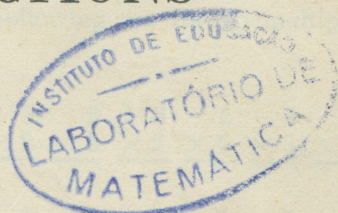


✓ Working With Numbers Teaching Aids
FOR THE THIRD GRADE

C A R D S F O R
BUILDING THE MEANING OF
MULTIPLICATION AND DIVISION

TEACHER'S
INSTRUCTIONS

By
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The Steck Company *publishers* Austin, Texas

INTRODUCTION

There are 25 cards in this pack, which can be used to build the understanding that multiplication is a short way to get a total when all the numbers to be combined are alike, as well as to demonstrate the relationship that exists between the addition and multiplication processes. Likewise, these cards can be used to show both the measurement and the partition idea of division, that is, the relation of division to successive subtractions and to finding fractional parts of a group respectively.

The 25 cards in this pack correspond to the multiplication and division facts which are listed as Groups I in the flash cards for multiplication and division published by The Steck Company, Austin, Texas. As these cards are designed to develop the meaning of the multiplication and division processes, they should be used before the flash cards mentioned above which are designed for drill after meaning has been developed. Following are the 25 multiplication facts represented on these cards:

$$\begin{array}{cccccccccccccc} 2 & 3 & 2 & 4 & 2 & 3 & 5 & 2 & 6 & 2 & 4 & 3 & 7 \\ \times 2 & \times 2 & \times 3 & \times 2 & \times 4 & \times 3 & \times 2 & \times 5 & \times 2 & \times 6 & \times 3 & \times 4 & \times 2 \\ \hline 2 & 5 & 3 & 8 & 2 & 4 & 9 & 2 & 6 & 3 & 5 & 4 \\ \times 7 & \times 3 & \times 5 & \times 2 & \times 8 & \times 4 & \times 2 & \times 9 & \times 3 & \times 6 & \times 4 & \times 5 \\ \hline \end{array}$$

Following are the 25 division facts represented on these cards:

$$\begin{array}{cccccccc} 2 \overline{)4} & 2 \overline{)6} & 3 \overline{)6} & 2 \overline{)8} & 4 \overline{)8} & 3 \overline{)9} & 2 \overline{)10} & 5 \overline{)10} \\ 2 \overline{)12} & 6 \overline{)12} & 3 \overline{)12} & 4 \overline{)12} & 2 \overline{)14} & 7 \overline{)14} & 3 \overline{)15} & 5 \overline{)15} \\ 2 \overline{)16} & 8 \overline{)16} & 4 \overline{)16} & 2 \overline{)18} & 9 \overline{)18} & 3 \overline{)18} & 6 \overline{)18} & 4 \overline{)20} \\ 5 \overline{)20} & & & & & & & \end{array}$$

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SUGGESTIONS FOR BUILDING THE MEANING OF MULTIPLICATION

I. Procedure

A. Select the eight "doubles" cards from the pack.

1. Ask these questions:

(a) How many circles (squares, rectangles, triangles, or hearts) are in each group?

(b) How many groups?

2. Have the pictures on each card read two ways, as:

3 and 3 7 and 7 5 and 5

2 threes 2 sevens 2 fives

3. Write the addition fact and the related multiplication fact for each card, as:

$$\begin{array}{r} 3 \\ 3 \\ \hline 6 \end{array} \quad \begin{array}{r} 3 \\ \times 2 \\ \hline 6 \end{array} \quad \begin{array}{r} 7 \\ 7 \\ \hline 14 \end{array} \quad \begin{array}{r} 7 \\ \times 2 \\ \hline 14 \end{array} \quad \begin{array}{r} 5 \\ 5 \\ \hline 10 \end{array} \quad \begin{array}{r} 5 \\ \times 2 \\ \hline 10 \end{array}$$

Read the addition fact: 3 and 3 are 6. Read the multiplication fact: 2 threes are 6. Stress the fact that in the multiplication example the top number tells how many are in each group and the number below it tells how many groups. In reading a multiplication fact, the number of groups (multiplier) is always read first.

B. Read the pictures on the cards taking the cards in random order. Ask these questions for each card:

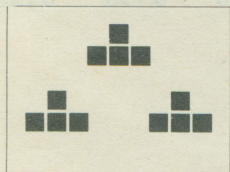
1. How many are in each group?

2. How many groups?

3. How would you read it as an addition example? As a multiplication fact?

C. Use the cards in random order (10 or 12 per lesson) without any concern for the sequence or the relationship of the multiplication facts that are pictured.

