Grade 1

CONTENTS

The Learner at This Level

THE FIRST GRADE CHILD:

- Loves to ask questions.
- Learns best through discovery.
- Likes to "work" and to explain things.

ALGEBRAIC REASONING

- Describes counting and number patterns.
- Identifies, extends and translates one- and two-attribute patterns.
- Rationalizes what belongs in the pattern and what does not.
- Describes and demonstrates equivalence.
- Iterates relative positions (outside, inside, top, bottom, left, right).
- Models real-life situations of addition and subtraction by using models, pictures and open sentences.
- Identifies patterns in counting.
- Explores the patterns of days, months, and seasons.
- Makes the connections in simple ratio patterns (one bird has two legs, two birds have four legs).
- Creates generalizations about patterns.
- Arranges several things one after another in a series or pattern according to their differences.

NUMERICAL AND PROPORTIONAL REASONING

- Develops number sense by counting real-world objects, sounds and movements.
- Understands that the last number said is the quantity.
- May be able to see at a glance the number of items in a small collection.
- Counts and groups by twos, fives and tens.
- Counts back from 10 by ones.
- Develops a deeper understanding of quantities to 100 by using 10 as a referent.
- Models a two-digit number by making groups of tens and ones with objects, such as sticks or snap cubes, before using commercial base-ten materials.
- Understands that counting by ones gives the same number as counting by a combination of tens and ones.

- Solves problems with objects or graphic representation and invents their own problem solving strategies.
- Writes number sentences only after many problems have been solved using objects and the solutions have been discussed.
- Sees the part-whole relations in addition and subtraction situations.
- Constructs and understands the different ways a quantity can be represented, e.g., seven is three and four; seven is two and five; seven is three less than 10.
- Masters basic adding and subtracting combinations using real-world problems, not by memorizing facts in isolation.
- Begins to solve problems without having real objects to count.
- Describes fractions as fair (equal) shares of the whole (unit) or set.
- Can be confused because the whole may consist of one piece or many pieces.

GEOMETRY AND MEASUREMENT

- Begins using informal units of measure to focus directly on the attribute being measured and discussion will then focus on what it means to measure that attribute.
- Needs frequent opportunities to estimate measures, during measurement activities.
- Uses plane, "two-dimensional," and solid, "three-dimensional" figures and their appropriate geometric names, position and direction while putting together and taking part figures (e.g., such as two squares put together can make a rectangle).
- Describes sorting and classifying criteria by moving from simple feature description, (e.g., "short" or "like a box"), to the description of geometric features, (e.g., "it has four sides" or "it is squarish").
- Creates groupings based on how shapes are alike and different using one or two attributes.
- Tells time by counting the hours.
- Creates two- and three-dimensional designs/patterns and replicates them from memory.

WORKING WITH DATA AND PROBABILITY

- Records work through multiple representations in written symbols and/or drawings.
- Becomes a more flexible thinker when experiencing many different ways to graph information
- Can see that graphs and charts display information about attributes and data and that different types of graphic representations tell different things about the same data.
- Constructs individual graphs and summarizes the results.
- Makes and discusses predictions about probability experiments.

Mathematics Background for Teachers

MATHEMATICS BACKGROUND FOR GRADE 1 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: The same pattern can be represented in many different forms.

Background: A child's capacity to efficiently construct mathematical ideas expands with a more developed understanding of relationships. Relationships recognized through sorting, classifying and patterning activities provide a foundation for algebraic reasoning. In their informal math experiences, young children explore numeric and geometric relationships and establish their own rules. As a formal sense of pattern emerges, children need experiences that are hands-on, varied and connected to contextual situations to recognize the conventions of patterns. Recognition of number patterns strengthens the understanding of number properties and strategies necessary for addition and subtraction of whole numbers.

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: Relationships between and among numbers can be described in a systematic way.

Background: The development of number concepts is a continuous process that provides the foundation for much of what is taught in mathematics (Copley, p.48). The conceptual understanding of number develops gradually as a result of exploring numbers in a variety of ways and contexts. The ability to create, compare and describe sets of objects and numbers in meaningful contexts is essential for the understanding of the sequential relationship and relative magnitude of whole numbers and builds flexible thinking that supports problem solving and estimation. Enumerating the objects in a set is central to the understanding of number and operations. The connection between counting whole numbers and the operations of addition and subtraction is developed through the joining and separating of sets using models and number lines. Problems can be solved through the actions of adding to, taking away from and comparing numbers. It is these actions or comparisons, in context that give a problem meaning, not the memorization of a number sentence or fact.

GEOMETRY AND MEASUREMENT

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

Central Understanding: Attributes can be determined through composing and decomposing shapes and solids.

Background: The study of shapes should focus on the attributes and properties of both two- and three- dimensional figures. (Copley, p.112) In order to move through the various levels (van Hiele) of geometric thinking children must be exposed to many experiences and participate in numerous activities. Explorations of geometric figures help develop a more meaningful understanding of their attributes and properties. In the explorations of shapes and solids comparisons can be made based the attributes of length, weight, area, and volume through the use of measurement.

WORKING WITH DATA: PROBABILITY AND STATISTICS

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

Central Understanding: Information about attributes can be organized to see relationships.

Background: Sorting and classifying helps children make better sense out of their world and handle increasingly complex relationships. The systematic organization of information incorporates mental actions such as ordering, grouping and summarizing. The ability to organize information develops naturally from sorting and classification activities. It is important that children learn ways to organize information so they can begin to see relationships, make predictions and make generalizations.

Correlated Grade-Level Expectations

Click here to access correlated grade-level expectations for Grade 1 on the State Department of Education Web site.

Sequenced Grade-Level Expectations

GRADE 1 SEQUENCED GLES

Grade-Level Expectations	Fall	Winter	CMT	Spring
ALGEBRAIC REASONING				
1.1 Understand and describe patterns and functional relationships.				
1. Sort, classify and order numbers and objects by one and two attributes including size, shape, color, texture, orientation, position and use, and explain the reason or rule used.				
2. Recognize, extend and create one- attribute and two-attribute patterns, e.g., size and shape, counting, e.g., by 5 or10, and number patterns, e.g., $n + 2$. Describe the pattern and the rule used to make it.				
3. Replicate a pattern using a different representation, e.g., from color to shape.				
4. Develop and test generalizations based on observations of patterns and relationships.				
1.2 Represent and analyze quantitative relationships in a variety of ways.				
5. Model real-life situations that represent the result of counting, combining and separation of sets of objects (addition and subtraction of whole numbers) with objects, pictures, symbols and open sentences.				
1.3 Use operations, properties and algebraic symbols to determine equivalence and solve problems.				
6. Demonstrate understanding of equivalence or balance with objects, models, diagrams, operations or numbers, e.g., using a balance scale, or an arm balance showing the same amount on both sides.				
NUMERICAL AND PROPORTIONAL REASONING				
2.1 Understand that a variety of numerical representations can be used to describe quantitative relationships.				
1. Represent and identify whole numbers up to 100 as groups of tens and ones using models and number lines.				
2. Compare and order quantities of up to 100 objects, including naming a number that is one or 10 more or less than a given number.				
3. Describe and estimate quantities using benchmark amounts such as zero, 10 and 100.				
4. Identify ordinal numbers up to 10th with an ordered set of objects, e.g., point to the fifth crayon lined up on the table.				

Grade-Level Expectations	Fall	Winter	CMT	Spring
5. Use a variety of models and familiar objects to compare two parts of a whole object and describe the parts as being closer to very little, one half or one whole.				
6. Use a variety of models and familiar objects to: • Make a whole of equal size parts of familiar objects. • Show and identify equal size pieces of a whole as halves, thirds or fourths • Identify pieces of a whole as not being halves, thirds or fourths.				
7. Determine half of a whole set of up to 20 objects.				
8. Describe ratios in terms of the patterns that develop in the relationships between quantities, e.g., if one cat has four legs, then two cats have eight legs.				
2.2 Use numbers and their properties to compute flexibly and fluently, and to reasonably estimate measures and quantities.				
9. Count by rote to at least 100.				
10. Count on from a given amount, orally and with models, and count back from 10.				
11. Count and group at least 100 objects by tens.				
12. Identify, read and write numerals to 100.				
13. Create problems and write one- and two-digit number sentences that reflect contextual situations and real world experiences. Solve the problems using a variety of methods including models, pictures, pencil and paper, estimation and mental computation, and describe the reasoning or strategies used. For example: Tell a story or draw a picture for a problem that can be solved using the number sentence 10 + 6 = 16.				
14. Solve contextual problems using all addition sums to 18 and subtraction differences from 10 with flexibility and fluency.				
15. Estimate the amount of objects in a set using zero, 10 and 100 as benchmarks and then determine if the estimate was reasonable.				
16. Identify and name pennies, nickels, dimes and quarters.				
17. Determine and compare sets of pennies and dimes valued up to $1.00; trade sets of pennies for dimes and vice versa. For example: José has three dimes and eight pennies. Andrea has two dimes and 17 pennies. If they do not have the same amount of money, who has more or less? How much more or less?				

