiples (the number of legs on five chairs can be rep-

resented as 5 x 4 so the number of legs on *N* chairs can be represented as *N* x 4).

- Give examples of situations like the following, that children can represent using expressions or equations.
    - Tim is 5 years older than his sister Sally. If *t* represents Tim and s represents Sally, we can express their ages like this: Sally (*t* - 5) or Tim (*s* + 5). If Sally is 11 years old, how old is Tim? *t* = 11 + 5

4. Describe how a change in one variable relates to a change in a second variable in context. For example: If a recipe requires two cups of flour for eight servings, the flour must be doubled for 16 servings or increased by one-half for 12 servings. (See also GLEs 1.1.2 and 3.2.6.)

- Give children opportunities to solve contextual problems such as:
    - Explain what happens to the perimeter of an equilateral triangle if the length of a side is decreased by one unit?
    - Explain what happens to the perimeter of a rectangle if the base or length is increased by two units?
    - How does the area of a rectangle change if the height or width is decreased by one unit?

COMPONENT STATEMENT: 1.3. USE OPERATIONS, PROPERTIES AND ALGEBRAIC SYMBOLS TO DETERMINE EQUIVALENCE AND SOLVE PROBLEMS

Grade-Level Expectations

5. Replace variables or symbols in algebraic expressions with given values and evaluate or simplify the expression, e.g., if □ = 5, find the value of 4 *x* □ +7. (See also GLEs 1.2.3 and 1.3.6.)

- Give children opportunities to express familiar situations algebraically. For example: The supplier for the fifth grade fundraiser will award each class 10 school store credits for every $200 in sales. Six of Mr. Mitchell's fifth-graders sold $200. How could we show the number of store credits the class will receive?

- Describe real world situations that demonstrate function. (i.e., the number of tickets sold determines the amount of money the class earns).

- Provide opportunities for children to use symbols in expression such as: Myra's number is 10 less than Sara's number, *S*. Write an expression for Myra's number. If Sara's number is 247, what is Myra's number?

6. Model, write and solve one-step equations by using appropriate concrete materials that model equivalence, e.g., If 4 x Δ = 36, then Δ equals 9.

- Read *Equal Shmequal* by Virginia Kroll. Have children recall the details of the story by acting out the story. Lead a class discussion about balance and equivalence.

- Give children opportunities to solve simple one-step equations by using pattern blocks. Begin by assigning a value of one to the green triangle.

- Use a two pan balance and objects to model equations. Have children record the equations they have created using pictures, symbols and numbers.

SAMPLE INTEGRATED LESSON: DOES SIZE MATTER?

See also Sample Integrated Lessons 1 and 2 in Geometry and Measurement

Context: We were cleaning out our folders and a group of classmates was trying to make baskets in the classroom recycle bin by throwing in wads of paper. Some of the boys were tearing sheets of paper into smaller pieces so that they could have more shoots at the bin. Our teacher reminded us that it was time for math. We were learning about functions, so he suggested that we could make good use of the skills we were developing through our paper throwing activity. Our teacher wondered out loud if the size of the paper wad had an effect on the distance it could be thrown. We were happy to help find the answer to his question.

GLEs: 1.1.2, 1.2.4, 4.1.1, 4.2.4, 3.3.10

Time: Two instructional periods

Objectives: Children will collect and record measurement data to determine if the size of a piece of paper is a function of the distance it can be thrown. Children will measure paper in inches and distance in centimeters. Children will determine the mean for a set of data.

Materials: 2-inch square, 4-inch square, 6-inch square and 8-inch square pieces of scrap paper, masking tape, meter sticks or tape measures, recording sheet, graph paper, calculators if necessary

Procedure: Children should work in teams of three for this activity. Each child should have the opportunity to have the role of recorder, measurer and thrower.

1. Children should cut squares from paper destined for the recycle bin. Use the same type, or weight, of paper for all of the squares. Children could be provided the with precut paper squares for this activity.

2. Each group must set up a test area by marking the throwing line with masking tape.

3. The group must then decide on a way to record the results of the throw trials and set up recording sheets.

4. Each child should have the opportunity to wad two of each size paper square and throw them, one at a time, from behind the line.

5. One teammate measures (in centimeters) the distance each piece of wadded paper traveled and another teammate verifies and records the result on the sheet.

6. Once all team members have completed their throws, the team should find the mean distance each size square traveled.

7. Data should be examined and discussed to determine if the question can be answered. Does size matter?

8. All teams can share their findings during class discussion of the data.

❖ Possible Assessment Opportunity

❖ Within a team, each child chooses and focuses on a different sized square. Using the data from every classmate, the child creates a table (and graph) showing the distance that size paper square traveled. Each team compares the data and prepares a written report explaining their collective findings and answer to the question.

Intervention: Place data in a table provided.

Challenge: Investigate to explain possible reasons for any unexpected results or trends in the data.

Interdisciplinary Framework Connections		
Science	**English/Language Arts**	**Physical Education**
B. INQ.1 Employ simple equipment and measuring tools to gather data and extend the senses. **B INQ.1** Use data to construct reasonable explanations. **B INQ.2** Analyze, critique and communicate investigations using words, graphs and drawings. **B INQ.3** Use measurement tools and standard units (e.g., centimeters, meters, grams, kilograms) to describe objects and materials. **B. INQ. 10** Use mathematics to analyze, interpret and present data.	• Select and organize relevant information from text to summarize. • Draw conclusions and use evidence to substantiate them by using text heard, read, and viewed. • Make and justify inferences from explicit and/or implicit information.	• Identify the critical elements of increasingly more complex movements and game forms. • Understand and apply increasingly more complete movement sequences and game forms. • Solve problem and make choices by analyzing consequences and solutions.

