

Minn. Univ. Duluth

A PROGRAM OF ACTIVITIES IN GRAPHIC SKILLS  
FOR ELEMENTARY SCHOOL CHILDREN

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Problems in Curriculum Construction

Ed.C.I. 271

Under the Direction of  
William C. Gemeinhardt

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A Requirement for the Degree  
Master of Arts (Plan B)

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## CHAPTER I

### THE PROBLEM

Elementary school pupils are exposed to tables and graphs both in and out of school. References are made and work is assigned in social studies, science, economics, and mathematics textbooks. Newspapers, magazines, television, and other media are relying more and more on tables and graphs to present information. The skills required in reading and understanding graphic materials are neither taught sequentially nor developed completely in today's elementary school curriculum. Several elementary school mathematics textbook series have attempted to meet this need. The scope of their programs and the grade placement of the content, however, varies greatly.

### STATEMENT OF THE PROBLEM

It is imperative, therefore, that teachers assume the responsibility to provide a developmental program for all children focusing on the skills in reading, interpreting and using graphs. It was the purpose of this study to prepare a series of activities that would aid teachers in presenting a comprehensive program in graphic skills. The contents are arranged so that they might be used independently

or in conjunction with a text currently in use. Experiences are provided for children from kindergarten through sixth grade. This material can be used with an entire class, with small groups or individuals. The lessons included utilize the guided discovery approach and have been selected because of their appeal to children's interests.

I hear, and I forget;

I see, and I remember;

I do, and I understand.

This old Chinese proverb is indicative of what the author feels is achieved by different methods of teaching. It was the author's aim in preparing these activities to help teachers stress the second and third methods, namely, "to see" and "to do."

## CHAPTER II

### REVIEW OF THE LITERATURE

The value of teaching children the skill of reading and interpreting tables and graphs is stressed by many educators today. Experts in the teaching of reading, social studies and science join with recognized leaders in the elementary school mathematics field in pointing out the need of this training in a basic skill which has been neglected. Although some have advocated more emphasis for several years, it does seem that there is a new interest of late. Brueckner and Grossnickle say:

In the elementary school the arithmetic textbook should provide instruction in the reading and interpretation of a variety of graphs similar to those found in reference books, social studies textbooks, and other sources, just as it provides instruction in the basic number processes. By studying graphs in his textbooks, the child should become very familiar with methods of discovering relationships among quantities in all areas of the curriculum. In this sense a graph is an aid in problem solving. The pupil should learn how to read graphs and tables in order to interpret data presented visually in the social studies, science, and other areas of study.<sup>1</sup>

The same feeling is expressed by Clyde G. Corle:

. . . Because material can be presented so economically and so effectively in pictorial form, newspapers, journals, and books make frequent use of

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<sup>1</sup>L. J. Brueckner and F. E. Grossnickle, Discovering Meanings in Elementary School Mathematics (New York: Holt Rinehart and Winston, Inc., 1963), p. 320-321.



graphs, and children must be able to read graphs in printed material readily and with understanding.<sup>2</sup>

In the words of Jo McKeeby Phillips:

It is not safe to assume that a child will see automatically how to read a table, a chart, a diagram, or even a sort of comic-strip illustration. . . . You must be ever alert to the possibility that at least one child is looking at it and seeing nothing but lines and squiggles.<sup>3</sup>

A member of the editorial staff of Weekly Reader, a newspaper for elementary school children, recognizes the need for the teaching of graph interpretation to children of this age:

Today's youngsters are growing up in an age when textbooks, newspapers, magazines, and television are making increasing use of graphs and tables to impart information. The ability to interpret these graphic forms of communication correctly is a skill that must be taught. Yet, up to now, elementary-level materials for this purpose have been almost non-existent.<sup>4</sup>

According to Pictorial Representation children must see and do to become prepared for the abstractions of mathematics. Handling objects, counting them, sorting them, setting them up in rows and columns and counting them again seem to be the way that children can be led into the realm of abstractions. Sorting, arranging, counting--these are

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<sup>2</sup>Clyde G. Corle, Teaching Mathematics in the Elementary School, (New York: The Ronald Press Company, 1964), p.286.

<sup>3</sup>Jo McKeeby Phillips, "Reading Mathematical Content," The Instructor (Vol. 77:2, March 1968), p. 120.

<sup>4</sup>Elaine Wonsavage, Weekly Reader (Columbus, Ohio: American Education Publications, 1968), p. 3.

also basic operations in the graphing of mathematical data. Graphs offer children means for exploring mathematical ideas and relationships. This study advocates that just as soon as children show an interest in collecting and sorting things it's time to start work with graphs.<sup>5</sup>

The need for critical interpretation is stated by Ruth Girard:

It takes but a cursory examination of a daily newspaper, a current magazine, or a commercially sponsored program on a local television channel to make evident the widespread use, and tremendous impact upon people, of numerical data that has been translated into a graphic representation. It also takes but a moment of questioning with students to make evident, as well, the implicit trust that many of them give to anything related to numbers as being the inalienable "truth." Somehow, the transference of statistics to a graph carries with it a factual implication that most students accept as being "reportorial rather than editorial." They assume that reading materials from a graph provides numerical answers that are not to be challenged. This is quite similar to the reverence felt for the printed page which makes every word so invariable that students often answer a question with, "The book says so."

To be sure, some graphs record information that is strict reporting. On the other hand, many graphs do not show the actual number count and do not show the whole picture or a clear picture, of the story behind the number ideas recorded. Since this is the case, it should be part of any elementary school program to develop a critical interpretation both of statistics and of graphs. This in no way implies a structured course in statistics that would include the formal nomenclature, the tabulation of different deviations, the amassing of statistical formulas; rather, a helpful program would provide, within the classroom environment, situations and experiences that would promote reflective and critical thinking,

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<sup>5</sup>Nuffield Mathematics Project, Pictorial Representation (New York: John Wiley & Sons Inc., 1967), p. 9.

problem solving and creative expression in the area of statistics and graphing. These would be objectives for all students. For the gifted student, exploration and interpretation would be more extensive and analysis more intensive.

Recent reports and studies made with children state again and again that it is a valuable practice to relate the information on graphs as closely as possible to the pupils' environment and to things that have personal meaning for them. Information graphed should be material that children want to interpret from the graph and its analysis should be related to physical phenomena and problems that are familiar to boys and girls.<sup>6</sup>

Elaine P. Wonsavage feels that because the skills of reading tables and graphs are not acquired automatically these skills must be taught. If children do not know how to understand and use graphic materials, they tend to skip or misinterpret graphic presentations. Critical reading of the tables and graphs is not done. Material the author felt important to the text is left unlearned or unnoticed.

Other reasons mentioned for a planned presentation of these skills are: children are constantly exposed to tables and graphs in the daily communications media and in textbooks; tables and graph reading sections appear in standardized achievement tests at grade three; the skills required in reading and understanding graphic material are not sequentially and completely developed by any one curriculum area although tables and graphs are included in most areas of the curriculum.

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<sup>6</sup>Ruth A. Girard, "Development of Critical Interpretation of Statistics and Graphs," The Arithmetic Teacher, XIV (April, 1967), p. 272-277.

Graphs and tables have several distinct advantages over narrative material, points out Wonsavage, in that numerical data of significance is presented in an organized, concise and visual manner which is easier to remember than that presented in a narrative form. Youngsters who have a reading difficulty might understand material from a graph better than from a text. Graphs have strong visual impact. Changes, trends and comparisons can be effectively shown and one can get more information from graphs and tables in a shorter time than by reading narrative material. Graphs can summarize, can amplify the text and be shortcuts.

More and more reading material is presented to the student; and it seems logical that he make use of this "shortcut." Pupils must learn the special "language of graphs" in order that they arrive at the correct interpretation of graphic material.<sup>7</sup>

Similar thoughts are expressed by J. Houston Banks:

Topics closely related to measurement include scale drawings, charts, graphs and tables. Casual perusal of the daily newspaper is sufficient evidence of their importance from the standpoint of social utility.<sup>8</sup>

Minnesota educators who have specialized in mathematics

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<sup>7</sup>Elaine Wonsavage, Weekly Reader (Columbus, Ohio: American Education Publication, 1968)

<sup>8</sup>J. Houston Banks, Learning and Teaching Arithmetic (Boston: Allyn and Bacon, Inc., 1959) p. 358.

at the elementary level have presented the current thinking of the group in a publication, Guidelines for Elementary Mathematics. This group has advocated the following in regard to the teaching of table and graph interpretation:

In the elementary school more time must be devoted to organization of data into tables and graphs. Too often we depend on the textbook to provide us with the "canned" material or data from which the pupils are to make generalizations or graphs, and in so doing we are losing a good deal of the learning motivation for the student. Children need the experience, not so much with canned data in the elementary school, as with the experience of starting with their own problem of collecting, organizing, and interpreting data - data which is close to their own experiences. As pupils get older perhaps more and more material could be of the canned variety, but even then original data can be the desired stimulant to better learning. Every daily newspaper contains data or numerical statistics on a variety of topics including such things as sports, weather, wages, prices and population changes. These data often form the basis for important decisions. To obtain correct decisions the data must be read and interpreted intelligently. Early training and experience with graphic data will facilitate this skill.<sup>9</sup>

The aim of the Nuffield Mathematics Project of Great Britain is to devise a contemporary approach for children from five to thirteen. The authors for the project had this to say about the teaching of graph skills:

Probably the most important value of graphs, and one which applies especially to the pupils of lesser ability, is that it helps the children to see relationships which may have passed by unnoticed. This is important because mathematics is the story of relationships.

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<sup>9</sup>Minnesota Department of Education - Division of Instruction, Guidelines for Elementary Mathematics (St. Paul: State Department of Education, 1964) p. 131.

From the day a child first enters the school, teachers are providing for the eventual mastery of basic number skills, by presenting material in a way that communicates the exciting creative aspect of mathematics. They organize experiences which will encourage the children to think out, seek out and discover ideas for themselves, looking for patterns and relationships from which a final generalization is given. Again, it is the interrelationships between the facts of arithmetic rather than the facts themselves which command primary attention. As these relationships are seen and discussed, concepts become clearer, and fundamental principles will emerge which will be of value in unifying the mathematics to follow.

For this study of relationships graphical representation is essential, not being introduced during 'Graphs Week' but being considered as a regular method of children recording and communicating their experiences.<sup>10</sup>

The worth of this type of instruction as an opportunity to provide experience in quantitative thinking is stressed by Brueckner and Grossnickel:

A graph is a visual representation of tabular data. A graph should enable the learner to see number relationships among quantities much more easily than when the data are given in a table. The reading of graphs of various kinds which express relationships among quantities should therefore be regarded as an essential element of a program for teaching problem solving.

To be able to read a graph, the pupil must understand its mechanical features and be able to interpret the data. The learner should be able to determine whether or not it is drawn to represent the data correctly. The ability to read a graph and to criticize its physical features constitutes a skill to be developed. The ability of the individual to interpret the data in a graph depends on his background. A pupil may not be able to interpret

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<sup>10</sup> Nuffield Mathematics Project, Pictorial Representation (New York: John Wiley & Sons Inc., 1967), p. 3.

the data because he is unfamiliar with the topic presented.<sup>11</sup>

The ability to read graphs, charts and tables is pertinent to problem solving according to Brueckner and Grossnickle:

Research has shown that pupils who excel in problem solving are significantly superior to those who are poor in problem solving in the following fields:

1. computational ability.
2. ability to apply the sequence of steps involved in problem solving.
3. ability to estimate answers to verbal problems.
4. range of information about social uses of arithmetic.
5. ability to read graphs, charts, tables.
6. ability to see relations in number series.
7. general and nonverbal reasoning ability.
8. general reading level.
9. level of mental ability.<sup>12</sup>

During the 1967-68 school term, Ida Mae Heard used a faculty research grant to initiate a modern math program in the kindergarten class at the Laboratory School of North Texas State University. She has reported that one of the most rewarding experiences was the use of graphs to picture number relations.<sup>13</sup>

Objectives seemingly accomplished with a group of elementary children in Florida after experiences with

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<sup>11</sup>L. J. Brueckner and F. E. Grossnickle, Discovering Meanings in Elementary Mathematics (New York: Holt, Rinehart, and Winston, 1963), p. 320.

<sup>12</sup>Ibid.

<sup>13</sup>Ida Mae Heard, "Making and Using Graphs in the Kindergarten" The Arithmetic Teacher, XV (October, 1968), p. 504.

number lines, arrays, and graphs were:

1. An understanding that two coordinates are required to locate a point in a plane.
2. Appreciation of number lines.
3. An understanding of the concept of ordered pairs as related to rectangular coordinates.
4. An understanding and reinforcement of the concept of zero as a point of origin.
5. An understanding of the concept of a rectangular coordinate system.
6. Skill in reading and locating the point at which two lines intersect, as described by an ordered pair.
7. Skill in graphing.
8. Development of favorable attitude toward math.<sup>14</sup>

Thorndike said that: "Life organizes mathematics, not in terms of processes, but in terms of problems."

Myrtle M. Townsend used this theory as a basis for the organization of some classes in elementary mathematics.

The class collected samples of real mathematical problems faced by the pupils of various ages in everyday living. As these problems were discussed, that interest was high and that the children were concerned over the accuracy of their answers.

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<sup>14</sup>Nicholas J. Vigilante, "The Address of a Point," The Arithmetic Teacher, XV (December, 1968), p. 687-693.



An example of their work was the construction of a graph that showed the trend in the population growth of their school. This graph had significance when the principal asked permission to use the graph at a meeting with parents.<sup>15</sup>

Another teacher reports that interest was heightened in learning multiplication facts when each member of a fourth grade class measured his achievement graphically. This procedure was adopted to provide an incentive for improvement, and to give each student a basis for self-evaluation. Each student was anxious to improve his own score. The graph-recording lent so much interest to the drill that the students did not want to miss a drill.

After two weeks each student wrote an evaluation of his own progress and knowledge of multiplication. The self-improvement was remarkable, a better understanding of graphing resulted, and the pupils were happy while learning.<sup>16</sup>

Lucy E. Driscoll's fourth grade class, through experiences in graphing, came to the realization that in problems involving pairs of numbers which have a relationship some type of graph is possible; that the type of graph is dependent upon the kind of relationship existing between the numbers; and that which was used in plotting some points.

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<sup>15</sup>Myrtle M. Townsend, "Problems or Processes", Childhood Education, XLII (February, 1966), p. 362-363.

<sup>16</sup>Josephine K. Coleman, "Just Plain Drill," Arithmetic Teacher, VIII (December, 1961), p. 431.

The youngsters talked of information they could "read" from graphs. The experiment was interesting and the results most satisfying according to the teacher. She points out that elementary pupils are undoubtedly capable of understanding deeper mathematical concepts than usually are expected of them. It should be a natural outgrowth of basic content. Such experiences are delightful for both the pupils and teacher. The author stresses that teachers need to be alert to recognize the opportunities for going deeper.<sup>17</sup>

Edwina Deans writes about satisfying results of experiences with elementary children in tabulating and charting social studies and science data.<sup>18</sup>

Sixth graders in Marquette, Michigan touched upon exploring set theory, functions, matrices and linear transformations. The instructor felt the youngsters could understand fundamental concepts of analytical college-level mathematics, apply them to some extent to the world of science as they see it, and enjoy it more than conventional elementary mathematics. The instructor felt the worth of continuing this type of arithmetic experiment at fourth and fifth grade levels and the possibility of incorporating this type of new "math" into regular elementary

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<sup>17</sup>Lucy E. Driscoll, "Ordered Pairs, Patterns, and Graphs in Fourth Grade," The Arithmetic Teacher, (March, 1961), p. 127-130.

<sup>18</sup>Edwina Deans, "Arithmetic in Science and Social Studies," The Arithmetic Teacher, VIII (April, 1961), p. 189-191.

curriculum is worth consideration.<sup>19</sup>

Andrew M. Gleason says the use of histograms is closely related to the idea of graphing data, one of the most useful tools of science. Experience has shown that children can quickly learn to plot points using coordinates. They can plot heights against weights or temperature against time, or the results of any experiment which leads to pairs of numbers.

This graphical treatment enables pupils to do ratio and proportion problems several years earlier than presently taught.<sup>20</sup>

One Cambridge Conference participant, a distinguished science educator, said that a major breakthrough in science education would be achieved if children master ratio problems. Working with graphs may well lead children to this mastery.<sup>21</sup>

Graphing would lend itself to the plan of study advocated by Welch and in turn it would be a most useful skill for children to utilize in other units of study.

A mathematical program may be enriched by a

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<sup>19</sup>Eugene H. Lehman, Jr., "College Math for Eleven Year Olds," Science, CLVII (July 28, 1967), p. 367.

<sup>20</sup>Andrew M. Gleason, "Science, Math, and Tomorrow's Child," Instructor (January, 1968), p. 54-56.

<sup>21</sup>A Report Prepared by the Cambridge Conference of School Mathematics (Cambridge, Massachusetts: 1967).

cooperatively planned unit of experiences related to a topic of both mathematical and social significance. Such units of work provide learning experiences which will help children achieve accepted goals. Teachers find that such units of work enable them to cut across subject-matter lines and to relate other curriculum areas to mathematics. Functional use of subject matter and skills is an important outcome of such an approach.

The variety of purposes, activities, interests, and abilities of students can be of worth to the whole class. The teacher can guide the work to meet individual differences.

The teacher can promote valuable kinds of group and individual learning where the effective techniques of thinking, the perceptions of relationships and the methods of locating, organizing, and evaluating information are given specific attention by utilizing this method of teaching.

Daily activities are the best sources for units of work. Such topics as the calendar, money, time, linear measurement, graphs, and maps are but a few examples of the many possible materials that may be used in broad units of work in mathematics.

The children have an opportunity to apply many of their arithmetic skills in problem situations, and this illustrates to them beyond all words, "Why Arithmetic?" They love it.<sup>22</sup>

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<sup>22</sup>Ronald C. Welch, "Using Units of Work in Mathematics," Education Digest, XXVI (November, 1960), p. 44-45.

### CHAPTER III

This collection of experiences includes activities related to: (1) readiness, (2) tables, (3) picture graphs, (4) bar graphs, (5) line graphs, and (6) surface or area graphs.

Each area provides lessons beginning with simple activities and progressing to the more difficult. The readiness section is just as the name implies . . . activities of preparation.

A variation of activities within each area is planned in order to reach all children. Because of the utility of this skill, it is important that each child is successful at his ability. The basic concepts are presented and activities suggested. The children will be encouraged to adapt the material presented, do research, and develop this type of work along lines of their individual interests. It is hoped that these skills will be developed so that they serve as valuable tools for the pupils throughout life.

It is not the intention of the author to present in entirety all possible lessons in each area, but rather to present suggestions which can be used, or adapted, to the needs of a particular child or class. It has often been the experience of teachers that the most successful lessons are those that develop or evolve from some simple beginning.

Children's interest grows as questions are raised and suggestions are made, learning then takes place and there is satisfaction for students and the teacher.

### READINESS ACTIVITIES

#### Objectives

These activities have been prepared:

1. to create an interest in pictorial representation.
2. to develop an understanding of pictorial representation of one to one or several to one.
3. to develop an awareness of equality.
4. to develop an awareness of inequality.
5. to develop ease in participation in discussion.
6. to encourage thoughtful suggestions of information to be so represented.

#### Materials

Red block for each girl in class

Blue block for each boy in class

(Blocks of only one color could be used if they were the only ones available. Blocks must all be the same size.)

Cards (6" x 12") labeled as needed by teacher

Extra blocks should be available

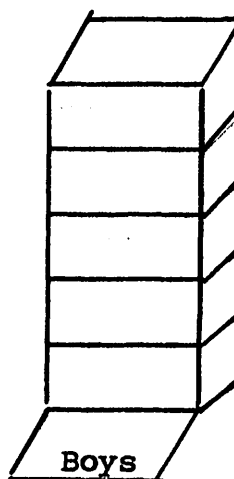
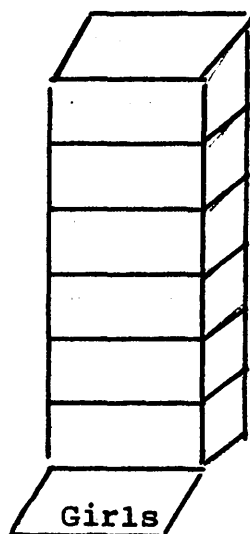
3" x 8" strips of construction paper stapled in shape of a small box

Bulletin board to which the teacher can pin labels and the folded strips

## ACTIVITY 1.

Each child holds a block. There should be only enough blocks available so that each child has only one. The teacher would guide children so blocks would be placed on top of one another in proper columns behind labeled cards placed on the floor by teacher. Discussion should follow. Questions similar to the following could be asked.

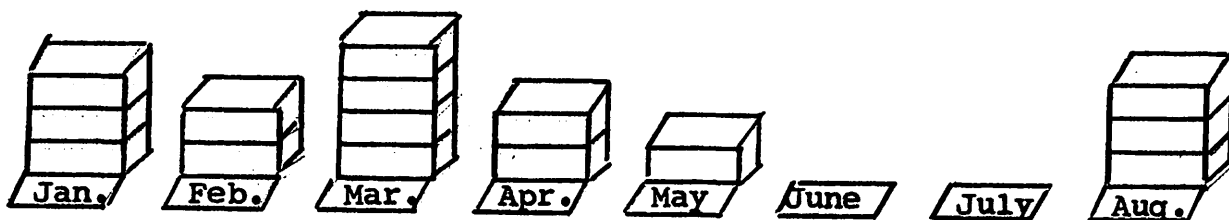
1. How many blocks are in the girls' column?
2. How many blocks are in the boys' column?
3. Are there more blocks in the girls' column than in the boys' column?
4. Are there fewer blocks in the boys' column than in the girls' column?
5. How many boys are in our class today?
6. How many girls are in our class today?
7. How many boys and girls are in our class today?
8. How many blocks are there altogether?



## ACTIVITY 2.

The teacher would place twelve cards in a row on the floor. Each card would be labeled with the name of a month. Each child would have a block. It would be desirable though not necessary to have the child's name on his block. Starting with the January card on the left, all the cards would be in order reading from left to right. As a month name was called off by the teacher, the children with birthdays in that month would arrange their blocks in a column behind the proper card. A discussion would follow. The teacher would note the children's observations as they answered questions similar to the following:

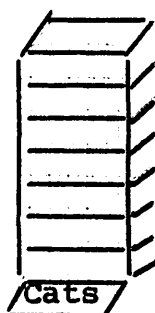
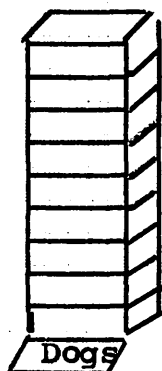
1. How many children have birthdays in January?
2. How many children have birthdays in February?  
In March? In April?
3. Are there months in which no one in our class has a birthday?
4. How many months are there in which none of you have birthdays?
5. In which month do the most children have birthdays?
6. In how many months are there more than three birthdays?





## ACTIVITY 3.

The teacher would place two cards labeled "dog" and "cat" on the floor. All the blocks could be put in one place. Each child who has a dog would place a block behind that label. Each child who had a cat would put a block behind that label. If a child had two dogs, the children would tell him to put two blocks in the dog column. The teacher would observe if and how the children would react to other situations such as one child who had a dog and a cat or another with neither. Similar questions to those listed in the first two activities could be asked. Questions would evolve also from the group discussion. It could be brought out in the discussion that in each of the first two activities there were the same number of blocks as there were children. In the third activity let the children note that the number of blocks in the two columns is not necessarily the same as the number of children in attendance that day. Ask why there is this variation. The children should list several reasons.



#### ACTIVITY 4.

The class could have a discussion as to what other information they could show by columns of blocks. The children might point out that they could show who were the only children in the home or who had brothers or sisters. They could show how many were of each age that might be represented in the group. Someone might point out that each could put in the proper place a block for each sister and each brother. Several of the suggestions made by the children should be used. These representations could be depicted as the previously mentioned activities.

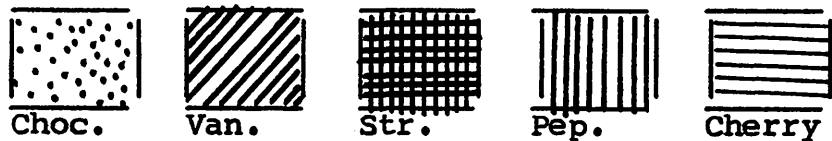
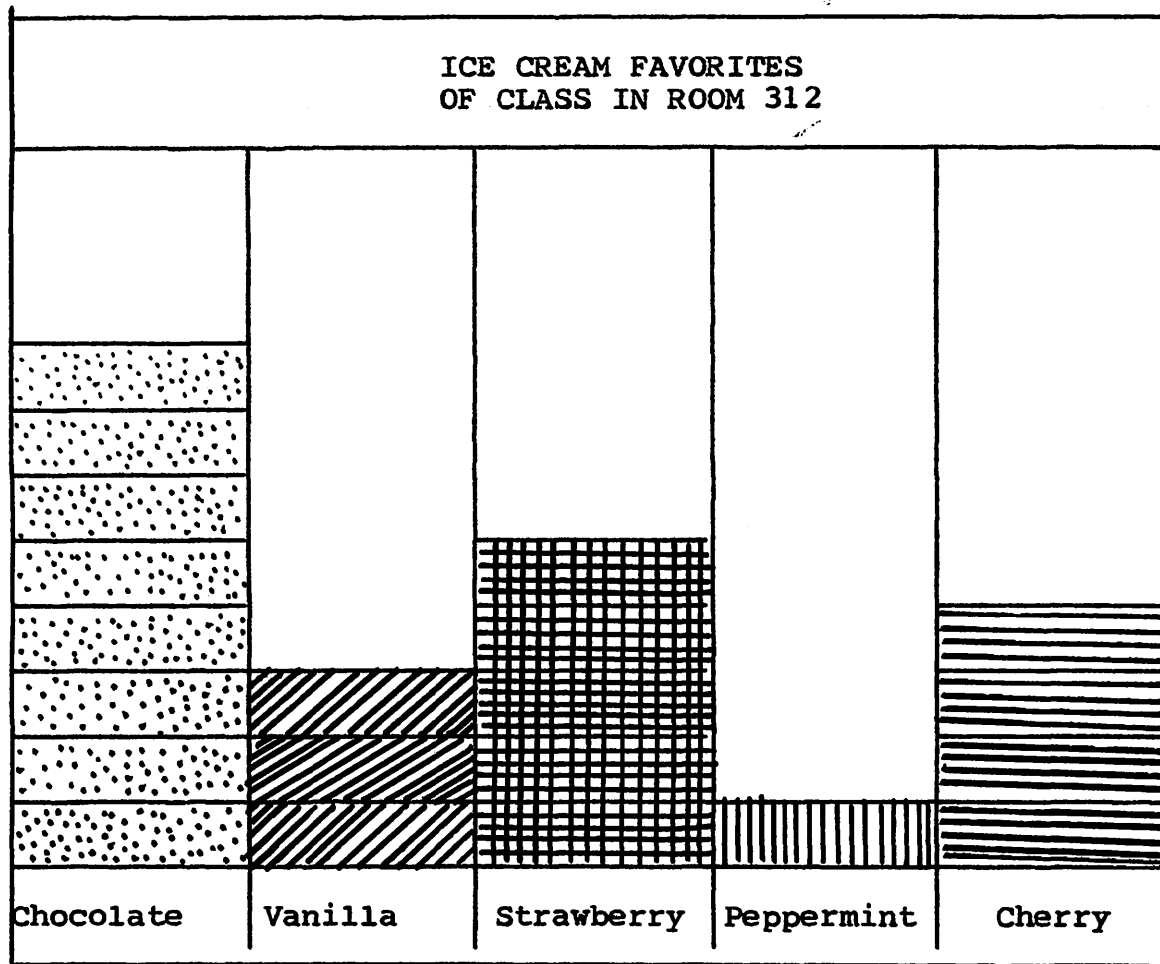
#### ACTIVITY 5.

The same type of activity could be carried out with the folded strips of paper (used in place of the blocks) pinned one below the other to the bulletin board under labels prepared by the teacher.

#### ACTIVITY 6.

A chart could be prepared ahead of time by the teacher. Each child could choose a square of paper representing his choice of ice cream flavor. Each pupil could paste his square above the label of his preference on the chart. After the chart is completed the class should have

a discussion as to what can be understood from the chart.  
 The teacher could be the recorder.



## MORE READINESS ACTIVITIES

Objectives:

These activities have been prepared:

1. to name an object located on given point on the number line (horizontal and vertical).
2. to name a point located by identifying the object located there.
3. to learn that a number can be used to indicate the position of an object in an arranged set of objects.
4. to use a pair of numbers to describe the location of an object in a chart.

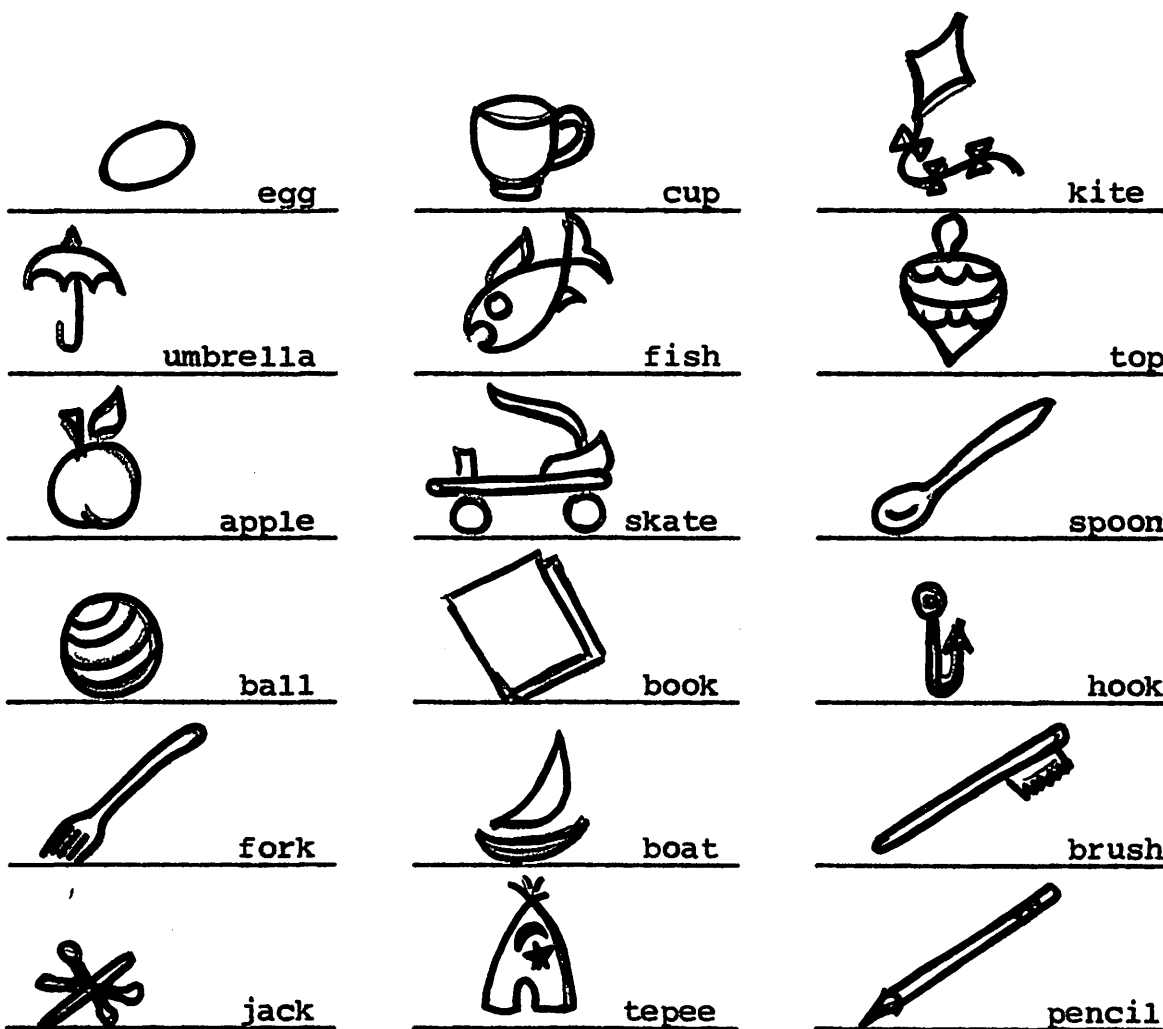
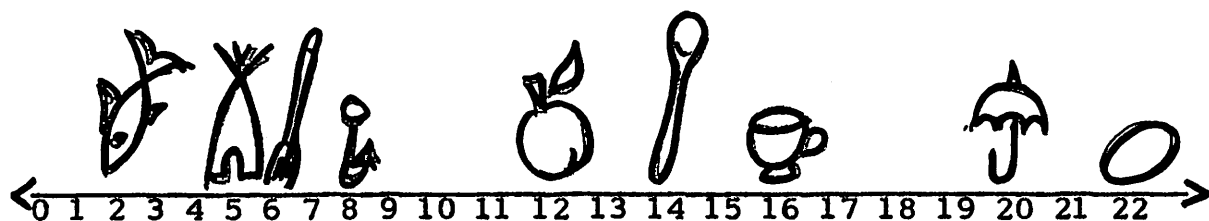
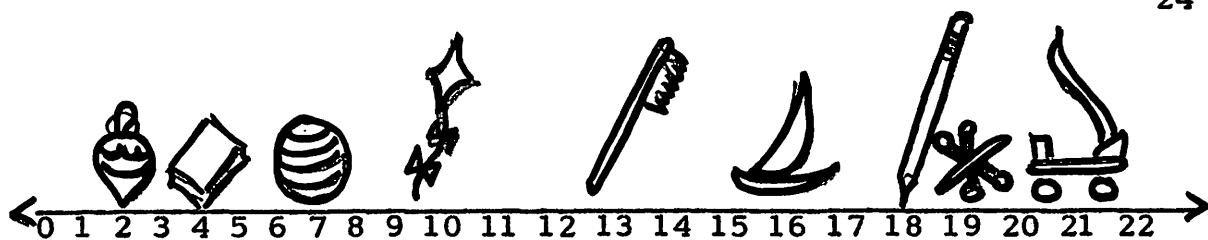
Materials:

Mimeographed sheets

Transparencies of simple illustrations

## ACTIVITY 7.

The teacher could use a number line pinned to the bulletin board and pictures of objects to be pinned also. The overhead projector could be used with simply illustrated transparencies. Children would be asked to name the points on which certain objects are placed and to name the objects located at given points. After a discussion of this sort the children could complete worksheets similar to the following:



20 c  
 19 p  
 18 j  
 17 b  
 16 g  
 15 o  
 14 w  
 13 a  
 12 n  
 11 d  
 10 i  
 9 e  
 8 k  
 7 s  
 6 f  
 5 m  
 4 q  
 3 h  
 2 r  
 1 l  
 0

Write the number that is  
 beside the letter that  
 begins each word.

will \_\_\_\_\_

into \_\_\_\_\_

14 w call \_\_\_\_\_

little \_\_\_\_\_

13 a fish \_\_\_\_\_

over \_\_\_\_\_

12 n book \_\_\_\_\_

kitten \_\_\_\_\_

11 d egg \_\_\_\_\_

house \_\_\_\_\_

10 i jump \_\_\_\_\_

no \_\_\_\_\_

9 e sit \_\_\_\_\_

queen \_\_\_\_\_

8 k mother \_\_\_\_\_

dog \_\_\_\_\_

7 s apple \_\_\_\_\_

puppy \_\_\_\_\_

6 f gone \_\_\_\_\_

rabbit \_\_\_\_\_

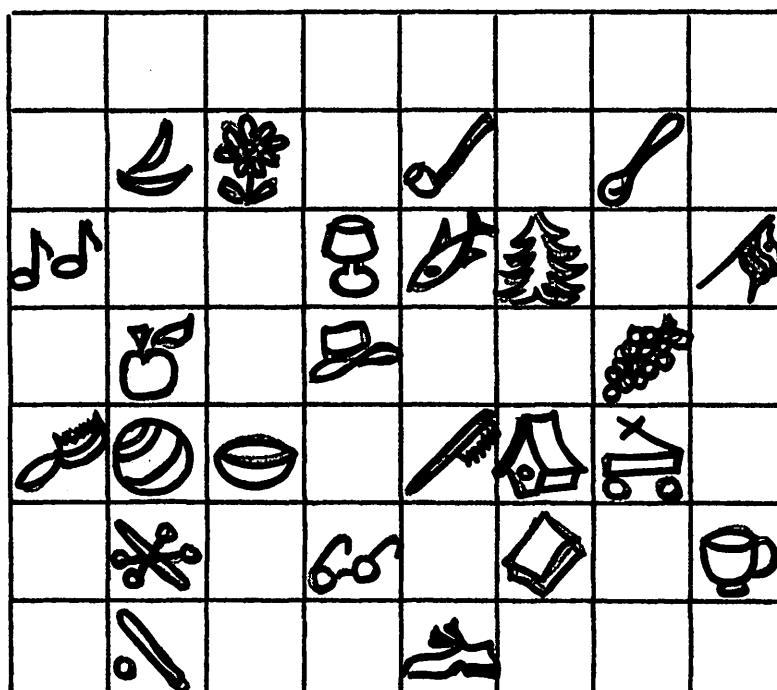
## ACTIVITY 8.

In this activity the chart of pictures could be on a transparency to be shown on the overhead or each child could have a mimeographed sheet to which he could refer. A discussion, led by the teacher, could point out that the fish is five across and five up and the ball is two across and three up. Questions similar to the following could be asked:

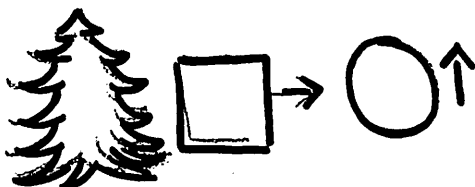
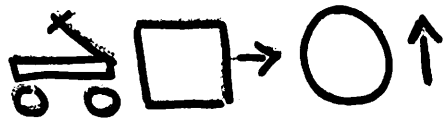
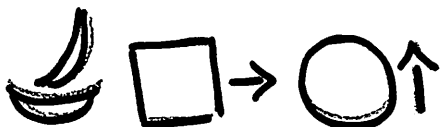
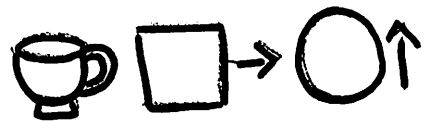
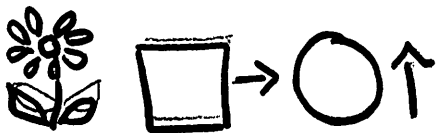
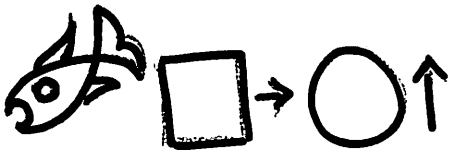
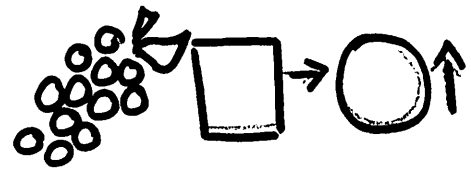
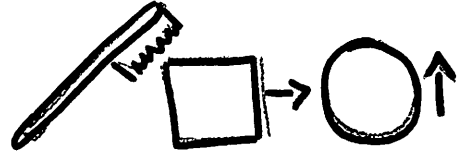
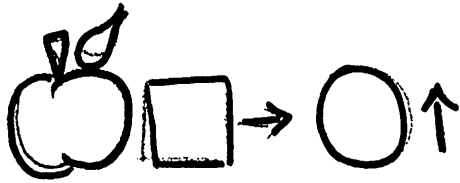
1. What picture is two across and four up?
2. What picture is four across and two up?

The following sheets could be completed by the children.

Put the two numbers that locate the pictured object. The sign  $\rightarrow$  means across at the bottom. The sign  $\uparrow$  means toward the top.



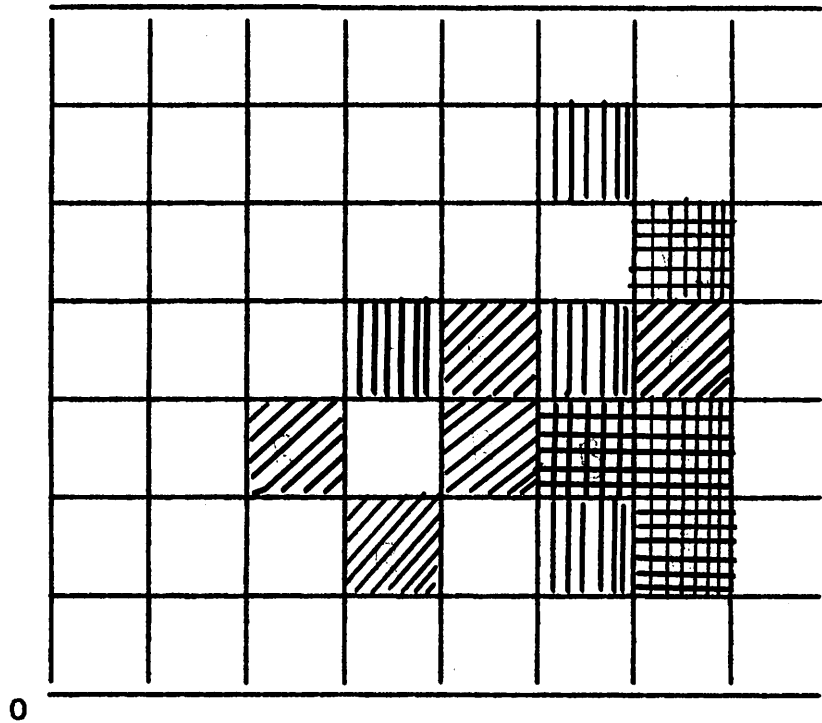
Place the correct numeral in each space.

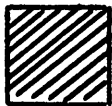

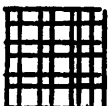




## ACTIVITY 9.

Designs can be made by pasting colored squares as directed by numerals and arrows on the squared paper.



Red Squares		Green Squares		Blue Squares	
3 → 3 ↑		4 → 4 ↑		6 → 3 ↑	
4 → 2 ↑		6 → 2 ↑		7 → 2 ↑	
5 → 3 ↑		6 → 4 ↑		7 → 3 ↑	
5 → 4 ↑		6 → 6 ↑		7 → 5 ↑	
7 → 4 ↑					

## ACTIVITY 10.

Another worksheet could be prepared which would direct the children to place letters in the squares as directed by the numerals and arrows. An added interest could be instilled by asking that each child whisper the secret message to the teacher as he discovers it.

	G	O	O	D		
M	O	R	N	I	N	G

0

G 2 → 5 ↑

D 5 → 5 ↑

N 4 → 3 ↑

O 4 → 5 ↑

O 3 → 5 ↑

M 1 → 3 ↑

O 2 → 3 ↑

R 3 → 3 ↑

I 5 → 3 ↑

G 7 → 3 ↑

N 6 → 3 ↑

## ACTIVITY 11.

In this case, sheets could be made with squares and a letter in each square. The child places the letter that is found as numerals and letters indicate in the blank.

S	O	X	K	E	L
M	I	S	T	B	R
A	C	I	O	M	S
L	D	U	E	F	N
H	Y	J	K	G	P
E	I	O	R	S	Q

\_\_\_\_\_

2 → 5 ↑

\_\_\_\_\_      \_\_\_\_\_      \_\_\_\_\_      \_\_\_\_\_

6 → 6 ↑      3 → 4 ↑      4 → 6 ↑      4 → 3 ↑

\_\_\_\_\_      \_\_\_\_\_      \_\_\_\_\_

2 → 2 ↑      2 → 6 ↑      3 → 3 ↑

## ACTIVITY 12.

An enrichment activity might be one that asks the

youngsters to make up the directions for finding letters to form messages of their own.

### ACTIVITY 13.

Each child would have a sheet of squared paper. A letter would be placed at the bottom of each column. Each child would start at the bottom of each column and fill in each square with a word of three letters or more that begins with the letter at the bottom. The teacher would correct the sheets and allow the child to color in the squares of the columns from the bottom -- one for each correct word. The child should be encouraged to fill in the blanks lightly so that the words show through. A discussion would follow to compare the heights of the various columns on different papers.

The squared mimeographed paper could be used without the letters, then the children could help choose the letters for the particular day. This could be used a number of times and in conjunction with other subjects.

				log
		road		lost
also		red	inch	let
all	picnic	rope	into	little
apple	play	run	ink	like
A	P	R	I	L

## TABLES

Objectives

These activities have been planned:

1. to illustrate the need for organizing data into a convenient form for easy reference.
2. to teach the parts of a table.

Vocabulary

Information, table, column, title, row, source

Materials

Duplicated sheets which contain information of interest to the children written in paragraph form

Transparencies of simple tables

Clean transparencies

Telephone books

Menus

Textbooks (tables of contents)

## ACTIVITY 14.

A sheet similar to the following example could be passed out to the children and a discussion could follow. Questions similar to those below could be asked. The children would realize that information is hard to use when hidden in a paragraph. Several paragraphs similar to the following could be on one sheet.

On May 23, forty-seven girls and boys went on a picnic. There were many activities and games from which they could choose. First eight girls and boys played horseshoe, five children played on the swings, eighteen played softball, seven girls jumped rope, four boys played catch, and five others hunted for agates. Later they chose something different to do.

How many children chose to play on the swings?

How many hunted for agates?

How many girls jumped rope?

How many more played softball than played horseshoe?

How many fewer hunted for agates than played horseshoe?

In which activity did most children take part?

How many played softball or catch?

In which two activities did the same number of children take part?

The children could be shown a table on the overhead projector. This table would contain all the above information. Then the children could be asked the same questions and they could be led to point out the greater difficulty they encountered in finding the data necessary to answer the same questions when the information was given in the paragraph form. More difficult questions involving two steps can be solved with comparative ease when presented in table form.

## FUN AT THE PICNIC

<u>Things to do</u>	<u>Number</u>
Horseshoe	8
Softball	18
Jumping rope	7
Agate hunting	5
Swinging	5
Playing catch	4

Miss Morgan

May 25

## FUN AT THE PICNIC

<u>Things to do</u>	<u>Number</u>
Horseshoe	5
Softball	18
Rope jumping	8
Agate hunting	4
Swinging	6
Playing catch	6

Miss Morgan

May 25

The parts of the tables could be introduced by the asking of questions relating to this. What part of the table tells what it is about? There are two lists. What are the names of the lists? These are the columns. There are six rows in the table. What are they? How many children played catch? What do you see at the bottom of the table? This name tells who made the table and the date tells when it was made.

The class can answer questions relating to other simple tables shown from an overhead projector. The teacher could have some transparencies prepared. The class and the teacher can prepare other tables together. The teacher writing on the transparency that which the children dictate. Information for the first tables can be gained from polls taken within the class. The children could suggest titles; and as the teacher guides them by questions, label the columns and rows correctly. The children should realize the importance of this. The children could make up questions to ask the class. Suggestions for tables that would pertain to children might include ice cream flavor choices, number of children in each family, favorite holidays, favorite pets, favorite days of the week, favorite school subjects, and favorite sport to watch. This information is all easily obtained by a show of hands, organized by discussion of children and teacher into a table which can be presented



immediately if the teacher records on a transparency, showing it to the pupils on an overhead projector as it is developed. Three youngsters could act as tellers. Leading questions would guide the procedure and enforce the steps and vocabulary to build good understanding. A summary of what can be learned from the completed table should be made by the children. The teacher could write on the board as the children dictate. Examples of tables which the youngsters might complete as a class follow:

FAVORITE HOLIDAYS

Holiday	Number
New Year	
Easter	
July 4th	
Thanksgiving	
Christmas	

Third Grade

May 25

FAVORITE ICE CREAM

Ice Cream Flavor	Number
Butter Brickle	
Butter Pecan	
Chocolate	
Strawberry	
Vanilla	

Third Grade

May 25

## CHILDREN IN FAMILIES

Name	Number
Jamie	
David	
Paul	
Gary	
Patty	
Donald	
Ann	
Steven	
Beverly	
Chris	

3rd Grade

May 28

## FAVORITE SUBJECTS

Subject	Number
Science	
Reading	
Social Studies	
Mathematics	
Spelling	
Language	
Music	

3rd Grade

May 28

The children should have many experiences consulting tables of contents and telephone books.

The class might help prepare a schedule of the day's activities and a table to show how much time is spent for each area of study.

## ACTIVITY 15.

The children and the teacher could bring train, bus and flight schedules. If an opaque projector is available, all could see a particular schedule simultaneously as a discussion is held. The children could take turns giving some information, asking a question, and calling on another to use the table to answer the question.

This same procedure could be followed using box scores and other tables from the newspaper sports page. A golf scorecard, with the owner's permission, would be interesting.

If the same table is in view of all the children, duplicated sheets might be passed out for the children to complete. Bulletin board space might be reserved for a collection of tables.

On some occasions the youngsters might help formulate the questions which can be written on the blackboard by the teacher.

The youngsters could be given the assignment of writing individual summaries concerning the tables, always striving to formulate deductions other than the obvious.

## ACTIVITY 16.

The children should be encouraged to seek out information from a reliable source or collect their own data and construct their own tables. Each should follow his own interests, but adhere to a prescribed form. There most certainly will be a wide variation in subject matter and degree of finesse depending upon the individuals represented. If the makers of the tables wish, the tables might be shared with the class. Each should write a summary of what can be deducted from his table. Constructive criticism and encouragement should be made whenever a child presents a table he has made. It is important that the interest is retained.

Reinforcement should take place throughout the school year. Emphasis should be placed on using tables of contents at every opportunity. Critical interpretation should be made of each table that appears in a textbook. Youngsters should be encouraged to bring to school any table which might be of interest to the class members. Discussion of the table should include a critical evaluation of the reliability of its source, its clarity and its usefulness.

## MORE TABLE ACTIVITIES

### Objectives

These activities have been planned:

1. to review the correct vocabulary.
2. to provide experiences in interpreting and using information from tables.
3. to provide experiences in completing tables from information which is provided.
4. to provide experiences in using tables in conjunction with various subject areas.
5. to provide experiences in writing summaries of the students' interpretation of completed tables.
6. to provide experiences in using tables related to travel and sports.

### Vocabulary

Source, m.p.h., rank, life span, average, maximum

### Materials

Duplicated sheets as suggested.

Train schedules

Flight schedules

Sports sheets

Bus schedules

Before discussing the following tables it would be necessary to clarify by review or definition the following terms which are pertinent to the lesson:

source . . . . .	book, statement, person, etc, supplying information
m.p.h. . . . .	.miles per hour
rank . . . . .	.to place in suitable order; arrange, classify, put in order
life span . . . . .	.the longest period over which the life of any plant, organism or species may extend, according to the available biological knowledge concerning it
average . . . . .	.usual
maximum . . . . .	.most

#### ACTIVITY 17.

The teacher could have several different tables duplicated for the children. The tables would be numbered. Another sheet could be given to each child on which the child would complete exercises pertaining to the table assigned him.

Examples of tables that would be suitable are included here.

TABLE A.

## SPEED OF ANIMALS IN THE AIR

Animal	Speed
Owl	40 m.p.h.
Housefly	5 m.p.h.
Blue jay	20 m.p.h.
Hummingbird	60 m.p.h.
Golden Eagle	120 m.p.h.
Duck Hawk	175 m.p.h.
Bat	15-20 m.p.h.
Robin	30 m.p.h.
Dragonfly	50 m.p.h.
Canvasback Duck	70 m.p.h.

TABLE B.

## SPEED OF ANIMALS ON LAND

Animal	Speed
Snake	2 m.p.h.
Man	20 m.p.h.
Greyhound	40 m.p.h.
African Elephant	25 m.p.h.
Gray Fox	40 m.p.h.
Ostrich	50 m.p.h.
Cheetah	65 m.p.h.
House Cat	30 m.p.h.
Gazelle	50 m.p.h.
Race Horse and Rider	45 m.p.h.



## ACTIVITY 18.

From information given to you in Table A complete these sentences.

1. What is the title of Table A?  
\_\_\_\_\_
2. In what year was this table prepared?  
\_\_\_\_\_
3. What is the source of this table?  
\_\_\_\_\_
4. What are the titles of the columns?  
\_\_\_\_\_ and \_\_\_\_\_
5. What animal listed is the fastest in the air?  
\_\_\_\_\_
6. What animal listed is the slowest in the air?  
\_\_\_\_\_
7. Which bird flies 12 times faster than the housefly?  
\_\_\_\_\_
8. Which bird flies 3 times faster than the owl?  
\_\_\_\_\_
9. How much faster does the duck hawk fly than does the golden eagle?  
\_\_\_\_\_
10. What animals are listed other than birds?  
\_\_\_\_\_

## ACTIVITY 19.

List or rank the animals from Table A in order, placing the slowest on the top line and the fastest at the bottom. Do the same for Table B. If two are the same, put one under the other using two spaces.

TABLE A

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_
9. \_\_\_\_\_
10. \_\_\_\_\_

TABLE B

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_
9. \_\_\_\_\_
10. \_\_\_\_\_

Were you surprised at the speeds listed for any animals? Which ones?

---

The speed of which animal surprised you most?

---

TABLE C.  
SPEED OF ANIMALS IN WATER

Animal	Speed
Goldfish	4 m.p.h.
Whale	20 m.p.h.
Sailfish	30 m.p.h.
Barracuda	30 m.p.h.
Pike	6 m.p.h.
Dolphin	25 m.p.h.
Man	5 m.p.h.
Trout	5 m.p.h.
Sea Turtle	20 m.p.h.

## ACTIVITY 20.

Rank animals from Table C in order, placing the fastest at the top.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_
9. \_\_\_\_\_

From information given to you in Table C, complete these sentences.

1. What is the title of Table C?  
\_\_\_\_\_
2. What are the titles of the columns?  
\_\_\_\_\_ and \_\_\_\_\_
3. In what year was this table prepared? \_\_\_\_\_
4. What is the source of this table?  
\_\_\_\_\_
5. M.p.h. means \_\_\_\_\_
6. Which animals listed are not fish?  
\_\_\_\_\_

TABLE D.  
AVERAGE LIFE SPAN  
MAMMALS

<u>Mammal</u>	<u>Years</u>
<u>Buffalo</u>	10
<u>Cat</u>	13-17
<u>Chimpanzee</u>	15-20
<u>Deer</u>	10
<u>Dog</u>	13
<u>Elephant</u>	60
<u>Goat</u>	10
<u>Grizzly Bear</u>	20
<u>Hippopotamus</u>	40
<u>Horse</u>	20-30
<u>Jaguar</u>	14
<u>Lion</u>	20-25
<u>Monkey</u>	15
<u>Mouse</u>	1 - 2
<u>Sheep</u>	10-15
<u>Squirrel</u>	9
<u>Tiger</u>	11
<u>Wolf</u>	12
<u>Zebra</u>	22

World Book

1967

Note: Figures used in this table are based on animals in captivity, because of the difficulty of determining the ages of wild animals.

TABLE E.  
 MAXIMUM LIFE SPAN  
 BIRDS

Bird	Years
Blue Jay	4
Canada Goose	32
Canary	24
Cardinal	22
Chickadee	7
Condor	52
Heron	24
Macaw	64
Ostrich (African)	50
Owl (Snowy)	24
Penguin (King)	26
Pigeon	35
Raven	69
Robin	12
Skylark	24
Sparrow	20
Starling	15

World Book

1967

Note: Figures used in this table are based on animals in captivity, because of the difficulty of determining the ages of wild animals.

## ACTIVITY 21.

Complete this sheet from information in Table D and Table E.

1. Which animal (bird or mammal) has the longest life span? \_\_\_\_\_
2. Is the animal with the shortest life span a mammal or a bird? \_\_\_\_\_ Which one? \_\_\_\_\_
3. Which animal has a life span closest to the age you are now? \_\_\_\_\_
4. Which animal has the second longest life span? \_\_\_\_\_ Is it a bird or mammal? \_\_\_\_\_
5. Which of all animals listed in Table D and Table E has the life span that surprised you the most? \_\_\_\_\_ Is it longer or shorter than you expected? \_\_\_\_\_
6. Do you feel that the source of these two tables is reliable? \_\_\_\_\_
7. How many columns does each table have? \_\_\_\_\_
8. Do these tables tell us that each and every monkey lives 15 years and each sparrow lives exactly 20 years? \_\_\_\_\_
9. Do average and maximum mean the same? \_\_\_\_\_

## PICTURE GRAPHS

### Objectives

These activities have been prepared in order:

1. to promote interest in picture graphs.
2. to provide experiences in reading pictographs.
3. to provide practice in selecting proper keys for pictographs.
4. to provide opportunities to help prepare pictographs.

### Vocabulary

Pictograph, key, symbols, value, source

### Materials

Teacher-made charts

Charts upon which children will paste pictures

Drawing paper (3" x 4") for each child

Duplicated sheets as specified

Teacher-made tables

Transparencies

Transparent paper to trace symbols for uniformity























### ACTIVITY 22


The teacher might present a large chart to the children and guide a discussion as to what it means. The



chart might be similar to the one illustrated here.

### ROOM 312 BIRTHDAYS

January									
February									
March									
April									
May									
June									
July									
August									
September									
October									
November									
December									

Key:  = 1 birthday
























Miss Morgan Sept.

The discussion should bring out that this chart might be called a picture graph and that we might change these two words to make one word, pictograph. The children should understand that a pictograph has a title, that the pictures tell us something (how many), and that a pictograph has a key to explain the pictures. The name of the one who made the chart and the date is written on the pictograph. Mention should be made of the months after which no pictures appear. The children should have the chance to reason why. The children should be asked if there are always more birthdays in December. Make a table of the children's mothers' birthdays, another of the fathers' birthdays. Use simple tables or pictographs on the board. Tables would show relationship of the tables to the pictographs. This would make clear to the children that the pictographs would change depending on groups represented. Teacher-prepared charts would prove this.

After this activity the teacher could present a partially completed chart (2' x 3') containing only the title, the names of the months, and the key. The children will complete the pictograph by first drawing a picture of himself to fill a paper (3" x 4"), cutting it out, and pasting it after his birthday month. This chart should be similar to this illustration.

The number represented by each symbol should be stressed as being the value of the key.

ROOM 312

January									
February									
March									
April									
May									
June									
July									
August									
September									
October									
November									
December									
















= 1 birthday


Room 312 Sept.

## ACTIVITY 23.

The children could be given duplicated sheets presenting several simple pictographs dealing with topics especially appealing to them. They should be given another sheet of blank tables. They would be asked to fill in the blanks with the information taken from the sheet of pictographs. This would give an opportunity to reinforce the previous work with tables. It would be wise to have the children bring in pictographs from different sources and interpret them for the class. The children should be asked to write a summary of what they can know by looking at one of the pictographs or tables. There will be a wide variation of maturity evidenced by the summaries. Some might just list the sizes and the corresponding numbers. Others might mention that three times as many wear size seven and 11 as size 12 or 13; and six times as many wear size nine as wear size 12 or 13. See table of boot sizes.

Samples of what the above mentioned duplicated sheets might contain follow:

FAVORITE TYPES OF BOOKS	CHILDREN ROOM 312								
Science									
Fairy Tales									
Poetry									
Travel									

























Key: 1 

= 5 books

Miss Morgan












Nov. 2

BOOT SIZES OF CHILDREN  
ROOM 312

13						
12						
11						
10						
9						
8						
7						
6						

Key: 1  = 1 child Room 312 Nov.

SWEATER SIZES OF BOYS  
ROOM 312

12				
10				
8				
6				

Key: 1  = 2 boys Room 312 Nov.

SUMMARY OF TABLE	

Make a table using the information from a pictograph on the other sheet. Write the title. Label the columns. Complete the rows. Because you made this table, write your name and date. Write a summary. Try to tell things others might not notice.

Look over the three pictographs.

1. Most children in Room 312 wear size \_\_\_\_\_ boots.
2. As many children wear size \_\_\_\_\_ as wear size seven.
3. Four children wear size eight and \_\_\_\_\_ children wear size ten.
4. \_\_\_\_\_ boys wear size ten sweaters.
5. Six boys wear size \_\_\_\_\_ sweaters.
6. There are \_\_\_\_\_ boys in Room 312 as shown on the pictograph.
7. Most children like \_\_\_\_\_ books.
8. \_\_\_\_\_ more children like science books than like poetry books.
9. \_\_\_\_\_ children like fairy tale books and travel books.
10. The type of book the children like the least is \_\_\_\_\_.
11. Each sweater stands for \_\_\_\_\_ boys.
12. Each boot picture stands for \_\_\_\_\_ boots but \_\_\_\_\_ child.
13. The value of each symbol on the book pictograph is \_\_\_\_\_ books.

## ACTIVITY 24.


















In other cases the children can help make tables from pictographs. The correct form should be adhered to in that the title, row headings, key, name, and date are included. The children can work as committees to collect the data. The teacher can record this information in tables on transparencies of the board. Sheets with lines for pictographs could be passed out.


Examples of tables and pictographs in this case follow:

FAVORITE TV NIGHTS  
OF CHILDREN IN 312

Night	Number
Sunday	4
Monday	2
Tuesday	4
Wednesday	4
Thursday	2
Friday	8
Saturday	10

FAVORITE TV NIGHTS  
OF CHILDREN IN ROOM 312

Sun.					
Mon.					
Tues.					
Wed.					
Thurs.					
Fri.					
Sat.					

Key: 1  = 2 Rm.312 Nov. 6

Room 312

Nov. 6



## OUR SUN'S PLANETS AND THEIR KNOWN MOONS

Planets	Moons
Mercury	0
Venus	0
Earth	1
Mars	2
Jupiter	12
Saturn	9
Uranus	5
Neptune	2
Pluto	0

World Book

1967

CARS OWNED BY FAMILIES  
OF CHILDREN IN ROOM 312

Make of Car	Number
Buick	2
Cadillac	0
Chevrolet	7
Ford	8
Mercury	2
Oldsmobile	2
Plymouth	3
Pontiac	2
Toyota	1
Volvo	1

Class in Room 312

Nov.

Questions guiding the children to careful observation should be asked. These questions might include some concerning the arrangement of the row headings and the choice of suitable symbols. Answers given by the children in response to questions should be followed by another question, "Why?". Again, upon the completion of this assignment, ask for summaries, written or oral.

#### ACTIVITY 25.

Picture graphs used with older children could deal with subject matter further removed from them. The vocabulary should be reinforced. The children should recall the points in making a good picture graph. It should be complete with a title, column of names (or dates), a key, simple symbols, a source, a date, and a starred note, if necessary. A good picture graph is neat and easy to read. A good picture graph is correct. Care should be stressed in the choice of symbols. The symbol chosen for a picture graph should be simple and representative of the information provided. Stress should be put on the importance of reliable source. There should be a great deal of practice in determining the number of symbols and parts of symbols necessary to denote data on pictographs.

The youngsters might bring in tables of special interest to plan the arrangement of a picture graph. Sources of tables are textbooks, newspapers, magazines,

encyclopedias. Data collected by the child himself would be most satisfactory. This last, of necessity, would be something close to the child.

Duplicated sheets of tables of special interest to the particular age group should be supplied. The youngsters could choose from the tables as many as the teacher assigns and design picture graphs. The class should review the criteria of a picture graph. After the discussion each child will construct the picture graphs of his choice. A few suggestions of tables to be presented follow:

#### MAXIMUM LIFE SPAN OF FISH

Fish	Years
Trout (Rainbow)	4
Pike	24
Perch	11
Sturgeon	50
Flounder	10

World Book

1967

**GAMES WON IN AMERICAN FOOTBALL LEAGUE**

<b>Team</b>	<b>Games Won</b>
Houston	9
New York	8
Buffalo	4
Miami	4
Boston	3
Oakland	13
Kansas City	9
San Diego	8
Denver	3
World Book	1968

**U.S. CONSUMER SPENDING ON FASHION  
GOODS IN BILLIONS OF DOLLARS**

<b>Year</b>	<b>Money</b>
1929	10
1934	5
1939	10
1944	15
1949	20
1954	25
1959	30
1967	40
World Book	1968

After the children had the opportunity to devise pictographs it would be wise to discuss the difficulties the youngsters might have encountered. It is recognized that not all the tables suggested would lend themselves to being made into pictographs. The class members might point out the difficulty of choosing a proper symbol to represent a year, a day, and large sums of money. The children will probably suggest the use of a drawing of a football to represent a football game. They could be led to agree that the dollar sign might represent five billion dollars. The necessity of using part of a symbol at times might be noted as a problem. The careful questioning will give the teacher a good insight into the maturity of the thinking of the individuals.

This might be a good time to discuss the advantages and limitations of pictographs. These statements should come from the children. They might suggest that pictographs are:

1. attractive
2. easy to read
3. easier to remember than data presented in table form.






The children should be led to recognize that pictographs:











1. necessitate the counting of symbols
2. present difficulties in depicting partial symbols
3. often require computation
4. cannot always be exact.

A pictograph requiring numerous symbols might be used to illustrate the necessity of counting the symbols. This could lead to the introduction of the bar graph and its utility in comparison without the necessity of counting symbols.

After the above discussion a natural outcome would be to suggest and evaluate data that could best be presented in the table form, and that best presented in the pictograph form. The data could be taken from textbooks, encyclopedias, newspapers, or magazines. Certainly the most worthwhile source, from the standpoint of what the children will derive from the experience, is the actual collection of data first-hand.

Some suggestions of topics for which the children might conduct their own research, record and make pictographs are suitable for the younger children first. They are:

1.  the days of the week matched with milk cartons sold.
2.  the bedtimes matched with the number in class at each time.
3.  the months matched with the number of birthdays in class each month.
4.  the class members matched with the number of children in each family.
5.  the shoe sizes matched with the number in class with each size.

6.  the songs learned in school matched with the number favoring each song.
7.  the days of the week matched with the number favoring each day.
8.  certain television shows matched with the number favoring each show.
9.  certain library books matched with the number who have read each.
10.  the color of eyes matched with the number in class who have each color.
11.  the color of hair matched with the number in class who have each color.
12. *name* popular first names matched with the number having these in several grades or the whole school.
13.  the makes of cars matched with the number of parents owning them.
14.  the professional sports matched with the number in class favoring watching each.
15.  ten popular songs matched with the number in class favoring each.
16.  the days of the school week matched with the number of cars passing the school during the same half hour each day.
17. any science activity that can be recorded in this manner.

Pictographs that might be made from data available in texts, the almanac, newspapers, magazines or encyclopedia are:

1. of the average number of young of various kinds of animals.
2. of the rainfall in various cities in one certain month.
3. of the rainfall in one city over a period of a year.
4. of the representatives from the states in one area of the United States.
5. of the lifetime home runs of the top major league ball players.
6. of the yield records of some crops in one state.
7. of the census of several cities in one year.
8. of the census of one city over several decades.
9. of the costs to our country of forest fires over several years.
10. of the number of national parks over a half century.
11. of the growth of air travel over a quarter century.
12. of the yield of one crop in several states.
13. of the census of public grade schools in one city over several years.
14. of the census of public grade schools in several cities in one year.



## BAR GRAPHS

Objectives:

These activities were prepared:

1. to provide experiences in locating a point on a plane by using two number lines.
2. to establish the concept of a lattice or grid, which is made up of number lines at right angles.
3. to establish the concept that graphs present a collection of facts in an organized and concise manner.
4. to establish the concept that graphs present a visual interpretation of numerical relationships.
5. to urge creativity.
6. to urge neatness.
7. to provide experiences matching number on horizontal number line to word on vertical line.
8. to provide experiences matching name on horizontal line and number on vertical line.

Materials:

A seating chart of the room on duplicated sheets or on overhead projector transparency.

Numbered rows and columns.

A similar arrangement of a map of ordered streets and avenues.

Simple grids on dittoed sheets.

Duplicated sheets of the same data contained in three forms: table, pictograph and bar graph to provide practice in reading the three different methods of presentation of information.

Vocabulary:

Grids, bars, grid lines, horizontal, vertical, axis, axes.

ACTIVITY 26.

It would be worthwhile to review activities such as mentioned in the Readiness Activities dealing with locating a point on a plane by the use of two numbers, one on a horizontal number line; the other on a vertical number line at a right angle to the first.

One such activity would be to locate and identify a child sitting in a particular seat. A transparency of the seating arrangement shown on the screen would be visible as the teacher named an ordered pair. The first number would designate the column, and the second the row of the desk being identified. Pairs of children take turns doing the same. Stress care in using "column" and "row" correctly.

The same activity could be used with streets and avenues.

## ACTIVITY 27.

The children could place cardboard squares in rows beside labels on a bulletin board. Match the bulletin board arrangement by coloring squares on graph paper. The graphs could represent children who walk to school, children who ride the bus, children who come by car, and children who ride bikes, etc. A summary should follow. The teacher would guide this discussion through questions.

Simple bar graphs should be presented on opaque projector, overhead projector or blackboard. The children should be asked to note the number line across the bottom and told that this is the horizontal axis. They should be asked for suggestions as to what association they might make to help them remember this new word. Someone will most likely point out the similarity to the word "horizon" and to the direction in which it lies. They should note that the horizontal bars run from left to right. Attention should be called to the first numeral on the horizontal axis, zero, just as on the ruler (although not labeled). The children should be asked why there are lines running up from the numerals on the horizontal axis. They should be told that these vertical lines are called grid lines. Note should be made of the graph's title, its source, and date. The horizontal axis title and the vertical axis title should be pointed out as each graph is presented.

## ACTIVITY 28.

Various simple bar graph transparencies should be shown on overhead screen and discussions held. The same data shown on a pictograph transparency would be worthwhile. The children should be encouraged to make comparisons between the two. The children could work as a group to translate data from a bar graph and pictograph to a table. This could be a class or group activity with the teacher or a student acting as recorder. The teacher should use correct graph vocabulary and encourage the children to do so.

## ACTIVITY 29.

Duplicated sheets of same data shown by a table, a pictograph, and a bar graph could be passed out to the children. Part of the data should be missing from each form but present on one of the others. The children would fill in the missing data. The material and difficulty could depend upon the class. This could be a class, group or individual activity.

An example of a sheet of this type is:



FOOTBALL GAMES WON  
IN AMERICAN LEAGUE 1967

Team	Number
Houston	
New York	8
Buffalo	
Miami	4
Boston	3
<del>Oklahoma City</del>	
Kansas City	9
San Diego	8
Denver	

World Book

1968

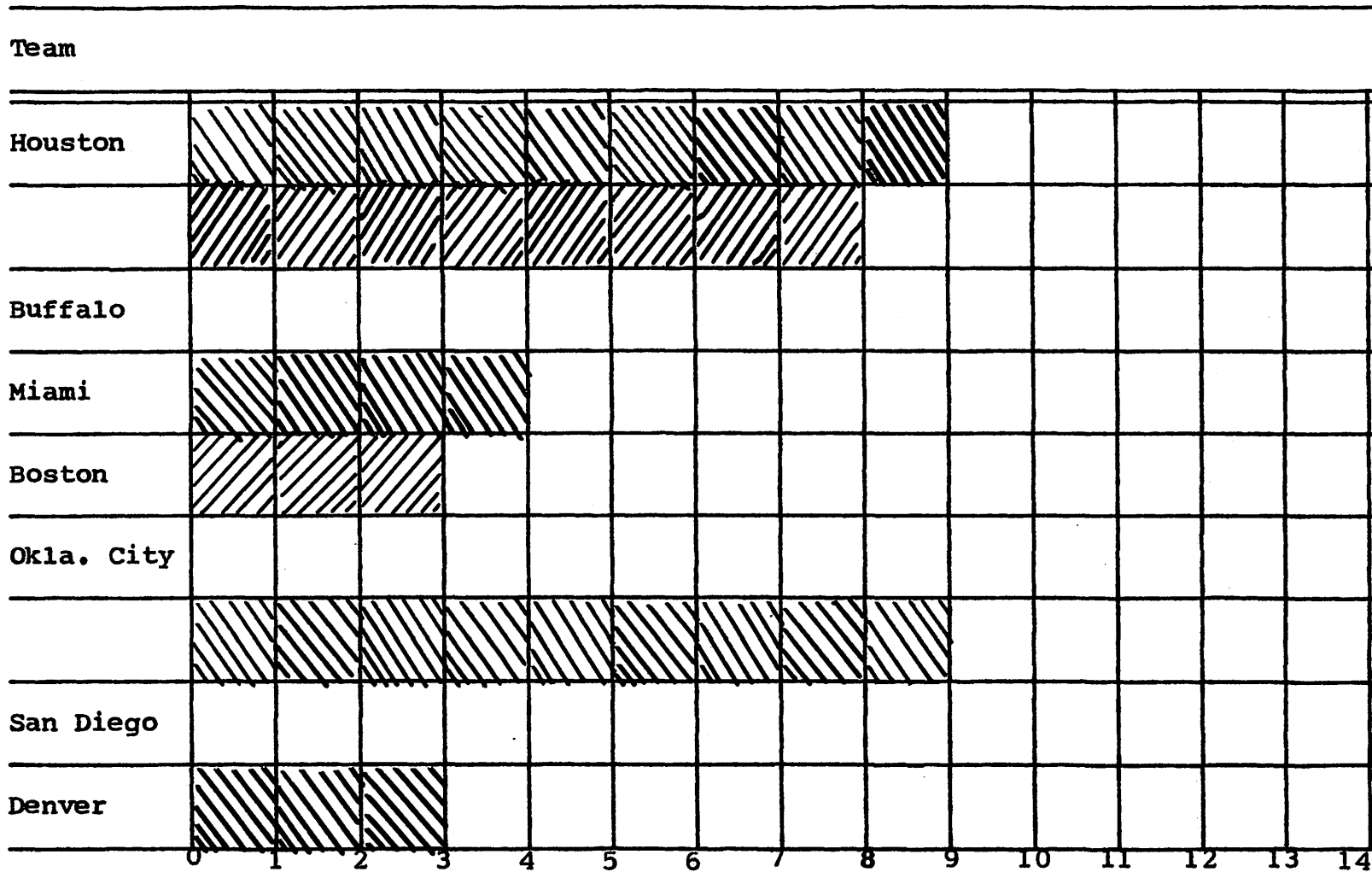
FOOTBALL GAMES WON IN AMERICAN LEAGUE 1967

Team	Games Won
Houston	
New York	
Buffalo	
Boston	
	
Kansas City	
San Diego	

Key: 

= 1 game

FOOTBALL GAMES IN AMERICAN LEAGUE 1967



Several horizontal bar graphs should be analyzed. Careful note should be made of the numeration of the horizontal axis. Observations of this numeration should be made and mentioned by the class members. Practice in reading the bar values should be given. Directions similar to the following should be given:

1. Follow the bar from left to right, stopping at the end of the bar.
2. If the bar ends on a grid line, follow the grid line down to the point where it meets the horizontal axis.
3. The axis numeral at the bottom of the grid line gives the value of the bar.
4. If the bar ends between the grid lines, find the point on the axis that is just below the end of the bar. Study the numerals on both sides of the point. Use the numerals to help you estimate the number value for the bar.

The teacher should ask if anyone can explain why a bar graph would be likely to be more accurate than a picture graph. To evaluate the worth of tables and bar graphs the following activity might be used.

#### ACTIVITY 30

The teacher might use an overhead transparency of

several tables and ask the children questions to be answered from this data. The subject matter and degree of difficulty would depend upon the class. Then she might use an overhead transparency of several bar graphs and repeat the procedure. She should let the children observe and relate that the answers are more obvious and that they can answer more quickly when using the bar graphs. They will realize that the ease of comparing data is what makes graphs so useful. The discussion could point out that if the numerical values associated with the data must be exact, the table form should be used. However, if comparison is important, the bar graph is more effective.

Several horizontal bar graphs should be analyzed. Practice in reading bars that end between grid lines should be given. The children should have practice in planning and numbering points on horizontal axes to accommodate data presented. These tables would be taken from reliable sources. Tables presenting a variation in numeration problems should be used. These could be of different degrees of difficulty. The children should be reminded to include the 0 at the point where the first grid line meets the horizontal axis. Accuracy and neatness should be stressed. A horizontal axis title should be given for each situation. The various topics presented in the tables might provide some children with new interests which might lead to



further study on their own. This new interest might help determine the tables a particular child might choose to bring to class. These tables could be selected from textbooks, newspapers, magazines and from data collected by the children.

Transparencies could be available and a few class members could take turns presenting and explaining horizontal axes they prepared.

After this practice the class members could have experiences in preparing complete horizontal bar graphs depicting data from a variety of subjects depending on the abilities and interests of the children.

In the construction of bar graphs these points should be stressed:

1. The graph should have a title, the source, and the date.
2. The horizontal axis is used as a ruler to measure the horizontal bars.
3. The first point on the left end of the horizontal axis is "0." This is the point where the first vertical grid line meets the horizontal axis.
4. Vertical grid lines spaced evenly meet the horizontal axis and the numerals are placed at these points.
5. A label should be placed below the numerals on the horizontal axis. This is the horizontal axis title.

6. The points on the horizontal axis are numbered allowing room for the largest number which must be represented. The points are numbered consecutively. The interval value must be the same across the axis.
7. The vertical axis must have a title.
8. All work should be carefully done.

After the children feel confident in constructing horizontal bar graphs the same procedure can be followed in dealing with vertical bar graphs. An effective lead into this might be for the teacher to ask a few children who understand to make transparencies of vertical bar graphs of the same data they used for their horizontal bar graphs. These could be shown to the class and they will note the relationship.

#### ACTIVITY 31.

The teacher would cut strips of paper to scale to represent the heights of the individuals in the class. These strips could be passed out to the children and as each name is called the child will bring his to the bulletin board to be pinned beside a label of his name. The class could discuss the length of each strip in comparison to the one before and the one after. They should judge if what is true of the strips is true of the same children's heights. The point should be noted that each child's height is the same whether

he is standing or lying down. A child could demonstrate this. Thus the association between horizontal and vertical bar graphs can be made. This could be done with children who could each measure his own actual height on adding machine paper. These strips could be fastened to the wall in graph form with masking tape.

#### ACTIVITY 32.

Use the table included here to round out the circulation numbers to the nearest million. Construct a horizontal bar graph. Be as accurate as possible in doing this. Remember your bar graph won't be as accurate as the table but will be a quick, convenient and useful method for comparison between the different magazines.

It might be interesting to use one color bar for the monthly magazines, another for the biweekly magazines, and still another color bar for the weekly magazines. Be accurate, be neat. Use labels.

If you had not been told to make a horizontal bar graph, would you have chosen this type of graph?

List several reasons why you would have chosen this type of graph:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_

## LEADING MAGAZINES OF UNITED STATES

Name	Publication Period	Circulation
Readers' Digest	Monthly	15,213,233
T. V. Guide	Weekly	9,359,148
McCall's	Monthly	8,347,957
Look	Biweekly	7,562,241
Life	Weekly	7,299,470
Family Circle	Monthly	7,085,897
Saturday Evening Post	Biweekly	6,620,622
Ladies' Home Journal	Monthly	6,598,536
Woman's Day	Monthly	6,506,577
Better Homes & Gardens	Monthly	6,334,666
Good Housekeeping	Monthly	5,122,726
National Geographic Magazine	Monthly	3,973,913
Redbook	Monthly	3,849,021
American Home	Monthly	3,383,701
Farm Journal	Monthly	3,059,104
Time	Weekly	3,057,415
American Legion Magazine	Monthly	2,527,710
True	Monthly	2,400,338
Playboy	Monthly	2,297,723
Boy's Life	Monthly	2,286,671
True Story Magazine	Monthly	2,267,589
Parents' Mag. & Better Homemaking	Monthly	1,960,262
Photoplay	Monthly	1,757,355
Newsweek	Weekly	1,683,735
Senior Scholastic	Weekly	1,396,660

## ACTIVITY 33.

Make a bar graph using the information given in this table.

## THE WORLD'S TALLEST SKYSCRAPERS

Name of Building	City	Stories
Empire State	New York	102
Marina City	Chicago	60
First National Bank	Dallas	52
Chanin	Chicago	56
Irving Trust Company	New York	50
Terminal Tower	Cleveland	52
First National City Trust	New York	57
Chase National Bank	New York	60
R C A	New York	70
Chrysler	New York	77
Woolworth	New York	54
Lincoln	New York	55
500 Fifth Avenue	New York	60
Metropolitan Life	New York	50
60 Wall Tower	New York	66
General Electric	New York	50

World Book Encyclopedia

1967

1. Did you choose to make a vertical or horizontal bar graph? \_\_\_\_\_
2. Why did you choose to make the type you did make?  
\_\_\_\_\_
3. In which city are most of the buildings mentioned?  
\_\_\_\_\_
4. Why do you think so many are in this one city?  
\_\_\_\_\_

5. This table was constructed in \_\_\_\_\_.

Find any information you can as to whether there are any newer buildings which are taller than any of these. Be sure to note the source of your information. \_\_\_\_\_

---

6. Do some research on at least one of these buildings. Bring some facts and the source to class.

## ACTIVITY 34.

Arrange the data contained in the following table in a horizontal bar graph. Arrange the names of the stadiums from top to bottom along the vertical axis in alphabetical order according to the cities in which they are located, although the name of the city need not be included. Decide on the best way to number the horizontal axis. Label the horizontal axis so that the number each numeral below a grid line represents is understood. Should your numeral on the horizontal axis stand for the number of seats in 500's, 1,000's, 5,000's, or 10,000's? Include a footnote to explain the \* you will place beside the name of a stadium where necessary.

After you have completed your graph, checked to see that you have included the necessary items, and have checked for accuracy, go on with one of the following activities.

1. Find out what you can about the first stadiums built in other parts of the world. Where were they built? How were they built? How large were they? How were they used?

2. Find out what you can about the newer stadiums that have been built. There are some newer than those listed in the table. What are some of the newest innovations? What is the source of your information?

## 25 OF THE LARGEST STADIUMS IN THE U.S.

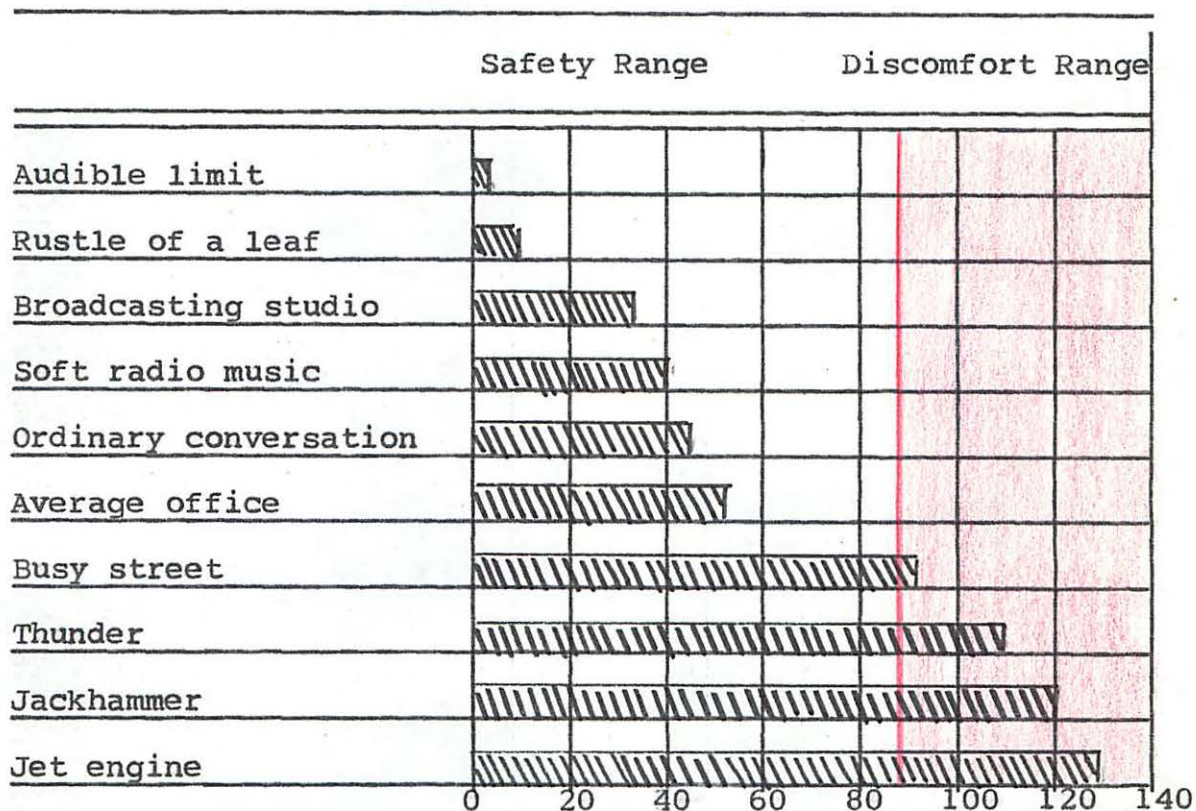
Name and Location	Seating Capacity
*Memorial Coliseum, Los Angeles	104,573
Univ. of Michigan Stadium, Ann Arbor	101,100
*Rose Bowl, Pasadena, California	100,423
*Soldier Field, Chicago	100,000
John F. Kennedy Stadium, Philadelphia	98,604
Stanford University, Palo Alto, California	89,000
*Ohio (State University) Stadium, Columbus	81,000
Tulane Stadium, New Orleans, La.	80,895
Municipal Stadium, Cleveland	78,516
*Camp Randall Stadium, Madison, Wis.	77,248
Calif. (Univ. of) Memorial Stadium, Berkeley	76,780
Spartan Stadium (Mich. S.U.) East Lansing	76,000
Cotton Bowl Stadium, Dallas	75,504
*Orange Bowl Stadium, Miami	72,880
*Rice Stadium, Houston	72,000
Illinois Memorial Stadium, Champaign	71,119
Yale (University) Bowl, New Haven, Conn.	71,000
Louisiana State Univ. Stadium, Baton Rouge	67,500
Yankee Stadium, New York City	67,000
*Texas Memorial Stadium, Austin	65,810
*Franklin Field, Philadelphia	64,767
*Univ. of Minn. Stadium, Minneapolis	63,555
Owen Field (Univ. of Okla.), Norman	61,826
*Pitt Stadium (Univ. of Pitt.) Pittsburgh	60,331
*Univ. of Iowa Stadium, Iowa City	60,300

\* Includes temporary bleacher seats



## ACTIVITY 35.

## LEVELS OF COMMON NOISES



World Book

1970

Consult this graph. Estimate the numerical value in decibels of each bar. Prepare a table of this data. Be able to explain how you determined the numerical values.

Find out more about decibels. What is the decibel count of rock music when played in a room using an amplifying system? Try to find out. Add it to your table. Put a star and footnote explaining the addition.

## LINE GRAPHS

Objectives

These activities have been planned:

1. to point out to the children the usefulness of line graphs.
2. to help the children learn to read and interpret line graphs.
3. to teach the children the correct way to construct a line graph.

Vocabulary

Line graph, curve, trend, multi-line

Materials

Transparencies of simple bar graphs

Transparencies of grids

Transparencies of tables containing data which is of interest to children of the particular age group

## ACTIVITY 36.

A transparency of a simple vertical graph could be shown to the class; and a discussion held which would serve as a review of the study of vertical bar graphs. Attention could be called to the title, the subtitle, the vertical axis title, the horizontal axis title, the source of the data,

and the date the graph was made. A vertical bar graph which shows a definite upward or downward trend would be preferable. The children could observe the teacher or the child, chosen to demonstrate at the overhead projector, place a small x on the center top of each bar. These points, marked with the x's, should be joined with a ruler until all the bars are connected. The children will note that the line leads their eyes from the top of one bar to the next. The children should be told that the pattern the lines form is called the curve.

A transparency with both horizontal and vertical grid lines should be shown. The parts needed to complete a line graph showing the same data as the first bar graph could be dictated to the teacher or child who was at the overhead projector. Points would be plotted and the points joined as directed by volunteers from the class. The trend shown by the line, or curve, should be mentioned.

As a follow-up lesson some in the class could find a vertical bar graph in a book, magazine, or newspaper and construct a line graph from the data obtained from it. Others in the class can construct vertical bar graphs from line graphs they have obtained from a reliable source. It would add interest if the children strived to find data that would prove the most interesting or revealing to the class. Good discussions could take place after some children present the line graphs they had found and brought in. As the trends are

noted the reasons for the trends could be discussed. Predictions could be made as to what the outcome in each case might be if additional data were obtained. Discussion of data brought in might spark an interest in a subject for some child in which he will do further reading.

Each child could cut the size grid he would need from graph paper and mount it on plain paper. This would give him straight grid lines and also a plain background to make labeling easier.

#### ACTIVITY 37.

The next activity would be for the children to find tables containing information in which they were interested and to organize this so that the construction of a line graph could be made. Numerical amounts that have changed over a number of years would adapt to use constructing a line graph. The data they use might also be taken from the text of an article in which they had an interest. The subject they choose for this should be one in which they have an interest so that they retain information rather than just the mechanics of constructing a line graph. They are learning to construct graphs to use as tools not as an end in itself. Children today have interest in various topics. The exposure to varied subjects is greater because of today's communications. A review of rounding numbers should take place before

the children are asked to plot points. They should be reminded of certain criteria for the formation of effective line graphs.

1. The vertical and horizontal axes should be about the same length.

2. The horizontal axis should be divided to accommodate the years or other divisions of time needed. Vertical grid lines meet this axis to do this.

3. The vertical axis should be divided into segments by the horizontal grid lines to accommodate the smallest number and the largest. The point where the axes meet should be marked "0."

4. The title should designate what the graph is about. There should be a subtitle for further explanation if necessary.

5. The vertical axis should be labeled. In dealing with large numbers the label for this axis might be thousands or millions as the case may be.

6. The source and date should be included.

7. In case of multi-line graphs a key must be provided.

8. Care must be used in plotting points which fall between grid lines.

9. Accuracy and neatness must be stressed.

An example of a line graph assignment follows:

## ACTIVITY 38.

## BOWLING LANES IN U. S.

Year	Exact Number	Rounded Number
1965	159,079	
1960	107,908	
1955	58,203	
1950	52,488	
1945	38,023	
1940	26,382	
1935	11,473	10,000

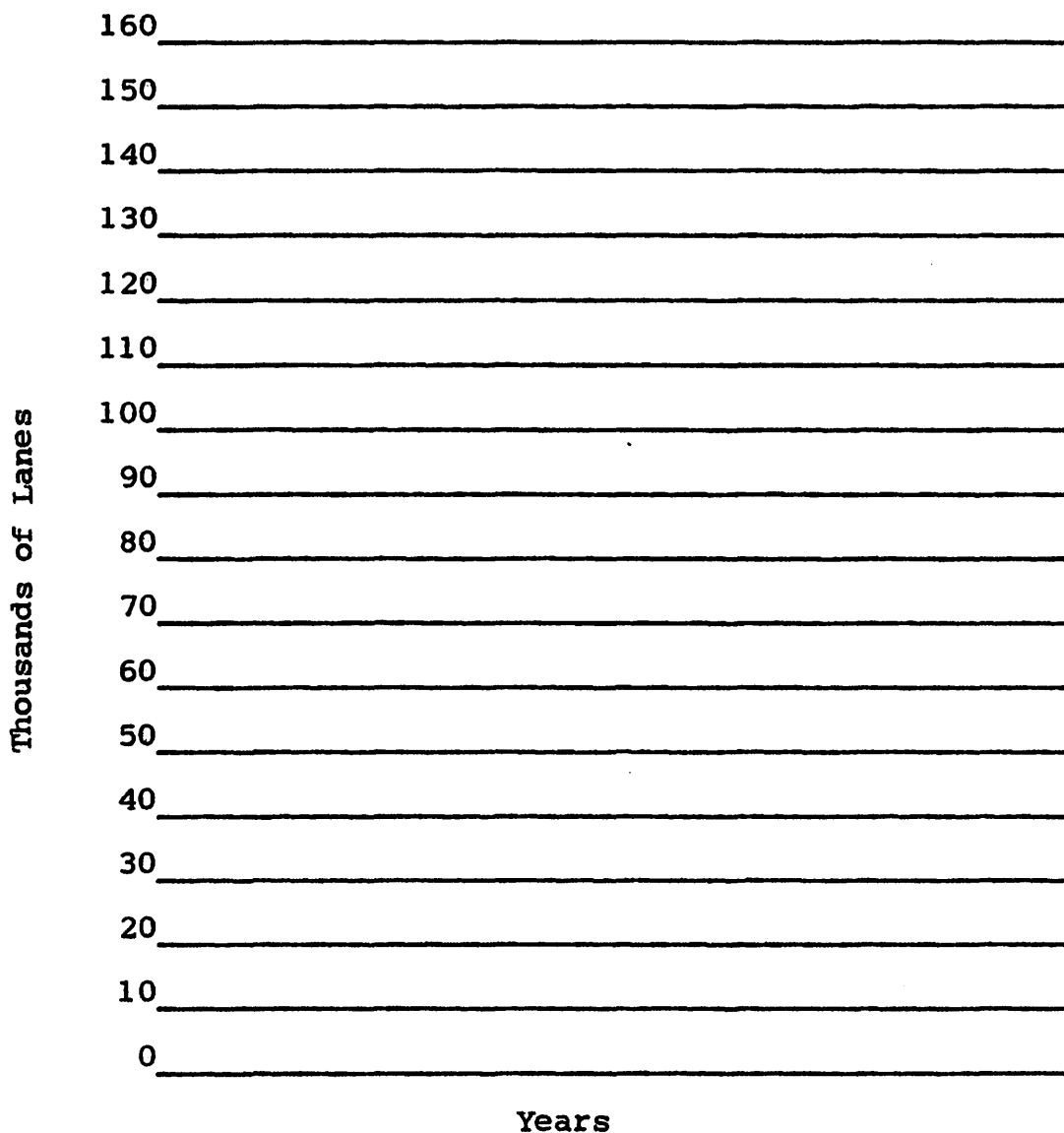
U.S. Bureau of the Census

1968

Round each year's number of lanes to the closest 10,000. Complete the table.

## ACTIVITY 39.

## BOWLING LANES IN U.S.



Bureau of Census

1968

Plan the number of vertical grid lines necessary to meet the horizontal axis in order to provide the spacing of

years to be presented. Label the vertical grid lines at the horizontal axis. Plot the points representing the number of bowling lanes for each year. Draw the graph's curve.

#### ACTIVITY 39.

Study the following table. Construct a multi-line graph. Arrange the spacecraft names along the vertical axis in the order they appear in the table. They appear in chronological order in the table. Number the horizontal axis to accommodate the times of flight. Round the flight times to the nearest hour. Intervals of 24 hours between grid lines might work well. Use your own plan for this if you have another. It might be better. Color the curve illustrating the Russian flights red and the curve illustrating the American flights blue.

When you are satisfied that you have done your best work continue with the next activity. Use encyclopedias or space books available to you and complete the other column of the table. Complete the table to the best of your ability. You might have difficulty finding some of the information. If you are successful in completing the table you might make a multi-line graph showing the curves of the number of orbits. The Russian curve could be red. The United States curve in blue. The astronaut and cosmonaut names could be along the vertical axis; or the dates could be along the vertical axis and the number of orbits on the horizontal axis.



## MANNED SPACE FLIGHT

Year	Astronaut or Cosmonaut	Spacecraft	Country	No. of Rev.	Time of Flight
1961	Gagarin	Vostok I	Russia	1	1 hr. 48 min.
	Titov	Vostok II	Russia	17	25 hr. 11 min.
1962	Glenn	Friendship 7	U.S.A.	3	4 hr. 55 min.
	Carpenter	Aurora 7	U.S.A.	3	4 hr. 56 min.
	Nikolayev	Vostok III	Russia	64	94 hr. 25 min.
		Vostok IV	Russia	48	70 hr. 57 min.
		Sigma 7	U.S.A.	6	9 hr. 13 min.
1963		Faith 7	U.S.A.	22	34 hr. 20 min.
		Vostok V	Russia	81	119 hr. 6 min.
		Vostok VI	Russia	48	70 hr. 50 min.
1964		Voskhod I	Russia	16	24 hr. 17 min.
1965		Voskhod II	Russia	17	26 hr. 2 min.
		Molly Brown	U.S.A.	3	4 hr. 53 min.
		Gemini 4	U.S.A.	62	97 hr. 56 min.
		Gemini 5	U.S.A.	120	190 hr. 56 min.
		Gemini 7	U.S.A.	206	330 hr. 35 min.
		Gemini 6	U.S.A.	15	25 hr. 31 min.
1966		Gemini 8	U.S.A.	6½	10 hr. 42 min.
		Gemini 9	U.S.A.	44	72 hr. 21 min.
		Gemini 10	U.S.A.	42	70 hr. 47 min.
		Gemini 11	U.S.A.	44	71 hr. 17 min.

## ACTIVITY 40.

Each child could be given a large sheet of graph paper. He would be asked to plot the square of each consecutive counting number; and connect the points. This graph paper could be mounted on a larger plain paper so labels could be inserted correctly. The child's name could be listed as the source and the current date filled in.

This could be done again cubing the counting number each time. The graphs could be compared. Some children could plot both sets of numbers and use different colors or type of line in order to have a multi-line graph.

The children will conclude that line graphs are useful in that they show changes, trends and growth patterns. They are effective with many items; and easy to plot once constructed. The effectiveness of the multiple line graph will become apparent as it is used.

## AREA GRAPHS

Objectives:

These activities have been planned:

1. to illustrate the worth of area graphs.
2. to provide practice in reading area graphs.
3. to teach the children the correct method of constructing area graphs.
4. to provide the children with practice in constructing these graphs.
5. to help the children see which data they find in tables or in their own research would best be represented by this type of graph.

Vocabulary:

Area, parts, portions, whole, rectangle, circle, elements.

Materials:

Transparencies

Prepared sheets of printed material for each child - circles drawn, portions marked for labeling, questions to be answered, etc. - similar tables for each child.

Tables available for children's use of information which would lend itself to being depicted on circle or area graphs. These could be available but still in such a way the children must cull out those most adaptable for this type of graphic presentation.

To begin the discussion of area graphs the teacher might discuss with the class how a picture graph uses pictures to show number values, lines to represent number values in line graphs, and bars to denote number values in bar graphs. The area of a flat object indicates or measures the total or whole surface of the object. Thus the parts of the whole can be observed in relation to the whole and in relation to each other. The part of the whole represents number values. The whole can be expressed by a circle or pie shape or by a rectangular shape. The use of the circle shape in area graph study would seem more suitable for younger children as they would recognize the circle as a complete unit more readily than a rectangular shape which could be longer or shorter and still be rectangular.

Discussion at first could center on a simple discussion of day and night - dividing our twenty-four hour day. Depending upon the maturity of the group the subjects could range from how the total hours of the day are spent, how each would spend one dollar on a shopping tour, the part of the class who had dogs, cats, other pets or no pets, to the make-up of the earth's crust, elements of the human body, or the make-up of the earth's atmosphere. Hopefully each child in each grade in which this work is introduced will find a subject that interests him, suits him and is adaptable to be represented by a circle or area graph. The most capable and interested children will gather their

own statistics. The reliability of the sources and the accuracy of the child's research should be stressed.

The fact that the circle could represent a whole day, a man's lifetime, a whole dollar, a whole year, a whole month, a whole week, the whole class, the whole school, all the cars manufactured in one month, all the books belonging in the library, population of the United States, etc. should be stressed.

The advantages and disadvantages of circle graphs will become apparent as work progresses - depending on the maturity of the group. The class will see that a circle graph shows parts of a whole, shows fractions, percentages and comparisons can readily be seen. It is also true that labeling of integral parts depends upon the size of the parts. More than six or seven parts cause the graph to be less effective. Trends can not be shown and the difficulty of construction will make the circle graph less helpful.

## ACTIVITY 41.

## HOW A CHILD'S DAY IS SPENT

Activity	Hours
Sleeping	11 (Blue)
In School	6 (Red)
Play - Free time	3 (Green)
Meals	2 (Yellow)
Preparation - bed, meals, school	2 (Orange)

John

September

Use colors given in table and do the following:

Draw a line around the hours used for sleep. Fill in with small lines.

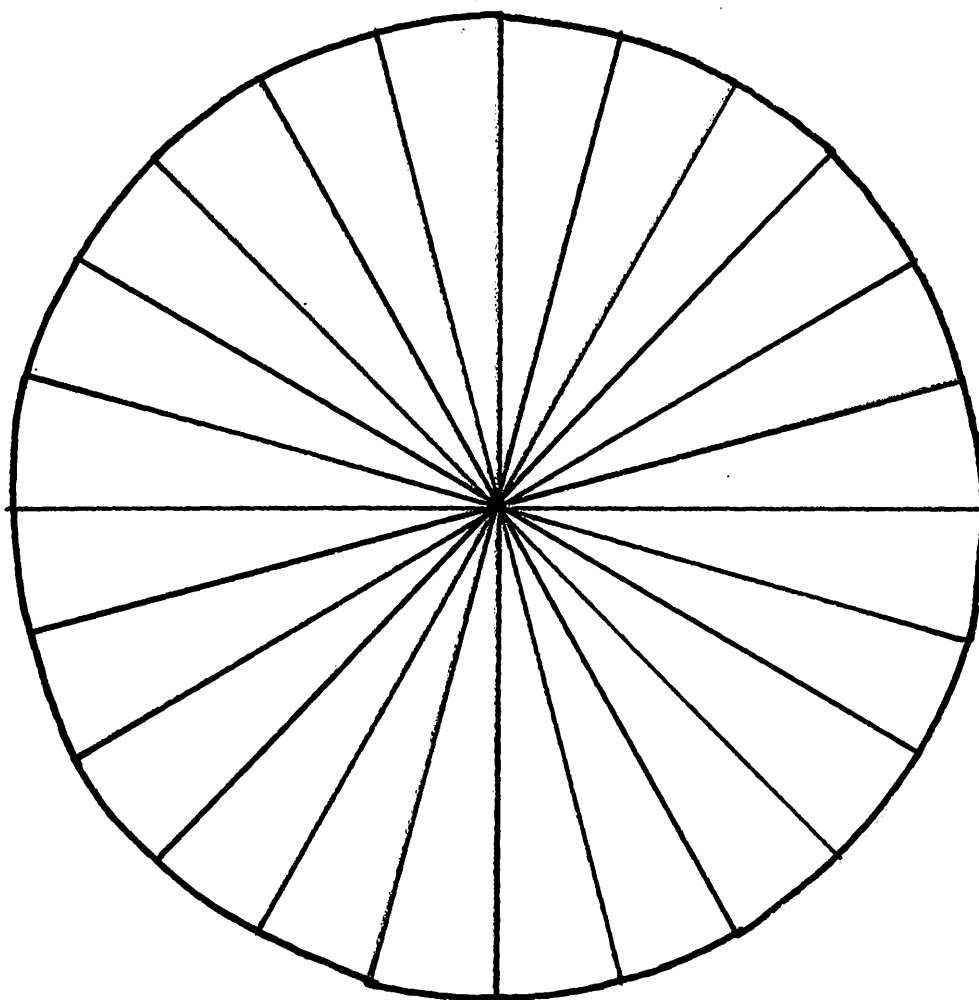
Draw a line around the hours used for school. Fill in with small dots.

Draw a line around the hours used for play. Fill in with larger lines.

Draw a line around the hours used for meals. Fill in with larger circles.

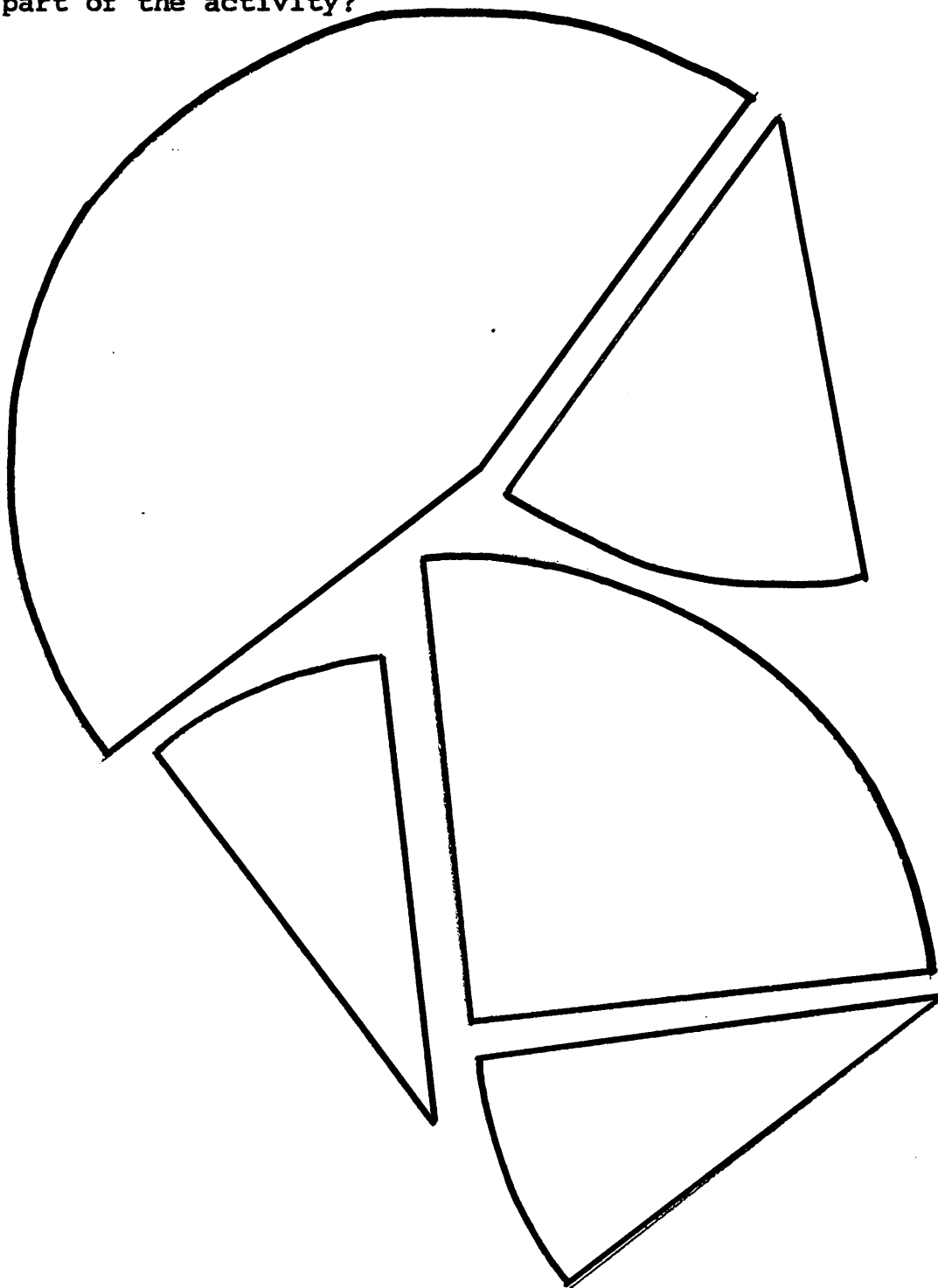
Draw a line around the hours used for preparation. Fill in with triangles.

## ACTIVITY 42.



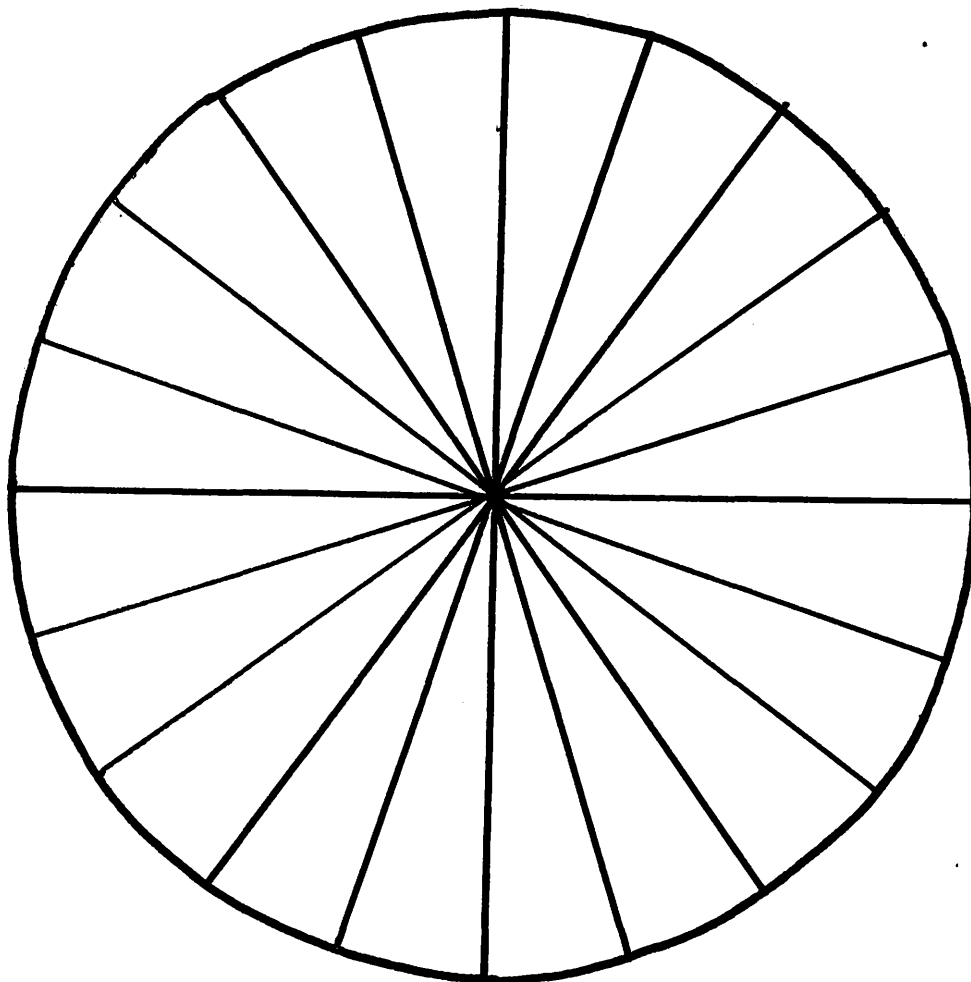
Do as you are asked to do in the directions given to you on the first sheet of this activity.

Cut out these portions of a circle representing blocks of time discussed earlier in this activity. Color corresponding sections as table directs. Paste portions to form a circle. Does it match the circle in the other part of the activity?





## ACTIVITY 43.



DOLLAR SPENT ON SHOPPING TRIP	
Expenses:	Cost in Cents
Lunch	60
Balloon	10
Coke	5
Marbles	25

Outline part spent for coke in brown, lunch in red, balloon in green, and marbles in blue.

## ACTIVITY 44.

Each child might choose an important person whose life history is recorded; and construct a circle graph depicting the portion of his life devoted to each phase of his life. Each child will do his own research. A bulletin board of these graphs would make an interesting and informative display.

## ACTIVITY 45.

Each child might choose a particular state or country in which he is interested and construct circle graphs representing the percentages of ages making up its population, its important products, the make-up of its import or export market, and any other information which would lend itself in being represented this way.

## ACTIVITY 46.

Each child might be assigned the task of finding information about some geographical phase of the country or world and constructing an accurate circle graph.

## ACTIVITY 47.

Each child might be asked to choose a table of information of a new scientific development and prepare a circle graph, checking for accuracy of source and construction.

## ACTIVITY 48.

The children might be asked to prepare what they felt would be a sensible family budget, prepare a graph; then get more reliable data, prepare a graph and compare the two graphs.

## ACTIVITY 49.

The children might be assigned the task of obtaining data and preparing a circle graph which would dramatically call attention to some phase of the pollution problem today.

## CHAPTER IV

Elementary school pupils are exposed to tables and graphs both in and out of school. Newspapers, magazines, television and other media are relying more and more on tables and graphs to present information. Standardized achievement tests confront children with questions based on the ability to understand these skills. The skills required in reading and understanding graphic materials are neither taught sequentially nor completely through the elementary schools. Several elementary mathematics textbook series have introduced lessons in graphic skills in recent years but the scope of these programs and the grade placement of the topics vary greatly.

It is important for teachers to provide the background necessary and to present developmental material applicable to his grade. It was the purpose of this paper to develop sets of experiences from which the teacher would choose and use these activities as presented or adapt them as he saw fit.

Sections on tables, picture graphs, bar graphs, line graphs and area graphs were set up. The activities vary from the simple to the more complex. Teachers of grades one through six may use the material as the activities are arranged for all pupils of the elementary school. The projects were prepared to be used with an entire class,

smaller groups or individuals. Suggestions to the teachers were made to allow for the provision of individual needs. Special effort was made to include tables with information which is current and of interest to children.

It is hoped that the preparation of these materials may prove beneficial to an elementary school teacher who realizes the need of teaching these skills to children.

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