Grade-Level Expectations	Fall	Winter	CMT	Spring
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. Identify and describe familiar two- dimensional shapes and three-dimensional solids in the environment and contextual situations.				
2. Copy two- and three-dimensional designs from visual memory.				
3. Compare and sort familiar shapes and solids and designs found in the environment and contextual situations				
4. Construct shapes and solids using a variety of materials and create two-dimensional shapes and designs with a line of symmetry.				
3.2 Use spatial reasoning, location and geometric relationships to solve problems.				
5. Describe location, direction and position of objects or parts of objects, using terms such as left, right and opposite.				
3.3 Develop and apply units, systems, formulas and appropriate tools to estimate and measure.				
6. Know the days of the week in order and locate dates, days, weeks and months on a calendar. Use the information to solve problems involving the planning and sequencing of events.				
7. Solve problems involving telling time to the nearest hour using digital and analog clocks. Estimate and compare the length of time needed to complete a task using comparative language such as longer, shorter, more or less.				
8. Use nonstandard units or physical referents to estimate answers to measurement problems involving length, area, weight, temperature, volume and capacity, and then justify the reasonableness of the answers. Suggested materials include Unifix or locking cubes, paperclips, Popsicle sticks, square tiles, water and sand				
9. Use nonstandard units, references or direct comparison of objects (appearance), to order objects by length, area and capacity.				
10. Explore using standard units of measure (inch and centimeter) to communicate measurement in a universal manner.				

Grade-Level Expectations	Fall	Winter	CMT	Spring
WORKING WITH DATA				
4.1 Collect, organize and display data using appropriate statistical and graphical methods.				
1. Pose questions that can be used to guide data collection, organization and representation.				
2. Collect and systematically organize and represent the data that answers the questions using lists, charts and tables, tallies, glyphs (coded pictures) picture graphs, and bar graphs.				
4.2 Analyze data sets to form hypotheses and make predictions				
3. Describe data that have been organized and make comparisons using terms such as largest smallest, most often or least often.				
4.3 Understand and apply basic concepts of probability				
4. Describe and explain the likelihood of the occurrence of various events in the student's world using terms such as possible impossible, likely, unlikely or certain.				
5. Engage in simple probability activities and games including the use of number cubes and spinners; record, graph and describe the results of the activities and games.				

Correlated GOALS 2000 Criterion Referenced Test

GRADE 1 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.

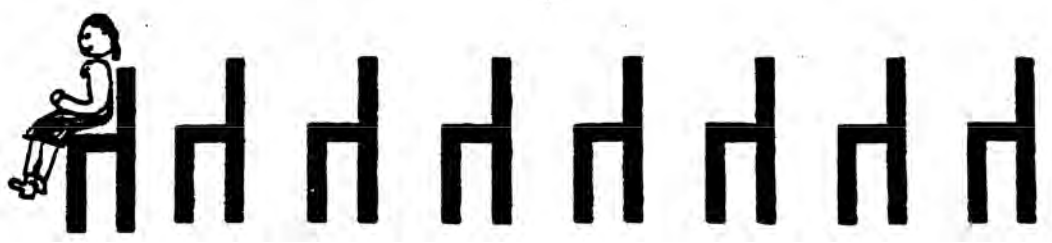
The Grade 1 Criterion Referenced Test Part A from the Goals 2000 Mathematics Curriculum is aligned to the Grade 1 sequenced GLEs and can be used for pre- and post-assessment.

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

GLE 2.1.4

1. There is a row of chairs. Tanya is sitting in the first chair. Joe will sit in the fifth chair. Circle the chair Joe will sit in.



GLES-1.2.5, 2.2.13, 2.2.14

Use this example to complete questions 2-4.
Here is a picture of a cube train with 8 cubes, 3 black and 5 white.

This train can be described with a number sentence

3 + 5 = 8

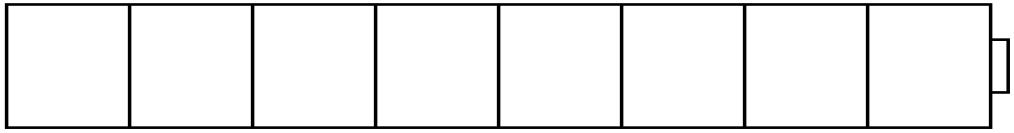
GLES-1.2.5, 2.2.13, 2.2.14

2. Color in the train below with 1 black and 7 white cubes.

Write a number sentence that describes the train.

_____

3. Color in the train below with all 8 cubes the same color.



Write a number sentence that describes the train.

_____

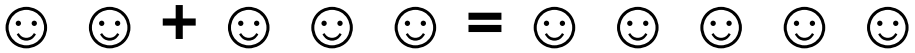
4. Choose 7 of your cubes. Make a cube train with them. Color in the train below.

Write a number sentence that describes the train.

_____

GLE 1.3.6

A number sentence is shown below.



2 + 3 = 5

Complete the 3 number sentences below, so that each one is different.

5. _____ + _____ = 5

6. _____ + _____ = 5

7. _____ + _____ = 5

GLE 2.2.14

8a. Circle all the problems with answers that are less than 8.

5	9	2
+3	+1	+4
4	3	2
+3	+6	+7

8b. Circle all the problems with answers that are less than 3.

9	7	6
- 1	- 6	- 2
8	7	10
- 6	- 5	- 8

GLE 1.1.2

Use the number chart to help you answer questions 9-12.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

9. What numbers come next?

2, 4, 6, _____ , _____

10. What numbers come next?

1, 3, 5, _____ , _____

11. What numbers come next?

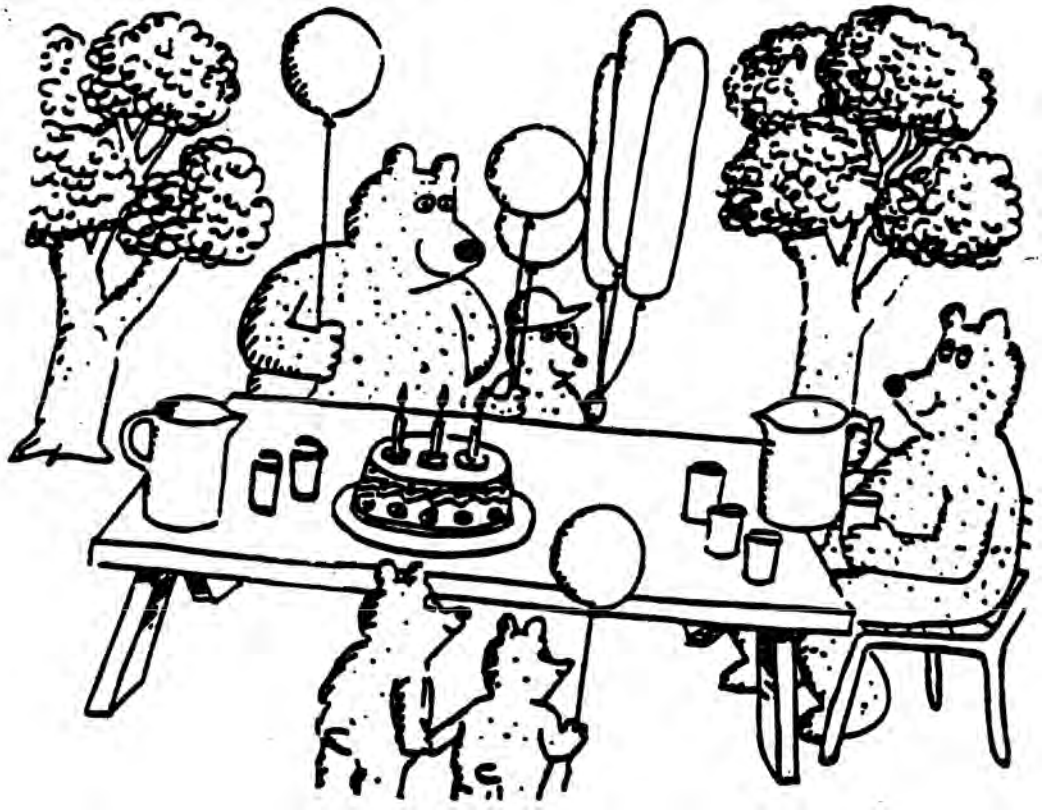
9, 19, 29, 39, _____ , _____

12. What numbers come next?

58, 57, 56, _____ , _____

GLES 2.2.13, 2.2.14

Look at the picture. There are lots of things in the picture. Think about what you see. Think about how many you see.



13. Put an "X" on each bear in the picture. How many bears are there?

_____

GLES 2.2.13, 2.2.14

14. Circle each cup on the table. How many cups are there on the table?

_____

15. What are there exactly three of?

_____

16. What are there exactly two of?

_____

17. Can each bear have at least one balloon?

_____

18. If each bear drinks two cups of juice, how many cups of juice do all the bears drink?

_____

GLE 2.2.14

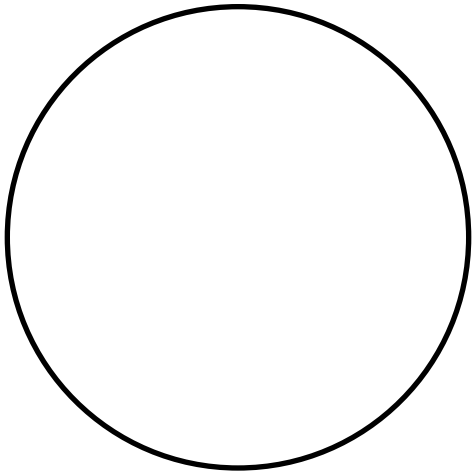
19. Jill has 4 dogs. Alonzo has 1 more dog than Jill. Rosa has 1 more dog than Alonzo. How many dogs does Rosa have?

_____

GLES 2.1.5, 2.1.6

Color one half of each shape.

20.



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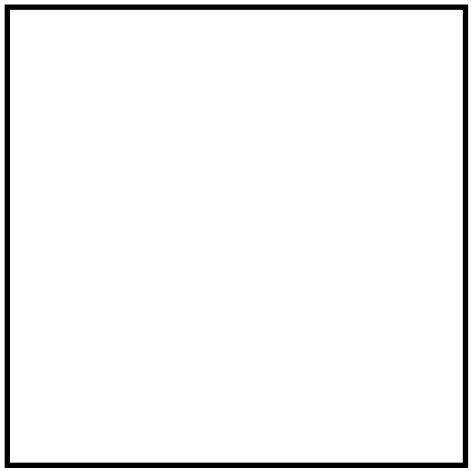


GLE 2.1.6

22. Show two ways to divide this figure into two equal parts.

GLES 3.1.1, 3.2.5

1. Follow these directions.

a. Draw a rectangle.

b. Draw a square on top of the rectangle.

c. Draw a triangle on the bottom of the rectangle.