1. Read the pictures on each card two ways. For example:



4 and 4 and 4
3 fours

(Card No. 11)

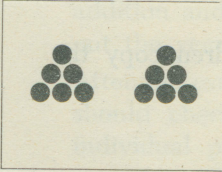
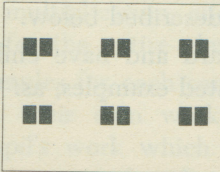
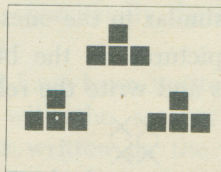
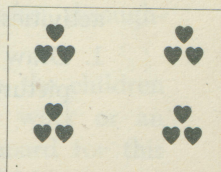
2. Write the addition example pictured and then the multiplication fact, as:

$$\begin{array}{r} 4 \\ 4 \\ 4 \\ \hline \end{array} \quad \begin{array}{r} 4 \\ \times 3 \\ \hline \end{array}$$

Add the addition example and write the sum. Then write the same number for the product of the multiplication fact. (Many multiplication facts will be learned as a result of this exercise though this is not the direct objective.)

Always read the examples, taking care to say the multiplier first in the multiplication fact. The above multiplication fact should be read "3 fours are 12."

D. Select the cards from the pack that give the same sums and products, and write the addition examples and the multiplication facts for each card. For example:

| | | | |
|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| (Card No. 9) | (Card No. 10) | (Card No. 11) | (Card No. 12) |
|  |  |  |  |
| $\begin{array}{r} 6 \\ 6 \\ \hline \end{array} \quad \begin{array}{r} 6 \\ \times 2 \\ \hline \end{array}$ | $\begin{array}{r} 2 \\ 2 \\ 2 \\ 2 \\ 2 \\ \hline 2 \end{array} \quad \begin{array}{r} 2 \\ \times 6 \\ \hline \end{array}$ | $\begin{array}{r} 4 \\ 4 \\ 4 \\ \hline \end{array} \quad \begin{array}{r} 4 \\ \times 3 \\ \hline \end{array}$ | $\begin{array}{r} 3 \\ 3 \\ 3 \\ \hline 3 \end{array} \quad \begin{array}{r} 3 \\ \times 4 \\ \hline \end{array}$ |

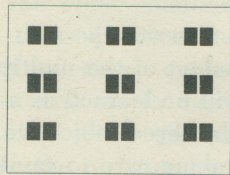
(All but the 2 cards showing the 3 threes that picture 9 and the 2 twos that picture 4 may be used in this activity. Of the cards to be used, there are 2 cards that picture 20; 4 cards that picture 18; 3 cards that picture 16; 2 cards that picture 15; 2 cards that picture 14; 4 cards that picture 12; 2 cards that picture 10; 2 cards that picture 8; 2 cards that picture 6.)

Read all the multiplication facts as suggested above.

Stress the fact that the pictures and the examples for each card are different even though the total is the same.

Make sure each child is writing and reading the multiplication facts correctly.

E. Prove that multiplication is a quicker way than addition to find a total by having two pupils find the totals for a given card with one using addition and the other multiplication. (Demand good legible writing of each participant.) For example:



(Card No. 21)

$$\begin{array}{r}
 2 \\
 2 \\
 2 \\
 2 \\
 2 \\
 2 \\
 2 \\
 2 \\
 2 \\
 2 \\
 \hline
 18
 \end{array}
 \qquad
 \begin{array}{r}
 2 \\
 \times 9 \\
 \hline
 18
 \end{array}$$

(Obviously the "doubles" cards cannot be used to illustrate this reason for learning the multiplication facts!)

F. Vary the practice by supplementing the use of the cards with activities similar to the ones described below:

1. Draw pictures on the board and have children copy the pictures and write the related examples, as:

$$\begin{array}{r}
 \times \times \\
 \times \times \\
 \times \times \\
 \times \times \\
 \times \times \\
 \times \times \\
 \hline
 12
 \end{array}
 \qquad
 \begin{array}{r}
 4 \\
 4 \\
 4 \\
 \times 3 \\
 \hline
 12
 \end{array}$$

2. Write an addition example on the board and have the pupils copy it and then write the related multiplication fact.

3. Write a multiplication fact on the board and have the pupils copy it and then draw a picture of it, as:

$$\begin{array}{r}
 5 \\
 \times 3 \\
 \hline
 \end{array}
 \qquad
 \begin{array}{ccc}
 \bullet & \bullet & \bullet \\
 \bullet & \bullet & \bullet \\
 \bullet & \bullet & \bullet
 \end{array}$$

4. Write a multiplication fact on the board and have the pupils copy it and write the related addition example.

G. Introduce 2- and 3-place multiplicands by using addition examples in which no carrying is involved. (No pictures will be needed.) Four examples are at the top of the next page.

$$\begin{array}{r}
 21 \\
 21 \\
 \hline
 21
 \end{array}
 \qquad
 \begin{array}{r}
 30 \\
 30 \\
 \hline
 30
 \end{array}
 \qquad
 \begin{array}{r}
 42 \\
 42 \\
 \hline
 42
 \end{array}
 \qquad
 \begin{array}{r}
 122 \\
 122 \\
 \hline
 122
 \end{array}$$

Ask pupils how to write these as multiplications examples. If sufficient work has been done with the cards in this pack, the children will be able to say, "It means to take 21 three times, etc." And they will be able to suggest the way to write each addition example as a multiplication example. Practice with such examples in pairs should be provided, as:

$$\begin{array}{r}
 21 \\
 21 \\
 \hline
 21
 \end{array}
 \qquad
 \begin{array}{r}
 21 \\
 \times 3 \\
 \hline
 63
 \end{array}
 \qquad
 \begin{array}{r}
 30 \\
 30 \\
 \hline
 30
 \end{array}
 \qquad
 \begin{array}{r}
 30 \\
 \times 2 \\
 \hline
 60
 \end{array}
 \qquad
 \begin{array}{r}
 42 \\
 42 \\
 \hline
 42
 \end{array}
 \qquad
 \begin{array}{r}
 42 \\
 \times 2 \\
 \hline
 84
 \end{array}$$

II. Frequency of Use. After their introduction, these cards should be used a short period each day for several weeks with the entire class participating. This should be followed by daily practice for the small group that has failed to see the relationship of addition and multiplication, and occasionally thereafter throughout the year for the entire class.

After the examples for each card have been written, the children should check their own work with the teacher's work or an individual pupil's work which is written on the board for this purpose. The papers of each individual pupil should be scanned by the teacher at the close of the work period to determine which pupils are having difficulty so that they can be invited to sit where they can be more closely observed by the teacher at the next work period. Help can be given immediately if children are so arranged.

A very helpful technique to aid the teacher in making a rapid check of the pupil's work as well as to help the pupils do good legible work and keep up with the group is to have them fold their papers at the beginning of the activity so as to form 12 or 16 work spaces. The examples for one card can be written in one space, as shown on the the next page.

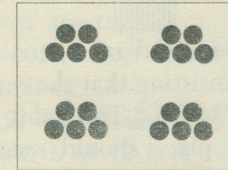
Dick Brown
Robert E. Lee School

| | | | |
|-------------|-------------|------------|------------|
| 4 | | 2 | |
| 4 | 4 | 2 | 2 |
| 4 | $\times 3$ | 2 | $\times 4$ |
| $\hline 12$ | $\hline 12$ | $\hline 8$ | $\hline 8$ |

SUGGESTIONS FOR BUILDING THE MEANING OF DIVISION

I. Procedure

- A. To develop the measurement idea of division choose any card from the pack and tell the pupils the total number of objects pictured. Then ask questions which will aid in developing the understanding desired. For example:



(Card No. 24)

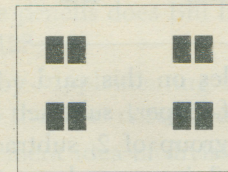
There are 20 circles on this card.

1. How many in each group?
2. How many groups?
3. How many 5's are there in 20?

Do this for as many days as it takes to use all the cards in the pack several times during this introductory period.

- B. Introduce the computational form after the cards can be read without difficulty as described above. Take the following steps:

1. This is the sign of division: $\overline{)}$



(Card No. 5)

2. There are 8 rectangles on the card so we write this number under the division sign $\overline{)8}$
3. How many in each group?

Write the number here $\longrightarrow 2 \overline{)8}$

4. How many groups?

Write the number here $\longrightarrow \begin{array}{r} 4 \\ 2 \overline{)8} \end{array}$

5. Think: How many 2's in 8? 4.
6. Read two ways: How many 2's in 8? 4. There are 4 twos in 8.

C. Prior to writing the example for cards picturing 10 or more objects, concrete materials should be used to show that the ten's group must be changed to one's before the division can be performed. For example, show with counting sticks (or any objects that can be grouped easily) that 12 means 1 ten and 2 ones, as:

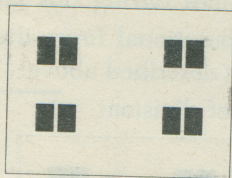


Before the answer to the question "How many 4's in 12?" can be demonstrated, the group of ten will have to be changed to 10 ones and combined with the 2 ones, as:



This makes 12 ones instead of 1 ten and 2 ones and establishes the reason for insisting that the quotient figure be written in a way to show its value. The habit of writing the quotient figure in the correct place should receive emphasis from the very first exercise in division.

D. The relation of measurement division to successive subtractions should also be noted. This need not be stressed to the extent that the relation of multiplication to addition is stressed, however, because it is not a procedure that is followed in any situation as is the addition procedure. For example:



(Card No. 5)

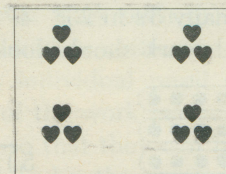
There are 8 rectangles on this card. As I cover a group of 2 with this sheet of paper, subtract the hidden 2 from 8. As I cover another group of 2, subtract it from 6. As each successive group of 2 is covered, continue to subtract until none remains. (All the rectangles on the card are covered by the sheet of paper.) The example will look like this:

$$\begin{array}{r} 8 \\ -2 \\ \hline 6 \\ -2 \\ \hline 4 \\ -2 \\ \hline 2 \\ -2 \\ \hline 0 \end{array}$$

Note that 2 has been taken from 8 four successive times and nothing remains.

A way to do this is by division, as: $2 \overline{)8}$

E. The partition idea of division can also be illustrated with these cards. The following procedure is recommended:



(Card No. 12)

There are 12 hearts on this card.

1. How many groups are there?
2. Each group is what part of the whole?
3. What is one-fourth of 12? $\frac{3}{4}$
4. To find $\frac{1}{4}$ of 12, we divide. $4 \overline{)12}$ We can read this example, "One-fourth of 12 is 3."

Much practice with concrete materials should precede the use of these picture cards. For example, have 4 children stand and pass out 12 pencils (or any other objects), previously counted by the children, to them one at a time until all the pencils are gone. Then ask questions similar to the following:

1. How many pencils did I have before I gave them away?
2. How many pencils does Bill have? Sue? Bob? Jane?
3. Do they each have the same number of pencils?
4. How many children are here? One is what part of four?
5. What part of the pencils does Bill have? Sue? Bob? Jane?
6. What is $\frac{1}{4}$ of 12?

F. Vary the practice by supplementing the use of the cards with activities similar to the ones described below:

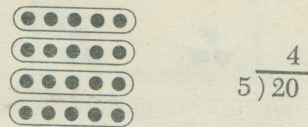
1. For the measurement idea of division make 20 circles on the board and have pupils copy them on their paper. Ask the following questions and have pupils carry out the directions as the work progresses:
 - a. What is the sign of division? Draw it by the side of your picture.
 - b. How many circles have you drawn? Write the number underneath the division sign.
 - c. Draw rings around 5 circles at a time until all the circles have been used.
 - d. How many circles did you put in a group? Write that number here $\longrightarrow \overline{)}$

e. How many groups do you have? Write that number

here 

f. Think, "How many 5's in 20? 4."

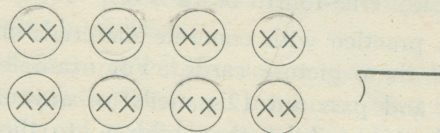
The completed work should look like this:



g. Read two ways:

How many 5's in 20? 4. There are 4 fives in 20.

2. Draw a picture indicating the grouping. Have the pupils copy and write the division fact it illustrates, as:



3. Write a division fact and have the pupils draw a picture to illustrate it.

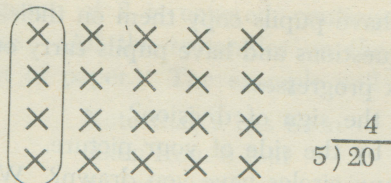
4. Give directions for drawing a picture so that the result will illustrate the partition idea of division. For example:

a. Make a picture of 20 x's in which you have arranged them to show 5 equal groups. What does each group show?

b. Draw a ring around one-fifth of the x's.

c. Write the division example that your picture illustrates.

d. Read your example, "One-fifth of 20 is 4." The completed work should look like this:



II. Frequency of Use. After their introduction, these cards should be used a short period each day for several weeks with the entire class participating. This should be followed by daily practice for the small group that has failed to see the relationship of division to both subtraction and finding fractional parts of groups,

and occasionally thereafter throughout the year for the entire class. After the examples for each card have been written, the children should check their own work with the teacher's work or an individual pupil's work which is written on the board for this purpose. The papers of each individual pupil should be scanned by the teacher at the close of the work period to determine which pupils are having difficulty so that they can be invited to sit where they can be observed easily by the teacher at the next work period. Help can be given immediately if the children are seated in this manner.

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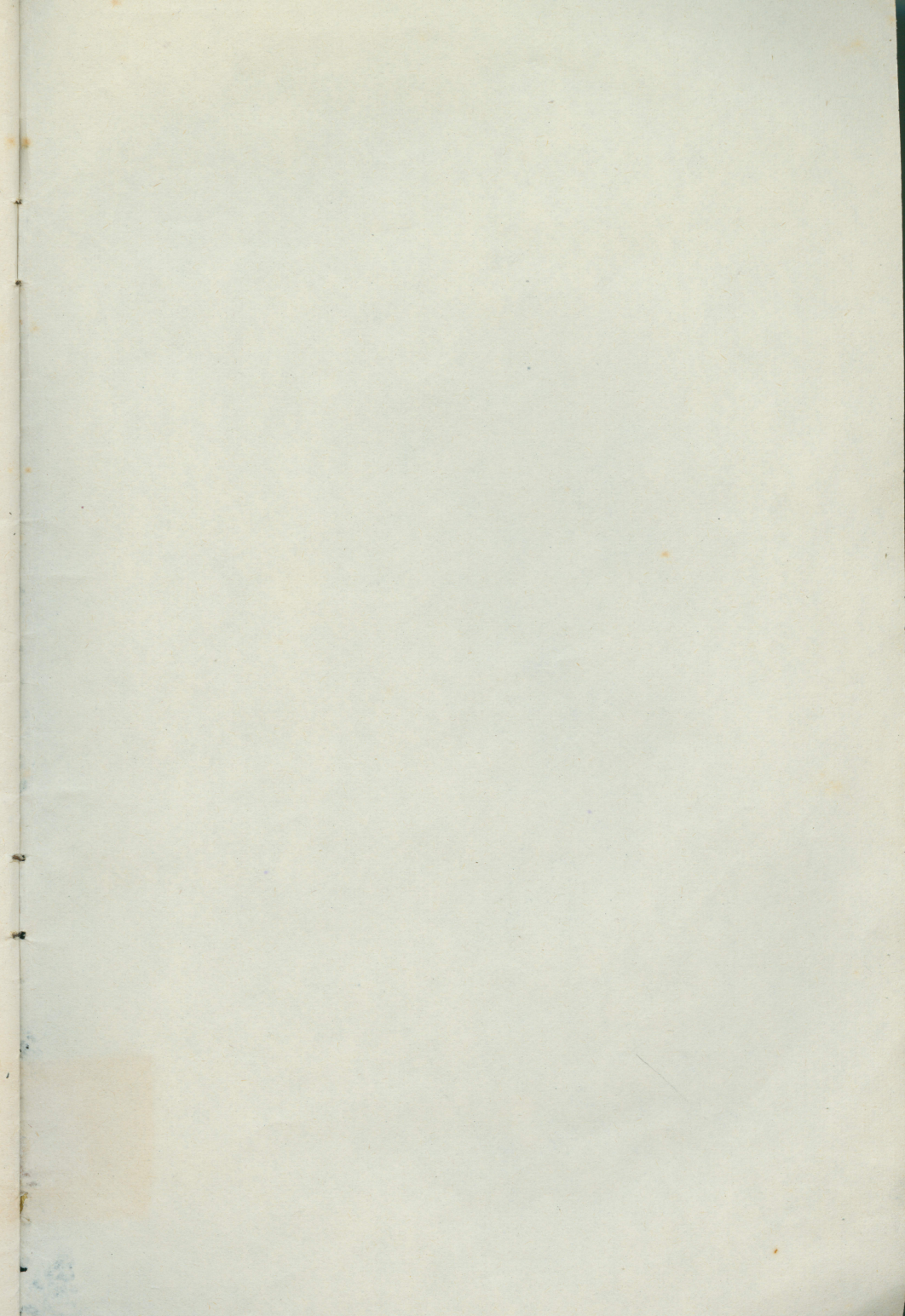
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BENBROOK, G.

Working with Numbers Teaching Aids.

Third Grade

Cards for building the meaning of multiplication and division.

Teacher's Instructions.

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