Vocabulary: T-chart, input value, output value, variable, equation, expression, algebraic symbol, inequalities, trends, predictions, analyze, properties, scale drawings, CMT Web site - http://www.sde.ct.gov/sde/lib/sde/pdf/curriculum/math/cmtgrade5.pdf

Resources

Teacher resources:

Putting Fun in Functions – Teaching Children Mathematics – NCTM – Dec/Jan 2006

Navigating through Algebra – Grades 3-5 – NCTM

Groundworks: Algebraic Thinking-grades 4-7 from Creative Publications

Electronic Resources:

The Hundredth Block – Goals 2000

A Teeter-Totter Discovery – Goals 2000

Children's Literature:

Anno's Mysterious Multiplying Jar by Anno and Anno

Patterns by Henry Arthur Pluckrose

My Little Sister Ate One Hair by Bill Grossman

Mathematicles by Betsy Franco

Spaghetti and Meatballs For All by Marilyn Burns

Anno's Magic Seeds by Mitsumasa Anno

Two of Everything by Lily Toy Hong

Bunches and Bunches of Bunnies by Louse Matthews

Piece=Part=Portion by Scott Gifford

Equal Shmequal by Virginia Kroll

Notes:

NUMERICAL AND PROPORTIONAL REASONING. Quantitative relationships can be expressed numerically in multiple ways in order to make connections and simplify calculations using a variety of strategies, tools and technologies.

COMPONENT STATEMENT: 2.1. UNDERSTAND THAT A VARIETY OF NUMERICAL REPRESENTATIONS CAN BE USED TO DESCRIBE QUANTITATIVE RELATIONSHIPS

Grade-Level Expectations

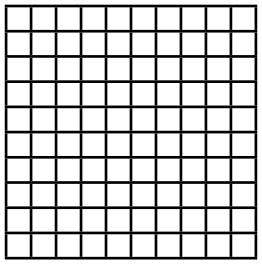
1. **Compare, order and round whole numbers to 1,000,000 using number patterns, number lines and diagrams.**

2. **Represent whole numbers up to 1,000,000 in expanded and regrouped forms and use the forms to support computation.**

3. **Construct and use models, number patterns and pictorial representations to extend place value concepts and patterns to decimals, e.g., 0.1 is one-tenth of one and 0.01 is one one-hundredth of one and one-tenth of 0.1.**

   - Have children begin by constructing human number lines that represent decimal numbers. Initially, the number lines must be from 0-1 and divided into tenths, and then into hundredths so that children understand that 0.45 is between 0.4 (0.40) and 0.5 (0.50).

   - Decimal Squares are a good model to use for conceptual development and can be downloaded. See hundredths below.



4. **Investigate negative integers (values less than zero) using place value models, diagrams and number lines and represent negative integers in practical applications, e.g. temperatures, money and locations below sea level.**

5. **Classify numbers as prime, composite or perfect squares and identify factor pairs using rectangular arrays.**

    - Provide children with numerous opportunities to configure arrays using different materials such as square tiles, cubes, paper squares. Have them record the arrays and factor pairs on 11 x 18 paper so that the numbers can be classified as prime, composite, etc. For example, 29 is prime because it can only be configured in a 1 x 29 rectangle which yields one factor pair.

6. **Represent equivalent fractions, decimals, ratios and percents using models, pictures, number patterns and common factors.**

    - Have children show a fraction using a decimal square or a flat from base-ten blocks. Ask questions such as:

        - How many units are represented here? How many are shaded?

        - Is this fraction more or less than ½? …than ⅔? …than ¾?

        - How can this fraction be represented as a decimal? A percent (which means per 100)

7. **Choose and use benchmarks to approximate locations, of fractions, mixed numbers and decimals, on number lines and coordinate grids.**

    - Use a number line as a guide in estimating decimals. Write a four digit decimal number on the board, e.g. 4.0832. Choose a number which represents something that might be interesting to the children (size of an insect, price of gold or silver). Ask questions such as:

        - Is this closer to four or five?

        - Is it closer to 4.0 or 4.1?

        - Is it closer to 4.08 or 4.09?

        - Is it closer to 4.083 or 4.084?

8. **Write division problems in fraction form and round the fraction form to estimate an answer to a division problem, e.g., $^{14}/_{3} = 4\ ^{2}/_{3} \approx 5$.**

   - Have children solve contextual problems such as how many pencils will 23 students receive if there are 27 pencils to share? $^{27}/_{23} = 1\ ^{4}/_{27} \approx 1$. Children should reason that since it is not practical or realistic to divide pencils into 27ths, each student will receive one pencil.

9. **Use models and pictures to identify and compare ratios and represent ratios in equivalent fraction and decimal forms.**

   - Give children opportunities to use different colored interlocking cubes to build and compare ratios. For example, use five cubes, two blue and three yellow so that students can see that the ratio of blue to yellow is 2 to 3. Have children build another set of five interlocking cubes to see that a ratio of 4 to 6 is equivalent. Children can record the ratio by coloring a column of five squares the appropriate colors (see model in GLE 2.1.3) on a hundredth square so that they can see the decimal equivalent.

COMPONENT STATEMENT: 2.2. USE NUMBERS AND THEIR PROPERTIES TO COMPUTE FLEXIBLY AND FLUENTLY AND TO REASONABLY ESTIMATE MEASURES AND QUANTITIES

Grade-Level Expectations *(Italics indicate links not evident in 2005 framework)*

10. ***Solve practical problems involving 10, 100, 1,000 and 10,000 more or less than a number.***

11. **Estimate products and missing factors using multiples of 10, 100 and 1,000.**

12. **Develop and use strategies involving place value relationships, inverse operations and algebraic properties (commutative, associative and distributive) to simplify addition, subtraction and multiplication problems with three-, four- and five-digit numbers and money amounts and division by one-digit factors.**

13. ***Multiply and divide decimals and money amounts by whole numbers.***

14. **Write and solve multistep problems for all four operations involving multidigit whole numbers and money amounts and explain how answers were determined, orally and in writing.**

15. **Find fractional parts of a set by using estimation, counting, grouping of objects, number patterns, equivalent ratios and division.**

    - http://www.lessonplanspage.com/printables/PMathPercentFractions.htm

16. **Add and subtract fractions, decimals and mixed numbers using a variety of strategies, e.g., models, mental math, equivalence and substitution: ½ + ¾ can also be solved using 0.5 + 0.75.**

    - Encourage children to use more than one way to solve computation problems, especially using fraction representation for decimals and vice versa.

17. **Construct and use models and pictorial representations to multiply common fractions and mixed numbers by whole numbers. 2 x ⅔ = 1 ⅓** 

18. **Use ratios and proportions to solve practical problems, e.g., interpreting scale drawings and maps and determining the probability of an event.**

    - Provide numerous opportunities to use ratio and proportion, such as:

        - If the map key indicates that ¼ inch = 50 miles, what distance does a 2-inch long line represent?

        - If $^1/_5$ of a spinner is colored blue, what is the probability that the arrow will land on blue if it is spun 25 times? 50 times?

19. **Use estimation to predict results and to recognize when an answer is or is not reasonable, or will result in an overestimate or underestimate and explain the reasoning used orally and in writing.**

SAMPLE INTEGRATED LESSON: MAKING A QUILT BLOCK

Context: A safe house on the Underground Railroad has a quilt hanging out of the window or on a fence to give slaves a message. You want to make a replica of one of the quilts. You need to use one of the symbolic blocks and put a border around each block to make it easily visible. Before the quilt can be made, you must make a "mock-up" of the block and decide how much it will cost to make your quilt.

GLEs: 2.1.6, 2.2.13, 2.2.16, 3.1.2, 3.1.3, 3.3.8

Time: This project will require multiple instructional periods in class.

Objectives: Children will create and solve multi-step problems.

Children will develop strategies to simplify computations with two-, three-, and four-digit numbers and money amounts.

Children will measure accurately using a ruler with inches.

Children will identify the difference in perimeter between a block and a block with a border.

Materials: construction paper, graph paper, rulers, pencils, scissors, glue, printed copies of the block designs, *Sweet Clara and the Freedom Quilt* by Deborah Hopkinson

Procedure: Read the book *Sweet Clara and the Freedom Quilt* and discuss the significance of the Underground Railroad.

1. Using the following Web site, http://pathways.thinkport.org/secrets/secret_quilt.cfm, explain that some quilt blocks had special meanings for the slaves.

2. Print out the patterns and distribute a copy to each child. Name each block and discuss its symbolic meaning. Have the children identify the shapes in each of the blocks and determine the number of squares or triangles needed to make each block.

3. Set a price for one square inch of material e.g., $0.20, and a limit for the cost of the block. Colors should be priced differently, e.g., yellow costs $0.30, blue costs $0.50, and white costs $0.10.

4. Have each child choose material in two different colors to construct one quilt block. **Note:** The blocks can be any size as long as all the blocks are the same size. Squares can be cut in half on the diagonal to make triangles.

5. Children should use measurement and/or graph paper to determine the area and cost of the quilt block.

6. Lead the children in a discussion about perimeter. Each child then determines the perimeter of their quilt block. Ask questions such as:

    - How can you find the perimeter without measuring?
    - What shape can you put in the corner to show how the perimeter changes? {a square}
    - What mathematics did you use to find the perimeter?
    - Will the perimeter change when the border is added?
    - Help children understand the changes in perimeter when a border is added to a rectangle or square.

7. Construct a border for the block and find the cost of the border.

❖ Possible Assessment Opportunities

❖ Calculate the cost of the cloth for the entire quilt. Group all the blocks of one design together to make a quilt. The children must write the story of their quilt, including all cost calculations, pattern decisions, squares and perimeter measurements, and the meaning of the quilt. Hang the quilts on the bulletin board with the name for each block and the cost of making the quilt.

Intervention: Guide a small group of four in making a small, four block quilt with a total of two colors. Use the following suggestions as needed. Provide a template or pattern for the children to use when choosing pieces for the quilt block including the border, and determining area. Make a chart with prices for the colors already calculated.

Challenge: Use additional colors to create a more complex design.

Interdisciplinary Connections			
English/Language Arts	**Social Studies**	**Visual and Performing Arts**	**Technology**
• Draw conclusions and use evidence to substantiate them by using texts heard, read and viewed. • Identify and discuss the underlying theme or main idea in texts.	• Demonstrate an in-depth understanding of major events and trends of United States history. • Describe examples of how societies throughout history have used various forms of visual arts, dance, theater, myths, literature and music to express their beliefs, sense of identity and philosophical ideas. • Identify the various causes and effects of movements of people.	**Visual Arts** • Use ways of arranging visual characteristics and reflect upon what makes them effective in conveying ideas • Compare and contrast purposes for creating works of art.	• Describe a course of action for addressing an essential question and completing the task, with prompting • Use menus, icons and links to access and use digital media to conduct basic research.

Vocabulary: prime, composite, referent, visual organizer, part-whole, whole, numerator, denominator, improper fraction, region model, length model, measurement model, fractional parts, fractional value, property, target number, factor, product, partitioning, quotient, divisor, multiple, decimal, decimal notation, regroup, commutative property, associative property, distributive property, compare, round, estimate, reasonable, approximate, underestimate, overestimate, see page in Handbook at CMT Web site: http://www.sde.ct.gov/sde/lib/sde/pdf/curriculum/math/cmtgrade5.pdf

Resources:

Electronic Resources:

Best Lessons for All Grades http://score.kings.k12.ca.us/bestofscore.htm

Forty-Eight Word Problems http://www.stfx.ca/special/mathproblems/grade5.html

Grade 5 Math, all topics http://www.aaamath.com/grade5.html

Interactive games http://www.internet4classrooms.com/skills_5th_original.htm

The Factor Game http://www.pbs.org/teachersource/mathline/lessonplans/pdf/msmp/factor.pdf or

http://illuminations.nctm.org/ActivityDetail.aspx?ID=12

Equivalent Fractions http://illuminations.nctm.org/ActivityDetail.aspx?ID=80

Product Game http://illuminations.nctm.org/ActivityDetail.aspx?ID=29

Are You A Daredevil? - Goals 2000

Are You A Good Adjuster? - Goals 2000

Ballpark Estimation - Goals 2000

Edible Story Problem - Goals 2000

Estimates Only - Goals 2000

Flexible Estimator - Goals 2000

Fractional Parts of a Group - Goals 2000

Dog Food - Goals 2000

Millie’s Business - Goals 2000

Teacher References:

Fraction Track http://standards.nctm.org/document/eexamples/chap5/5.1/index.htm

Teaching Student-Centered Mathematics, Grades 3 – 5 by John Van de Walle and LouAnn Lovin

Number Sense: The Common Sense of Mathematics by Bill Leibfritz – (a middle school teacher resource book)

Ideas: NCTM Standards-Based Instruction by Michael C. Hynes

Explain It! Grades 5 - 6 by Creative Publications

Math and Literature, Grades 4 – 6 by Marilyn Burns

Research Ideas for the Classroom: Middle School Mathematics

Adding it Up! NRC

Children's Literature:

Math for Smarty Pants by Marilyn Burns

Fly on the Ceiling by Julie Glass

Is a Blue Whale the Biggest Thing There Is? by Robert Wells

Cookies by William Jaspersohn

The 329th Friend by Marjorie Sharmat

The Phantom Tollbooth by Norman Juster

Follow the Drinking Gourd by Jeanette Winter

Sam Johnson and the Blue Ribbon Quilt by L. C. Ernst

Sweet Clara and the Freedom Quilt by Deborah Hopkinson

Selina and the Bear Paw Quilt by B. Smucker

On Beyond A Million by David M. Schwartz

Gator Pie by Lousie Matthews

Can You Count To A Google by David Schwartz

Fraction Action by Loreen Leedy

How Much Is A Million? by David Schwartz

G is for Google by David Schwartz

The Man Who Counted: A Collection of Mathematical Adventures by Tahan.

Counting On Frank by Rod Clement *Pumpkins* by Mary Lyn Ray

How Much, How Many,...is 1000? by David Schwartz *Math Curse* by Jon Scieszka

Notes:

GEOMETRY AND MEASUREMENT. Shapes and structures can be analyzed, visualized, measured and transformed using a variety of strategies, tools and technologies.

COMPONENT STATEMENT: 3.1. USE PROPERTIES AND CHARACTERISTICS OF TWO- AND THREE-DIMENSIONAL SHAPES AND GEOMETRIC THEOREMS TO DESCRIBE RELATIONSHIPS, COMMUNICATE IDEAS AND SOLVE PROBLEMS.

Grade-Level Expectations

1. **Represent the surface of three-dimensional solids using two-dimensional nets.**

   - Children should work in pairs or small groups to create pentominoes from five 1-inch square tiles. Children should record their findings on 1-inch square graph paper and investigate which of the 12 pentominoes can be folded into a topless box. Findings should be recorded and explained in writing

   - Begin with familiar three-dimensional objects such as empty cereal boxes or food containers. Provide numerous opportunities for children to investigate the relationship between the solid and the net which can be created by completely opening the box so that it can be laid flat on a desk or table.

   - Have children open a cylindrical container such as an oatmeal box so that they can see the shapes made by the resulting net. (circles and rectangle)

   - Provide opportunities to explore perspective for cubes and rectangular prisms by using building materials such as Cuisenaire rods or snap cubes to create three-dimensional "buildings" from two-dimensional footprints or orthogonal views and pictures.

2. **Develop formulas for finding the perimeter and area of squares, rectangles and triangles and use them to solve problems. (See also GLEs 3.1.3 and 3.1.4.)**

- Have children use geoboards or grid paper to construct or draw rectangles with a specific area, and then determine the dimensions of the figure.

- Give children the dimensions of a rectangle and ask them to find the area. Grid paper or construction paper and rulers ca be used for this activity.

3. Use the attributes of parallel sides, perpendicular sides, congruent sides/angles, number and length of sides or faces and number and kinds of angles (right, acute or obtuse) to describe, classify and sort polygons and solids (cube, prism, pyramid and sphere). (See also GLEs 1.1.1, 3.1.1, 3.1.4 and 3.1.2.)

- Have children construct different sized squares and rectangles using graph paper, construction paper and virtual manipulatives or computer software to explore relationships and develop generalizations.

- Provide opportunities for children to create different triangles from squares, rectangles and other parallelograms.

- In pairs, the children make important discoveries about triangles by measuring and taping strips of construction paper together. Cut out 1 cm x 18 cm strips of construction paper. Children fold the strips into a collection of triangles with different measurements. The pairs record in their math journals discoveries they have made about triangles.

- Working in groups of three or four, have the children examine the diagonals of various classes of quadrilaterals (i.e., parallelograms, rhombi, rectangles and squares). Using the information from the diagonals, list observed properties of that type of quadrilateral. Compare the different quadrilaterals from the list, and write a method or criteria for distinguishing among these quadrilaterals.

❖ **Possible Assessment Opportunity**

❖ Create a collection of mystery shapes and describes one or more of the properties of a shape. Challenge children to create that shape using the given properties on graph paper or a geoboard. Examples: a shape with just one square corner and four sides, or a shape with two pairs of parallel lines and no right angles.

Intervention: Highlight “clue” math words or have the child look at the geoboard to describe and duplicate the shape on another geoboard or graph paper.

Challenge: Provide mysteries that include multiple attributes and characteristics of shapes. Have children recreate and name the shapes. Create new mysteries for others to construct using varied materials.

- Examine commercially produced geometric solid materials to identify and compare characteristics of three-dimensional figures.
- Create Platonic solids using materials like toothpicks and marshmallows. Examine the figures and write descriptions of each using correct terminology.

4. Make and test conjectures about polygons using geometric relationships. (See also GLEs 3.1.2 and 3.1.3.)

- Begin with shapes such as parallelograms, pentagons and hexagons use Mira, mirrors or other reflective materials to determine the lines of symmetry.
- Geoboards and pattern blocks can be used to create different shapes and designs with reflective symmetry. Identify each line of symmetry and use correct terminology to explain why the parts created are reflective.
- Use Geostrips or oaktag strips attached with paper fasteners or brads at the vertices to allow for children to investigate physically changing angles of a figure and compare figures.

COMPONENT STATEMENT: 3.2. USE SPATIAL REASONING, LOCATION AND GEOMETRIC RELATIONSHIPS TO SOLVE PROBLEMS.

Grade-Level Expectations

5. Use an *x, y* coordinate system to plot points, to estimate the distance between points and to determine the horizontal or vertical distance between two points.

- Provide opportunities to use varied grid coordinates to read or locate information.

- Create maps using coordinate grids and scales of customary and metric measurement.
- Play "Xs and Os," from NCTM Navigating through Geometry Grades 3–5, to locate points on a coordinate plane using ordered pairs.
- Place various objects in different locations on a large grid (marked by masking tape) on the floor or playground. Have the children describe how to move from one object to another based on location, position and direction, using appropriate terminology.
- Provide a collection of pictures or stickers that the children will arrange on an *x*, *y* (quadrant 1 only) according to directions such as, place the picture of the flower next to the picture of the clown. The picture of the cat will be two places to the right of the clown. Stamps can also be used for this activity.

6. Analyze and describe the effect that changing the dimensions (perimeter) of a polygon has on its area and vice versa. (See also GLEs 1.1.2 and 1.2.4.)

- Have children begin investigations using geoboards to construct a 2 x 2 rectangle and compare to a 2 x 3 rectangle.
- Provide children with square tiles and graph paper to build and record rectangles. Record results and organize the data to determine patterns or relationships discovered through the investigations. Children should explain their findings using drawings and writing.

COMPONENT STATEMENT: 3.3. DEVELOP AND APPLY UNITS, SYSTEMS, FORMULAS AND APPROPRIATE TOOLS TO ESTIMATE AND MEASURE

Grade-Level Expectations *(Italics indicate links not evident in 2005 framework)*

7. Use calendars and clocks to plan and sequence events and to solve problems involving the conversion of measures of time and elapsed time using days, hours, minutes and seconds.

8. **Estimate and measure to solve a variety of problems that involve angles, length, area, weight, mass, temperature, capacity and volume in either metric or customary units explain the reasoning used orally and in writing.**

9. ***Use cubic inch or cubic centimeter models to find the volume of rectangular solids.***

   - Fill a cubic liter container (commercially available) by layering centimeter cubes.

   - Build solids using Cuisenaire rods and determine volume (in cubic centimeters) by counting.

10. ***Solve length problems involving conversions of measure within the customary (inches, feet, yards and miles) or metric systems (millimeters, centimeters, meters and kilometers).***

SAMPLE INTEGRATED LESSONS 1 AND 2 – AS PEOPLE GET OLDER, THEY GET TALLER

http://illuminations.nctm.org/LessonDetail.aspx?ID=L701

GLEs: 3.3.8, 3.3.10

Time: One instructional period

Objectives:

Lesson 1: Students will:

- measure another student using a variety of nonstandard and standard measuring instruments;
- recognize the errors inherent in the use of different methods of obtaining measurements; and
- represent data collected on two variables in a tabular format.

Materials: *If I Were One Inch Tall*, by Shel Silverstein (optional), measuring tape, yardstick, one piece of yarn for each student in the class, about 6 feet in length, one pair of scissors for each student in the class, How Old are We? worksheet (see next page)

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http://illuminations.nctm.org

How Old Are We? How Tall Are We?

NAME _____ PARTNER'S NAME _____

1. When is your birthday? _____

2. How old are you? _____

3. Measure your height using a piece of yarn.
- Then, find out how long the piece of yarn is by using a yardstick.
- Write down how tall you are:

I am _____ feet and _____ inches tall.

4. When is your partner's birthday? _____

5. How old is your partner? _____

6. Measure your partner using a piece of yarn.
- Then, find out how long the piece of yarn is by using a yardstick.
- Write down how tall your partner is:

My partner is _____ feet and _____ inches tall.

http://illuminations.nctm.org/LessonDetail.aspx?ID=L702

GLEs: 1.1.2, 1.2.4, 4.1.1

Objectives:

Lesson 2 Students will:

- represent data collected on two variables in a line graph format;
- understand how changes in one variable relate to changes in a second variable; and
- develop an initial understanding of statistical concepts including slope, sample, The Law of Large Numbers, and variability.

Materials: A measuring tape, large sheets of plain or graph paper, colored markers

SAMPLE INTEGRATED LESSON 3 – GETTING THERE FROM HERE

Context: Jake was describing the different ways he goes from his house to the mall. The more he talked the more Hector was becoming confused. The two boys decided the best way to figure out how Jake gets to the mall was to make a map. Hector wants to know if there is more than one way for Jake to get to the mall. There are obstacles that block them from traveling across the yards, so they stay on the streets. How many different ways can Jake get to the mall?

GLEs: 3.2.5

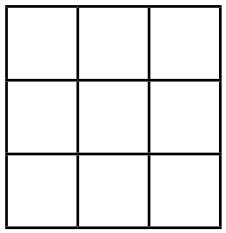
Time: One instructional period

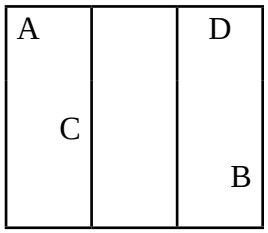
Objective: Children will find multiple ways to move on a coordinate grid between given points.

Materials: Coordinate grid

Procedure:

1. Using a 3 x 3 grid, label Jake's house A and the mall B.
2. How many different ways can the Jake and Hector travel from Jake's to the mall?
3. Staying on the streets, what's the shortest number of blocks they travel?
4. What's the longest number of blocks?





5. The next day before they go back to the mall, they need to stop at the store (C) to bring milk to Jake's aunt (D) before they proceed to the mall. How many different routes can they take?

❖ **Possible assessment opportunities**

❖ What is the shortest route? Explain the thinking in your journal.

Intervention: Use a geoboard or create a grid on the floor or ground, use paper discs or plates as destination points.

Challenge: Create larger grids with more stops along the way. Given a specific distance to cover, have children find a path.

Interdisciplinary Framework Connections				
Science	**English/Language Arts**	**Social Studies**	**Visual and Performing Arts**	**Physical Education**
• **B INQ.1** Employ simple equipment and measuring tools to gather data and extend the senses. • **B INQ.2** Use data to construct reasonable explanations. • **B INQ.3** Analyze, critique and communicate investigations using words, graphs and drawings. • **B INQ.4** Use measurement tools and standard units (e.g., centimeters, meters, grams, kilograms) to describe objects and materials. • **B. INQ. 10** Use mathematics to analyze, interpret and present data.	• Select and organize relevant information from text to summarize. • Draw conclusions and use evidence to substantiate them by using text heard, read, and viewed. • Make and justify inferences from explicit and/or implicit information. • Interpret information that is implied in a text.	• Interpret data in historical maps, photographs, art works, and other artifacts. • Makes maps, charts, models, and globes.	**Dance** • Identify and demonstrate longer and more complex steps and pattern. • Transfer a spatial pattern from the visual to the kinesthetic. • Transfer a rhythmic pattern from sound to movement. **Acting** • Describe and compare the functions and interactions of performing artist, visual artists, and audience members in theater.	• Identify the critical elements of increasingly more complex movements and game forms. • Understand and apply increasingly more complete movement sequences and game forms. • Solve problem and make choices by analyzing consequences and solutions.

Vocabulary: *x*-axis, *y*-axis, point of origin, measure, digital, analog, length, area, weight, capacity, volume, pictograph, bar graph, estimate, thermometer, scale, polygon, parallel, perpendicular, congruent, attributes, sets and subsets, polygon, quadrilateral, nets, coordinate, conversion, customary, metric, properties, scale drawings, handbook on CMT Web site - http://www.sde.ct.gov/sde/lib/sde/pdf/curriculum/math/cmtgrade5.pdf

Resources:

Electronic Resources:

National Library of Virtual Manipulatives http://nlvm.usu.edu/en/nav/grade_g_1.html

Math Forum http://mathforum.org/paths/fractions/e.fraclessons.html

Tennessee State Department of Education http://www.state.tn.us/education/ci/standards/math/5math.php

S.M.A.R.T. http://www.hcpss.org/math/elem.math/smart/gr5/

Great Sites for Kids http://www.greatsitesforkids.com/gsfk/mathlessons.asp

Illuminations -http://illuminations.nctm.org/

Good News Travels Fast – Goals 2000

Garden Fence – Goals 2000

Shape Explorer. Exploring Area: http://www.shodor.org/interactivate/lessons/area.html

Geometry and Measurement: http://www.shodor.org/interactivate/elementary/index.html#geo

Teacher References:

NCTM *Navigating through Geometry* Grades 3 –5

Children's Literature:

Sea Squares by Joy N. Hulme

Three Pigs, One Wolf and Seven Magic Shapes by Grace Maccarone

Mouse Views: What the Class Pet Saw by Bruce McMillan

*Millions to Measu*re by David Schwartz

Scholastic Kid's Almanac for the 21st Century by Scholastic Publishers

The Librarian Who Measured the Earth by Kathryn Lasky

My Map Book by Sara Fanelli

Is the Blue Whale the Biggest Thing? by David Wells

One Grain of Rice by Demi

The Village of Round and Square Houses by Ann Grifalcone

If Dogs Were Dinosaurs by David Schwartz

Evan's Corner by Elizabeth Starr Hill

How Tall, How Short, How Faraway! by David Addler

All in a Day by Mitsumasa Anno

The Mysterious Tadpole by Steven Kellog

The Bedspread by Sylvia Fair

Spaghetti and Meatballs for All by Marilyn Burns

The Amazing Book of Mammal Records by Samuel G. Woods

The Village of Round and Square Houses by Ann Grifalcone

Notes:

WORKING WITH DATA: PROBABILITY AND STATISTICS. Data can be analyzed to make informed decisions using a variety of strategies, tools and technologies.

COMPONENT STATEMENT: 4.1. COLLECT, ORGANIZE AND DISPLAY DATA USING APPROPRIATE STATISTICAL AND GRAPHICAL METHODS.

Grade-Level Expectations *(Italics indicate links not evident in 2005 framework)*

1. **Represent sets of data using line plots, bar graphs, double bar graphs, pictographs, simple circle graphs, stem and leaf plots and scatter plots.**

   - Catch It! – Embedded Science Task can be used to measure reaction time and to record and analyze data. http://www.sde.ct.gov/sde/lib/sde/word_docs/curriculum/science/cmtgr5taskstudent.doc

   - Graphs of Skittles – Using skittles have the students sort skittles and display and interpret data by constructing frequency graphs. The children can also explore basic probability by calculating probabilities of selected sub-samples. Ask students to make predictions based on their group data. http://littlegiraffes.com/skittlesgraph.doc

2. ***Compare different representations of the same data set and evaluate how well each kind of display represents the features of the data.***

   - The children decide how to obtain and organize data on the number of students absent from school each day last week. Each child predicts the number of students who will be absent Wednesday of next week and justifies the prediction. Additional question for the children could be, what could you do to make you feel more confident in being able to predict how many students would be absent on any specific day in the future? Explain.

❖ **Possible Assessment Opportunities**

❖ Translate information freely among charts, tables, line plots, picture graphs, and bar graphs; e.g., create a bar graph from the information in a chart.

Intervention: Begin by using picture graphs, line plots, and bar graphs.

Challenge: Determine when specific data can be accurately displayed. Use more complex tables and graphs.

~ *COMPONENT STATEMENT: 4.2. ANALYZE DATA SETS TO FORM HYPOTHESES AND MAKE PREDICTIONS.*

Grade-Level Expectations *(Italics indicate links not evident in 2005 framework)*

3. **Design and conduct surveys of a representative sample of a population and use the data collected to begin to make inferences about the general population.**

4. ***Determine the mean, mode and median of a data set and explain in writing, how they are affected by a change in the data set.***

- Provide numerous opportunities for children to explore measures of central tendency using activities like:

  - Have children line up by height to find the median and mode of the set they have created. If Shaquille O'Neill joined the class, how would the median change? Would the median change if Tom Thumb joined the class? Explain. What would happen to the median and the mode if both Shaquille and Tom became classmates? Discuss in class and then ask children to write about it.

  - Use different color interlocking or Unifix cubes to represent the number of family members in each child's family. Working in groups of five, have children decide how to find the mean number of family members for their group. Have each group share their methods and results with the whole class.

COMPONENT STATEMENT: 4.3. UNDERSTAND AND APPLY BASIC CONCEPTS OF PROBABILITY

Grade-Level Expectations

5. **Design and conduct probability experiments and simple games of chance to test predictions about outcomes and fairness.**

   - http://socrates.acadiau.ca/courses/educ/reid/Elem-math-virtual-Workshops/UpElemStats/Skittles-activity.doc

   - Have children work in pairs to determine the probability of getting certain sums (2–12) when tossing two dice. Once the pair has completed the experiment, they should work on designing a game using dice sums that will be fair to all players.

6. **Determine and describe possible outcomes and express the likelihood of events as a fraction.**

   - When children are considering events, remind them that outcomes must be expressed on the continuum form zero (impossible) to one (certain).

7. **Determine and describe possible outcomes using permutations, where order does matter, e.g., when there is a choice of vanilla (V), chocolate (C) or strawberry (S) ice cream for a three-scoop cone, there are two possible ways to have the chocolate scoop on top CVS or CSV.**

SAMPLE INTEGRATED LESSON 1 – POPULATION CHANGE

Context: Tony's grandfather was talking about the day the census takers came to house to ask who lives there. After they left, Tony was curious about what a census was. Tony and his grandfather decided to find out how many people lived in their town now and how many people lived in town when grandfather was born 50 years ago. What do you think they discovered? (Students need to be able to access information using the internet, read large numbers and graph data using line and bar graphs.)

GLEs: 4.1.1, 4.1.2, 2.1.1

Time: Two instructional periods

Objective: Children will plot a line graph to make predictions

Materials: Library access, Internet

Procedure:

1. Review the census and its purpose. http://www.census.gov/main/www/cen2000.html
2. While working in pairs, the children determine the current population of the town. http://factfinder.census.gov/home/saff/main.html?_lang=en
3. Discuss whether the population has changed over time.
4. Ask questions such as:
    - How could we find out if the population of our town has changed over time?
    - What could cause dips or rises (decreases or increases)?
    - How could we organize this kind of information?
5. Use research to find the population over the last 50 years. Discuss why we don't have the number yearly.

6. Create the graph.
7. Discuss results and predict the population for the next ten years.
8. Encourage children to think of other questions that they could investigate further.

SAMPLE INTEGRATED LESSON 2 — IS A STEM AND LEAF PLOT REALLY A PLANT?

