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Literature and Writing Connections With Mathematics in a First Grade Classroom

Linda Joan Sheeler Sorenson

Literature and Writing Connections With

Mathematics in a First Grade Classroom

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A Project Report

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Linda Joan Sheeler Sorenson

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The National Council of Teachers of Mathematics Standard #2, communication in mathematics, is addressed. The benefits of integrating writing and the use of children's literature in mathematics are studied. Writing strategies and an annotated bibliography of children's literature that address instruction of first grade mathematics outcomes prescribed by the Yakima (WA) School District are developed. Recommendations for implementing the project are given.

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CHAPTER 1

BACKGROUND OF THE STUDY

Introduction

The nationwide reform of mathematics is impacting the way
mathematics is taught in public schools in Washington state. The
Washington State Commission on Student Learning (WSCSL) has developed
statewide academic goals called Essential Academic Learning
Requirements (EALRs). The goals which address mathematics are based
upon the 1989 recommendations of the National Council of Teachers of
Mathematics (NCTM). NCTM stresses the importance of making
mathematical connections by addressing the curriculum standards as one
integrated whole rather than in separate, independent content areas
(NCTM, 1989).

Statement of the Problem

Current practices in teaching mathematics fail to integrate
mathematics with other content areas adequately (NCTM, 1989). If
current educational practices and procedures in mathematics are to
comply with the recommendations and standards established by the NCTM
and the WSCSL, mathematics must be integrated with other content areas.
In the author's opinion, the isolation of mathematics from other content

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areas is conspicuous, especially regarding language arts. The author's research question, "How can language arts be used in mathematics?" was developed after observing the discrepancy between the recommended WSCSL and NCTM standards and current educational practices of teaching mathematics in the author's school district.

Purpose

The NCTM (1989) recommends mathematics include numerous opportunities for communication so students realize that language arts components are vital parts of learning and using mathematics. The purpose of this project is to develop activities in which literature and writing are connected to mathematics outcomes for first grade students in the Yakima (WA) School District.

Rationale

The difficulty students have with word problems in mathematics is symptomatic of the larger problem of words and mathematics (Countryman, 1992). According to Whitin and Wilde (1992), connecting children's literature with mathematics can provide a rich context for understanding mathematical concepts. Others (Countryman, 1992; NCTM, 1989; Wadlington, Bitner, Partridge, Austin, 1992) believe the use of

writing with mathematics helps students reflect on and clarify their thinking about mathematical ideas and skills.

Product

This project will consist of three components:

1. A descriptive list of writing strategies that could be used in teaching mathematics for the purpose of developing mathematical concepts.

2. An annotated bibliography of children's literature which correlates with some of the first grade mathematics outcomes of Yakima School District.

3. Sample lesson plans.

Limitations

This project will not include all activities possible which might be used to make connections between literature and writing with mathematics. Neither is it meant to include a comprehensive review of all children's literature. The connection of literature and writing with mathematics is limited to nine of the mathematical concepts prescribed by the Learning Outcomes specific to first grade students in the Yakima (WA) School District.

Definition of Terms

The terms used in this project are to clarify the authors meaning.

<u>Children's literature</u>: Any printed matter which has been sanctioned by the Yakima (WA) School District and is of interest to first grade students.

<u>Language arts</u>: The educational content area that deals with listening, speaking, reading and writing. Listening and writing will be the focus of this project.

<u>Outcomes</u>: Skills or tasks that reflect student's understanding of concepts or skills.

<u>Writing</u>: The use of letters, numerals, illustrations, or other symbolic representation to convey an idea on a surface with an instrument (as a pencil or pen).

Overview of the Project

In Chapter I, the author addressed the focus of the project. The problem of connecting the literature and writing components of language with mathematics was stated. A purpose, rationale, and brief description of the product to be developed was given. Limitations and definitions for this project were indicated.

Chapter 2 will provide a review of selected literature which explores

the significance of connecting children's literature and writing with mathematics.

In Chapter 3, the author will describe the procedure that will be used to develop the project. How information will be gather to to show justification for the project will be addressed. The criteria for choosing areas of mathematics addressed in the project will be given. Steps taken to develop writing activities, book lists and lesson plans will be described. How the author will gather books for review and annotation will be specified.

Chapter 4 will indicate the components of the project. The organization of the components will be specified.

Chapter 5 includes a summary of the project, the author's conclusions, and some recommendations on incorporating literature and writing into mathematics instruction.

CHAPTER 2

REVIEW OF THE LITERATURE

Introduction

According to Countryman (1992, p.2) "the productive use of language is a skill that all students should practice in all disciplines; reading, writing, and speaking belongs in every classroom, even math classrooms." She claims that students' difficulty with word problems is symptomatic of the larger problem of words and mathematics. Mathematician, Henry Pollak agrees: "the ability to communicate with others is one of the requirements for a good research mathematician" (cited in Countryman, 1992, p. 2).

The Curriculum and Evaluation Standards for School Mathematics (*NCTM,* 1989), has served as the catalyst to integrate language arts with mathematics in classroom instruction. Standard #2 of the document addressed mathematics as communication. The standard specifically recommended that students have opportunities for communication to:

- relate physical materials, pictures, and diagrams to mathematical ideas
- reflect on and clarify their thinking about mathematical ideas and situations

- relate their everyday language to mathematical language and symbols

- realize that representing, discussing, reading, writing and listening to mathematics are vital to learning and using mathematics. (NCTM, 1989, p. 26).

The Mathematical Association of the United Kingdom (MAUK) (1987) concurred when it emphasized the use of language in conjunction with activities that bring home mathematical ideas and findings to the student. Healy (1994) pointed out that if you learn something you have to make it part of your language system. You have to be able to explain it in your own words. Sunflower (1994) cited research which has shown that students become better thinkers if they are taught in classrooms where meaning is actively constructed through reading and writing.

The discipline of Language Arts reflects a developmental process of skill and concept acquisition through cognitive maturation and social development which should guide the degree of integration of language arts components with mathematics. According to the Bullock Report:

in the primary school, children's ability to talk and to listen is always in advance of their ability to write and to read. To confine children to mathematical tasks where the language skills of writing and reading predominate over those of talking and listening is unlikely to maximise mathematical growth. It is important,

therefore, to place a high value on talking and listening, although teachers should also strive to develop reading and writing skills in mathematics. (cited in MAUK, 1987, p. 2)

In summary, the integration of language arts components with mathematics currently is viewed as a commendable practice by the National Council of Teachers of Mathematics of the United States and by the Mathematics Association of the United Kingdom as based upon the recommendations of numerous researchers and recognized mathematicians. When incorporating language arts with mathematics the developmental stage of the students should be considered. Further evidence will be presented in the remainder of this chapter to justify the connection of disciplines of Language Arts and Mathematics specifically with the use of writing and children's literature in the instruction of mathematics.

Literature Review on Writing in Mathematics

Zinsser (1988) stated, "writing is a way to work yourself into a subject and make it your own" (p.16). Writing across the curriculum at the elementary grade level is an accepted approach to instruction, but Wilde (1991) believed mathematics is probably the area of curriculum in which children write the least. Students need to use oral and written

language, to make conjectures and conclusions and to discuss their mathematical reasoning (Burton, 1995).

Countryman (cited in Zinsser, 1988) maintains that writing mathematics is a way to explore a question and gain control over it, engaging the imagination, the intellect and the emotions, all of which are powerful aids to learning. Writing compels the learner to wrestle with language to examine their thoughts and perceptions, then organize them and present them clearly. (Burns, 1995; Griffiths, 1994; Abel, 1988; Zinsser, 1988). Writing helps students clarify their thinking and develop deeper understanding of mathematics (NCTM, 1989). Mathematics as in all disciplines is not so much learning from experience, but rather, learning is derived from processing experience. Writing is a method of processing experience.

Writing in mathematics can be divided into two types, formal and informal. Formal writing is used as a means to display memory and test concept mastery. Writing used across the curriculum often engages in this type of writing to show mastery of a subject or concept. Informal writing is about forming meaning, or writing to learn. According to Connolly (1989), it is fundamentally about using words to by Britton as acquire concepts through informal writing. It has been referred to as "thinking aloud on paper" (cited in Rose, 1989, p.16). [This method uses writing to serve as a vehicle to enable the discovery of knowledge.]

In the words of poet William Stafford:

> A writer is not so much someone who has something to say as
>
> he is someone who has found a process that will bring about
>
> new things he would not have thought of if he had not started to say
>
> them. (cited in Connolly, 1987, p. 3).

Informal writing aids and supports the constructive nature of learning mathematics. According to the National Research Council (1989, p. 58), "students learn mathematics well only when they construct their own mathematical understanding." Thus, one of the values of writing in mathematics is the manner in which it serves as a vehicle to enable the discovery of knowledge (Connolly, 1989). Both informal and formal writing have a place in mathematics. Each type can provide specific contributions to the mastery of mathematics ideas and concepts. Often, the line of distinction between the two purposes is vague.

The consideration of developmental abilities must be addressed when applying the use of writing as a strategy for learning mathematics. To what degree should writing be incorporated in a classroom of students functioning on an emergent level of reading and writing? Teachers of early primary students may have concerns about using writing activities with non-reading children. Mills (1994) addressed and modeled some of her strategies for working with emergent writers. She generated class discussions based on the work her students produced and shared with the

other children in the classroom. Students used inventive spelling and pictures to help explain their own thinking and mathematical discoveries.

Gordon (1984) asserts that illustrations are a natural part of the development of writing. Calkins (1986) points out that in eagerness to see evidence of writing, educators wrongly dismiss picture-stories which students produce. In emergent writers, pictures often carry the meaning acting as the written word. With young children, the old saying, 'a picture is worth a thousand word' is especially true. As children advance in their skills of writing by more conventional means, pictures continue to maintain a critical role in early writing. Working as a type of scaffold to construct writing, a child can go back and forth between the picture and the word to maintain and develop his/her idea in writing (Calkins, 1988). Writing is developed from pictures to pretend writing that initiates a random use of letters. As children gain more experience with the printed word, students will begin to use letters and sounds more intentionally to convey meaning in text when writing, often foregoing the picture. Even so, children will move back and forth between levels as the purpose and type of writing changes.

Key to these early writing attempts is the children's need to feel that their writing will be accepted. Griffiths (1994) describes the hesitation shown in young children when they are first asked to write about mathematics:

their text in many cases may focus on their emotional response

to the lesson. Sharing the children's writing is sometimes enough

to encourage initially reluctant writers to have a go or to focus

those who have not addressed the mathematics (p. 69).

It is crucial to have children read what they have written (Calkins, 1986; McCurdy, 1984). Not only does reading and sharing their work help develop their sense of purpose for writing in mathematics, it also affords the students opportunity to reflect upon and discuss their writing and clarify their meaning.

Writing in mathematics can and should be used in the earliest levels of writing. Burns (1995) notes that not only do the writing samples provide insights into students' views of mathematics and their learning experiences, but they reveal the students' thinking as well. The NCTM (1989) advocates that it is important to keep in mind that often what may appear to be an error in a child's mathematical thinking may be, in fact, an inability to communicate. Students need to be learn how to explain mathematical concepts in their own words.

In summary, the use of writing in connection with mathematics is viewed by many researchers as a means to enhance the learning of mathematics. Not only does writing help students reflect on and clarify their thinking of mathematical concepts, it can serve as a means to construct new mathematical knowledge. The developmental stage of

language skill acquisition is an important consideration when using

writing in mathematics with students who are at the emergent stage of

reading and writing. Nevertheless, children at even the early

levels of writing acquisition should be encourage to communicate their

mathematical ideas and perceptions through writing and speaking.

Children's Literature in Mathematics

According to the NCTM (1989), listening to, and reading children's

literature about mathematics is an important aspect of communication

that needs more emphasis in the curriculum. The NCTM (1989) advocates

the use of children's books as a vehicle for communicating mathematical

ideas. Whitin (1992) agrees with the NCTM:

> Children's literature helps to break down the artificial dichotomy
>
> that exists sometimes [sic] between learning mathematics and
>
> living mathematics. Books can provide a rich context for
>
> understanding. Without context, learners may come to regard
>
> mathematics as an abstract and irrelevant system. (p.4)

Brownell (1945), asserted insights and relationships between

concepts are secured through associations which are meaningful to the

learner. Using children's literature to expose and explore mathematical

concepts helps students make associations with their own experience and

knowledge. Children's knowledge and excitement about mathematics

grows if situations are provided to encourage discussion about their learning (Irons & Irons, 1989).

Nevin (1992) maintains that the use of children's literature is a natural way to introduce new concepts because children recognize and love to listen to stories and are anxious to become a part of the drama. Many children's books present interesting problems and illustrations where others solve problems. Stories require students to listen, interpret, and reflect on content. Stories are a means to provide situations where discussion of mathematical concepts can be explored. The use of children's literature provides a resource for developing mathematical power as students develop confidence in their ability to engage in mathematical tasks involving problem solving, reasoning, and communications (NCTM, 1992).

Mathematics is a symbolic language that expresses and explains higher level conceptualization of human thought and insights. West (1993) notes that when children discuss the stories and discover the mathematical concepts embedded in the literature, they learn the subtle message that mathematics is a form of communication. Through books and other pieces of literature, mathematics can be seen as an common activity which used by people in different contexts for different purposes to communicate thoughts and ideas (Whitin, 1995).

One critic expresses hesitation to fully embracing the approach to

teaching mathematics through the use of children's literature. Saxton (cited in West, 1993) has argued that drill and practice is a superior approach to learning mathematics as opposed to an inquiry based method. Saxton states that any technique that fails to emphasize rote learning is untested experimentation. He questions the claims that using children's literature strengthens mathematics instruction as there is lack of evidence proving any significant gains in student mathematical learning. Nevertheless, Saxton does finds the concept attractive and has indicated interest in incorporating the literature method into his own drill and practice approach.

Summary

The use of writing and children's literature in connection with mathematics is recommended by the NCTM and is reflected in the mandates of WSCSL as set forth in the EALRs. The author's review of research has shown that the use of writing to facilitate the learning of mathematics is thought to be an effective strategy to strengthen mathematical understanding. Writing helps students to reflect and clarify their thinking about mathematics, as well as serves as a means to construct new mathematical knowledge.

Likewise, the use of children's literature is thought to contribute to the learning of mathematics by providing a context to explore and examine

mathematical concepts. There is some speculation to the validity of using children's literature as a strategy to enhance and support the learning of mathematics due to the lack conclusive evidence. Nevertheless, the use of children's literature to help teach mathematics is being considered by the skeptics and advocates alike.

Based upon the literature review, there is sufficient reason to vigorously pursue the facilitation of integration of language arts into the instruction of mathematics. Chapter 3 will provide the methodology on how language arts and mathematics can be connected for first grade students in the Yakima (WA) School District.

Chapter 3

PROCEDURES

The procedure for this project consisted of several steps. First, a background was written which included a statement the problem and purpose for the study.

Second, the author did a review of the literature was conducted to determine the validity of using writing activities and children's literature to strengthen the acquisition of concepts in mathematics for students at the primary grade level. In addition to a review of related literature, the author participated in a regional mathematics conference and attended other in-services and workshops to gain a better understanding of current thoughts and practices in mathematics and the implications of the recommendations of the NCTM.

Third, titles of children's literature were investigated which might be used in teaching mathematics. Reference books, publisher's book list, and bibliographies from several texts were examined for suggestions of book titles. Additional titles were gained though accessing the card catalog at several libraries. Books were obtained by visiting libraries, bookstores and book fairs. Books that were deemed useful for the project were then annotated and categorized into lists by the learning outcome areas.

Fourth, the Mathematics Learning Outcomes for first grade students of

the Yakima (WA) School District were reviewed. Outcomes were organized into compatible areas, reducing the eleven Mathematics Learning Outcomes into eight areas of focus for the project.

Fifth, strategies which could be used to implement writing activities in mathematics were considered. This involved a review of notes from workshops and in-services, and further review of texts and manuals. Models and suggestions found in these resources were used to develop writing activities suitable for the mathematics outcome areas.

Next, the writing activities and the annotated bibliography of children's literature were organized by the learning outcomes, and put into a notebook. A few illustrated lesson plans were included also.

Lastly, a summary of the project was given. Conclusions and recommendations for further use of the project were stated.

Chapter 3 outlined the procedures taken in the project. In Chapter 4, the components of the project and grouping of the learning outcomes will be indicated. Specification of how the components were organized will be established. Chapter 5 will summarize the author's conclusions and recommendations for further use of the project.

Chapter 4

THE PROJECT

Project Specifications and Organization

The Mathematics Learning Outcomes for first grade students of the Yakima (WA) School District have been organized into compatible areas, condensing the eleven outcomes into nine areas. Learning outcomes M101 through M105 are individually addressed in the project, as is M108, and M111; M106, M107, M109, and M110 have been grouped together.

Learning Outcome M106, Number Sense, has been grouped together with M107, M109, and M110. The latter three all deal with counting by ones, fives, and tens respectively. Because there is considerable overlapping in the two areas, they are dealt with as one entity for the writing strategies. In the component dealing with selections of children's literature, the author did separate M106, Number Sense, was separated from counting, and a list of books were provided for each area. Even so, both areas are represented in book selections on both lists.

The project order is established by the ordinal sequence of the Learning Outcomes, except where previously noted. The order is as follows: M101, M102, M103, M104, M105, M106 and M107 with M109 and M110, followed by M108, then M111.

The components are arranged as indicated:

I. Mathematics Learning Outcomes number and specific area.

II. List of suggestions for writing activities for use in the specified Mathematics Learning Outcome area.

III. Annotated bibliography of children's literature which relates to the Mathematics Learning Outcome area.

IV. Four sample lesson plans which incorporates the learning outcome, children's literature selection and a list of writing strategies are included.

Components I-IV are found in Appendix A.

Chapter 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The author's purpose in undertaking this project was to respond to the NCTM recommendation that mathematics should include numerous opportunities for communication. A review of related literature indicated that the use of writing in mathematics can help students to reflect upon and clarify their thinking, and serves as a means to construct new mathematical knowledge. Further review of the literature suggests the the use of children's literature in teaching mathematics contributes to the acquisition of mathematical concepts by providing a context to explore those concepts. The author gathered titles of books which addressed the outcomes specified in the project, then read and annotated a selection of children's literature. A compilation of writing strategies was developed by the author. The strategies suggested were the result of the authors ideas and classroom experimentation stimulated by suggestions from numerous texts on teaching mathematics. A notebook was used to contain the list of annotated children literature and writing activities which correlate to learning outcomes specific to first grade students of the Yakima (WA) School District. Four sample lesson plans

were included for illustrative purposes. Some of the components of this project were implemented in the author's classroom.

Conclusion

The author found most of the literature which addressed the use of writing in mathematics was targeted towards second grade level and above as students in first grade frequently function at a pre-literate or emergent literate level. Writing with students at the first grade level encompasses a wide range of ability levels, frustration levels, and approaches. These variances can prove challenging for both the students and the teacher. It should be kept in mind that writing is a developmental skill, therefore students' efforts to write in mathematics should focus on the mathematics aspect of the composition as opposed to being grammatically correct. The writing strategies proposed in this project contain a wide variety of suggestions which could be used with students functioning at various levels, but not all the suggests presented may suitable for all children in the first grade. The suggestions presented are only meant to serve as a sample of writing activities and are not inclusive of all possible activities.

In the author's opinion, implementing writing in mathematics for students at the first grade level will take significant time and effort to manage writing activities efficiently and effectively. The author

attempted several writing activities with a group of first grade students. The attempts met with mixed results. In the author's experience, the biggest obstacle to writing in mathematics was the time needed for the students to accomplish the writing activities. Student shared reading of individual pieces was very time consuming, yet a highly valuable aspect of the activities. At times, a student's ideas were challenged and interesting mathematics discussion ensued.

The bibliography of children's literature reflects only some of the books that that might be used. Procuring books which address specific concepts in mathematics was sometimes difficult. Many books were not available in bookstores, the public library, or university library which the author visited. Nor did the library system of the Yakima (WA) School District provide access to all the books which the author hoped to review. In the author's experience, bookstores and libraries referencing system were limited to broader mathematical concepts, often lumping together books dealing with mathematical concepts under the listing of counting and not by specific concepts. This method of identifying books often excluded or overlooked books which might prove useful in mathematics.

The author found that the use of children's literature in presenting mathematical ideas was well received by the group of first grade students sampled by the author. The students frequently requested a repeat reading of the books. The author observed students experimenting and playing out

ideas presented in the text. These observations do not represent any conclusive finding nor are they to be generalized to any other groups.

Recommendations

Writing in mathematics should be a regular element of teaching mathematics from the onset of the teaching year. The type of writing activities should be guided by the students level of ability and skill. Early endeavors should include picture drawing and taking student dictation. Copying and sentence frames are two more strategies which can be used to support and model writing in mathematics. Independent writing with the use inventive spelling should be encourage from the beginning of the year and interspersed with other writing activities. This writing strategy should be increasingly used as the year progresses and students skills develop. Additional writing strategies need to be developed to afford students many opportunities to write in mathematics.

Key to using writing in mathematics, is allowing time for students to read and discuss their writing. Through the reading and discussion, the teacher is able to assess students grasp of mathematical concepts. Also, students are able to examine and critique other views and perspective of mathematical concepts. The time needed to allow reading and discussion of students' work creates greater demands on the limited time available for instruction. Strategies need to be developed on how to maximize

efficient and effective use of time while maintaining this critical component.

The author recommends that children's literature be used in conjunction with mathematics instruction. If possible, such literature should be presented on a daily basis, and made available for student use. As the teacher shares the stories and books with the students, attention should be directed toward the mathematics used in the text. Through the use of the literature, the teacher can help enhance the students' understanding and awareness of mathematics as a tool to explain, predict, and create everyday life experiences.

In order for educators to be able to use children's literature in teaching mathematics, two areas need to be developed. First, teachers need to develop a greater awareness of children's literature which address mathematical concepts. Suggestions of literature that deal with mathematics can be found in a variety of places. Many of the books reviewed for this project were listed in a resource book published by the NCTM. Other sources include: the bibliography section of teacher manuals and texts dealing with teaching mathematics; publisher's book lists which categorize their mathematics selections by concepts; libraries and bookstores; and other teachers. The author recommends that teachers create their own book lists which they might use in teaching mathematics.

Second, once book titles have been found, access to the literature

needs to be made available. Requesting children's literature that address mathematics will help increase their availability in libraries and bookstores. The easiest source should be made through access at school libraries. Educators need to share their knowledge of children's literature with school librarians, emphasizing the importance of using children's literature to mathematics, and encourage the purchase of books that deal with specific mathematical concepts to add to the libraries' selections.

In regards to the use of children's literature in teaching mathematics, the author would like to offer one last recommendation. The author limited the analysis of concepts addressed in the children's literature to mathematical concepts, but many of the books included multi-concepts outside of mathematics. Most of the books reviewed in this project would prove effective integration tools for relating mathematics to other content areas such as science or social studies. Those interested in using this project may want to develop this correlation with other content areas.

A final recommendation is suggested in closure to this project. Educators who are responsible for mathematics instruction in the primary level need to continue to develop their own mathematical understanding of the world around them. In doing so, children's literature and writing activities will be seen as meaningful and useful vehicles to teach mathematics for purpose and as a useful tool to be used throughout life.

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APPENDIX A

LANGUAGE ARTS AND MATHEMATICS:

USING CHILDREN'S LITERATURE AND WRITING IN MATHEMATICS

Outline for Appendix A

Estimation

Money

Time

Measurement

Geometry

Number Sense & Counting

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Patterning

I.   Learning Outcome M101: **Estimation**

II.   Writing Strategies

1.   Write an estimate of how many steps it is from the classroom to a specified destination within the school (music room, gym, etc.). Pace off the distance, then write the the result of the findings.

2.   Make an estimation of how many items are in a jar. Explain how you made your estimation and why you think it will work.

3.   After listening to the story, *Counting on Frank*, write additional scenarios that could be used in this story.

4.   Write a song about estimation. Example: (to the tune of *Are You Sleeping?*)
      Estimation, estimation,
      Make a guess, make a guess,
      Think about it carefully, think about it carefully
      Or you'll miss, or you'll miss!

5.   Estimate how many books you can read in one month. Keep a record of titles to check your estimate at the end of the month. Share the result with your teacher.

6.   Define the word, estimate.

7.   Design and make an award certificate that can be given to classmates when someone makes an accurate estimation.

8.   Estimate what time the sun will set each day for one or two weeks. Watch the weather report on the television or note the paper and check your estimation daily. Record the estimate and the official times daily. Summarize your findings.

9.   Make list of times when a person many need to estimate.

10.   Estimate and record what day of the week a specific holiday or event will occur.

III. Bibliography of Children's Literature on Estimation

Beesey, C. (1991). *Money.* Sidney, Australia: The Macmillan Company.

This problem solving book addresses many aspects of money from purchase power to estimation, and making fifty cents with a variety of coins. A the bottom of the page for each concept is a note to the teacher noting the focus points of that page. Concepts: money use and spending, coins, decimal point, estimation.

Clement, R. (1991). *Counting on frank.* Milwaukee, WI: Gareth Stevens Publishing.

Frank is a dog, but to his owner Frank is a non standard unit of measurement. It takes approximately twenty-four Franks to fill a bedroom. However, if Frank was a humpback whale, the calculations would be quite different. Frank's owner is a measuring maniac who spends his time calculating measurements by pretty unconventional units. A hilarious book with equally amusing illustrations to match! Concepts: estimation, counting, comparison, measurement.

Linn, C. (1972). *Estimation.* New York, NY: Thomas Y. Crowell Publishers.

Estimation is a calculated guess. It is also a skill that improves with practice. In this book, the author suggests experiments and activities for the reader that will help improve their estimating skills. The text is somewhat wordy for primary students, but presented in a summary form the students will find the experiments and activities a fun challenge. Concepts: estimation, measurement.

IV.   Sample Lesson Plan: Estimation

Goal: Give students experience in estimation.

Objective: Students will write list items and give estimate of number as to how many item
                    are needed to fill a specified container.
                Students will check measurement and record results.
                Students will summarize findings. (optional)

Material: Book, Counting on Frank
                Small box or other small similar container.
                Significant quantity of various items that will fit and fill a small shoe box or
                    other container, i.e.- books, marbles, pencils , unifix cubes, milk cartons,
                    mittens, etc.
                Student of recording materials
                Word card with the word estimation printed on it

Cue Set: Hold up a fist full of items, anything large enough that one fist full will be
                    inadequate to serve the number of children in the class.
                Ask the students if they think there are enough of the items that everyone in the
                    classroom could have one.
                Admit that you don't know. (Ham it up a little about how full your hand is.)
                Do a thumbs up or down as to the students opinion on whether there are enough
                    items for every person to have one.
                Pass out the the items to check.
                Discuss the results. Ask students what they would have done if they were the
                    teacher.
                Discuss how people make guesses.
                Introduce the word 'estimate' on the word card. Discuss the letters and sound,
                    shape of the word syllables. Define the word as a calculated guess or a
                    'thinking guess' as opposed to a wild guess.

Set Purpose   "Thinking guesses or to estimate help us be more accurate, or closer to the real
& expectation: amount. When someone doesn't have time to count an exact amount they
                    sometimes need to make an estimate. People estimate everyday. You parents
                    may estimate if there is enough milk left to fix breakfast or if they will need
                    to buy more; or if there is enough gas in the car to drive to Selah. You
                    estimate when you play marbles and have to guess how hard to throw the
                    marble to hit your opponent. You are learning estimate if you have enough
                    room on the paper to fit all the letter of a word on a line."
                Ask student when they might need to make a estimate or 'thinking guess'.
                "Estimating is a skill that gets better with practice. Today we are going to
                    practice estimating. It's a lot like a game- guess check, guess and check. Each
                    time you try to make your guess as close to the real number as you can get."
                Direct students on how to record this activity. Write their estimates, record
                    the accurate count, then write what they discovered. Time to share what they
                    have written.

"First we will hear a story about a boy who likes to exercise his mind by thinking and estimating, The name of the book is Counting on Frank by Rod Clement."

Procedure: Read book. If time allows briefly discuss book letting students share opinions and impressions about the book.
Have students ready writing material.
Write each time to be estimated on the board one at a time. Have students copy the word off the board, then write their estimate beside the word.
Fill box, counting the items as you go along. You may want the students count along and make tally marks as they help keep count. Ideally, you will want to stop somewhere along the filling of the box and let students make a second estimate if they choose. Have them write their second estimate next to their first estimate.
Record accurate count next to the estimates.
Continue process as time allows or supplies are used up. This may be a good place to have students summarize their findings for this day's lesson and continue the lesson in smaller time frames over a period of several days.

Closure: Have students share with the class, or in small groups, their findings and their thinking processes in this activity.

Extensions: Extend this lesson by using a different container and other items to count.
Let children write scenarios that could become a part of the book, <u>Counting on Frank</u>.
Experiment with estimating distance.

I.   Learning Outcome M102: **Money**

II.   Writing Strategies

1.   Copy the words to a song or rhyme that pertains to money.

2.   List items that may be purchased for a penny, nickel, dime, quarter, dollar or any other specified amount.

3.   Write a story about one time you had money.

4.   Write two or more facts indicated in a graph on money expenditure.

5.   Write a "playlet" or short skit, describing a story using money.

6.   List jobs you could do and the wages you feel you should be paid.

7.   Write how you would teach a younger child how to tell the difference between the two or more coins.

8.   Write a story of how you spend money your own money.

9.   Make a grocery list with the cost of items you want to buy from the newspaper advertisement.

10.   Write an advertisement for a sale at a play store.

11.   Write out play checks.

12.   Label the names and value of pictures of coins on a worksheet.

13.   Write a narrative on what you would do with one-million dollars.

14.   Determine how much money it costs to feed the classroom pet.

III. Bibliography of Children's Literature of Money

Axelrod, A. (1994). *Pigs will be pigs*. New York, NY: Simon & Schuster Books for Young Readers.

> The Pig family is hungry for a snack, but there is nothing in the house to eat. They decide to go out to eat, but first they have to come up with some money. The family turns the house upside-down looking for coins and bills in coat pockets, between couch cushions, in the washer, in the sock drawer and so forth. they finally find enough money to afford a meal out at the Enchanted Enchilada. The menu for the restaurant is included in the book for the reader to explore. The Pigs go home stuffed. Concepts: coins and bills, purchasing, arithmetic.

Beesey, C. (1991). *Money*. Sidney, Australia: The Macmillan Company.

> This problem solving book addresses many aspects of money from purchase power to estimation, and making fifty cents with a variety of coins. A the bottom of the page for each concept is a note to the teacher noting the focus points of that page. Concepts: money use and spending, coins, decimal point, estimation.

Brisson, P. (1993). *Benny's pennies*. New York, NY: Dell Books for Young Readers.

> Everyone suggests to Benny how he can spend his five new pennies. But can Benny buy so many things with just five pennies? You'll be surprised what five cents can buy! Bob Barner illustrates this book using a interesting technique of paper applique. Concept: purchasing.

Caple, K. (1986). *The purse*. Boston, MA: Houghton Mifflin Company.

> Katie enjoys the clinkity-clink sound her money makes inside of a bandaid box. But her sister finds the noise annoying and she convinces Katie to buy a purse. After Katie buys the purse, she has no money to put into it. She devices several schemes to earn more money. Even with money in her purse, she still isn't satisfied with the sound, so she comes up with a new plan. Concepts: purchasing, dollars and cents, earning money.

Elkin, B. (1960). *The true book of money*. Chicago, IL: Childrens Pres.

> From bartering to banks, this book covers many aspects of the subject of money. This is an older book, but the information is not out-dated. Concepts: money (U.S. currency).

Hoban, L. (1981). *Arthur's funny money*. New York, NY: Harper and Row Publisher, Inc.

> Arthur and Violet get work together to find ways for Arthur to get enough money to buy a glow-in-the dark frisbee. In the process they spend some money and earn some money. The frisbee goes on sale, but does Arthur have enough money? Arthur isn't quite sure. Concepts: money, addition and subtraction.

Hoban, T. (1987). *26 letters and 99 cents.* New York, NY: Greenwillow Books.

> Two books in one, turn the book upside-down and begin reading a new book from the other side. A wordless book of brightly colored photos of coins, numbers, and letters. Concepts: coins; numeral value; beginning letter sounds.

Johnston, A. (1992). *The go-around dollar.* New York, NY: Four Winds.

> Follow the movements of one dollar bill as it travels from one hand to the next. The author tells a fictional story, but the book is full of dollar facts! Illustrated by Joyce Audy Zarins. Concepts: dollar bill.

Maestro, B. (1988). *Dollars and cents for harriet.* New York, NY: Crown Publishers.

> Harriet wants to buy something special at the store, but first she needs some money. Each dollar she acquires by a different means, and with different coins. First she finds one hundred pennies, then she earns twenty nickels, ten dimes, four quarters, and two half dollars until she attains the five dollars necessary to buy a kite. Concepts: names and values of pennies, nickels, dimes, quarters, half dollars, dollar.

Medearis, A. (1990). *Picking peas for a penny.* New York, NY: Scholastic, Inc.

> The author relates a story from her mothers childhood of picking peas for a penny a pound during the depression. The text is placed in a rhyming verse with a repetitive chorus of counting from one to ten every few pages. The story comes alive through the illustrations of pencil sketches and water color of Charles Shaw. Concepts: earning a wage, spending, pennies and dollar.

Rockwell, A. (1978). *Gogo's pay day.* New York , NY: Doubleday & Company, Inc.

> Gogo the clown is such a funny clown that the ringmaster gives him a pay raise. Gogo is pleased to receive the pay raise so he decides to use it to do nice things for others. He buys gifts for his friends and his mother and even treats himself to a nice meal out. Gogo's happy day turns sad when he finds that he has spent more than he thought and now hasn't enough money to pay his rent. Gogo finds a solution to his dilemma and learns how to manage his money better. Concepts: budgeting, borrowing, interest.

Rogers, K. (1991). *Melissa makes change.* Minneapolis, MN: Judy/Instructo.

> Kathy and her animal friends go off shopping for birthday gifts for their friend. Concepts: counting money; some subtraction. An interactive book.

Schwartz, D. (1989). *If you make a million.* New York, NY: Lothrop, Lee and Shepard Books.

> From pennies to millions of dollars, this book explores earning, saving, and spending money with the aid of Marvelosissimo the Mathematical Magician. Pictures by Steven Kellogg. Concepts: value and names of coins and bills, place value.

Silverstein, S. (1962). "Smart" in *Where the sidewalk end.* New York, NY: Harper & Row Publishers.

> A humorous poem of a child telling his father just how smart he is in trading the one dollar bill he had been give until he had four pennies. Concept: coin values.

Viorst, J. (1979). *Alexander who use to be rich last sunday.* New York, NY: Atheneum Publishers.

> Alexander's grandparents gave him a dollar. So many possibilities! Should he save it for walkie talkies or spend some? Alas, pennies , nickels, dimes, and quarters have a way of quickly disappearing. Alex is being nickel and dimed to death. He wants to save his money to buy something special, but it isn't that easy. The story tell of the humorous misadventures of Alexander and his money. Concepts: coins, subtraction.

Williams, V. (1982). *A chair for mother.* New York, NY: Greenwillow Books.

> A family saves change to buy a chair after a fire destroys their household belongings. Concept: saving money, coins.

IV.   Lesson Plan: Money

Goal: To familiarize students with the value of coinage.

Objectives: 1. Students will write the words to Money Song in their math journal.
                2. Students will write at least one fact related to coinage.

Materials: Book: Melissa Makes Change by K. Rogers.
                change counting bank
                pennies, nickels, dimes, quarters
                math journals, pencils, crayons
                copy of Money Song
                read-a-long chart with lyrics to Money Song
                giant coin samples label by name
                money chart
                note cards, felt pen, tape

Cue Set: Ask students to help sort money from coin purse by the use of a coinage bank.
                Empty coin purse and distribute coins to several children.
                Ask children to deposit coins into bank.
                Briefly discuss students ideas on why differing coins went into the various
                    compartments in the bank.

Procedure: Read the book Melissa Makes Change. Solicit students comments and thoughts
                    as they relate to the story.
                Introduce giant coin samples and coin chart. Have students compare and contrast
                    the coin.
                Introduce Money Song. Sing through several times. Discuss lyrics and review
                    the value of coins. Practice singing the song.
                Write on the note cards, facts students discover in their observations and learned
                    in the song. (Being sure to include to name of the student, i.e. Linda said, "the
                    quarter is the biggest.")
                Give note card to students and have the student tape the note card to the related
                    giant coin sample.
                Review facts students have started for each coin.
                Instruct students to copy word to the song into their math journals. Have them
                    write one fact they know about coins. (They may copy the fact from the note
                    card.)

Closure: Ask students to share with one other person the fact they wrote their journal.
                Sing Money Song together as a class.

Extensions: Jump rope to the Money Song.
                Invite student to make up a dance to go along with the song.

I.   Learning Outcome M103: **Time** (short time, as measured on a clock)

II.   Writing Strategies

1.   Write a book telling what you do at each hour of the day.

2.   List things that take a specified duration of time to preform such as one minute, one hour, one day, etc.

3.   Write a story problem about time..

4.   Using the newspaper movie guide, find a movie you would like to see. Write a note to your parent asking to go to the movies including what time the movie starts.

5.   Label the parts of an analog clock.

6.   Write as many words as you can in a specified time limit.

7.   Write a reflection on something you would like to do for an hour and something you would like to do for just a minute.

8.   Write instructions on how to tell time on an analog watch.

9.   Take a watch or clock apart. Write about what you find inside of the watch.

10.   Copy the day's schedule off the chalkboard. Leave it on the corner of your desk and check off each activity at the appropriate time. Does the class stay on the time schedule?

11.   Write an explanation describing an analog and digital clock.

III. Bibliography of Children's Literature of Time

Baker, A. (1991). *Raps & rhymes in math.* Portsmouth, NH: Heinemann Educational Books.

This resource book is filled with rhymes, songs, riddles and finger plays that all have to do with mathematics. This book is geared toward use with primary aged children. Concepts: counting, reverse counting, arithmetic, measuring, time, and probability.

Base, G. (1988). *The eleventh hour.* New York, NY: Harry N. Abrams.

When Horace turns eleven he decides to host a party for his friend. He get ready for the party by preparing eleven different sorts of food and planning eleven games. Every one comes dressed in costume and have a wonderful time playing the games. When the eleventh hour strikes and it is time to eat the feast they discover the birthday feast has disappeared! The fanciful pictures and rhyming text of this book captures the attention of the reader. Concepts: time in the morning, and the number eleven.

Bassett, L. (1985). *A clock for beany.* New York, NY: Dodd, Mead & Company.

Squirrel tries to fix his friend's alarm clock, but now the clock only tells one time. Happily the two friends don't mind because now it is always lunch time! Fun story, but not strong on teaching concept of time other than noon. Concepts: clocks, noon-time.

Cassidy, J. (1991). *The time book.* Palo Alto, CA: Klutz Press.

A "how to book" about using an analog watch to tell time to the hour, minute and second. Humorous drawings and lots of fun facts about time. Concepts: hour, minute, second.

Hutchins, P. (1970). *Clocks and more clocks.* New York, NY: Macmillan Company.

Mr. Higgins finds that none of his clocks read the same time and assumes that they must be broken. He goes to the Clockmaker to find a solution to his problem. Concepts: telling time to the minute, and the passage of time.

Krenshky, S. (1989). *Big time bears.* Boston, MA: Little, Brown & Company.

The Bear family takes time to do everything. This book covers the life of the bear family marking the passage of time from seconds to a century. Illustrated by Mary Ann Cocca-Leffler. Concepts: seconds, minutes, hours, days, weeks, months, seasons, years, decades, and century.

Maestro, B. (1984). *Around the clock with harriet.* New York, NY: Crown Publishers, Inc.

Harriet gets a watch for a present. The story follows Harriet through the day marking the hours on her analog watch. Time is presented in digital reading as well. Brightly colored pages and a simple text. Concepts: time to the hour on analog and digital clocks.

McMillan, B. (1989). *Time to...* . New York, NY: Lothrop, Lee Shepard Books.

    A primary age boy is followed through the day measuring the time by the hour on both analog and digital clocks. Photographic pictures. Simple story line. Concept: hour.

Moncure, J. (1982). *Wise owl's time book.* Chicago, IL: Childrens Press.

    Wise Owl is always late, so his family gives him a clock for his birthday. Wise Owl assembles the clock with the help of one of his children while discussing how the hands of the clock move throughout the day. Concepts: hour, half hour, and minute.

Pluckrose, H. (1988). *Time.* New York, NY: Franklin Watts.

    The author examines the concept of time from a second to a year. Chris Fairclough provides wonderful photographs that add interest to the text and help convey the authors ideas. Concepts: seconds, minutes, hours, days, weeks, months, years.

Quackenbush, R. (1981). *Henry's important date.* New York, NY: Parents Magazine Press.

    Henry the Duck was invited to his friend's birthday party which is planned to be held on Sunday from two o'clock until five o'clock. Poor Henry has one mishap after another as he tries desperately to get to the party before it ends. His misadventure is marked by the time on the clock. Each page shows an analog clock somewhere in the picture. When Henry finally arrives at location for the party he is met with a big surprise. Concepts: time on a analog clock to the half, quarter and minute.

Wallace-Bodeur, R. (1992). *Home by five.* New York, NY: Margaret K. McElderry Books.

    Rosie is instructed to be home from the skating rink by five o'clock. The skating rink closes at 4:30 and is only four blocks from home. Will Rosie make it home by five? Judging the passage of time isn't always easy! Perhaps, Rosie does need a watch after all! Beautifully illustrated by Mark Graham. Concepts: relevance of time.

IV.   Sample Lesson: Time

Goal: Familiarize students with the parts of an analog clock while introducing time to
                   the hour.

Objective: Students will label the parts of an analog clock using the words: face, minute
                   hand, hour hand.
                   Students will indicate in a sentence one activity which they like to do at a specific
                   hour of the day and demonstrate that hour on the clock they created.

Materials: Book, Wise Owl's Time Book by Jane Moncure.
                   Parts to construct an analog clock (tag-board is best)diameter of clock face
                       should be about 7" , brads, 9x12 construction paper, scrap construction
                       paper pieces and/scrapes of paper, glue, crayons, felt pens, scissors, pencil
                   Vocabulary word cards: hour, minute, second hand, face, o'clock, numbers one to
                       twelve each on a different card, analog, digital, sample of a digital time (1:00)
                   Demonstration clock (Judy Instructo type)
                   Alarm clock hidden in a box or somewhere in the room, set to go off at the lesson
                       time (preferably at an hour setting). Attach a note to the clock that reads,
                   "When the alarm sounds it is time for mathematics."
                   Writing paper smaller than 9x12"

Cue Set: When the alarm sounds, appoint a student to find the source of the noise. Gather
                   the students to the story area and read the note to the students.

Set Purpose   "I set the alarm to remind me that at I wanted to have the class do a art lesson in
& Objectives: mathematics today at one o'clock! Today the class is going to make fancy
                   clocks.
                   The type of clock we are going to make are called analog clocks. (display the word
                       card.) Sometimes clock show digital time like this (display sample and digital
                       word card).
                   How many of you know what time this clock says? (solicit class response)
                   Here is what an analog clock looks like (Show analog clock indicating an hour
                       time) Thumbs up, thumbs down if you know what time is shown on this clock.
                       (note responses, then ask someone to offer an answer. Ask the student how
                       they knew the time.)
                   Telling time on an analog clock can be confusing at first, but if you build a clock
                       for yourself you, it will help you to learn to tell time on an analog clock.
                   Why would it be important to know how to tell time? (let students comment)
                   I have a story to read to you about someone who had a real problem with time.
                       Let's here what happened." (Introduce the book, Wise Owl's Time Book by
                       Jane Moncure.)

Procedure: Read book. Questions: "What was Wise Owl's problem?
                   What difficulties did Wise Owl have because he never knew what time it was?
                   Have you ever had to wait because someone was late?
                   What did his family get him?

Would you say the clock was a digital clock or an analog clock?   Why?"

Talk about the parts of the clock using the demonstration clock for a model. Label the parts of the clock by taping the appropriate word cards onto the clock.

With class participation, practice telling time to the hour. Introduce the 'o'clock' word card.

Introduce art lesson. Show sample of clock face. Talk about the face with the numbers written on it, the short hour hand, the long minute hand, and the brad.

Have students return to their seat. Distribute clock face materials.

As a class, have students label the part of their clocks (write words on the board, face, hour, minute).

Then assemble the clocks using a brad to secure the hands.

As a class, have students practice showing hour times on their clocks. (This can be done simply by calling out a time then having all the students set their own clocks. Say, "Everybody show." At that point, each child holds their clock up into the air at one time. This give the teacher a quick visual check on students' grasp of the concept.)

Show students how to glue clock face onto the clock housing, or in this case, the 9x12" construction paper. Students can then decorate the clock with scraps of paper and coloring.

On the writing paper, have the students write at what hour the do certain activities. You may want to use a sentence starter or let the students do independent writing. Display the word cards of numbers one through twelve and o'clock for reference for the students. Glue writing paper on to the back of the clocks.

Closure: Let students read what they have written and demonstrate the use of their clocks either to the whole class or in small groups.

Extensions: Keep clock available at school to be used to explore half hour and/or time to the minute.

Make a mouse out of construction paper, attaching the mouse to the bottom of the clock with a 12" piece of yarn (one end taped to the mouse, the other end taped to the bottom of the clock.)   Read the nursery rhyme, Hickory, Dickory, Dock, to the and have the student practice showing the appropriate time on their clocks. They can cause the mouse to 'run up the clock'. Provide a copy of the nursery rhyme. Omit the number words from the rhyme leaving spaces where the words should be. Read over the rhyme with the students. Instruct students to fill-in the missing word.

I.   Learning Outcome M104: **Measurement**
      (temperature, length, long time as measured in days, weeks, months, seasons, years)

II.   Writing Strategies

A. Temperature
1.   Keep a weather log. Record the temperature daily and describe the weather for each day. Graph the temperature and weather conditions as well. (This could be a group project, with each child taking turns as the recorder.)

2.   Write a story of what you might do on a hot day. (cold, mild, etc.)

B. Length
1.   Measure off one-hundred yards of string. Measure from the door of the classroom, all the locations which are within one-hundred yards of the classroom door. Record all the places.

2.   Write a comparison of the heights of two or more students in the classroom.

3.   List as many things as can be found in the classroom that measure a foot.

4.   Write a secret message using a ruler. Place ruler at the left side of the paper. At each inch write one letter of your message. Then fill in the spaces with other letters. To read someone else message, place a ruler at the edge of the paper and copy down all the letters at each inch mark.

C. Calendar
1.   Sequence the seasons or months of the year.

2.   Graph birthdays or other special events that occur during a year. Write statements that reflect facts in reference to the graph.

3.   List the days of the week in ordinal sequence.

4.   Relay a sequence of events from your day.

5.   Create birthday cards that can be used when someone in the class has a birthday

III.   Bibliography of Children's Literature of Measurement

Allen, P. (1980). *Mr. archimedes' bath.* Sydney, Australia: Angus & Robertson Publication.

> Whenever Mr. Archimedes and his friend bathe together there is always a big mess to to clean up afterwards. Mr. Archimedes. tired of cleaning up the mess, tries to discover who it is that is responsible for making such a mess. This story is a parody of the mathematician Archimedes' discovery of hydrostatics.   Concept: measurement by water displacement.

Allen, P, (1982). *Who sank the boat?* New York, NY: Coward-McCann.

> Five animal friends go out in a boat to row in the bay. The challenge of each animal is to get into the boat without making it become unbalanced and causing it to sink. Everything goes fine until the smallest of the friends gets into the boat and tips it over.   Concept: weight and balance.

Anno, M. (1982). *Anno's math games II.* New York, NY: Philomel Books.

> A sequel the Anno's Math Games book, this book uses whimsical elfish characters to challenge the reader's thinking and observations of the world around him. Easy to read, Math Games II contains five chapters. Chapter one deals with relationships and the use of abstract symbols to represent real objects. Chapter two deals with comparison, chapter three deals with dots and co-ordinates, chapter four number value, and in chapter five, measurement. Concepts: relationships, comparison, direction, number concepts, and measurement.

Baker, A. (1991). *Raps & rhymes in math.* Portsmouth, NH: Heinemann Educational Books.

> This resource book is filled with rhymes, songs, riddles and finger plays that all have to do with mathematics. This book is geared toward use with primary aged children. Concepts: counting, reverse counting, arithmetic, measuring, time, and probability.

Barner, B. (1995). *How to weigh an elephant.* New York, NY: Rooster Books.

> Animals arrive it a building where an elephant operates the elevator. The weight capacity of the elevator is only as much as the elephant, so how any animals can get on the elevator at one time? This book is one of the Start Smart Math Books designed and written to address the recommendations of the National Council of Mathematics.   Concepts: weighing, comparative.

Branley, F. (1976). *How little and how much.* New York, NY: Thomas Y. Crowell Company.

> Branley introduces the concept of scales and how they are used in measurement. He begins with a Likert Scale then moves on to a more quantitative scales using standard units of measurement for length and temperature. He does a wonderful job moving the reader from the familiar to the abstract. The book is filled with helpful illustrations done by Byron Barton. Concepts: scales, temperature, length.

Carle, E. (1969). *The very hungry caterpillar.* New York, NY: Philomel Books.

> A little caterpillar has a ravenous hunger and eats his way through a number of foods to satisfy his appetite. Each day of the week he eats more and more food. Concepts: counting, sequencing days of the week.

Clement, R. (1991). *Counting on frank.* Milwaukee, WI: Gareth Stevens Publishing.

> Frank is a dog, but to his owner, Frank is a non standard unit of measurement. It takes approximately twenty-four Franks to fill a bedroom. However, if Frank was a humpback whale, the calculations would be quite different. Frank's owner is a measuring maniac who spends his time calculating measurements by pretty unconventional units. A hilarious book with equally amusing illustrations to match! Concepts: estimation, counting, comparison, measurement.

Clifton, L. (1974). *Everett anderson's year.* New York, NY: Holt, Rinehart, and Winston.

> This a book of poems, one for each month of the year. Each poem relates to an event or activity in the life of a seven year old boy named Everett Anderson. Concept: months of the year.

Corey, D. (1986). *Will it ever be my birthday?* Niles, IL: Albert Whitman & Company.

> Month after month Rabbit is invited to one birthday party after another, but the only birthday he wants to celebrate is his own! Rabbit learns birthdays come only once a year. Concept: year.

Hoban, T. (1976). *Big ones little ones.* New York, NY: Greenwillow Books.

> Hoban uses black and white photos of zoo animals to illustrate the concepts of big and little. Concept: size, big and little.

Hoban, T. (1985). *It is larger? Is it smaller?* New York, NY: Greenwillow Books.

> This wordless book uses photos to show comparison of size. Color photos of everyday objects are used to show the differences and relationship between sizes. Concept: size comparison.

Hoff, S. (1964). *Lengthy.* New York, NY: G. P. Putnam's Sons.

> Lengthy is a very long dog. He isn't very happy about his size until one day being extra long makes him a hero. Concept: length.

Lionni, L. (1992). *A busy year.* New York, NY: Alfred A. Knopf.

> Two little mice named Willie and Winnie, befriend a talking tree and watch the tree transform through the months and seasons of the year. Concepts: sequencing of months and seasons.

Lionni, L. (1960). *Inch by inch.* New York, NY: Mulberry Paperback Book.

A smart little inch worm inches his way out of trouble by showing how useful he is in measuring. Astor honor, Caldecott honor book. Illustrations done in crayon and textured collage. Concepts: measuring, and inch.

Maestro, B. (1985). *Through the year with harriet.* New York, NY: Crown Publishers.

Harriet's birthday party has just ended. How long until she can have another birthday? The story follows Harriet through the year as she waits for her next birthday. Brightly colored pages with simple text. Concept: months, and seasons.

Myller, R. (1962). *How big is a foot?* New York, NY: Dell Publishing.

The king decides to have a bed made for his queen. He decides that it should be 3ft. by 6ft., but when the bed is presented to the queen it is too small. The carpenter's apprentice tries to figure out what went wrong. Concepts: length to the foot, standardization of measurement.

Peppe, R. (1974). *Odd one out.* New York, NY: Penguin Books Ltd.

Follow Peter through his day from breakfast to bedtime as one odd incident leads to the next event throughout his day. A misplaced picture on each page gives clue to what will happen next. Concept: sequencing, day.

Pluckrose, H. (1988). *Length.* New York, NY: Franklin Watts.

Pluckrose does an excellent job of introducing the concept of measurement by length in this book. Both standard and metric measurement are addressed. Simple, clear explanations and stimulating inquiry make this an engaging book for students. Chris Fairclough's photographs of familiar subjects wonderfully illustrates the concepts addressed in the text. Concepts: length, height, inch, foot, centimeter, meter, mile, kilometer, comparative lengths.

Pluckrose, H. (1988). *Time.* New York, NY: Franklin Watts.

The author examines the concept of time from a second to a year. Chris Fairclough provides wonderful photographs that add interest to the text and help convey the authors ideas. Concepts: seconds, minutes, hours, days, weeks, months, years.

Pluckrose, H. (1988). *Weight.* New York, NY: Franklin Watts.

In this book the author helps the reader to understand the concept of weight. The author explores reasons why knowing weight is important and how weights of objects compare with weights of other objects. The text is illustrated through the use of photographs taken by Chris Fairclough. Concepts: weighing, balancing.

Provensen, A. (1978). *The year at maple hill farm.* New York, NY: Atheneum.

This book follows through a year on the Maple Hill Farm marking the passage of time by the daily and seasonal events on the farm. Illustrations are colorful and rich in detail. Concepts: time measured in months and seasons.

Sendak, M. (1962). *Chicken soup with rice.* New York, NY: Harper Collins Publishers.

It doesn't seem to matter what the month nor what the activity, the boy in this book thinks everything goes well with chicken soup! Concept: months of the year.

Srivastava, J. (1970). *Weighing and Balancing.* New York, NY: Thomas Y. Crowell Company.

Explores nonstandard measurement of weight with the use of a balance. Instruction on how to make a simple balance scale and provides simple experiments. Book also poses problem solving questions to be explored. Illustrated by Aliki. This book is from the Young Math Books series. Concept: weight comparison, and balance scale.

Srivastava, J. (1974). *Area.* New York, NY: Thomas Y. Crowell Company.

This book explores the properties of areas and ways to measure different areas using standard and nonstandard measurement. The author begins with defining terms by providing examples of areas which are familiar to children. Problem solving questions are given to encourage exploration of this concept. Concepts: vocabulary, and area.

Tresselt, A. (1969). *Its time now!* New York, NY: Lothrop, Lee & Shepard Company.

Each season brings a time of change. A young boy notes theses changes as the the seasons progress through the year. Illustrated by Roger Dovoisin. Concept: seasons.

Waller, L. (1959). *Time.* New York, NY: Henry Holt and Company.

This book traces the history of the development of time from the calendar sticks to the atomic clock. The quantity of information covered in this book may too much for primary students to absorb in one sitting, and may be suitable for a brief teacher summary of each page or presented in smaller pieces. Concept: history of the development of various devices for tracking time, measurement of time.

Ward, C. (1988). *Cookie's week.* New York, NY: G. P. Putnam's Sons.

This story relays the adventures of Cookie the cat, who gets into mischief everyday of the week. Illustrated by Tomie de Paola. Concept: sequencing of the days of a week

Weiss, M. (1977). *Solomon grundy, born on oneday.* New York, NY: Thomas Y. Crowell Company.

This book explores the calendar to unravel the mystery of how the Mother Goose character, Solomon Grundy. Born on Monday, married on Wednesday, then dying on Saturday, could a baby really do so much? Illustrated by Tomie de Paola. Concept: weeks, months, and years.

IV.   Sample Lesson Plan: Measurement

Goal: To use a ruler and measure to a foot.

Objective: Give instruction and practice in measuring to a foot, students will compose a list
               of items found in the room which measures twelve inches.

Materials: Book, How Big a Foot? by R. Myller.
               One, twelve inch ruler for each child or pair of children.
               Student writing materials.
               Vocabulary word cards: length, ruler, inch, inches, foot.

Cue Set: Read the book How Big a Foot? by R. Myller.
               Discuss the story.
               Solicit student's ideas about the importance of knowing about measurement of
                   length. Have students give examples when measurement

Set Purpose   "Knowing that a foot is a specific length is helpful when you need to measure just
& Objectives: as it would have been helpful for the King's carpenter. Having a sense of a foot
               length is helpful when estimating size and distance. Today you will have a chance
               to develop a better sense of the length of a foot. You will practice measuring
               things with a one foot measuring stick and record your finding.

Procedure: (For this activity, students may work in pairs or individually.)
               Let students explore rulers. Count the inches together. Ask where zero should
                   be.
               Demonstrate measuring with a ruler. Have students estimate if an item is more,
                   less or about the same length as one foot. Check length by using a ruler.
               Instruct students to make three columns on their paper. Head each column with
                   these headings: less than a foot, about a foot, more than a foot.
               Direct students to investigate objects in the room and classify them under the
                   proper heading. Set time limit for investigating.
               Have students summarizes there findings by writing a comparison of three items.
                   Students should be encouraged to illustrate there writing.

Closure: Let students read there findings with one other person in the classroom. Teacher
               may request that a few volunteers share their work with the entire class.

Extensions: Repeat the lesson using a specified number of inches less than a foot.

I.   Learning Outcome M105: **Geometry**

II.   Writing Strategies

1.   List objects in the room that meet the qualification of a given shape, i.e. rectangles: window pane, desk top, science book, sink, etc.

2.   Label the shapes that are used in a specific picture, i.e. a picture of a house: the door is a rectangle, the roof is a triangle, etc.

3.   List names of polygons and specify the number of sides in each shape.

4.   Create a design or picture using pattern block template or papers. Label the design.

5.   Name your favorite shape and tell why you like it.

6.   Write a riddle for a shape. See if anyone can guess your riddle.

7.   Write one new fact learned about shapes from the day's lesson.

8.   Pose a question you have about any shape.

9.   Choose a shape. Keep a journal for a week of all the places you find that shape.

10.   Compare and contrast two shapes indicating a similarity and a difference.

11.   Write a story about a shape.

12.   Create a pattern using shapes. Record the pattern by writing the names of the shape in the order of the pattern.

III.   Bibliography of Children's Literature of Geometry

Barner, B. (1995). *Space race*. New York, NY: Rooster Books.

> Two robots have a race to build a structure to blast off to space using various shaped building materials. Written in rhyming verse with colorful, simple illustrations. The book deal with problem solving with geometrical shapes.   Concepts: shapes.

Baum, A. (1987). *Opt: An illusionary tale*. Markham, Ont.: Viking Kestrel.

> In the land of Opt the people are getting ready for a birthday party for the Prince. As the court prepares for the festivities the reader is entertained with visual tricks. Questions posed by the court jester address the optical illusions in the illustrations of the story.   Concepts: spatial sense.

Bendick, J. (1968). *Shapes*. New York, NY: Franklin Watts.

> This book begins with a dot and develops the concept of shapes into three dimensional objects, exploring many aspects of shapes. The text is 67 pages long, cut could be shared in sections to add insight and understanding to various aspects of geometry.   Concepts: shapes.

Burns, M. (1994). *The greedy triangle*. New York, NY: Scholastic Incorporated.

> The greedy triangle finds life a bit boring so he decides to visit the shapeshifter so he can experience life from a new angle. So begins the progression of a polygon from a triangle to a many sided polygon which approaches a circle. This book introduces names of shapes from a triangle to a decagon. Colorful illustrations of geometrical shapes found in everyday experiences. The text contains a two page section which explains the underlying mathematics of the story and suggestions for ways to extend a child's learning.   Concepts: polygons.

Charosh, M. (1972). *Straight lines, parallel lines, perpendicular lines*. New York, NY: Thomas Y. Crowell Company.

> The concepts of straight, parallel, and perpendicular lines are introduced and explored through suggested learning activities. This is a book from the Young Math Book series. Concepts: lines, vocabulary.

Dunham, M. (1987). *Shapes: How do you say it?* New York, NY: Lothrop, Lee & Sheppard Books.

> Simple illustration of ten primary shapes. Text provides the name of each shape in English, French, Spanish, and Italian with pronunciation helps provided.   Concepts: basic shapes.

Ehlert, L. (1989). *Color Zoo*. Philadelphia, PA: J.B. Lippincott.

> Color Zoo is an intriguing book of colors and shapes. Ehlert uses cutout shapes in overlays to create animal faces. This book will help children to see how various shapes can work together to convey a idea of an identifiable animal.   Concepts: star, circle, square, triangle,rectangle, heart, oval , diamond, hexagon, octagon.

Fisher, L. (1987). *Look around!* Marknam, Ont.: Viking Kestrel.

> The reader is presented with four basic shapes and is challenged to find those shapes in the everyday items illustrated in the book. Concepts: circle, square, triangle, rectangle.

Friedman, A. (1994). *A cloak for the dreamer.* New York, NY: Scholastics.

> The tailor's three sons each take on the challenge of constructing a quilted cloak for the king . Each uses a different geometrical shape to construct his cloak. Two of the sons find success in their strategy, but one son lacks basic understanding of geometry. Concepts: square, triangle, circle, hexagon.

Friskey, M. (1973) *Three sides and the round one.* Chicago, IL: Childrens Press.

> Mr. Round shape has no use for Mr. Triangle. Round brags about all the places he can be found. Even square has many important job, but what can Triangle do? Wise owl points out all the things triangles make happen. Round concludes that it takes all shapes to make a world. Concepts: square, round, and triangle.

Froman, R. (1975). *Angles are as easy as pie.* New York, NY: Thomas T Crowell Company.

> From just about any angle this book offers wonderful opportunities to see how angles are found and used in the world around us. Concept development begins with concrete examples such as a piece of pie, then moves the reader to abstract examples such as how angles are used in piloting a plane. This book is full of mind stretchers and revelations. Illustrated by Byron Barton. Concepts: angles, plotting courses.

Hoban, T. (1974). *Circles, triangles, and squares.* New York, NY: Macmillan Publishing Company.

> Attractive black -and-white photographs of everyday scenes highlight the presence of circles, triangles, and squares in various sizes. Concepts: circles, triangles, and squares.

Hoban, T. (1983). *Round and round and round.* New York, NY: Greenwillow Books.

> In this wordless picture book, Hoban's colorful photographs clearly capture the concepts of roundness. Concepts: circle, spheres, and cylinders.

Hoban, T. (1986). *Shapes, shapes, shapes.* New York, NY: Greenwillow Books.

> Arcs, circles, hearts, hexagons, ovals, parallelograms, rectangles, squares, stars, trapezoids, and triangles are the shapes to explore in this wordless book. Shapes are presented in colorful photographs. Concepts: various shapes found in the environment.

Phillips, J. (1972). *Right angles.* New York, NY: Thomas Y. Crowell Company.

> This book challenges the reader to explore and test angles. Instruction is given on how to make a model of a right angle. This book is part of the Young Math Books series and is rich in mathematical vocabulary. Concepts: three and four sided polygons, and right angles.

Pienkowski, J. (1987). *Shapes.* New York, NY: Little Simon.

A beginning book of shapes, this book presents ten different geometric shapes in brightly colored illustrations. Concepts: various shapes.

Podendorf, I. (1970). *Shapes: Sides, curves and corners.* Chicago, IL: Childrens Press.

This book helps the reader to discover shapes and how to see them in relationship with other shapes. The text is wordy, but stimulates thinking and questioning. Concepts: two dimensional and three dimensional shapes.

Reiss, J. (1974). *Shapes.* Scarsdale, NY: Bradbury Press.

Simple text and illustrations help reader to explore square, triangle, rectangle, circle, oval, pentagon, hexagon, and octagon. Examples are given. Concepts: polygons.

Russell, S. (1965). *Lines and shapes, a first look at geometry.* New York, NY: Henry Z. Walck Inc.

Simple black and white drawings illustrate a variety of concepts in geometry. The text is rich in vocabulary and develops concepts of geometry from a single line to three dimensional shapes. This thirty-one page book may be a bit overwhelming to primary students and may be best suited for presentation in several short session. Concepts: various concepts in geometry.

Sitomer, M. (1971). *Circles.* New York, NY: Thomas Y. Crowell Company.

This book helps the reader to discover the mathematical principles involved in circles. the reader is introduced to radius and circumference in an easy to understand manner. Experiments are suggested that give the reader opportunity to explore the concepts introduced in this text. Large, simple illustrations demonstrate the principles that are addressed. A book from the the Young Math Book series. Concepts: circles and spheres.

Testa, F. (1983). *If you look around you.* New York, NY: Dial Books for Young Readers.

The author leads the reader into discovery of shapes found in everyday surroundings. Concepts: circle, cylinder, sphere, square, cube, triangle, cone.

Tompert, A. (1990). *Grandfather tang's story.* New York, NY: Crown Publishers.

Tompert relays a story of two fairies foolish competition that required each to magically turn themselves into animals. They almost destroy their friendship when the natural instincts of the creatures they become threatens the life of the other. Throughout the story tangrams are used to illustrate the transformations of the character. Concepts: tangram configurations.

Trivett, D. (1974). *Shadow geometry.* New York, NY: Thomas Y. Crowell Company.

This book provides an introduction to the principles of geometry through the use of shapes and shadows. A wonderful blend of science and mathematics. A book from the Young Math Books series. Concepts: shadows in relationship to shapes.

Yenawine, P. (1991). *Lines.* New York, NY: Delacoute Press.

> This is one in a series of books written about modern art, but it is also a book that tells about mathematics! Art pieces which can be found on display at the Museum of Modern Art in New York City are used to show example of various lines. The reader is challenged to look for obvious and hidden lines. Concept: line.

Yenawine, P. (1991). *Shapes.* New York, NY: Delacoute Press.

> This is one in a series of books written about modern art, but it is also a book that tells about mathematics! Art pieces which can be found on display at the Museum of Modern Art in New York City are used to show examples of the use of shapes in a picture. Sometimes shapes are obvious and easily seen, other times they are invisible. The reader is challenged to look closely at each picture to discover something about shapes used to create the picture. Concept: triangle, square, circle, cylinder, rectangles, shapes in general.

V.   Sample Lesson Plan: Geometry

Goal: To familiarize students with attributes of particular shapes.

Objective: Students will write a comparison/ contrast paper on two shapes of the students
               choosing.

Materials: Book, Shapes by J. Reiss.
               A variety of die-cut geometrical shapes of papers all of one color: circles, ovals,
                   rectangles, squares, diamonds, triangles, pentagons, hexagons, octagons,
                   trapezoids, etc. (Each shapes should have about the same number as three or
                   four times the class size.)
               Presort shapes into two specified groupings: 1. group A. should have enough
                   different shapes to permit the class to be divided into small groups of two to
                   four children with the same shape (vary group sizes), 2. group B should be
                   sorted by shapes and placed on separate 9x12" sheets of papers. Write the
                   name of the shape on its paper. Display the set for easy access by the students.
               A picture chart where each shape used in this lesson is represented and labeled.
               Student writing materials
               Glue

Cue Set: Read the book Shapes.

Set Purpose   "Today we are going to think about how shapes can be alike, yet also be
& Objectives: different. The class is going to play a game with shape. Then each of you will
                   write about how two shapes can be alike, but still be different. Comparing
                   shapes will help you to understand shapes better. Shapes are used in different
                   places all around us just like we learned in the book, but not all shapes can be
                   used in every place. Can you imagine how a car would work if the wheels were
                   square?

Procedure: Distribute the shapes from group A so each child gets a shape.
               Direct the students to find all the other students in the classroom that have a
                   shape exactly like his/her own. When they find all the same shapes, they
                   are to sit down on the floor and quietly discuss why their shapes are the same.
               When all the groups are seated, the teacher checks their work. If errors are
                   found let students find resolution to the mistake.
                   Teacher should present the questionable shapes to the class and have them
                   work out the solution to the problem.
               Question the students: What made this task easy? What made it hard? How did
                   you know who would be in your group? Why didn't any squares sit with the
                   triangles? What make those shapes different?
               Collect and redistribute the shape again. This time instruct the students to find a
                   partner who's shape is not exactly the same, but somewhat alike. Tell them to
                   be ready do tell the class in what way their shapes are alike. Select a few
                   groups to share with the class.

Closure: Let students read there findings with one other person in the classroom. Teacher may request a few volunteers share their work with the entire class.

Extensions: Repeat the lesson using a specified number of inches less than a foot.

I. Learning Outcomes M106, M107, M109, M111: **Number Sense and Counting**

II. Writing Strategies

1. List all the items that can be found that show a specified number.

2. Write the words for the numbers.

3. Create a story where counting is part of the story line like in the book, <u>Counting Our Way to Maine</u>.

4. Write directions on how to get somewhere in the classroom or on the school grounds using the number of steps it takes to get to the destination.

5. Write a simple autobiography identifying one incident from each year of the student's life. (This would be a good parent involvement activity.)

6. List items that meet a specific numeral characteristic i.e. list all the animals that walk on two feet; list all the stories you know who's title has three words.

7. Write facts related to a graph that reflects counting in some manner, i.e. modes of transportation that student use to get to school.

8. Copy the words to a poem, song, or story that uses counting.

9. List activity using ordinal numbers.

10. Contribute a riddle to a classroom <u>Number Riddles and Joke Book</u>. You can make up your own or write down one you got from another source. Be sure to illustrate your joke or riddle.

11. Create a population sign for the classroom for classroom pets and/or people.

12. Design a poster displaying a number. You may want to get ideas from the books, <u>Numblers</u> by J. Rees or <u>Animal Numbers</u> by B. Kitchen.

Adler, D. (1975). *Base five.* New York, NY: Thomas Y. Crowell Company.

> More a book about a number system than a number concept, it does give the reader opportunity to explore the concept of place value using a more manageable number than ten. The author introduces the idea of grouping with tally marks. Nickels and pennies are used, as well as other opportunities to practice using base five.   Concepts: place value, base five.

Aker, S. (1990). *What comes in 2's. 3's, and 4's?* New York, NY: Aladdin Paperbacks.

> Familiar examples are given to build number concepts for the two , three, and four. Colorful illustrations.   Concept: two, three, and four.

Anno, M. (1982). *Anno's counting house.* New York, NY: Philomel Books.

> In Anno's Counting House the author masterfully illustrates the blending of art, imagination and mathematics! Two houses sit side by side. One is empty, one is full of ten people, five male, five female. One by one the occupants of the full house move to what is the empty house until all ten people have moved. Delightful detailed illustrations are sure to delight the reader. The author provides notes to the reader at the beginning of the book on how to use the book in counting games. At the end of the text he provides additional notes directed toward adults which explain childrens cognitive growth and development of acquisition of number sense Concept number sense, counting, conservation of number ten.

Anno, M. (1982). *Anno's math games II.* New York, NY: Philomel Books.

> A sequel the Anno's Math Games book, this book uses whimsical elfish characters to challenge the reader's thinking and observations of the world around him. Easy to read, Math Games II contains five chapters. Chapter one deals with relationships and the use of abstract symbols to represent real objects. Chapter two deals with comparison, chapter three deals with dots and co-ordinates, chapter four number value, and in chapter five, measurement. Concepts: relationships, comparison, direction, number concepts, and measurement.

Baker, A. (1991). *Raps & rhymes in math.* Portsmouth, NH: Heinemann Educational Books.

> This resource book is filled with rhymes, songs, riddles and finger plays that all have to do with mathematics. This book is geared toward use with primary aged children. Concepts: counting, reverse counting, arithmetic, measuring, time, and probability.

Base, G. (1988). *The eleventh hour.* New York, NY: Harry N. Abrams.

> When Horace turns eleven he decides to host a party for his friends. He prepares for the party by creating eleven different sorts of food and planning eleven games. Everyone comes dressed in costume and has a wonderful time playing the games. When the eleventh hour strikes and it is time to eat the feast they discover the birthday feast has disappeared! The fanciful pictures and rhyming text of this book captures the attention of the reader.   Concept: eleven, morning time.

Charosh, M. (1974). *Number ideas through pictures.* New York, NY: Thomas Y. Crowell Company.

    This book presents mathematics through play. It addresses odd and even numbers, and square and triangular numbers. Giulio Maestro provides the illustrations for this text. Concepts: odd, even, square, triangular numbers, addition, subtraction.

Edwards, R. (1989). *Five silly fishermen.* New York, NY: Random House.

    Five silly fishermen go out fishing together. At the end of the day, they take count of each other before returning to home. To there great sorrow, it seems that one of the fishermen is missing and assumed drowned. A bright little girl figures out the fisherman's error in counting and offers to find the missing fisherman in exchange for a fish. Concept: number concept of five, counting.

Howard, K. (1979). *I can count to 100... can you?* New York, NY: Random House.

    A little mouse teaches the reader how to count to one hundred by ones. Numbers one to twenty are counted by objects. Twenty to thirty are demonstrated through addition establishing the pattern needed to count on to one hundred. Colorful picture and easy to follow text. Illustrations by Michael J. Smollin. Concepts: number concepts one to thirty, counting by ones from one to one hundred, addition.

Kitchen, B. (1987). *Animal numbers.* New York, NY: Dial Books.

    Primarily a picture book of animals and numbers, the text takes numbers one through ten illustrating each number concept with a mother animal and a correlating number of off spring. After the number ten, the examples jump to fifteen, twenty-five, fifty, seventy-five, and one hundred. Concepts: numbers one through ten, fifteen, twenty-five, fifty, seventy-five, and one hundred.

Leedy, L. (1994). *Fraction action.* New York, NY: Holiday House.

    Miss Prim and her animal students explore fractions by finding many examples in the world around them. Concept: fractions.

MacDonald, S. (1988). *Numblers.* New York, NY: Dial Books for Young Readers.

    Imaginative book of numbers one through ten that change into fanciful images. The numeral it is used to detail the image two twos make a swan four fours a sailboat, eight eights and a butterfly. Illustrated by Bill Oakes. Concept: numbers one to ten.

McMillan, B. (1991). *Eating fractions.* New York, NY: Scholastics.

    Colorful photograph show children cutting up food convey the ideas in this text. Recipes for each dish is provided at the back of the book. Concepts: halves, thirds, and quarters.

Moncure, J.   (1985).   *My five book.* Chicago, IL: Childrens Press.

> This book is about a boy named Five. Five has many adventures which involve finding five carrots in the garden, chasing rabbits, fishing and more. Children should enjoy relating to the boys activities, and the arithmetic challenges put forth in the story line. This book was illustrated by Linda Hohag.   Concepts: number concept of five, addition and subtraction.

Moncure, J.   (1985).   *My four book.* Chicago, IL: Childrens Press.

> This book is about a boy named Four. Four visits the zoo and discover all the animals are in groups of four. This book was illustrated by Linda Hohag.   Concepts: number concept of four, addition and subtraction.

Moncure, J.   (1985).   *My one book.* Chicago, IL: Childrens Press.

> This book is about a boy named One. One lives in a one room house that has one chair and one table. He has one of everything he owns and everything he does he does one time giving the reader a lot of opportunity to explore the concept of one. This book was illustrated by Pam Peltier.   Concepts: number concept of one, addition and subtraction.

Moncure, J.   (1985).   *My two book.* Chicago, IL: Childrens Press.

> This book is about a girl named Two. Two lives in a two room house that has two windows. She goes for a walk and has lots of adventures discovering many things in groups of two. This book was illustrated by Pam Peltier.   Concepts: number concept of two, addition and subtraction.

O'Brien, T. (1971).   *Odd and evens.* New York, NY: Thomas Y. Crowell Company.

> Readers can discover the property of even and odd numbers and the importance of both kinds of numbers in everyday life.   Concepts: even and odd numbers.

Pluckrose, H. (1988). *Numbers.* New York, NY: Franklin Watts.

> In this book, the question is raised, "can you imagine the world without numbers?" In response to that question, the author helps the reader explores many places where numbers play important roles in our everyday lives through the use of photographs of familiar things. The photographs displayed in this text are the work of Chris Fairclough.   Concepts: the uses and need for numbers.

Schwartz, D. (1985). *How much is a million?* New York, NY: Lothrop, Lee & Shepard Books.

> Marvelosissimo the Mathematical Magician takes the reader on a guided tour of large numbers: million, billion, and trillions. There is only one concrete example of over 100,000 stars that the reader can count in this book, but the concept of million, billion, and trillion are skillfully represented. The author provides end notes which give detailed explanation of how he made the calculations used in the book. Illustration in the text are created by Steven Kellogg.   Concepts: number sense and counting to million, billion, trillion.

Sitomer, M. (1978). *Zero is not nothing.* New York, NY: Thomas Y. Crowell Company.

This book examines the purposes and origins or the numeral zero. It presents zero as a starting point, a separating point, a break even point or used to show place value. This is one of the books from the Young Math Book series. Concept: zero.

Watson, N. (1954). *What is one?* New York, NY: Alfred A Knopf.

Linda queries of Peter, "What is one?". Big brother Peter points to a tree standing alone. Linda continues to ask about numbers in sequence from one to ten with Peter showing some illustration of the concept of each number. This is an old book, but if it can be found it is worth sharing with children. Concepts: number sense and counting one to ten.

Whitney, D. (1973). *Numbers and numerals.* New York, NY: Franklin Watts.

Exploration of the origins of number systems and place value are presented. Somewhat of a challenging text for primary students, but provides interesting information. Concepts: origin and number sense.

Zaskavsky, C. (1989). *Zero, is it something? Is it nothing?* New York, NY: Franklin Watts.

This book explores the history, value and uses for zero. Place value is discussed. Colored illustrations on each page of the text. Concept: zero.

Ziefert, H. (1985). *A dozen dogs.* New York, NY: Random House.

A dozen dogs go to the beach to enjoy swimming, eating and playing. The group of twelve are broken down into smaller sets that go together to make a dozen. Concept: number concept of twelve, addition addends of twelve.

Accorsi, W. (1992). *Billy's button.* New York, NY: Greenwillow Books.

> Billy has lost his button and the reader is challenged to find Billy's button throughout the various events illustrated in this book. Buttons are used to illustrate all round objects in each illustration. Some buttons have one hole or two, three or five holes, but Billy's button has four holes exactly. Concepts: attribute of number, number concept of four, counting one to five.

Anno, M. (1977). *Anno's counting book.* New York, NY: Harper Collins.

> This picture book offers an introduction to numbers zero through ten. Anno's beautifully illustrated pictures show the progressive growth of a village and the transformation of the town throughout the months and seasons of the year. Masterfully done, the reader will be delighted to discover the many objects that can be counted on each page (except for the page on zero!). Concepts: numbers and counting zero to twelve.

Anno, M. (1982). *Anno's counting house.* New York, NY: Philomel Books.

> In Anno's Counting House the author masterfully illustrates the blending of art, imagination and mathematics! Two houses sit side by side. One is empty, one is full of ten people, five male, five female. One by one the occupants of the full house move to what as the empty house until all ten people have moved. Delightful detailed illustrations are sure to delight the reader. The author provides notes to the reader at the beginning of the book on how to use the book in counting games. At the end of the text he provides additional notes directed toward adults which explain childrens cognitive growth and development of acquisition of number sense Concept number sense, counting, conservation of number ten.

Anno, M. (1982). *Anno's math games II.* New York, NY: Philomel Books.

> A sequel the Anno's Math Games book, this book uses whimsical elfish characters to challenge the reader's thinking and observations of the world around him. Easy to read, Math Games II contains five chapters. Chapter one deals with relationships and the use of abstract symbols to represent real objects. Chapter two deals with comparison, chapter three deals with dots and co-ordinates, chapter four number value, and in chapter five, measurement. Concepts: relationships, comparison, direction, number concepts, and measurement.

Baker, A. (1991). *Raps & rhymes in math.* Portsmouth, NH: Heinemann Educational Books.

> This resource book is filled with rhymes, songs, riddles and finger plays that all have to do with mathematics. This book is geared toward use with primary aged children. Concepts: counting, reverse counting, arithmetic, measuring, time, and probability.

Bang, M. (1983). *Ten, nine, eight.* New York, NY: Greenwillow Books.

> A count down book of a father helping his young daughter get ready for bed. Concept: reverse counting ten to one.

Beck, I. (1992). *Five little ducks.* New York, NY: Henry Holt and Company.

This book is based on a familiar children's song of five little ducks who go swimming over the hills and far away. Each time mama duck calls her children back less ducklings come back than started out. Concept: reverse counting from five to one.

Blumenthal, N. (1989). *Count-a-saures.* New York, NY: Four Winds Press.

Blumenthal uses the scientific names for ten kinds of dinosaurs to show numbers one through ten. Illustrations by Jay Kaufman. Concepts: numbers and counting one to ten.

Boyton, S. (1977). *Hippos go berserk.* Boston, MA: Little, Brown and Company.

"One hippo all alone, call two hippos on the phone..." It isn't long before the lonely hippo is overrun with hippo company! The hippos go berserk and party all night long. Concepts: numbers and counting one to nine, reverse counting.

Brown, M. (1976). *One, two , three; an animal counting book.* Boston, MA: Little, Brown and Company.

A beginning counting book, Brown illustrates animals in groups of one to twenty. Numbers hidden within the design of each animal. Concept: numbers one to twenty.

Butler, C. (1988). *Too many eggs.* Boston, MA: David R. Godine, Publisher.

An interactive book where the reader is encouraged to place paper eggs into Mrs. Bear's mixing bowl as she mixes a cake for Mr. Bear's birthday surprise. But why does everyone run for cover? They know that bears can't count and that means disaster when it comes to baking! Illustrated by Meg Rutherford. Concepts: counting, measuring and arithmetics.

Carle, E. (1972). *The rooster who set out to see the world.* New York, NY: Franklin Watts.

A rooster decides he would like to see the world. He doesn't get very far before he begins to feel lonely. Rooster invites some new acquaintances to go along on his adventure around the world. When evening comes the traveling band finds that none have prepared very well for their journey. With nothing to eat, and no place to sleep the fellow travels decide to return to their homes. Concepts: counting forwards and backwards between one and five.

Carter, D. (1988). *How many bugs in a box?* New York, NY: Simon and Schuster Books for Young Readers.

A pop-up book filled with some creepy surprises! Each page is constructed in such a way that different kinds of bugs pop out of a box. Concept: counting one to ten.

Christilow, E. (1991). *Five little monkeys sitting in a tree.* New York, NY: Clarion Books.

Five little monkey go on a picnic with their mother. While she naps, the monkeys hav e fun teasing a hungry crocodile. One by one the monkeys disappear after each attempt of the crocodile to snatch them off the tree branch. Concepts: reverse counting from five, subtraction.

de Regniers, B (1985). *So many cats!* New York, NY: Clarion Books.

    This is a story of how a family comes to own twelve cats. Lots of opportunities to count throughout the book as the reader tries to keep track of how many cats belong to the the family. The book is illustrated by Ellen Weiss. Concept: a dozen, counting one to twelve.

Dunrea, O. (1989). *Deep down underground.* New York, NY: Macmillan Publishing Company.

    The movement of a mole as he tunnels his way underground has a rippling effect on the movement of nine other groups of creatures that live under the surface of the earth. Wonderful illustrations of a view of life underground, this book is sure to be a delight to children. Concepts: counting forwards and backward from one to ten.

Edens, C. (1994). *How many bears?* New York, NY: Macmillan Publishing Company.

    The reader is invited to explore the shops in Little Animal town with the challenge to figure out how many bears it takes to run the bakery. Each shop gives a mathematical clue to the puzzle. Plenty of opportunity to count, add, subtract, multiply and divide. The detailed illustrations drawn by Marjett Schille invite the reader to revisit this book again and again. Concept: problem solving with arithmetic and counting one to thirty-two.

Ernst, L. (1986). *Up to ten and down again.* New York, NY: Lothrop, Lee & Shepard Books.

    This picture book shows a story of a family out on a picnic. From the arrival at the picnic site, to the departure due to a rainstorm, the author uses objects from each scene to show a different set of numbers. Concepts: numbers and counting one to ten, reverse counting.

Farber, N. (1979). *Up the down elevator.* Reading, MA: Addison-Wesley Publishing Company.

    At the first floor, one passenger gets onto the elevator. Up the elevator goes ten floors stopping at each floor to pick up new passengers. Pictures are done in black, whites and grays and illustrated by Annie Gusman. Concepts: counting and number concept.

Feelings, M. (1971). *Moja means one.* New York, NY: Penguin Books.

    Beautifully illustrated brown and white drawings of African scenes lends the interest in learning to count to ten in Swahili. Concept: counting.

Fleming, D. (1992). *Count!* New York, NY: Henry Holt and Company.

    Bold and colorful, this book illustrates numbers one to fifty through an animal theme. Flemings use of brilliant colors against a contrasting background practically makes his painting jump off the page! Concepts: numbers, counting one to ten, counting ten to fifty by tens.

Friedman, A. (1994). *The king's commissioners*. New York, NY: Scholastics.

> The king has so many commissioners he has lost count of them all! He summons all the commissioners to come to the palace to be counted, but his advisors all come up with different sums because they count in different bases. Illustrated by Susan Grievara. Concepts: counting by twos, fives, and tens and with place value.

Ga'g, W. (1929). *Millions of cats*. New York, NY: Coward-McCann.

> A farmer goes off to find a cat for his wife, but when he comes across millions of cats he can't decide which cat is the most beautiful, he decides to let all of them follow him home. How will they ever be able to feed all those cat? Concept: large numbers.

Grover, M. (1988). *Amazing & incredible counting stories*. San Diego, CA: Browndeer Press.

> Unbelievable newspaper headlines of a missing skyscraper, inflatable pickles, carrot icicles and dancing refrigerators. The bright pictures and silly news stories are sure to delight students and keep them counting. Concepts: numbers and counting 1 to 25, 50, 75, and 100.

Hamm, D. (1991). *How many feet in a bed?* New York, NY: Aladdin Paperbacks.

> A family of five enjoy a morning of laughter and fun as each family member climbs in and out of the parent's bed. One child keeps track of how many people are in the bed by counting each pair of feet. Concept: counting by twos to ten, reverse counting by twos from ten to zero.

Howard, K. (1979). *I can count to 100... can you?* New York, NY: Random House.

> A little mouse teaches the reader how to count to one hundred by ones. Numbers one to twenty are counted by objects. Twenty to thirty are demonstrated through addition establishing the pattern needed to count on to one hundred. Colorful picture and easy to follow text. Illustrations by Michael J. Smollin. Concepts: number concepts one to thirty, counting by ones from one to one hundred, addition.

Hoban, R. (1974). *Ten what? A mystery counting book*. New York, NY: Charles Scribner's Sons.

> Amusing characters are on an mysterious mission. Each page provides the reader with many opportunities to count. Illustrated by Sylvie Selig. Concept: counting on to ten.

Hoban, T. (1972). *Count and see*. New York, NY: Collier Books.

> Black and white photographs of items are used to present number concepts and promote counting from one to fifteen, then twenty to fifty by tens. Concepts: number concept, counting.

Hoberman, M. (1973). *The looking book*. New York, NY: Alfred A. Knopf.

> Ned has lost his cat and goes looking for him through the pages of this book. The story line is written in rhyming verse which adds interest to this text. Concept: counting one to twenty-eight.

Hughes, S. (1985). *When we went to the park.* New York, NY: Lothrop, Lee & Shepard Books.

> When a little girl and her grandfather go for a walk in the park they encounter many things to count. Concepts: numbers and counting one to ten.

Hutchins, P. (1982). *1 hunter.* New York, NY: Greenwillow Books.

> A nearsighted hunter walks past two elephants, three giraffes, and continues on passing number after number of hidden animals. He finds a surprise when he turns around and discovers that there is a whole jungle of animals who are now tracking him! Concepts: counting and sequencing numbers one to ten.

Katz, M. (1990). *Ten potatoes in a pot.* New York, NY: Harper & Row Junior Books.

> A collection of counting rhymes dealing with numbers from one to twelve. Colorfully illustrated by June Otani. Concepts: number concept and counting.

Keats, E. (1971). *Over in the meadow.* New York, NY: Scholastics.

> Keats illustrates this old Southern Appalachian counting rhyme which relates the activities of various animals that live in a meadow. Concept: numbers and counting one to ten.

Koontz, R. (1988). *This old man.* New York, NY: Dodd, Mead, & Company.

> A familiar nursery rhyme is illustrated into a story book of a girl who is surprised to discover little old men are popping up everywhere! She decides to join in their fun, and drums along with the little old men. Concept: counting one to ten.

Le Sieg, T. (1961. *Ten apples up on top.* New York, NY: Random House.

> Three animals challenge each other to balancing apples on top of their heads. First one, then two and on until all are balancing ten apples up on top of their heads. The new challenge is to perform stunts without letting the apples drop. This is a humorous and action packed book. Illustrated by Roy McKie. Concepts: counting 1 to 10, counting by tens to one hundred.

Lewin, B. (1981). *Cat count.* New York, NY: Dodd, Mead & Company.

> Lewin uses comical black and white drawings of cats to relay a rhyming account of all the cats she knows. Her brother has two cats, her sister has three, her uncle has four, and on it goes. A running tally is kept of how many cats there are altogether. Would you believe there are over fifty-five cats in this book? Concepts: counting one to ten, addition of adjacent numbers.

Lindbergh, R. (1987). *The midnight farm.* New York, NY: Dial Books for Young Readers.

> While under the blanket of night, a mother and child stroll about the farm.. There they discover domestic and wild animals peaceful and protected by friendly darkness. This counting rhyme story has wonderful illustrations that lend to the tranquil feeling of this book. Concepts: counting one to ten.

MacKinnon, D. (1993). *How many?* New York, NY: Dial Books for Young Readers.

    A beginning book of counting one to ten. Anthea Sieveking's photographs show toddlers and preschool aged children engaged in various activities. Concept: numbers and counting one to ten.

MacMillan, B. (1986). *Counting wildflowers.* New York, NY: Lothrop, Lee & Shepard Books.

    McMillan uses photographs of wild flowers to show number sets. Each page shows a different set of numbers. Concepts: number concepts and counting from one to twenty.

Maestro, B. (1977). *Harriet goes to the circus.* New York, NY: Crown Publisher.

    Harriet wants to be first in line at the circus so she can have the best seat. The line grows longer then suddenly someone opens the door at the opposite end of the line. Now Harriet is last in line. Concept: ordinal numbers first through tenth.

Matthews, L. (1982). *Cluck one.* New York, NY: Dodd Mead & Company.

    Mr. and Mrs. Cluck are excited to become parents, but weasel isn't too excited at the thought of having another 'alarm cluck' to wake him during his nap. Weasel decides to play a practical joke on the proud rooster by the eggs of other creatures in the chicken nest. Everyone is in for a big surprise when the eggs crack. Concept: counting 1 to 6.

Matthias, C. (1982). *Too many balloons.* Chicago, IL: Childrens Press.

    A young girl wants to entertain the zoo animals by showing them balloons. One balloon to show the lion, six balloons to show the six polar bears, and so on until the numbers add up to more than she can handle! The little girls is lifted up out of the zoo by a huge bouquet of balloons. Concept: counting one to ten.

Mayer, M. (1978). *Little monster's counting book.* New York, NY: Golden Press.

    Mercer Mayer uses a whole cast of monsters to show numbers one through twenty-one. Questions are posed on each page to encourage the reader to count objects in the picture. Concepts: numbers and counting one to twenty-one, reverse counting ten to one.

McGrath, B. (1994). *The m & m counting book.* Watertown, Maine: Charlesbridge Publishing.

    Simple photo illustrate number concepts from one to twelve with the use of m&m candies. This book will be an attention grabber for children especially when real m&ms are used as a follow up activity. Concepts: numbers 1 to 12, number sets, subtraction.

Moore, J. (1991). *Six-dinner sid.* New York, NY: Simon and Schuster Books for Young Readers.

> Sid the cat is the pet of six different owners, but no one knows except for Sid. He enjoyed six dinners a day, has six different beds to choose from and six different people to scratch. Not a bad life until he gets a cold and is taken to the vet's six times! Concept: six.

Nol, S. (1984). *Off and counting.* New York, NY: Greenwillow Books.

> A wind-up toy frog hops and leaps over a number of toys to show numbers one through ten. Concepts: numbers and counting one to ten.

O'Donnell, E. (1989). *I can't get my turtle to move.* New York, NY: Morrow Junior Books.

> A little girl can get three kitchens to move, six inchworms to munch on a leaf, even ten rabbits to nibble on lettuce, but she can not get her turtle to come out of of its shell. Concepts: numbers and counting one to ten.

O'Keefe, S. (1989). *One hungry monster.* New York, NY: Scholastics.

> One by one monsters go looking for something to eat. Just what does one feed to hungry monsters? A counting book in rhyme sequencing numbers from one to ten. Concept: counting one to ten.

Peek, M. (1987). *The balancing act.* New York, NY: Clarion Books.

> At the animal fair, the audience is entertained by an elephant high-wire act. One by one elephants mount the high-wire to perform more challenging acts. The text is written in a rhyming verse that can be sung as a song and used in a game. The music for the song and directions for the game are included at the end of the book. Concept: counting one to ten.

Peppe, R. (1969). *Circus numbers.* New York, NY: Delacorte Press.

> A counting book of circus events beginning with one ringmaster and progressing through to a ten clown act. How many people are watching the circus? Count and find out! Concept: counting one to ten.

Pluckrose, H. (1988). *Counting.* New York, NY: Franklin Watts.

> This book is an introduction the concept of counting. It addresses purpose for counting, some examples of numbers, and comparison the numbers by more and less. Photographs by Chris Fairclough provide examples of numbers and items to count. Concept: purpose of counting.

Pomerantz, C. (1984). *One duck another duck.* New York, NY: Greenwillow Books.

> Danny and his grandmother go to the pond where they find a family of ducks. Danny show his grandmother how he can count to ten as one duck after another comes out of the brush to swim with in the pond. Concepts: numbers and counting from one to ten.

Rees, J. (1988). *Ten in the bed.* Boston, MA: Joy Street Books.

Ten children are sleeping in one bed until the littlest one said, "roll over." They all rolled over causing one to fall out. Comical drawings illustrate this familiar children's verse. Concept: reverse counting ten to zero.

Reiss, J. (1991). *Numbers.* Scarsdale, NY: Bradbury Press.

A brightly colored picture counting book that begins by sequencing numbers from one to twenty, then goes on to count to one hundred by tens. Concept: counting by ones and tens.

Ryan, P. (1994). *One hundred is a family.* New York, NY: Hyperion books for Children.

This book explores the many different meanings of the word family. Colorful pictures by Benrei Huang, depict families from various cultures. Concepts: numbers, counting one to ten by ones, counting to one hundred by tens.

Scarry, R. (1975). *Richard scarry's best counting book ever.* New York, NY: Random House.

Willy Bunny complains of nothing to do. His father suggests that Willy practice his counting, then share with his dad at dinner all the things he has counted during the day. Willy thinks this is a great idea and begins counting right away. The reader is encouraged to count along with Willy through the pages of the book. Willy counts all the way from one to one hundred. Colorful and entertaining illustrations are provided by the author. Concepts: counting to one hundred by one, fives, and tens.

Schwartz, D. (1985). *How much is a million?* New York, NY: Lothrop, Lee & Shepard Books.

Marvelosissimo the Mathematical Magician takes the reader on a guided tour of large numbers: million, billion, and trillions. There is only one concrete example of over 100,000 stars that the reader can count in this book, but the concept of million, billion, and trillion are skillfully represented. The author provides end notes which give detailed explanation of how he made the calculations used in the book. Illustration in the text are created by Steven Kellogg. Concepts: number sense and counting to million, billion, trillion.

Sloat, T. (1991). *From one to one hundred.* New York, NY: Puffin Unicorn Books.

One to One Hundred is a picture book, but that doesn't mean it's a quick read. On each page are numerous opportunity to count, count, and count! The detailed color pencil drawings depict a wide variety of subjects and characters of ethnic diversity. There are more than 2,500 items to count. Concepts: number concepts and counting by ones to one-hundred.

Smith, M. (1995). *Counting our way to maine.* New York, NY: Orchard Books.

The family's vacation trip to Maine begins with packing one baby, two dogs, and three bicycles into the family car. The story goes on recounting twenty memorable events of the trip. Wonderfully illustrated the pictures add to the humor of this book. Concepts: number sense and counting on to twenty.

Szekeres, C. (1984). *Cyndy Szekeres' counting book 1 to ?* New York, NY: A Golden Book.

>   A beginning counting book. Delightful illustrations of active little field mice who numbers increase on each page. Concept: numbers and counting one to ten.

Tafuri, N. (1986). *Who's counting?* New York, NY: Greenwillow Books.

>   An introductory book of counting one to ten with pictures of animals and flowers to illustrate the concept of each number. Large, beautiful watercolor illustrations fill the entire page throughout the book. Concepts: numbers and counting one to ten.

Testa, F. (1982). *If you take a pencil.* New York, NY: Dial Press.

>   This imaginative book that begins with one pencil and ends with twelve treasure chest. Concepts: numbers and counting one to twelve.

Walton, R. (1993). *How many, how many, how many.* Cambridge, MA: Candlewick Press.

>   This engaging book will capture children's interest as they guess the answer to familiar trivia from nursery rhymes to science facts. Each answer is a number and is represented in each picture.. Colorful pictures are illustrated by Cynthia Jabar. Concepts: counting one to twelve, number concept.

Warren, C. (1983). *The ten-alarm camp-out.* New York, NY: Lothrop, Lee & Shepard Books.

>   Mama armadillo loves even numbers and straight lines. She also loves picnics and camp-outs, but the latest outing with her little ones causes a panic with the unsuspecting towns people. Illustrated by Steven Kellogg. Concepts: counting one to ten, opportunity for addition and subtraction.

Wild, R. (1978). *The bears' counting book.* New York, NY: Harper & Row Publishers.

>   A play on the classic Goldie Locks and the Three Bears, the three bears go for a walk and discover a farmhouse where no one is home. They try out the chairs, beds, and food, then move on to investigate other household items and personal belongs they find in the house. The mischievous bears reck havoc and disaster in every room they enter in the house. Each room has a different number of things to count. They find more things to count when their curiosity takes them outside. Concepts: counting by ones from one to ten, counting by ten from twenty to fifty.

Yolen, J. (1976). *An invitation to the butterfly ball.* New York, NY: Parents' Magazine Press.

>   A counting rhyme relating a story of animals getting ready for the Butterfly Ball. Concepts: counting one to ten, reverse counting.

I.   Learning Outcome M108: **Arithmetic**

II.   Writing Strategies

1.   Write a story problem using addition or subtraction.

2.   With the class, generate a list of words that indicate operations of addition. Copy the list into your mathematics journal. Do the same activity for subtraction.

3.   Copy the words to a rhyme, song, or rap that deal with addition or subtraction. Illustrate the verse.

4.   Write about how you feel about addition and/or subtraction.

5.   Explain what is subtraction and/or addition.

6.   Write out a equation in word form.

7.   Write a story box adventure.

8.   Explain how to use a calculator for a specified operation.

9.   Complete an arithmetic crossword puzzle. Find the solution to number equations and write the answer using the word number.

10.   Explain how you could share a bag of cookies with everyone in the classroom so all received an equal amount.

11.   Develop a plan to decide how much juice is needed for a classroom party.

12.   Determine how much food is needed to feed the classroom pet. Explain how you figured out your answer.

13.   Try to figure out the age of the school's principal. Write a letter to the principal requesting the his/her year of birth.

III.   Bibliography of Children's Literature of Arithmetic

Baker, A. (1991). *Raps & rhymes in math.* Portsmouth, NH: Heinemann Educational Books.

> This resource book is filled with rhymes, songs, riddles and finger plays that all have to do with mathematics. This book is geared toward use with primary aged children. Concepts: counting, reverse counting, arithmetic, measuring, time, and probability.

Barner, B. (1995). *Too many dinosaurs.* New York, NY: Rooster Books.

> When at first, six dinosaurs hatch from their eggs there seems to be plenty of room to frolic and play on their small island and grow. But as they grow they find that it is too crowded to have any fun.They must move to different islands in order to have room to perform various activities. Story line is set in rhyming verse. This book is one in a series of Start Smart Math Books. The presentation of the concepts presented in this series are based on the education standards for school mathematics of the NCTM for problem solving with addition and subtraction. Concepts: counting, addition and subtraction to six.

Burningham, J. (1980). *The shopping basket.* New York, NY: Thomas Y. Crowell Company.

> Steven is asked to run an errand for his mother. Steven is successful shopping at the store for everything his mother requested, but he runs into trouble trying to get it all home. Along the way home he ran into animal after animal who threaten him if he doesn't hand over the goods. Steven is a quick thinker and tricks each of his assailants. The items Steven buys and loses are illustrated showing the loss of one item with each animal encounter. Concept: subtraction of one.

Butler, C. (1988). *Too many eggs.* Boston, MA: David R. Godine, Publisher.

> An interactive book where the reader is encouraged to place paper eggs into Mrs. Bear's mixing bowl as she mixes a cake for Mr. Bear's birthday surprise. But why does everyone run for cover? They know that bears can't count and that means disaster when it comes to baking! Illustrated by Meg Rutherford. Concepts: counting, measuring and arithmetics.

Chwast, S. (1974). *Still another number book.* New York NY: McGraw-Hill Book Company.

> The book begins with one boat and ends with ten jugglers. With each set of objects to count there is an addition problem of addition of ones to the sum of the objects. Sometimes the object being counted covers two pages, but other times only one page. This may cause a little confusion during some parts of the book. Illustrations are fanciful and brightly colored. Concepts: counting sets, addition one to ten.

Edens, C. (1994). *How many bears?* New York, NY: Macmillan Publishing Company.

    The reader is invited to explore the shops in Little Animal town with the challenge to figure out how many bears it takes to run the bakery. Each shop gives a mathematical clue to the puzzle. Plenty of opportunity to count, add, subtract, multiply and divide. The detailed illustrations drawn by Marjett Schille invite the reader to revisit this book again and again. Concept: problem solving with arithmetic.

Froman, R. (1978). *The greatest guessing game.* New York, NY: Thomas Y. Crowell Company.

    Froman begins this book by referring to guessing games which are familiar to children. He develops the principles of divisions by continuing to relate division to experiences common to life such as sharing two sodas between three friends or 237 books between eleven club members. Concept: estimation, division.

Gackenbach, D. (1981). *A bag full of pups.* New York, NY: Clarion Books.

    Mr. Mullin's dog had twelve pups. He puts the pups in a bag and takes them to town to see if he can find homes for each of the pups. Many people show interest in taking a pup, but each for different reasons. In the end Mr. Mullin goes home with an empty bag. Concept: dimensioning numbers from twelve to zero.

Gigantic, P. (1992). *Each orange had eight slices.* New York, NY: Greenwillow Books.

    The author uses the riddle pattern of the nursery rhyme, "St. Ives" to provide the reader with creative number problems. To figure out the questions the reader can count, add, or multiply. Clear, colorful picture illustrated by Donald Crews will help attract the reader to this book. Concepts: number, counting, sets, addition and multiplication.

Grant, E. (1964). *Twenty white horses.* New York, NY: Holt, Rinehart and Winston.

    Twenty white circus horses perform tricks in groups of 2, 3, 4, 5, 6, 7, 8, and 9. Pictures illustrate how the twenty horses can be divided into the various groups Concepts: conservation of twenty, division.

Howard, K. (1979). *I can count to 100... can you?* New York, NY: Random House.

    A little mouse teaches the reader how to count to one hundred by ones. Numbers one to twenty are counted by objects. Twenty to thirty are demonstrated through addition establishing the pattern needed to count on to one hundred. Colorful picture and easy to follow text. Illustrations by Michael J. Smollin. Concepts: number concepts one to thirty, counting by ones from one to one hundred, addition.

Hutchins, P. (1986). *The doorbell rang.* New York, NY: A Mulberry Paperback Book.

> Mama hands a plate of fresh baked cookies to Sam and Victoria which they divide between themselves getting six cookies each. That is, until the doorbell rings and guest arrive with whom they must share their plate of cookies. Each time the doorbell rings there are more children and less cookies that each child has to eat! But the last person who rings the doorbell brings a pleasant surprise for everyone. Concepts: division of twelve by two, four, six and twelve.

Lewin, B. (1981). *Cat count.* New York, NY: Dodd, Mean & Company.

> Lewin uses comical black and white drawings of cats to relay a rhyming account of all the cats she knows. Her brother has two cats, her sister has three, her uncle has four, and on it goes to the farmer who has ten cats. A running tally is kept of how many cats there are altogether. Would you believe there are over fifty-five cats in this book? Concepts: counting one to ten, addition of adjacent numbers.

Mathews, L. (1978). *Bunches and bunches of bunnies.* New York, NY: Dodd, Mead & Company.

> Bunnies on a walk, at a picnic and parade, at the beach...bunches and bunches of bunnies everywhere! This is a book about multiplying rabbits showing the squaring of numbers one to twelve. Concept: multiplication, squaring of numbers one to twelve.

McGrath, B. (1994). *The m & m counting book.* Watertown, Maine: Charlesbridge Publishing.

> Simple photos illustrate number concepts from one to twelve with the use of m&m candies. This book will be an attention grabber for children especially when real m&ms are used as a follow up activity. Concepts: numbers 1 to 12, number sets, subtraction.

Merriam, E. (1993). *12 ways to get to 11.* New York, NY: Simon & Schuster Books for Young Readers.

> The book presents twelve number combinations that add up to eleven such as picking up nine pine cones and two acorns. Large, colorful illustrations by Bernie Karlin add to the delight of this book. Concepts: number value of eleven, addition with sums of eleven.

Moncure, J. (1985). *My five book.* Chicago, IL: Childrens Press.

> This book is about a boy named Five. Five has many adventures which involve finding five carrots in the garden, chasing rabbits, fishing and more. Children should enjoy relating to the boys activities, and the arithmetic challenges put forth in the story line. This book was illustrated by Linda Hohag. Concepts: number concept of five, addition and subtraction.

Pinczes, E. (1993). *One hundred hungry ants.* New York, NY: Houghton, Mifflin Company.

Ants are on the march to get some yummies for their tummies, but they must hurry as there is competition from the others to get to the picnic goods. The ants begin their march walking in single file until one clever ant suggests the they could make better time if they shortened the length of the line by marching two by two, then four by four, then five by five, and finally ten by ten. His suggestions would be beneficial if the regrouping won't take so long. concept: division of 100 by two, four, five, and ten.

Rogers, K. (1991). *Melissa makes change.* Minneapolis, MN: Judy/Instructo.

Kathy and her animal friends go off shopping for birthday gifts for their friend. Concepts: counting money; some subtraction. An interactive book.

Weiss, M. (1977). *Solomon Grundy, born on oneday.* New York, NY: Thomas Y. Crowell Company.

This book explores the calendar to unravel the mystery of how the Mother Goose character, q Solomon Grundy, could do a life time of living in just one week. Born on Monday, married on Wednesday, then dying on Saturday, could a baby do so much? Illustrated by Tomie de Paola, this is yet another book from the Young Math Books series. Concepts: counting and adding in base seven, time measurement in weeks, months, and years.

Whitney, D. (1968). *Let's find out about subtraction.* New York, NY: Franklin Watts.

This is an older book, but it still offers valuable lessons in subtraction. Illustrations are done in simple black and white drawings. Concepts: number sets, subtraction.

I.   Learning Outcome M111: **Pattern**

II.   Writing Strategies

1.   Write a story using a pattern such as in <u>Brown Bear, Brown Bear</u>.

2.   Look for patterns in the room or outside. List all the patterns found.

3.   Create a repetitive pattern using pattern blocks. Label the pattern parts using words to describe the patterns color or shape. Rename the pattern using number words.

4.   Create a theater pattern for a special event, story, or theme using descriptive sounds or actions to relay an idea. Write the parts. Preform piece with friends. Examples: 1.) animal theme: moo, baa, quack, quack; 2.) story of The Three Little Pigs: oink, oink, oink, howl.)

5.   Use name or word to create a pattern on graph paper, using one space for each letter. Repeat word until graph paper is filled. Color each letter its own color.

6.   Copy or write a poem that has a set pattern in it's verse.

7.   Define symmetry.

8.   Create a pattern block design. Copy the design onto construction paper using pattern block paper pieces. Write the name of your design on the construction paper.

9.   Learn about Fibonacci's number sequence. List all the things you find that are in Fibonacci's sequence, beginning with your own body.

10.   Prepare to interview a quilter by writing three questions you have about quilt designs.

III.   Bibliography of Children's Literature of Pattern

Cooke, T. (1994). *So much.* Cambridge, MA: Candlewick Press.

> Each time the door bell rings a new relative enters the house. Each new person want to play with the baby. After some time with the baby, everyone sits and waits until the doorbell rings again and the scenario is played out again. The pattern in this book's story line helps the reader to predict what will happen next in the story. Helen Oxenbury's delightful illustrations capture the joy and light hearted humor of the story.   Concept: patterning.

Linn, C. (1972). *Probability.* New York, NY: Thomas Y. Crowell Company.

> Life is full of uncertainties. Nevertheless, people plan each day based on the probability that events and activities will go according as planned. Making predictions with confidence is an exercise in mathematics. This book introduces the reader to the probability theory and suggests several experiments that the reader can do to better understand this concept. Understanding probability may prove challenging to primary aged students, but they will enjoy doing the experiments and graphing their results.   Concepts: probability, graphing.

Pluckrose, H. (1988). *Pattern.* New York, NY: Franklin Watts.

> Using the photography of Chris Fairclough, author Henry Pluckrose introduces the concept of pattern to the reader. The book gives many examples of patterns and suggests some activities which the reader may want to try.   Concept: repetitive pattern, symmetry, random pattern.

Sitomer, M. (1970). *What is symmetry?* New York, NY: Thomas Y. Crowell Company.

> An introduction to symmetry, the author provides examples of the different kinds of symmetry. This book offers a good opportunity to integrate mathematics with science and art. Concept: symmetry.