Draw here:

GLE 3.3.9

24.

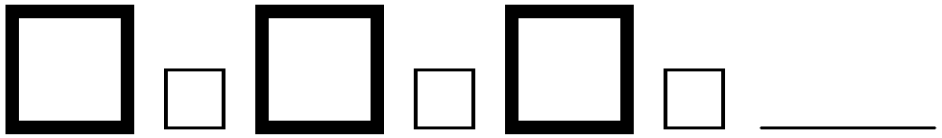
a. Circle the longest pencil.

b. Put an X on the shortest pencil.

GLE 1.1.2

25. What comes next in the pattern? Draw it.

26. What comes next in the pattern? Draw it.



27. What comes next in the pattern? Draw it.

GLES 1.2.5, 2.2.13, 2.2.14

28. Finish this story. Fill in the blanks with numbers so the story makes sense.

There were 8 birds on a fence.
There was a loud noise, so _____ birds flew away.
There were _____ birds left on the fence.

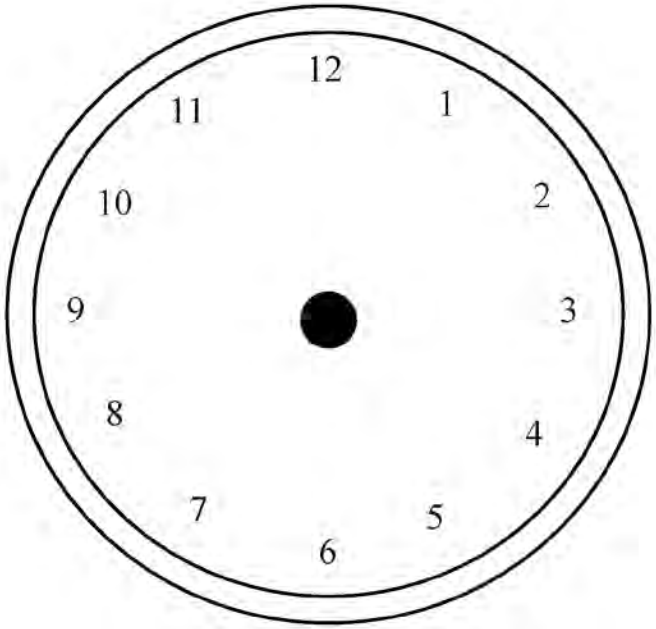
Draw a picture to show your story.

29. Ben found 5 pencils and 3 scissors in his desk. Then he found 4 more pencils. How many pencils did he find?

_____

GLE 3.3.7

30. Draw the hands on the clock to show four o'clock.



GLES 2.2.16, 2.2.17

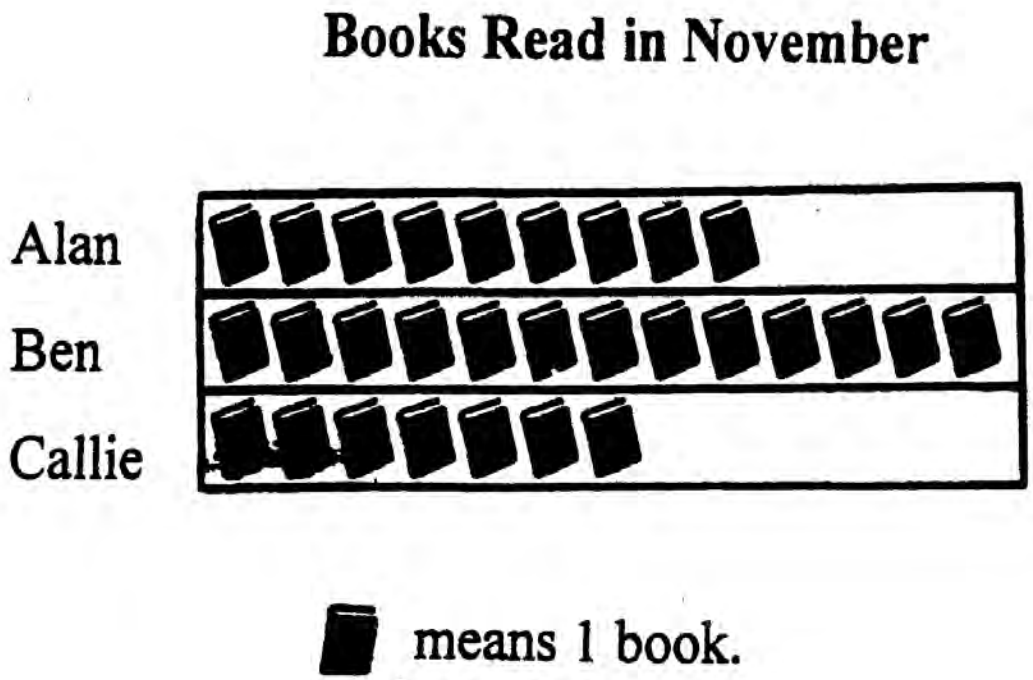
31. A toy boat costs 12¢.

31A. Show one way you could pay for the boat by putting an "X" on each coin you would use.

31B. Show another way. Put an "X" on the coins.

GLE 4.2.3

32.



How many books did Alan read in November?

_____

GLE 3.3.6

Use the calendar below to answer the questions that follow.

APRIL

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

33. What day of the week does April 10 fall on?

_____

34. How many Saturdays are in April?

_____

35. What is the last day of April?

_____

36. One day before April 9 is April _____

GLE 2.2.12

37. Use the number line below to answer the questions that follow.

0 1 2 3 4 5 6 7 8 9 10 11 12

37a. Put an X on a number between 5 and 9.

37b. Circle a number greater than 10.

37c. Put a box around a number smaller than 6.

GLEs 2.2.14, 2.2.17

Your class runs the school store. Use the information in the box to answer the questions below.

School Store Prices			
Pencil	2¢	Pen	5¢
Ruler	7¢	Eraser	3¢

40. How much will it cost to buy a pencil and an eraser?

_____

41. How much will it cost to buy a ruler and a pencil?

_____

42. How much will it cost to buy 2 pencils and 1 pen?

_____

43. How much more does a pen cost than a pencil?

_____

44. How much more does a ruler cost than an eraser?

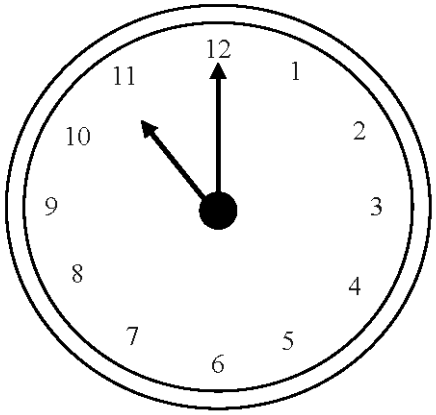
_____

45. You have a nickel and two pennies. What can you buy at the store that uses all the money you have?

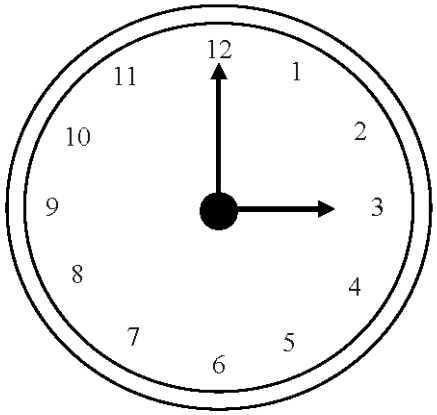
_____

GLE 3.3.7

Match each clock face to the time.



3:00



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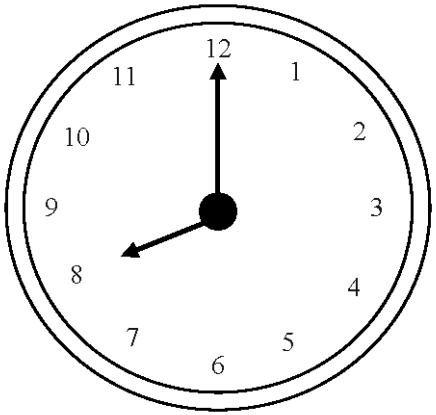
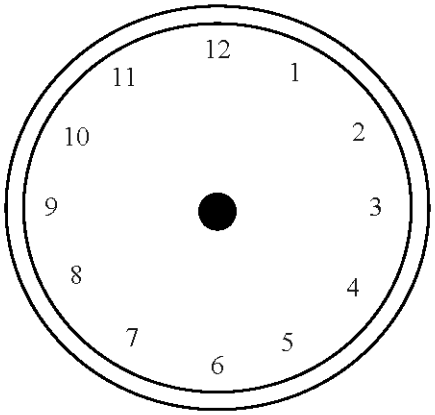
11:00



47. Draw on the clock face to show the time.



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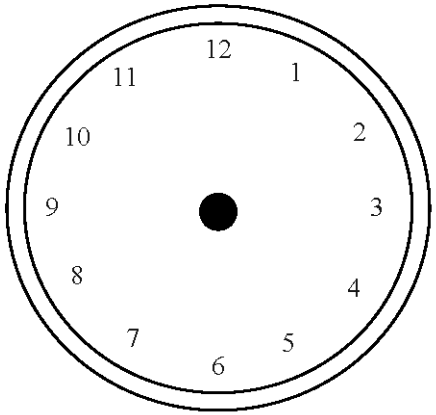