A Dicey Stem and Leaf Plot: http://www.learnnc.org/lessons/DebbieNewton5232002546

Context: Marisol's teacher will introduce the concept of a stem and leaf by using visuals: a stem and leaf on a real plant. She will lead the students in a discussion of this concept.

- The teacher will review place value of tens and ones.
- The teacher will bring together the place value of numbers and the concept of a stem and leaf.

GLEs: 4.1.1, 4.2.4

Time: One instructional period

Objectives: Children will identify the parts of a stem and leaf plot and what they represent and create their own stem and leaf plot in a game-type format.

Materials: One live plant that vividly shows the stem and leaf concept, white construction paper or graph paper, colored pencils, dice (one die per person), display examples of Stem and Leaf Plots.

Procedure:

1. Introduce the lesson by having one or more examples of stem and leaves.
2. After discussing how the stem and leaves are connected and reviewing place value, show the students examples (about two or three) of stem and leaf plots.
3. With class participation, take the plots apart and then put them back together again.
4. Create a class stem and leaf plot by collecting every students' favorite two digit number between 11 and 99. Have them write their number down, hand it in, and then have it read by one student while the teacher puts the numbers on the board. From this point, the class guides the teacher in constructing their favorite numbers' stem and leaf plot.

5. Review quickly the parts and concept of a stem and leaf plot.

6. Hand out paper and dice. Instruct the students to create twenty numbers by rolling their dice once for the tens place and once for the ones place. Then plot their numbers on a stem and leaf plot using colored pencils: stem-green; leaves-any color.

7. Then have students create 20 more numbers and exchange with a partner who will create a stem and leaf plot from their partners' numbers.

8. Collect the students' stem and leaf plots and display them on a giant stem, using the papers as leaves.

9. From this lesson, you can move into range, medium, mean, and mode by using the students' own stem and leaf plots.

Interdisciplinary Framework Connections				
Science	**English/Language Arts**	**Social Studies**	**Visual and Performing Arts**	**Physical Education**
B. INQ. 1 Employ simple equipment and measuring tools to gather data and extend the senses. **B. INQ. 2** Use data to construct reasonable explanations. **B. INQ. 3** Analyze, critique and communicate investigations using words, graphs and drawings. **B. INQ. 10** Use mathematics to analyze, interpret and present data.	• Generate and respond to questions. • Distinguish between fact and opinion. • Use content vocabulary appropriately and accurately (math, music, science, social studies, etc.). • Develop a critical stance and cite evidence to support the stance. • Use oral language with clarity and voice and fluency to communicate a message. • Determine purpose, point of view and audience, and choose an appropriate written, oral or visual format. • Use strategies to generate and develop ideas for speaking, writing and visual activities. • Research information from multiple sources for a specific purpose. • Examine sources of information and determine validity. • Publish and/or present final products in a myriad of ways, including the use of the arts and technology.	• Examine data to determine the adequacy and sufficiency of evidence, point of view, historical context, bias, distortion and propaganda, and to distinguish fact from opinion. • Analyze data in order to see persons and events in their historical context, understand causal factors and appreciate change over time. • Locate the events, peoples and places they have studied in time and place (e.g., on a time line and map) relative to their own location. • Use latitude and longitude to locate places and calculate differences between places. • Use basic climatic and other physical data to understand how natural processes shape environmental patterns	• Select media, techniques and processes to communicate ideas, reflect on their choices and analyze what makes them effective. • Use different media, techniques and processes (two-dimensional and three-dimensional, including media/technology) to communicate ideas, feelings, experiences and stories. • Select and use the elements of art and principles of design to improve communication of their ideas. • Describe ways in which the principles and subject matter of the visual arts and other disciplines taught in school are inter-related. • Apply visual arts knowledge and skills to solve problems common in daily life.	• Assess physiological indicators (e.g., heart rate, body temperature, perspiration) of exercise during and after physical activity. • Maintain personal records of moderate to vigorous physical activity.

Vocabulary: pictograph, bar graph, estimate, survey, line graph, key, line plot, stem-and-leaf plot, survey, sampling, central tendency, mean, median, mode, range, numeric, geometric, ratio, probability, coordinate, conversion, outlier, fairness, display, population. See also page 54 of CMT Math Handbook: http://www.state.ct.us/sde/dtl/curriculum/math/CMTGrade5.pdf

Resources:

Electronic Resources:

Accessing and Investigating Data: http://standards.nctm.org/document/eexamples/chap5/5.4/index.htm Exploring Data: http://mathforum.org/workshops/usi/dataproject/

Dealing with Data: http://illuminations.nctm.org/LessonDetail.aspx?ID=L1297

Plotting with Pennies: http://www.learnnc.org/lessons/NancySaunders5232002144

Solar Sizzler: http://www.learnnc.org/lessons/LarryParker5232002571

Billy's Bath – Goals 2000

Decks of Cards – Goals 2000

Pet Survey – Goals 2000

Representing Data – Goals 2000

Teacher References:

NCTM Data Analysis Standards 3 - 5

Adding It Up by National Research Council

Elementary and Middle School Mathematics by John Van De Walle

Graphing and Computers in Grades 3 – 5: http://www.venturaes.com/graphing/

Developing Graphing Comprehension, NCTM

Teaching Student-Centered Mathematics by John Van De Walle

Children's Literature:

Three Pigs, One Wolf and Seven Magic Shapes by Grace Maccarone

Scholastic Kid's Almanac for the 21st Century by Scholastic Publishers

A Cloak for a Dreamer by Aileen Friedman

One Grain of Rice by Demi

The Village of Round and Square Houses by Ann Grifalcone

Evan's Corner by Elizabeth Starr Hill

The Hundred Penny Box by Sharon Bell Mathis

Notes: