

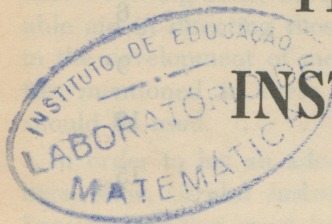
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✓ Working With Numbers Teaching Aids  
FOR THE SECOND GRADE

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TEACHER'S  
INSTRUCTIONS



By

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## INTRODUCTION

The activities outlined in *Teacher's Instructions* are designed to help the teacher in the use of the materials in *Working With Numbers Teaching Aids, Second Grade*. The directions provide invaluable aid in directing those experiences of children which will result in the development of meaningful concepts of numbers. The activities mentioned in these instructions and many other similar ones should be used.

In order to lay an adequate foundation for later work with numbers, slow, careful instructions in the early grades are necessary. Special attention must be given to the development of meaningful concepts, to the building of an understanding of the number system, and to the development of a knowledge of the number facts and number processes.

Instructions for using the fraction cards, counting-by-2's cards, the 200-chart, and all of the other Teaching Aids for the second grade are in *Teacher's Instructions*. These aids make possible many opportunities for children to develop basic number concepts. With these materials they can demonstrate their understandings of these concepts.

Varied directed experiences in the use of Teaching Aids are necessary if adequate meanings are developed. Careful guidance and supervision by the teacher are of utmost importance.

## FRACTION CARDS

Before children enter the first grade at school, they have had many opportunities to share an apple, a stick of candy, some cookies, or other things with playmates. They may think in terms of "the biggest half," however, so it is necessary to begin teaching fractions by setting aright any wrong notions which children may have.

The fraction  $\frac{1}{2}$  should receive attention first, and it should be applied in situations in which real objects are used. One-half of a single object should be taken up before  $\frac{1}{2}$  of a group of objects is considered. The concept to be developed is that  $\frac{1}{2}$  means 1 of the 2 equal parts, and only those things which can actually be divided into 2 equal parts should be used. The apple which the teacher often cuts into so-called halves may be far from symmetrical, which means that the 2 pieces are not exactly the same size, and that the apple, therefore, should not have been used.

Paper can be folded and cut to illustrate  $\frac{1}{2}$ . String, lengths of ribbon, thread, or other similar things can be divided into 2 pieces of equal length. After considerable practice with this type of material, fraction flash cards can be introduced and used in exercises similar to the following:

1. Select the 4 cards which show  $\frac{1}{2}$ . Talk about the different ways the pictures on the cards are divided to show  $\frac{1}{2}$ . Discuss with the children what could be done to prove that the colored portion is one of the 2 equal parts and is therefore  $\frac{1}{2}$ . Cut a square or a circle of paper the same size as the square or the circle outlined on the card and fold or cut the paper in 2 equal parts. Will one of these pieces exactly fit the portion of the flash card which is outlined but not colored?
2. Cut other shapes of paper as a heart or a long rectangle and divide each one into 2 equal parts by folding and cutting. Write  $\frac{1}{2}$  on each piece of paper. Read this 2 ways:  $\frac{1}{2}$ , and 1 of the 2 equal parts.
3. After considerable practice with  $\frac{1}{2}$ , introduce  $\frac{1}{4}$  with concrete objects and then the flash cards which show  $\frac{1}{4}$ . Repeat the activities suggested in numbers 1 and 2 above.
4. Put all the flash cards showing  $\frac{1}{2}$  and  $\frac{1}{4}$  in a wall pocket or in the chalk tray. Have the children get a card that shows  $\frac{1}{2}$ ; one that shows  $\frac{1}{4}$ . Continue this activity until all the cards are taken. Also, have them write  $\frac{1}{2}$  and  $\frac{1}{4}$  on squares of paper and put them by the flash cards they match.

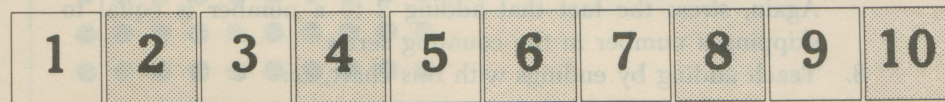
5. Add  $\frac{1}{3}$  to the group of cards and repeat all activities suggested above.
6. Have oral flash card drill with all the cards showing  $\frac{1}{2}$ ,  $\frac{1}{3}$ , and  $\frac{1}{4}$ .
7. Flash the mixed group of cards and have children write the fraction each one represents.

## COUNTING-BY-2's CARDS

The even numbers from 2 to 50 have been printed on light-blue tagboard and the odd numbers from 1 to 49 on cream-colored tagboard. The purpose of this is to give children some help when counting by 2's, without objects, and to develop the understanding that when a person counts by 2's, he skips a number in the counting series.

When counting by 2's is introduced, have much practice with concrete materials such as pennies, jacks, buttons, and various other things. Children should note that they move 2 objects each time, saying 1 number name — but that they skip a number name, so the object really is counted in the total.

After considerable practice with concrete objects, put the numbers 1 to 10 in a line in a wall pocket or on the bulletin board as shown below:



The shaded squares represent the light-blue tagboard squares.

1. Have a child count to 10, beginning at 2, by reading the numbers on the light-blue tagboard. Call attention to the fact that all he has done is to skip a number in the counting series.
2. Count by 2's, beginning at 1, by reading the numbers on the cream-colored tagboard. Note also that a number is skipped each time.
3. Place the number cards 11 to 20 in a row directly underneath the first row. Begin at 2 and count by 2's by reading the numbers on the light-blue squares; begin at 1 and count by 2's by reading the numbers on the cream-colored squares. Stress the fact that a number is skipped each time.

- Point to number 6 and ask a child to point to the number that means 2 more. Choose other numbers both even and odd, and have the children either get or point to the number that means 2 more.
- Point to number 7 and have the children write the number that means 2 more. Then, have them write the whole addition fact, as: 7 + 2 = 9. Practice this activity until there is complete

$$\begin{array}{r} 7 \\ + 2 \\ \hline 9 \end{array}$$

understanding that adding 2 to a number is the same as skipping a number in the counting series just as counting by 2's is skipping a number.

- Place numbers 21 to 50 in 3 rows of 10. Place these numbers directly underneath the first 2 rows in the wall pocket or on the bulletin board. Repeat all activities suggested above using these larger numbers.
- Ask for the number that means 2 more than 24; 2 more than 38; 2 more than 17; 2 more than 29. Write these numbers in addition form also, as:

$$\begin{array}{r} 24 \\ + 2 \\ \hline \end{array} \quad \begin{array}{r} 38 \\ + 2 \\ \hline \end{array} \quad \begin{array}{r} 17 \\ + 2 \\ \hline \end{array} \quad \begin{array}{r} 29 \\ + 2 \\ \hline \end{array}$$

Again, stress the fact that adding 2 to a number is equal to skipping a number in the counting series.

- Teach adding by endings with this chart, as:

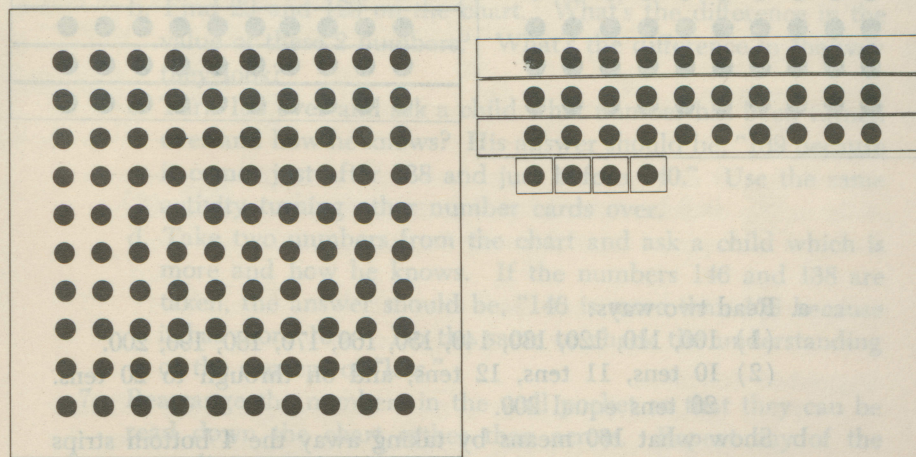
$$\begin{array}{r} 6 \\ + 2 \\ \hline \end{array} \quad \begin{array}{r} 16 \\ + 2 \\ \hline \end{array} \quad \begin{array}{r} 26 \\ + 2 \\ \hline \end{array} \quad \begin{array}{r} 36 \\ + 2 \\ \hline \end{array}$$

## THE 200-CHART

Considerable practice in developing the meaning of 2-place numbers should precede any work with 3-place numbers. Much use of concrete materials such as counting sticks or narrow strips of tagboard which can be bundled into groups of 10 is recommended. Children must be able to demonstrate that 25 means 2 tens and 5 ones; 37 means 3 tens and 7 ones; 40 means 4 tens. Many other such meanings should be taught before the idea is established that 10 groups of 10 are

to be put together to make a new unit called 100. The 200-chart material will be of great help in establishing the fact that each 3-place number can be broken up into 100's, 10's, and 1's.

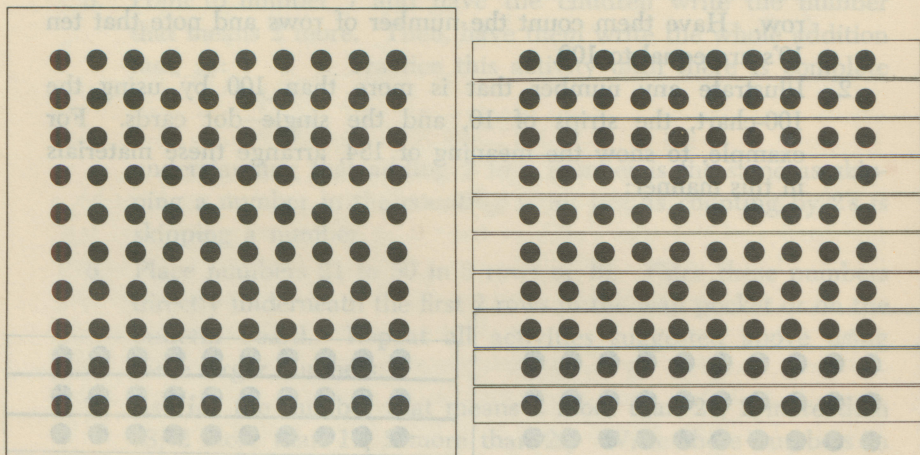
- Put the one-page chart containing 100 dots on the bulletin board. Have the children count the number of dots in each row. Have them count the number of rows and note that ten 10's are equal to 100.
- Illustrate any number that is more than 100 by using the 100-chart, the strips of 10, and the single dot cards. For example, to show the meaning of 134, arrange these materials in this manner:



Write: 134 means 100  
30  
4

Picture many other 3-place numbers in this manner. Also show the meaning of 3-place numbers by using sticks, toothpicks, or tickets – single, in bundles of 10, and in bundles of 10 tens.

3. Arrange the 100-chart and the 10 strips of 10 as shown in the following:



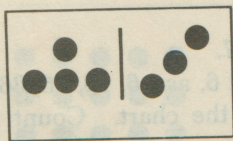
- a. Read two ways:
    - (1) 100, 110, 120, 130, 140, 150, 160, 170, 180, 190, 200.
    - (2) 10 tens, 11 tens, 12 tens, and on through to 20 tens. 20 tens equal 200.
  - b. Show what 160 means by taking away the 4 bottom strips of the strip chart. Do the same for 130, 170, etc.
  - c. Indicate what 123 means by pointing to the 100-chart, the 2 top strips, and the first 3 dots on the third strip of the strip chart. Do this for 149, 186, and other such numbers.
4. Hang the 100-chart and an empty wall pocket side by side on the board. Put the strips and the single dot cards where the children can get them. Have them illustrate any 3-place number by placing the strips and single dot cards in the wall pocket.
5. Put the numbers 1 to 100 which are printed on the 3-inch squares of tagboard in a wall pocket. Begin with 1 and place the numbers in order. Place 10 numbers in each row.
- a. Have a child get the number that:
    - (1) Means 3 tens and 9 ones.

- (2) Means 40 and 8.
  - (3) Comes after 51.
  - (4) Comes before 90.
  - (5) Comes between 47 and 49.
  - (6) Means 1 more than 66.
  - (7) Means 1 less than 44.
  - (8) Means 2 more than 67.
- b. Count by 10's beginning at 6, as: 6, 16, 26, 36, etc. Note the place of each number on the chart. Count to see if there are 10 squares with numbers on them from 6 to 16, from 16 to 26, etc.
6. In another wall pocket put the numbers 101 to 200 in order, and:
- a. Repeat all activities suggested in number 5, and use 3-place numbers each time.
  - b. Find 29 and 129 on the chart. What's the difference in the value of these 2 numbers? What's the difference in the way they look?
  - c. Turn 139 over and ask a child what number has been turned over and how he knows? His answer should be, "139 because it comes just after 138 and just before 140." Use the same activity turning other number cards over.
  - d. Take two numbers from the chart and ask a child which is more and how he knows. If the numbers 146 and 138 are taken, the answer should be, "146 is more than 138 because it has more 10's." Do the same to check the understanding of the concept of "less."
7. Rearrange the numbers in the wall pocket so that they can be read down the chart rather than across. Repeat any of the preceding exercises in 5 and 6 that are needed.

## PARTIAL COUNTING CARDS







Partial counting is the ability to recognize a group of objects within a total number and to count the rest of the objects to this group to find the total. This method of finding a total is frequently used by adults to determine the number of people in a room, the number of objects on a table, and the totals of various other things when they are irregularly spaced.

Practice in partial counting with dots arranged in regular patterns as they are on these cards should lead to the recognition in succession of a series of groups and finally to the ability to give totals of two groups, as:



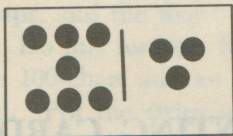
4 and 3 are 7.

Three of the most common patterns of 2, 3, 4, 5, and 6 have been used on these cards, and one pattern each for 7, 8, and 9. The children should be taught to recognize the patterns for 7, 8, and 9 in their relation to one of the patterns for 6. Activities similar to the following ones may be used in teaching recognition of 7, 8, and 9.

1.  is 7 because it has 1 more dot than  (6).
2.  is 8 because it has 2 more circles than  (6).
3.  is 9 because it has 3 more x's than  (6).

**Suggested Activities:**

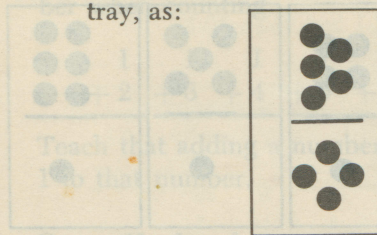
1. Flash these cards, one at a time, and have a child tell how many dots by recognizing one of the groups and counting the remainder of the objects to this group to get the total, as:



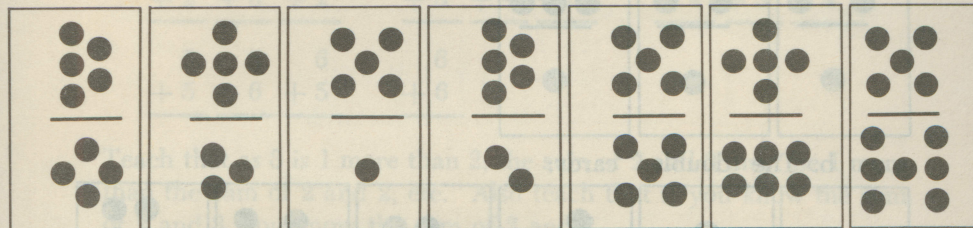
7 - 8, 9, 10.

2. Make a game of the above activity by allowing each child to keep all the cards for which he finds the correct totals.
3. Let two children race to get the total. This will demonstrate the importance of beginning with the larger group. The winner takes the card. Let every child in the group have several turns. The child who gets the most cards wins the game.

4. Pass out all the cards except one. Put this one in the chalk tray, as:

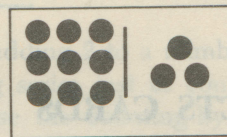


Ask each child who can match the top group to put his card in the chalk tray by the side of it. The cards will look like this:



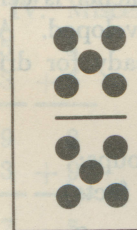
Take up all these cards and put a new card in the chalk tray. Match this card in the same way and then remove all the cards. Continue matching until all the cards have been put in the chalk tray.

5. Flash these cards, one at a time, and have the children name the two groups without giving the total, as:

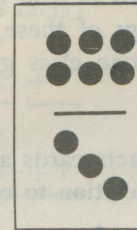


9 and 3

6. Match with these cards the abstract number facts, as:



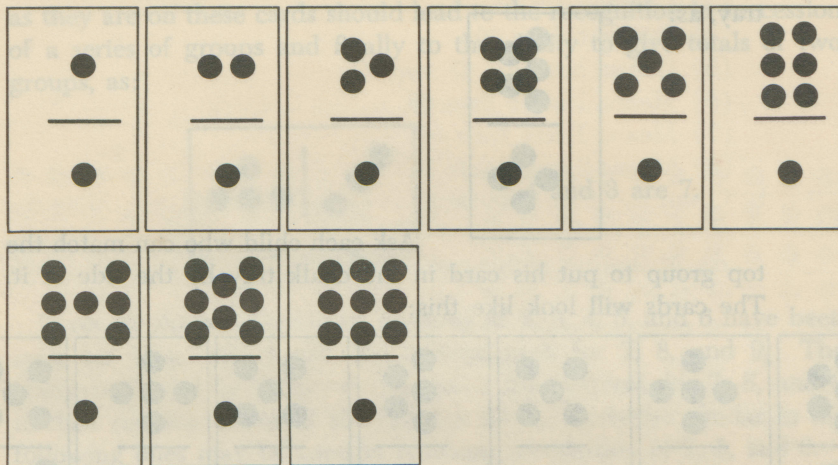
$$\begin{array}{r} 5 \\ +5 \\ \hline \end{array}$$



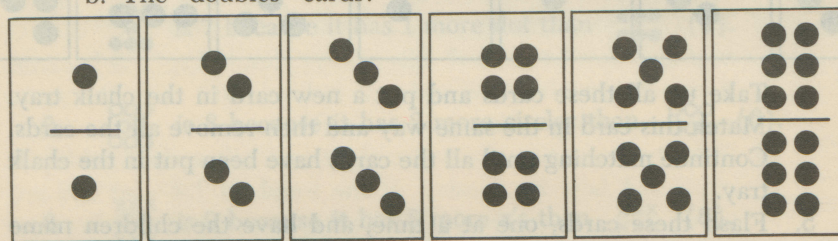
$$\begin{array}{r} 6 \\ +3 \\ \hline \end{array}$$

7. Group cards in the following manner and write the number facts they picture:

a. Cards with 1 dot on one end of the cards:



b. The "doubles" cards:



c. Cards with 2 dots on one end of the card, with 3 dots, with 4 dots, etc.

## SINGLE FACTS CARDS

There are 60 addition and 60 subtraction cards in this packet. They should not be used in drill exercises until the teacher is certain that adequate meanings of these facts have been developed. All of the children in any one class group will not be ready for drill at the same time.

The addition facts cards are divided into 4 groups:

GROUP I. In relation to counting by 1's. (17 facts)

$$\begin{array}{cccccccccc} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ +1 & +1 & +1 & +1 & +1 & +1 & +1 & +1 & +1 \end{array}$$

Teach that adding 1 to a number is equal to saying the next number when counting.

$$\begin{array}{cccccccc} 1 & 1 & 1 & 1 & 1 & 1 & 1 & 1 \\ +2 & +3 & +4 & +5 & +6 & +7 & +8 & +9 \end{array}$$

Teach that adding a number to 1 gives the same answer as adding 1 to that number.

GROUP II. In relation to the "doubles." (13 facts)

$$\begin{array}{ccc} 2 & 2 & 3 \\ +2 & +3 & +2 \end{array} \quad \begin{array}{ccc} 3 & 3 & 4 \\ +3 & +4 & +3 \end{array} \quad \begin{array}{ccc} 4 & 4 & 5 \\ +4 & +5 & +4 \end{array}$$

$$\begin{array}{ccc} 5 & 5 & 6 \\ +5 & +6 & +5 \end{array} \quad \begin{array}{c} 6 \\ +6 \end{array}$$

Teach that as 3 is 1 more than 2, the sum of 2 and 3 must be 1 more than the sum of 2 and 2, etc. Also teach that if you know the sum of 2 and 3, you know the sum of 3 and 2.

GROUP III. In relation to counting by 2's. (12 facts)

$$\begin{array}{cccccc} 4 & 5 & 6 & 7 & 8 & 9 \\ +2 & +2 & +2 & +2 & +2 & +2 \end{array} \quad \begin{array}{cccc} 2 & 2 & 2 & 2 \\ +4 & +5 & +6 & +7 \end{array}$$

$$\begin{array}{cc} 2 & 2 \\ +8 & +9 \end{array}$$

Teach that adding 2 to a number is equal to skipping a number in the counting series just as counting by 2's is equal to skipping a number. Use the counting-by-2's cards in developing these concepts.

GROUP IV. Miscellaneous group. (18 facts)

$$\begin{array}{cc} 5 & 3 \\ +3 & +5 \end{array} \quad \begin{array}{cc} 6 & 3 \\ +3 & +6 \end{array} \quad \begin{array}{cc} 7 & 3 \\ +3 & +7 \end{array} \quad \begin{array}{cc} 8 & 3 \\ +3 & +8 \end{array}$$

$$\begin{array}{cc} 9 & 3 \\ +3 & +9 \end{array} \quad \begin{array}{cc} 6 & 4 \\ +4 & +6 \end{array} \quad \begin{array}{cc} 7 & 4 \\ +4 & +7 \end{array} \quad \begin{array}{cc} 8 & 4 \\ +4 & +8 \end{array}$$

$$\begin{array}{cc} 7 & 5 \\ +5 & +7 \end{array}$$



Let the children tell how they recall these sums, as: "I know 5 and 3 are 8 because they are the same as 4 and 4." "I know 9 and 3 are 12 because 10 and 3 are 13, and 9 is 1 less than 10."

The subtraction facts cards are divided into 4 groups:

GROUP I. In relation to counting by 1's. (17 facts)

$$\begin{array}{cccccccc} 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 \\ \hline -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 & -1 \end{array}$$

Teach that when we take 1 from a number, it is equal to saying the number that comes just before it.

$$\begin{array}{cccccccc} 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 \\ \hline -2 & -3 & -4 & -5 & -6 & -7 & -8 & -9 \end{array}$$

Teach that when two numbers come right together in the counting series and the smaller is subtracted from the larger, the remainder will always be 1.

GROUP II. In relation to the "doubles." (13 facts)

$$\begin{array}{ccc} 4 & 5 & 5 \\ \hline -2 & -2 & -3 \end{array} \quad \begin{array}{ccc} 6 & 7 & 7 \\ \hline -3 & -3 & -4 \end{array} \quad \begin{array}{ccc} 8 & 9 & 9 \\ \hline -4 & -4 & -5 \end{array}$$

$$\begin{array}{ccc} 10 & 11 & 11 \\ \hline -5 & -5 & -6 \end{array} \quad \begin{array}{c} 12 \\ \hline -6 \end{array}$$

Teach that since 5 is 1 more than 4, 2 from 5 is 1 more than 2 from 4, etc. Also teach that if 2 from 5 is 3, 3 from 5 is 2, etc.

GROUP III. In relation to counting by 2's. (12 facts)

$$\begin{array}{cccccc} 6 & 7 & 8 & 9 & 10 & 11 \\ \hline -2 & -2 & -2 & -2 & -2 & -2 \end{array} \quad \begin{array}{cccc} 6 & 7 & 8 & 9 \\ \hline -4 & -5 & -6 & -7 \end{array}$$

$$\begin{array}{cc} 10 & 11 \\ \hline -8 & -9 \end{array}$$

Teach that taking away 2 is the same as counting back 2. Also teach that if 2 from 6 is 4, 4 from 6 is 2.

GROUP IV. Miscellaneous group (18 facts)

$$\begin{array}{cc} 8 & 8 \\ \hline -3 & -5 \end{array} \quad \begin{array}{cc} 9 & 9 \\ \hline -3 & -6 \end{array} \quad \begin{array}{cc} 10 & 10 \\ \hline -3 & -7 \end{array} \quad \begin{array}{cc} 11 & 11 \\ \hline -3 & -8 \end{array}$$

$$\begin{array}{cc} 12 & 12 \\ \hline -3 & -9 \end{array} \quad \begin{array}{cc} 10 & 10 \\ \hline -4 & -6 \end{array} \quad \begin{array}{cc} 11 & 11 \\ \hline -4 & -7 \end{array} \quad \begin{array}{cc} 12 & 12 \\ \hline -4 & -8 \end{array}$$

$$\begin{array}{cc} 12 & 12 \\ \hline -5 & -7 \end{array}$$

Let the children tell how they know these remainders, as: "3 from 8 is 5 because 4 from 8 is 4, and 3 is 1 less than 4." "8 from 12 is 4 because 8 and 2 are 10 and 2 more are 12. 2 and 2 are 4."

If the relationships suggested here are taught and then followed by drill, automatic responses to the number facts will result. The round-about way of thinking and talking about facts to ensure understanding will not become permanent.

Teach addition and subtraction facts together. That is, after the addition facts in Group I are taught, teach the subtraction facts in Group I. Then teach the relation of addition and subtraction, as:

$$\begin{array}{ccc} 8 & 1 & 9 & 9 \\ \hline +1 & +8 & -1 & -8 \end{array} \quad \begin{array}{ccc} 7 & 1 & 8 & 8 \\ \hline +1 & +7 & -1 & -7 \end{array}$$

Practice with a group of facts until near mastery is reached. Then introduce a new group of facts. After considerable practice with the new group, put the two groups together for practice. Continue adding cards to your maintenance pack of practice cards in this manner until all groups have been added. Practice until automatic responses can be given and the facts can be used in addition and subtraction examples with ease.

## RELATED FACTS CARDS

There are 27 addition and 27 subtraction cards in this packet. They should be used when teaching that if the same figures appear in a fact but in different positions, the sums are the same. That is, the sum of 4 and 1 is the same as the sum of 1 and 4 because it makes

no difference which number is said first. Use these cards when teaching Group 1 of the addition facts:

$\begin{array}{r} 2 \\ +1 \\ \hline \end{array}$ $\begin{array}{r} 1 \\ +2 \\ \hline \end{array}$	$\begin{array}{r} 3 \\ +1 \\ \hline \end{array}$ $\begin{array}{r} 1 \\ +3 \\ \hline \end{array}$	$\begin{array}{r} 4 \\ +1 \\ \hline \end{array}$ $\begin{array}{r} 1 \\ +4 \\ \hline \end{array}$	$\begin{array}{r} 5 \\ +1 \\ \hline \end{array}$ $\begin{array}{r} 1 \\ +5 \\ \hline \end{array}$
$\begin{array}{r} 6 \\ +1 \\ \hline \end{array}$ $\begin{array}{r} 1 \\ +6 \\ \hline \end{array}$	$\begin{array}{r} 7 \\ +1 \\ \hline \end{array}$ $\begin{array}{r} 1 \\ +7 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ +1 \\ \hline \end{array}$ $\begin{array}{r} 1 \\ +8 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ +1 \\ \hline \end{array}$ $\begin{array}{r} 1 \\ +9 \\ \hline \end{array}$

These cards can be used for independent study, or children can work in groups with them since the sum is printed on the back of each card.

Use these cards when teaching Group I of the subtraction facts:

$\begin{array}{r} 3 \\ -1 \\ \hline \end{array}$ $\begin{array}{r} 3 \\ -2 \\ \hline \end{array}$	$\begin{array}{r} 4 \\ -1 \\ \hline \end{array}$ $\begin{array}{r} 4 \\ -3 \\ \hline \end{array}$	$\begin{array}{r} 5 \\ -1 \\ \hline \end{array}$ $\begin{array}{r} 5 \\ -4 \\ \hline \end{array}$	$\begin{array}{r} 6 \\ -1 \\ \hline \end{array}$ $\begin{array}{r} 6 \\ -5 \\ \hline \end{array}$
$\begin{array}{r} 7 \\ -1 \\ \hline \end{array}$ $\begin{array}{r} 7 \\ -6 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ -1 \\ \hline \end{array}$ $\begin{array}{r} 8 \\ -7 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ -1 \\ \hline \end{array}$ $\begin{array}{r} 9 \\ -8 \\ \hline \end{array}$	$\begin{array}{r} 10 \\ -1 \\ \hline \end{array}$ $\begin{array}{r} 10 \\ -9 \\ \hline \end{array}$

These cards can be used for independent and group study since the remainder for the first fact is always equal to the number which is to be taken away in the second fact, and the remainder for the second fact is always equal to the number which is to be taken away in the first fact.

As each new group of addition or subtraction facts is introduced, select the cards from this group which will help in learning those facts and provide opportunities for their use.