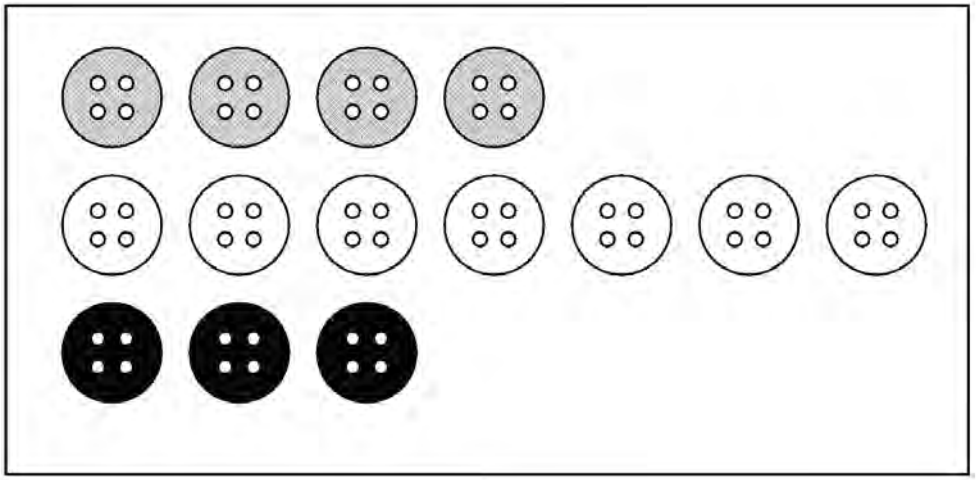
10:00

GLEs 2.2.13, 2.2.14

48. Use the number 10.
Write an addition story problem that has the number 10 for the answer.

GLE 4.2.3

49. Button Graph



1. How many black buttons? _____

2. How many gray buttons? _____

3. Which has more buttons, gray or white? _____

4. How many more white buttons than black buttons? _____

5. Tell something else about the graph. _____

_____

_____

GLEs 3.3.8, 3.3.9

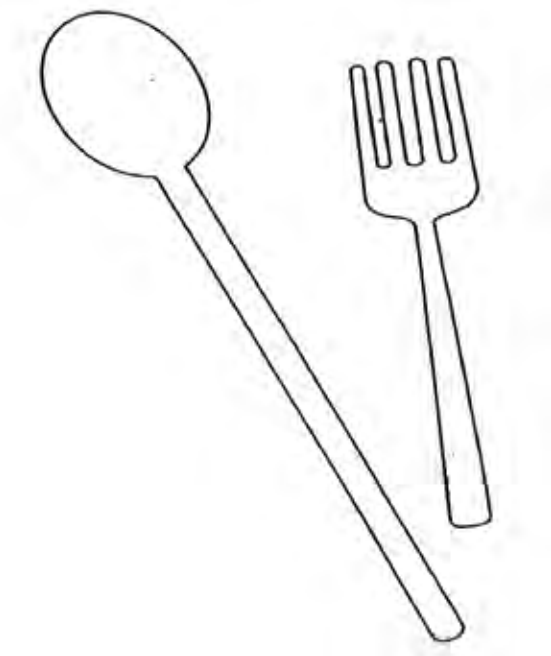
Find some paper clips.

Estimate how many to measure the fork. _____ .

Measure _____ .

Estimate how many to measure the spoon. _____.

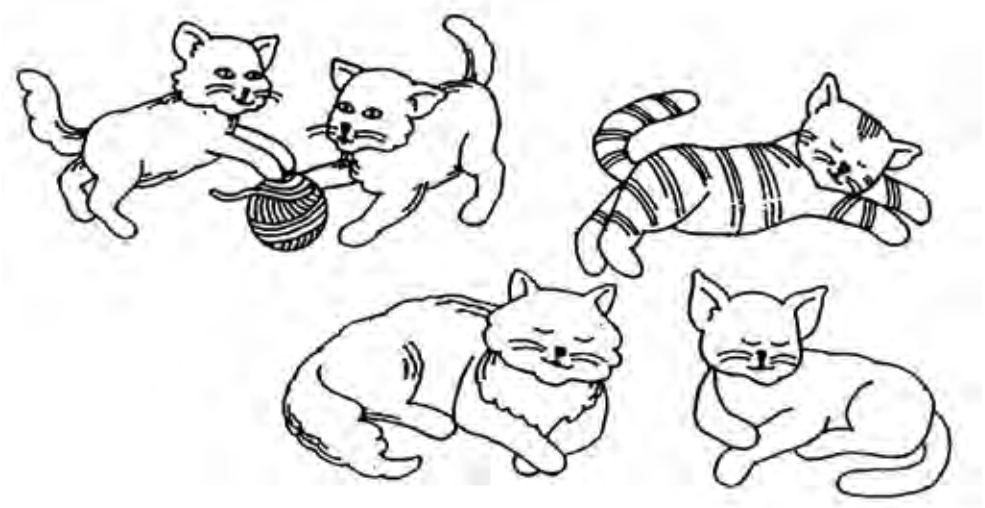
Measure _____ .



Tell how many more paper clips you used to measure the spoon. _____.

GLEs 2.213, 2.2.14

Write a subtraction number story about these cats. Tell where each number came from.



Write another story problem about the cats. Give it to a friend to solve.

Section B:
An adult should interview students & record their responses.

GLE 2.2.14

B1. There are 5 cats on a fence. There are 3 cats in the tree. Jeff says there are 2 cats in all. Kate says there are 8 cats in all.

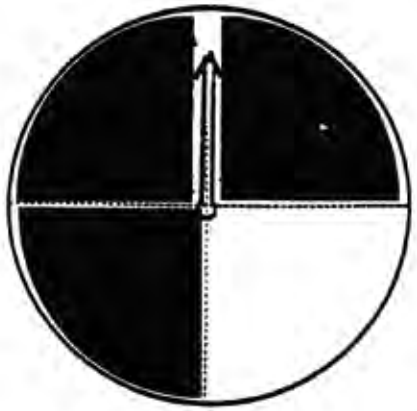
Who is right? _____

How do you know? _____

Section B:

GLE 4.3.5

B2. You have a spinner with four equal sections. Three sections are black and one is white.



a. If you spin the spinner, what is more likely to come up, black or white?

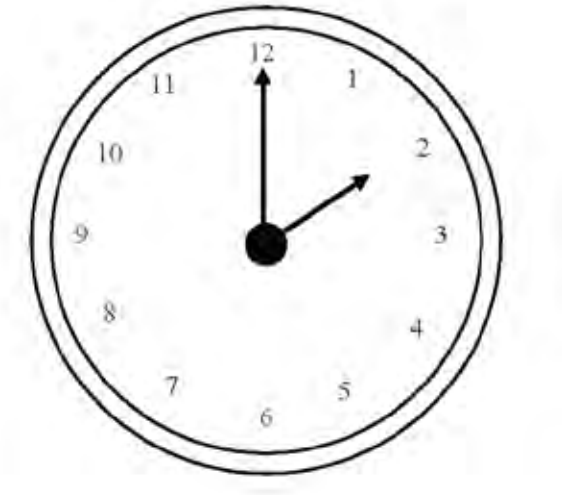
_____

b. Why do you think that? _____

Section B:

GLE 3.3.6

B3. What time does this clock show?



GLE 1.1.1

B4. Give the student a set of sorting materials such as Attribute blocks or sorting bears.

Ask the student to sort the set in some way.

Then ask the student to describe the sorting rule.

If successful, ask the student to try sorting the same set in a different way and then to describe the new rule.

Section B:

GLE 3.3.6

B5. Ask the student to name the days of the week in order.

B6. Ask the student to name the months of the year.

GLE 3.3.8

B7. Select two objects which, when held, appear to be about the same weight.

Give them to the child. Also have a pan balance available.

Ask the child to tell you which object is the heaviest.

GLEs 1.1.2, 4.1.2

B8. Give the student a collection of objects such as candy hearts, Unifix Cubes or jelly beans. The question is: What do we know about this collection of objects?

Ask the student to sort them.

Have the student place the sorted objects on grid paper to make a real graph.

On a second sheet of grid paper, have the student use crayons in matching colors to make a bar graph.

Ask the student to tell you something about the graph.

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. **Sort, classify and order numbers and object by one and two attributes and including size, shape, color, texture, orientation, position and use, and explain the reason or rule used. (See also GLE 3.1.3.)**

   - Arrange a set of objects in a pattern according to the differences between the objects, e.g., blocks by size, or containers by how much they can hold.

2. **Recognize, extend and create one- attribute and two-attribute, e.g., size and shape, counting, e.g., by five or 10, and number, e.g., *n* +2, patterns. Describe the pattern and the rule used to make it.**

   - Group objects into sets of two, five, or 10 to explore patterns in skip counting.

   - Use numbers or objects to generate and discuss various numeric or geometric patterns. (What comes next in a repeating pattern?)

3. **Replicate a pattern using a different representation, e.g., from color to shape.**

   - Read stories, poems or rhymes that have organizational patterns, such as in a Dr. Seuss book, and have the children identify the pattern and express the pattern using a different representation.

   - Use technology to represent a variety of patterns, e.g., Kid Pix software can be used to publish picture patterns.

4. **Develop and test generalizations based on observations of patterns and relationships. (See also GLE 2.1.2.)**

- Explore and describe objects in the environment using simple ratios, e.g., one bird has two legs, two birds have four legs.
- Discover numeric patterns on hundreds charts, e.g., the digits in the tens place and ones place when examining rows and columns on the chart.
- Discusses the difference between the numbers when we go to the left, the right, the number above and the number below using a hundreds chart (one less, one more, 10 less, 10 more).
- Use objects and/or a number line to explore the patterns in numbers 0 to 100.
- Use calendars to identify patterns in school and classroom routines.

❖ **Possible Assessment Opportunities**

❖ Identify the relative position of whole numbers on a number line 0 to 100; describe the position based on observable patterns.

Intervention: Provide numbers and a number line of more familiar numbers (e.g., 0 to 20, 0 to 50).

Challenge: Expand to numbers and number lines beyond 100.

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

Grade-Level Expectations

5. **Model real-life situations that represent the result of counting, combining and separation of sets of object (addition and subtraction of whole numbers) with objects, pictures, symbols and open sentences.**

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

Grade-Level Expectations

6. Demonstrate understanding of equivalence or balance with objects, models, diagrams, operations or numbers, e.g., using a balance scale or an arm balance showing the same amount on both sides.

- Play pretend "seesaw" to demonstrate equivalence. For example, using the teacher as the middle of a seesaw, have four children come and stand on one side, then have two children stand on the other side. Discuss what would happen to the seesaw and why. Invite children to show and explain how to balance the seesaw. Provide numerous opportunities using a variety of numbers, as the children's sense of number increases.

- If children are having difficulty with the "seesaw" representation of equivalence, use actual balance scales with objects or weights to show balance or equivalence.

SAMPLE INTEGRATED LESSON – LIVING AND NONLIVING THINGS

Context: Living things are all around us. It is important to know the difference between things that are alive and things that are not alive because living things require certain conditions to continue to live.

GLEs: 1.1.1, 1.2.5, 4.1.1, 4.1.2, 4.1.5

Time: One extended instructional period plus additional time for organizing the data

Objective: The children will compare objects using attributes and organize their findings.

Materials: A collection of pictures of living and nonliving objects from home and school including many similar items (these could be digital pictures taken by students), organizers for sorting and paper for representing their collections.

Procedure:

1. Discuss the terms living and nonliving. Ask the children how they know the difference between things that are living and nonliving to assess their background knowledge in this area.

2. Have the children identify living and nonliving things within the classroom. Ask the children whether you should make one list of all their answers. If the answer is no, then ask for suggestions for organizing their data. If the answer is yes, have the children define what type of organizer would help them quickly tell which items are living or nonliving.

3. Continue identifying living and nonliving items from outside the classroom.

4. Separate the living group into two different categories by common characteristics. Ask the children to guess your rule.

5. Ask a child to separate the nonliving group into two separate categories. Have other children guess the rule. Access prior knowledge by having the child share his or her rule for sorting with the class.

6. Place children in pairs. Provide each group with a set of pictures of living and nonliving objects.

7. Have the pair identify attributes for sorting and explain their thinking. Ask questions such as:

    - a. What are the differences between these living and nonliving things?

- b. How do you know these are all living things?
- c. What are the differences between the different categories you chose?

8. Question the children to guide them to explain, in sequence, how they classified and organized their items
9. Students should record their results using an organizer such as lists or tallies using a large poster "T" chart or glyphs.

❖ Possible Assessment Opportunities

❖ Children can use digital pictures, pictures from magazines or from the Internet, glue them to index cards, and sort into two categories: living and nonliving. The children sort the living category into groups based on similarities and create a picture graph to display the data. Use questions from the possible learning activities to assess their understanding of classification and organization of information.

Intervention: Provide an outline for the picture graph.

Challenge: Further sort and graph the nonliving items by their similarities by at least two attributes (e.g., texture, weight, hardness, etc.).

Interdisciplinary Framework Connections				
Science	**English/Language Arts**	**Social Studies**	**Visual and Performing Arts**	**Physical Education**
A.1. Describe the similarities and differences in the appearance and behaviors of plants, birds, fish, insects and mammals (including humans). **A.1.** Describe characteristics that distinguish living from nonliving things (i.e., sort living and nonliving things). **A INQ.1** Make observations and ask questions about objects, organisms and the environment. **A.INQ.9**. Count, order and sort objects by their properties.	• Organize information in proper sequence to use in a summary and/or retelling. • Generate and respond to questions. • Use content vocabulary appropriately and accurately (math, music, science, social studies, etc.). • Use oral language to communicate a message. • Determine purpose and choose an appropriate written, oral or visual format. • Publish and/or present final products in a myriad of ways, including the use of the arts and technology. • Use appropriate language as related to audience.	**Humans and Environment Interaction** • Explain ways in which humans use and interact with the environment (e.g., how we use sorting in our everyday life, such as sorting our clothes by seasons).	**Art** • Use different media techniques and processes to communicate ideas, feelings, experiences and stories. • Use elements of art and principles of design to communicate ideas. • Select and use subject matter symbols and ideas to communicate meaning (e.g., use art materials to create sorting pictures, such as cutting out pictures and sorting them, creating pictures of shapes, making collages, etc.).	**Responsible Behavior** • Follow class rules, activity-specific rules, safety practices, procedures, etiquette and good sportsmanship in various physical activity settings (e.g., identifying and categorizing the rules for indoor and outdoor activities).

Vocabulary: pattern, patterns, next, before, after, more, less, bigger, smaller, longer, one more, one less, 10 more, 10 less, over, under, size, shape, color, day, week, year, days of the week, few, fewer, fewest, add, subtract, ratio, ordinal numbers, attribute, hundreds chart, translate a pattern, balance, sort, classify, extend

Resources:

Electronic Resources:

Trains and Tunnels – Goals 2000

Pattern Block Puzzles – Goals 2000

Pattern Questions – Goals 2000

A to Z Teacher Stuff http://lessonplanz.com/Preschool/

SuperKids (Educational software Review) http://www.superkids.com/aweb/pages/reviews/multisub/preschoo/

Center for Distance and Online Learning http://teams.lacoe.edu/teachers/index.asp

Abouteducation.com http://math.about.com/library/blone.htm

Illuminations (Repeating and growing patterns) http://illuminations.nctm.org/LessonDetail.aspx?ID=L157

Apples 4 the teacher http://www.apples4theteacher.com/math/games/100-number-chart-one.html

Teach Learn Communicate http://www.alfy.com/teachers/teach/thematic_units/Patterns_Shapes/PS_1.asp

Songs for Teaching http://www.songsforteaching.com

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

What Does Your Pattern Look Like? – Goals 2000

Strips – Goals 2000

Teacher References:

Navigating through Algebra in Prekindergarten-2 NCTM

Algebra in the PreK-2 Curriculum? Teaching Children Mathematics, NCTM, September 2005

Children Literature:

The Boy and the Quilt, by Shirley Kurtz

The Table of Phinneas Fable, by George Green

One Fish, Two Fish, Red Fish, Blue Fish, by Dr. Seuss

Moon to Sun by Sheila Samton

Artic Fives Arrive, by Elinor J. Pinczes

One Watermelon Seed, by Celia Baker Lottridge

Ten Old Pails, by Nicholas Hellar

Fish Eyes - A Book You Can Count On, by Lois Elhert

From One to One Hundred, by Terri Sloat

Ten Sly Piranahs, by William Wise

One is a Snail, *Ten is a Crab*, by April Sayre

The Shapes Game, by Paul Rogers

Classroom Materials: Objects to use to create patterns or sets (e.g., blocks, counters, etc.), hundreds charts, spinners, number lines

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. **Represent and identify whole numbers up to 100 as groups of tens and ones using models and number lines. (See also GLEs 2.2.11 and 2.2.12.)**

   - Use opportunities during the day to count (the number of books on a shelf, the number of steps between locations, or the number of chairs in a room).

   - Represent the days of the month using bundles of 10 sticks and single sticks.

2. **Compare and order quantities of up to 100 objects, including naming a number that is one or ten more or less than a given number. (See also GLE 1.1.4.)**

   - Provide opportunities to count, compare and order objects in the classroom (especially use objects assembled for art, science and social studies lessons). Have children count by ones and group and count by tens.

   - Using hundreds charts, have the students identify one more, one less, 10 more, 10 less than given numbers.

   - Have children count a group of more than 20 objects. Use Unifix or interlocking cubes to build the two-digit number by matching the cubes with the objects and then putting the cubes in stacks of tens and ones. Write the number on the board or a chart. Ask questions such as:

1. How many tens? How many ones? How do you know?

2. If one stack of 10 is added, what will the number become? How do you know?

3. If two ones are taken away, what will the number become? How do you know?

❖ **Possible Assessment Opportunity**

❖ Write a two-digit number on a dry-erase board. Have the children build that number with interlocking cubes. Erase the number in the tens place and put in a higher or lower number.

Ask questions such as:

1. What is the number now?

2. How has it changed?

Intervention: Count a group of less than 20 objects. Build the number as a group of 10 and ones as a model. Have the child copy the model and then describe the number that was built using appropriate vocabulary. Repeat with other numbers that are less than 20 and then build numbers larger than 20.

Challenge: Have the child count a collection of at least 100 objects. Ask the child to model how the collection was counted using interlocking cubes and explain why that method was chosen. Have the child demonstrate another possible way to count the same collection.

3. Describe and estimate quantities using benchmark amounts such as zero, 10 and 100.

- Make a set of cards with groupings of two through 10 dots in many different arrangements. Play "Flash Math." Quickly show a group for one or two seconds. Ask questions such as:

  1. How many did you see?

  2. How do you know?

- Use a 10-frame to model groupings for each of the numbers, 4 through 10.

- Practice recognizing groups of objects represented by pennies, dice, dominoes, etc., over several weeks.

- Use objects collected for GLE 2 and have students estimate using benchmarks.

- Create a "Traveling Estimating Jar." Each week one child takes home two (one large and one smaller) plastic jars or containers. Have the child place a large amount of the same kind of item such as shells or ziti in the large jar. Have the child put 10 of the ziti in the smaller jar to be used as a referent. The children examine both jars during the week to estimate the number of objects in the larger jar and record their predictions. For the class discussion, take out 10 items from the large jar and place them in the smaller jar, so that jar now contains 20 items. Have the children revisit their estimates and make changes if they wish, explaining their thinking and strategies used.

4. Identify ordinal numbers up to 10th with an ordered set of objects (e.g., Point to the fifth crayon lined up on the table.).

5. Use a variety of models and familiar objects to compare parts of a whole object and describe as being closer to very little, one half or one whole.

- Cut the radius on two contrasting colored paper plates. Interlock the paper plates, rotate the plates to various positions and ask questions such as:

  1. Is this closer to very little?

  2. Is this closer to one half or one whole of the entire plate?

6. Use a variety of models and familiar objects to:

- **Make a whole of equal size parts of familiar objects.**

- **Show and identify equal size pieces of a whole as halves, thirds or fourths.**

  - Create opportunities to solve problems sharing objects among different numbers of children and use mathematical language to explain their thinking (one apple shared with two children; one pizza shared with four children).

  - Cut a construction paper rectangle into two, three or four parts. Hold up the pieces so that the children can describe whether or not the pieces are equal. Use correct language to describe the pieces.

- **Identify pieces of a whole as not being halves, thirds or fourths.**
    - Have children divide construction paper squares or paper plate circles into two, three or four parts. Have children identify the wholes that are correctly divided into fair shares and those that are not.

7. **Determine half of a whole set of up to 20 objects.**
    - Take sets of two, four, six, eight or 10 objects, such as candy, crayons, cubes or beans, and have the children divide the set into two equal parts.
    - Give children numerous opportunities to make two equal parts (halves) of a set objects, by making one-to-one matches. Example: With 10 objects, there should be five in each half.
8. **Describe ratios in terms of the patterns that develop from the relationships between quantities e.g., if one cat has four legs, then two cats have eight legs.**

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

Grade-Level Expectations

9. **Count by rote to at least 100.**
10. **Count on from a given amount, orally and with models, and count back from 10.**
11. **Count and group at least 100 objects by tens. (See also GLE 2.1.1 and 2.2.12.)**
    - Build numbers to 100 using real-world items in groups of 10.
    - Count singles and groups of 10 using bundles of sticks or cups with 10 objects each.
12. **Identify, read and write numerals to 100. (See also GLE 2.1.1, 2.2.11, 2.2.13 and 2.2.14.)**

13. **Create problems and write one- and two-digit number sentences that reflect contextual situations and real world experiences. Solve the problems using a variety of methods including models, pictures, pencil and paper, estimation and mental computation, and describe the reasoning or strategies used. For example: Tell a story or draw a picture for a problem that can be solved using the number sentence 10 + 6 = 16. (See also GLE 2.1.1, 2.2.12 and 2.2.14.)**

- Have children model and name the number sentence they are modeling, such as "two and three are five"; draw the combination and write the sentence below the picture.

14. **Solve contextual problems using all addition sums to 18 and subtraction differences from 10 with flexibility and fluency.**

- Have children arrange objects to build all possible combinations for a specific sum.

❖ **Possible Assessment Opportunities**

❖ Put some counters in each hand. Tell the children how many you have all together. Open one hand and ask how many are in the other hand.

Intervention: Put two small groups of counters on the table. Count all the counters. Place a paper over one group and ask how many are under the paper.

Challenge: Have child take as many counting objects as they can handle to model and make as many addition and subtraction sentences as possible. The child should create a context for one of the number sentences so that others can write down the number sentence, draw a picture of it can and solve the problem (can be placed in a center).

15. **Estimate the amount of objects in a set using zero, 10 and 100 as benchmarks and then determine if the estimate was reasonable.**

16. **Identify and name pennies, nickels, dimes and quarters.**

17. **Determine and compare sets of pennies and dimes valued up to $1.00; trade sets of pennies for dimes and vice versa. For example: José has three dimes and eight pennies. Andrea has two dimes and 17 pennies. If they do not have the same amount of money, who has more or less? How much more or less?**

- Give children a cup of up to 40 pennies. Ask the children to count the pennies out in groups of 10 and trade for dimes.

SAMPLE INTEGRATED LESSON – MORE OR LESS

Context: Rebecca and Marie thought that doing math was sometimes boring. Their teacher asked them to create an interesting activity for math. Try the activity they invented called "More or Less" and see if you find it interesting. Maybe your teacher would let you invent your own math activity.

Grade-Level Expectations: 2.1.2

Objective: Children will be able to identify one more, one less, 10 more, 10 less, through exploring number patterns on a hundreds chart.

Materials: Large hundreds chart displayed in the classroom; individual hundreds charts for each team; the names of students to "draw out of a hat"; cards with numbers from 1 to 100 on them; two different colored chips; and a soccer ball with 10 more, 10 less, one more, one less written in the pentagons or sections on the ball.

Procedure

1. Display a classroom hundreds chart large enough for students to see and distribute smaller hundreds charts to each team.
2. Divide the class into teams of three or four students.
3. The teacher draws a card from the number cards and asks all the children to place one of their colored chips on that number.
4. The teacher draws a child's name from the hat and calls on that child to catch the ball.
5. The soccer ball is tossed to the chosen child. The pentagon, where the child's left thumb touches the ball, gives the description of the new number (one more, one less, 10 more, 10 less).
6. The child reads the words under their thumb on the pentagon and each child in the room places the second chip on the appropriate number.
7. A point is awarded to the team of the child who caught the ball if it can show the right answer on the class hundreds chart (the original number and the new number).
8. The other teams respond in some manner, such as a round of applause, or thumbs up if the answer is correct. The point is then awarded.

9. Continue this process until all children have had a turn to catch the ball.

10. The winning team received the most points.

Teacher Note: If a number in the 90s was chosen and the child's thumb is on a 10-more pentagon, then ask the children questions such as:

1. What can we do to find the answer?
2. How could you make sure you were right?
3. What we have to do to this hundreds chart to show the answer?

❖ Formative Assessment Opportunities

❖ Provide each child with a hundreds chart and paper. Call out a number and say plus one, minus one, plus 10 or minus 10. The children should write the information down as a number sentence and then find the correct answer. Continue this process using various numbers.

Intervention: Children may use the hundreds chart as they did in the game to locate the correct answer.

Challenge: Ask the children to find the answer without using the hundred's chart and then explain how they knew the correct answer.

❖ Organize the children in small groups of no more than 5 members. Each group needs a hundreds chart, colored pencils or markers, a set of number cards and a spinner, marked with the following 4 sections: one more, one less, 10 more, and 10 less. Taking turns, each child pulls a number card, reads the number aloud and circles it on the hundreds chart, then spins the spinner. Using a hundreds chart, the child identifies one less, one more, 10 less, or 10 more than the pulled number and shades it in on the hundreds chart. One point is given for each correct answer. The goal is for each child to earn 5 points or 10 points, depending on the size of the group and skill level.

Intervention: Divide the hundreds chart into strips that include the target number and have them count up or down to find the answer.

Challenge: Compare the shaded areas and discover the patterns. Find out what happens to the pattern if we use five more, or five less.

Interdisciplinary Framework Connections				
Science	**English/Language Arts**	**Information and Technology Literacy**	**Visual and Performing Arts**	**Physical Education**
A INQ.1 Make observations and ask questions about objects, organisms and the environment.	• Use content vocabulary appropriately and accurately. • Listen to and respect the opinions of others about written, oral and visual texts. • Develop and discuss multiple responses while reading, listening and viewing.	• Use content-specific technology tools and software. • Demonstrate the ability to use basic features (entering information/ data, editing, calculating, manipulating text, sound and graphics, saving files) of personal productivity software.	• Use the elements of art and the principles of design to communicate ideas.	• Work cooperatively and productively with partners or in small groups to complete assigned tasks.

Vocabulary: same, equal, count, ones, tens, group of 10, a 10, regroup, tens place, ones place, 10-frame, add, subtract, sum, difference, combination, fact families, number sentence, more than, less than, one more, one less, close to, closer to, shorter, longer, taller, referent, almost, about, unit, set, unit fraction, fraction, equal parts, fair share, whole, portion, halves, thirds, fourths, penny

Resources:

Electronic Resources:

Buttons – Goals 2000

Ladybugs and Leaves – Goals 2000

Log Cabins – Goals 2000

Lets Count to 20! http://illuminations.nctm.org/LessonDetail.aspx?id=U153

Toy Shop Numbers! http://illuminations.nctm.org/LessonDetail.aspx?ID=L216

Toss and Make – Goals 2000

All in My Family – Goals 2000

Tell Me a Story – Goals 2000

Hidden Numbers – Goals 2000

Teacher References:

Elementary and Middle School Mathematics, Teaching Developmentally, by John Van de Walle, 4th and 5th editions

A Collection of Math Lessons: Grades 1-3, by Marilyn Burns

Research Ideas for the Classroom; Early Childhood Mathematics, by Robert J. Jensen

"Your Better Half," *Teaching Children Mathematics.* Colomb, Joanne & Kennedy, Kimberly, p.180–190, November 2005

Children's Literature:

Two Ways to Count to Ten, by Ruby Dee, 1988

The Baseball Counting Book, by Barbara B McGrath

Anno's Counting House, by Mitsumasa Anno

The King's Commissioners, by Aileen Friedman

Catch that Goat, by Polly Alakija

Island Counting 1 2 3, by Frane Lessac

My Granny Went to Market: A Round the World Counting Rhyme, by Stella Blackstone and Christopher Corr

Give Me Half! by Stuart J. Murphy

Classroom Materials: snacks, toys, shoes, clothing, items from nature (shells, rocks, leaves, flowers), items from the classroom (books, markers, crayons, furniture, white board, bulletin board) interlocking cubes, blocks, collections of items that are all the same size

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. **Identify and describe familiar two- dimensional shapes and three-dimensional solids in the environment and contextual situations.**

   - Provide children with old magazines and newspapers from which to cut out pictures of objects shaped liked triangles, rectangles, squares, and circles.

   - Go on a shape hunt around the classroom, school, or outdoors.

   - Show children a shape for a few seconds and have them try to draw the shape from memory. Have the children show each other their drawings and discuss the characteristics of the shape in their drawings. Then show the original shape again. Start with simple shapes and then progress to complex shapes and solids.

   - Use a geoboard and create a shape with one elastic. Copy the shape onto dot paper. Use two elastics to create a shape and copy the design on dot paper.

2. **Copy two- and three-dimensional designs from visual memory.**

   - Place a three dimensional solid in a bag. One child places his/her hand in the "feely bag," feels around, and describes the attribute of the solid to the remainder of the class without naming it. If the child needs help identifying the solid ask possible

clarifying questions such as:

- How many sides does your solid have?
- Does it have any round or curved parts?
- Are any of the sides longer than the others? Are all sides equal?
- Does your solid have any points? How many?

- Provide pipe-cleaners for the children to make frames of solids by wrapping the pipe cleaners around a model of the solid to create a frame of that solid.
- Build solid figures from clay, simple nets for cubes and rectangular prism, straws, etc.
- Using geoblocks and have the children trace the faces and identify the shape of each face.

3. Compare and sort familiar shapes and solids and designs found in the environment and contextual situations. (See also GLE 1.1.1)

- Describe the attributes of objects and shapes using appropriate mathematics terms and language and have the children use those attributes to sort the objects.
- Have the children sort the cut out pictures (GLE 3.1.1) and attempt to find congruent squares, rectangles, circles or triangles.
- Have children create designs using shapes or solids. Display the designs and have the class sort them by the shapes and solids included in the designs.

4. Construct shapes and solids using a variety of materials and create two-dimensional shapes and designs with a line of symmetry.

- Children explore symmetry by examining leaves, using mirrors with pattern blocks, folding paper or by making inkblot designs.

❖ **Possible Assessment Opportunity**

❖ Choose different pattern blocks to put together and make a new shape that has a line of symmetry. Ask children to explain how they know the new shape has a line of symmetry.

Intervention: Give the child an image of half a symmetrical pattern block design and have the child build the missing half or find the pattern block image that will complete the design.

Challenge: Have children create images with a line of symmetry using technology or pictures. Cut the images along the line of symmetry and paste onto blank pieces of paper. Have another student draw, sketch or build the missing half of the image.

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

Grade-Level Expectation

5. Describe location, direction and position of objects or parts of objects, using terms such as left, right and opposite.

≈ *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)*

6. Know the days of the week in order and locate dates, days, weeks and months on a calendar. Use the information to solve problems involving the planning and sequencing of events.

- Provide one blank calendar per month. The name of the month and the weekdays are written in on the first day of the month. Every Monday review the days of the week by starting with the first day of the week (Sunday). Each day children write in the correct number for that date and answer questions about yesterday's and tomorrow's days and dates.

- Use calendars to plan and sequence school activities and classroom routines.

- Sequence a variety of events in pictorial form. Some suggested ideas are: photographs of people aging, trees or other plants changing according to the seasons, steps to tying shoes, making a sandwich, or popcorn or a cake.

7. Solve problems involving telling time to the nearest hour using digital and analog clocks. Estimate and compare the length of time needed to complete a task using comparative language such as longer, shorter, more or less.

- Use clocks during daily schedules to help develop a sense of time by announcing when there are 5 minutes remaining a for an activity or 15 minutes before an activity should commence.

8. Use nonstandard units or physical referents to estimate answers to measurement problems involving length, area, weight, temperature, volume and capacity, and then justify the reasonableness of the answers. Suggested materials include Unifix or locking cubes, paperclips, Popsicle sticks, square tiles, water and sand.

- Give the children different lengths of string and have them measure the width of a doorway. Talk about why their answers are different and the kinds of problems this can cause.

- Children measure the width of their desks by counting how many widths of their hands it would take to go from one end of the desk to another. They compare the results and discuss what would happen to the number of hands of the teacher's hand were used instead.

- Children can discuss whether they should use links or meter sticks to measure the length of the gym. Why?

- Provide opportunities for children to work with a variety of objects as "units" to fill, cover or match and produce a number called measure, e.g., measure the area of the desktop with an index card unit and literally cover the entire desk with index cards. Ask students to report their findings using language such as: "I measured with index cards and the desk can be covered with __ cards."

9. Use nonstandard units, references or direct comparison of objects (appearance), to order objects by length, area and capacity.

- Make lists of things to measure in the classroom. Place a piece of masking tape along the dimension of each object to be measured. Make sure to include curves or other distances that are not straight lines. Designate the units to be used and have the children estimate before they actually measure.

- Children measure a distance more than once by covering it using different nonstandard units each time and comparing the results.

- Give each pair of children commercially available links or large paper clips. Have each child use the links to make a chain as long as his or her arm. Then, have the children in each pair compare their chains to determine whose arm-chain is longer (or shorter). Arm-chains can be used to measure objects in the classroom.

- Measure the length of desks using the length of a pencil. Will the amount of pencils used to measure the length change if the size of the pencil changes? Children verify predictions by measuring the desks with a pencil of a different length and explain what happened.

- Repeat the activities above using metric or standard rulers.

10. Explore using standard units of measure (inch and centimeter) to communicate measurement in a universal manner.

SAMPLE INTEGRATED LESSON — MEASURING SHADOWS

Context: Shadow tag is one of Josie's favorite games. She noticed that shadows were not always the same length. She wants to know if it is better to play the game at a particular time of day.

Grade-Level Expectations: 3.3.7; 3.3.8; 3.3.10; 4.1.2; 4.2.3

Time: Two instructional periods

Objectives: Children will be able to measure using a given non-standard unit.

Materials: Sidewalk chalk, string, paper and pencil, 12-inch rulers, straws or some other "unit"

Procedure:

1. Read the first verse of "*My Shadow*" by Robert Louis Stevenson. Ask the children what they think it means to have a shadow "go in and out."

2. Have the children play shadow tag. A person is tagged when his/her shadow is stepped on by another person. Discuss the different lengths of shadows and how and why they differ. Ask the class:

   a. Was there an easy way to tag someone? Explain.

   b. Can a person change the length of his shadow? Explain.

   c. When do you think would be the easiest time of day to tag someone?

3. At the beginning of the day, have the children work in pairs to measure each other's shadows. Use chalk to mark the top and bottom of the shadow. Cut a piece of string the same length as the distance between the marks.

4. Measure the string using a given nonstandard unit, such as straws, laid end to end, and then have the children count the number of units.

Intervention: Have a partner assist and replace string with masking tape so the children can lay the straws directly on top of the tape for a more accurate measuring surface.

Challenge: Measure the shadow and string to the nearest inch.

5. Tape children's strings to a large piece of paper titled, and label it with their name and the length and a.m.

6. Repeat the activity at the end of the day. Tape everyone's string to the large piece of paper next to the string from the morning measurement and label it p.m.

7. Have the children compare their measurements, paying special attention to the time of day and the shadow lengths of those who they estimate are close in height.

8. Discuss any changes of opinion on how a shadow can "go in and out."

❖ Possible Assessment Opportunities

❖ Have the children measure their own shadows on three more different days. Compare the information by making a chart or table. Ask questions such as:

1. Was the morning or afternoon shadow longer?

2. What is the measurement of your shortest shadow? Longest?

3. How much longer is your longest shadow from your shortest shadow?

Intervention: Children can determine longest and shortest by counting the unit of measure and counting up from the shortest measure to the longest measure.

Challenge: Use their measurements to the nearest inch and use addition or subtraction to answer the questions or use a ruler or yard stick as a number line to find the answers. Order the shadows for entire class from longest to shortest or vice versa.

9. Decide the best time of day to play shadow tag and explain why.

Interdisciplinary Framework Connections			
Science	**English/Language Arts**	**Visual and Performing Arts**	**Physical Education**
1.1 A 11 Describe the apparent movement of the sun across the sky and the changes in the length and direction of shadows during the day. **1.4 A 17** Estimate, measure and compare the sizes and weights of different objects and organisms using standard and nonstandard measuring tools. **A INQ. 2** Use senses and simple measuring tools to collect data.	• Use content vocabulary appropriately and accurately. • Listen to and respect the opinions of others about written, oral and visual texts. • Develop and discuss multiple responses while reading, listening and viewing.	• Use the elements of art and the principles of design to communicate ideas.	• Demonstrate developmentally mature form in the fundamental movement skills: locomotor and nonlocomotor. • Recognize and apply the concepts of body space, effort and relationships in developing movement sequences and game strategies. • Work cooperatively and productively with partners or in small groups to complete assigned tasks.

Vocabulary: sort, alike, different, objects, diagram, shape, same, square, rectangle, triangle, circle, straight, color, inside, outside, top, bottom, close, closer, similar, cube, cylinder, pyramid, sphere, rectangular prism, cone, about, measure, longer, longest, shorter, shortest, taller, tallest, smaller, smallest, heavier, heaviest, lighter, lightest, compare, the days of the week, month, date, months of the year

Resources:

Electronic Resources:

Color & Shapes of Animals: http://school.discovery.com/lessonplans/programs/animalColorsShapes/

Learning to Measure with Ladybug: http://illuminations.nctm.org/LessonDetail.aspx?ID=L69

My Favorite Place: http://artsedge.kennedy-center.org/content/3809/

Shape Hunt Chant: http://www.readwritethink.org/lesson_images/lesson776/chant.pdf

Boxes Boxes – Goals 2000

How Big Am I? – Goals 2000

Popcorn Math – Goals 2000

Measure that Object – Goals 2000

Does It Fit? – Goals 2000

Teacher References:

NCTM Algebra and Geometry Standards K-2

Engaging Young Children in Mathematics, by Douglas H. Clements

Adding It Up, by National Research Council

Investigating with Pattern Blocks, by Marcia Miller

Children's Literature:

Mapping Penny's World, by Loreen Leddy

My Map Book, by Sara Fanelli

Farmer Mack Measures His Pig, by Tony Johnston

So Many Circles, So Many Squares, by Tana Hoban

The Long and the Short of It, by Nathan and McCourt

What Makes a Shadow? by Clyde Robert Bulla

How Big is a Foot? by Rolf Moyller

So Many Circles, So Many Squares, by Tana Hoban

Dollars and Cents for Harriet, by Betsy Maestro

What's Smaller than a Pygmy Shrew? by Robert E. Wells

Tiger Math, by Ann Whitehead

Much Bigger Than Martin, by Steven Kellogg

The Shapes Game, by Paul Rogers

Telling Time with Big Mama Cat, by Dan Harper

Nothing Sticks Like a Shadow by Ann Tompert

I Can See My Shadow by National Geographic

The Shapes Game, by Paul Rogers

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

1. **Pose questions that can be used to guide data collection, organization and representation.**

    - Provide opportunities for the children to pose questions and collect data about themselves, e.g., likes and dislikes, the time they go to bed, number of people in their families, types of animals as pets, and measures such as arm span. Ask questions such as:

        1. What kind of information would it be important to know about ourselves? Why?

        2. What question could we ask to find out that type of information?

2. **Collect and systematically organize and represent the data that answers the questions using lists, charts and tables, tallies, glyphs (coded pictures) picture graphs, and bar graphs.**

    - Once data have been collected, ask questions such as:

        1. How should we group the information or data?

        Example: Have the children draw pictures of the pets they have or wish they had and then decide how to group the pictures. Different classifications would produce different graphs, such as grouping by type of pet, by type of body covering such as fur, feather, skin or scale, or by the number of legs.

2. Use the pictures to create class picture graphs that answer the questions posed.

Have the children reflect on their organization of data and justify their selection with talking, writing or with pictures.

- Have children collect data and complete graphic organizers that answer the question: How much time do we spend reading?
- Have the children examine scoops of various brands of raisin bran cereal to make inferences about the "best" or "worst" brand of cereal. The children should count and record the number of raisins in each scoop and display the data in a bar graph.
- Read *Cactus Hotel* and gather and graph data of the life cycles of the various plants and animals.

❖ Possible Assessment Opportunities

❖ Have the children help the school librarian figure out what books to order for first graders

The children should work in small groups to develop a survey that will help identify the types of books first graders like to read. Children survey other first graders and collect the data, keeping track of responses using tally marks. Have each group organize the collected data into a bar graph compose a recommendation to share with the librarian.

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

Grade-Level Expectations

3. Describe data that have been organized and make comparisons using terms such as largest, smallest, most often or least often.

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

Grade-Level Expectations

4. Describe and explain the likelihood of the occurrence of various events in the student's world using terms such as possible, impossible, likely, unlikely or certain.

- Ask children to describe the likelihood of various events. Use examples such as: it will rain tomorrow, you will have two birthdays this year, three children will be absent tomorrow, a rock dropped in water will sink.

- Provide each child with "certain" and "impossible" cards which they display when presented with a series of situations such as landing on red when a spinner is all red or landing on red when the spinner is colored only yellow and green.

5. Engage in simple probability activities and games including the use of number cubes and spinners; record, graph and describe the results of the activities and games.

- Have children predict how often heads and tales come up when a coin is tossed. While working in pairs, toss a coin 10 times and tally the number of heads and tails. Make a class record of the results by combining the tallies. Compare the class results with the predictions

- Have the children roll a number cube; spin a spinner, or reach blindly into a container to select a colored marble (that is returned to the bag), a dozen times. They then color the appropriate square in a bar graph for each pick. Ask questions such as:

    1. Did some results happen more often or less often than others?

    2. Do you think some results are more likely to happen than others?

SAMPLE INTEGRATED LESSON – OUR TOWN

Context: Your class has been asked to describe your town for the local newspaper. The class has been asked to tell about specific types of geographical features such as mountains, lakes, meadows, forests and farmland. You must also describe man-made features such as roads, parks and buildings. You can only use information from the spaces near your neighborhood and school to help you describe your town.

Objective: Children will identify major physical and man-made features of their town using data they have identified and collected from areas around their home, neighborhood and school. Children will make generalizations about their town based on the data they have collected.

Materials: State map, town or city map, K-W-L graphic organizer (Know, Want to know, Learned)

Procedure:

1. Discuss, define and list geographical and man-made features.
2. Brainstorm why geographical features might be important to a town or to other places the children may know.
3. Access prior knowledge about man-made and geographical features in your town, doing a K-W-L chart with the children
4. Brainstorm categories with the children that would be appropriate for classifying the information from No. 1 above.
5. Locate your town on a state map and discuss its relationship to other places the children may have heard of or visited in the state.

   Ask the children:

   a. What other towns or places are near our town?

   b. How are they like our town? How are they different?

   c. Are there other towns that you have visited that are very different from our town?

   d. Do you know what area of the state your town is located in? What region of the country your state is located in?

6. Have the children observe their yards or areas near their home and describe the geography and man-made features.

7. Discuss ways to categorize the items described in No. 6.

8. Ask questions such as:

    - How do you know these are all related?

    - What are the differences between the features?

9. Create a class pictograph of the types and the number of features of the children have identified.

❖ Possible Assessment Opportunities

❖ Make generalizations about the features of our town from data and graphs. Investigate other towns and make comparisons about similar features, such as parks, hills, bodies of water, trees, types of buildings, etc.

Intervention: Make comparisons about the neighborhood where they live and the area around the school. Comparisons could also be made between the child's neighborhood and that of a friend or relative, if they are not the same location.

Challenge: Research another town or geographic location with different physical and man-made features. Create a second pictograph with this information and make comparisons to the data they collected about their town. Represent and display the same information in a different way.

❖ Have the children observe and record the types and number of wild animals (such as birds, squirrels or deer) they saw in their town over a specific period of time, or they could research the types of animals in geographic area. They can then make a pictograph of their data and make generalizations about the animals in their town.

Intervention: Provide children with pictures and a list of animals that might be found in their neighborhood. Children record sightings by placing check marks next to each animal listed. Use the same pictures to create pictographs.

Challenge: Investigate another area of the country using print and electronic resources. Make a pictograph of the findings, and compare to the results from the town. Offer possible reasons for the differences and or similarities.

Interdisciplinary Framework Connections			
English/Language Arts	**Social Studies**	**Visual and Performing Arts**	**Physical Education**
• Organize information in proper sequence to use in a summary and/or retelling. • Generate and respond to questions. • Use content vocabulary appropriately and accurately (math, music, science, social studies, etc.). • Use oral language with clarity and voice to communicate a message. • Research information from multiple sources for a specific purpose. • Determine purpose and choose an appropriate written, oral or visual format. • Publish and/or present final products in a myriad of ways, including the use of the arts and technology. • Use appropriate language as related to audience.	**Humans and Environment Interaction** • Explain ways in which humans use and interact with environment, e.g., how we use sorting in our everyday life, such as sorting our clothes by seasons). • Define and identify natural and human characteristics of places. • Locate major physical and human features in the New England region and the United States (e.g., sort , classify and graph items such as roads, mountains, lakes, buildings, etc.).	**Art** • Use different media techniques and processes to communicate ideas, feelings, experiences and stories. • Use elements of art and principles of design to communicate ideas. • Select and use subject matter symbols and ideas to communicate meaning (e.g. use art materials to create sorting pictures, such as cutting out pictures and sorting them, creating pictures of shapes, making collages, etc.).	**Responsible Behavior** • Follow class rules, activity-specific rules, safety practices, procedures, etiquette and good sportsmanship in various physical activity settings, (e.g., identifying and categorizing the rules for indoor and outdoor activities).

Vocabulary: sort, alike, different, objects, diagram, picture graph, pictograph, bar graph, data, collect, organize, tally, tally marks, largest, smallest, most often, least often, glyphs, likely, unlikely, certain, impossible, tables, charts,

Resources:

Electronic Resources:

Eye to Eye: http://illuminations.nctm.org/LessonDetail.aspx?ID=L169

A Shoe In: http://illuminations.nctm.org/WebResourceReview.aspx?ID=5

Exploring Data: http://mathforum.org/workshops/usi/dataproject

Making Glyphs: http://illuminations.nctm.org/LessonDetail.aspx?ID=L114

Our Favorites – Goals 2000

Popcorn Math – Goals 2000

Teacher References:

NCTM Algebra and Geometry Standards K-2

Engaging Young Children in Mathematics, by Douglas H. Clements

Adding It Up, by National Research Council

Project Learning Tree, by American Forest Foundation

Challenging Young Children Through Sorting & Classifying: http://www.findarticles.com/p/articles/mi_qa3673/is_200410/ai_n9429975

Children's Literature:

Guess Who My Favorite Person Is, by Byrd Baylor

Cactus Hotel, by Brenda Guberson

The Mouse Who Owned the Sun, by Sally Derby

Daley B, by Jon Blake

Chickens Aren't the Only Ones, by Ruth Heller

No Fair, by Carol Holtzman

Notes: