

GRADED ARITHMETICS

BOOK ONE

CHANCELLOR

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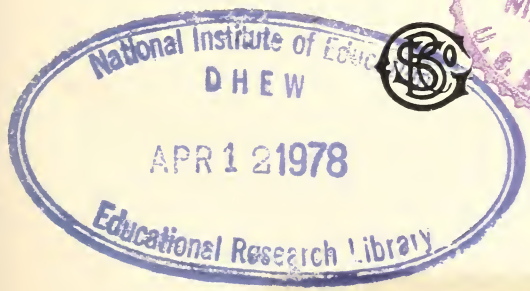


ELEMENTARY SCHOOL MATHEMATICS BY GRADES
GLOBE SERIES

FIRST BOOK

NUMBERS

BY
WILLIAM E. CHANCELLOR, M.A.
SUPERINTENDENT OF SCHOOLS, BLOOMFIELD, N.J.



GLOBE SCHOOL BOOK COMPANY
NEW YORK BOSTON CHICAGO

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1903

"If a child learns how to use the text-book, he learns how to make use of the experience of mankind. The text-book enables the child to do individual work for himself, and helps him to become independent of oral teaching."

W. T. HARRIS, LL.D.,

United States Commissioner of Education.

Date

4/12/28

"The proper use of the book in the elementary school requires that the teacher and class should read and study the text-book together. The preparation for each lesson should require that teacher and class take it up jointly, with the book open before them. . . . The text-book then fills its proper place, and enables the child to review and master in detail, and more thoroughly, the lesson with which he has become acquainted by joint study with the teacher. It enables the slow child to keep step with the brighter child who does not need such additional application."

F. LOUIS SOLDAN, LL.D.,

Superintendent of Public Instruction, St. Louis, Mo.

In Educational Review, February, 1903.

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Chancellor, William
Estabrook, 1867-

Elementary school
mathematics by grades

SUGGESTIONS TO TEACHERS

1. The preface explains the general purpose of the book.

2. Read the book itself. The purposes of certain special features appear only when seen in relation to other features. Read the appendix and the author's monograph, *Elementary School Mathematics: Theory of Method*.

3. When the needs of the class seem to require modification of the course as presented here, do not hesitate to use, in advance of the order in the book, facts which appear later in these pages.

4. Develop the number-story features of early primary work as much as time permits. The speaking of English sentences tends to promote that rational understanding of number-processes which is the end of arithmetic as a science.

5. See that the children do study this book, but do not ask them to study quietly over a quarter of an hour at any one time. Children tire quickly and recover even more quickly.

6. Drill for the sake of instant accuracy; but do not follow any drill to the point of over-fatigue. Take great care not to drill upon things not essential.

7. This book is a series of suggestions, not an encyclopedia of devices. Seek great variety in methods and devices. There are children who will not learn things in our ways. Try to find their ways of understanding number-facts and number-principles.

8. Every child has his own peculiar interests. For number-stories use facts which appeal to the various children. Remember that children have their "good" and their "bad" days. On their good days children sometimes learn a surprising amount of new matter.

9. A boy or girl may be ready to undertake harder work than this book offers before knowing this book from cover to cover. Yet doing easy things over and over begets confidence, which supports us in our attacks upon new and harder problems.

10. Neatness in writing tends to accuracy in all number-operations.

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Arithmetic

Walter Livingston

$$\begin{array}{r} 1. \quad 15 \\ 26 \\ 32 \\ \hline 73 \end{array}$$

$$\begin{array}{r} 2. \quad 29 \\ 17 \\ 35 \\ \hline 81 \end{array}$$

$$3. \quad 4 \times 5 = 20$$

$$20 - 6 = 14$$



$$\begin{array}{r} 4. \quad 36 \\ 19 \\ \hline 17 \end{array}$$


$$5. \quad 27 \div 3 = 9$$


b. Eleven, eight and seven are twenty-six which is twice thirteen.


TELLING NUMBERS AT SIGHT



 How many ones?  How many ones?

 How many twos?  Find twos and threes.

 How many ones? Find five and one.
 How many threes? Look across.
 How many twos? Look up and down.

 How many twos? Find threes and two.
 How many fours? Find five and three.

 How many threes? Find two fours and one.
 Find six and three. Find seven and two.
 Find five and four. Find eight and one.

 How many twos? 
 How many fives?

How many? 

Numbers tell how many.

COUNTING AND MEASURING

Count these dots ● ● ● ● ● and crosses X X X.
We cannot add dots and crosses together because they are not the same kind of things.

Count these circles ○ ○ ○ ○ and squares □ □ □ □ □.
Can we add circles and squares together? Why not?

Numbers tell how many things of the same kind.

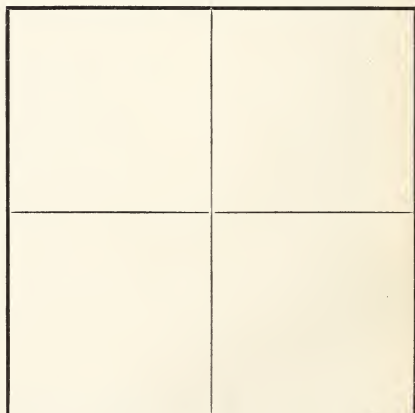
This picture shows one inch square. Draw one square inch on paper.



EACH SIDE IS ONE
INCH LONG

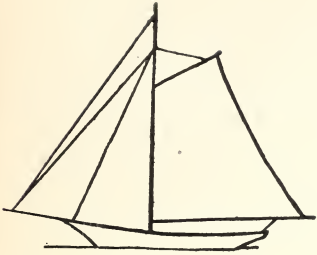
And this picture shows two inches square.

How many square inches do you find in this two-inch square picture?

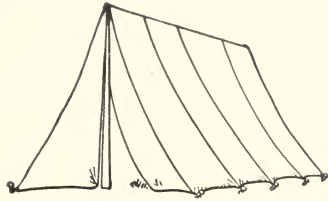


Telling the size or amount or weight is called *measuring*.

We answer "How many?" by counting; and "How much?" by measuring.



sloop



tent



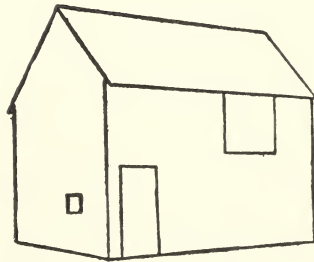
cup



ball



paper-doll



barn

Draw, or cut out of paper, various numbers of these objects.

REVIEW QUESTIONS, 1 TO 10

1. Mother had two tarts for each of three little boys. How many tarts had she in all?

2. A hen had nine little chicks. Three were black, and the rest were white. How many were white?

3. There were nine apples in a basket. Mary divided them equally between Susani, Kate, and herself. How many apples were there for each?

4. Tom caught two trout in a brook. Each weighed half a pound. How much did the fish weigh together?

5. How many letters are there in each of these names: Louise, Katherine, William, Charles, Thomas?

6. Alice had ten cents and John had seven. How many more did Alice have than John?

7. There were six chairs in the dining room. Father bought four more. Then how many were there in all?

8. Nine children were playing hide-and-seek. Four were boys. How many were girls?

9. Ralph counted three robins on the lawn, two in a tree, and one flying in the air. How many did he count in all?

10. Which is more, eight cents or five cents? By how much?

11. On a Christmas tree were nine glass balls. Five were gold in color, one was silver, and the others were bronze. How many were bronze?

12. A farmer put ten tons of hay in a barn. The cattle ate two tons a week. In four weeks how many tons of hay were eaten? How many were left?

FACTS OF 1 TO 10, IN REVIEW

Additions:

$1+1=2$	$1+6=7$	$2+3=5$	$2+8=10$	$3+7=10$
$1+2=3$	$1+7=8$	$2+4=6$	$3+3=6$	$4+4=8$
$1+3=4$	$1+8=9$	$2+5=7$	$3+4=7$	$4+5=9$
$1+4=5$	$1+9=10$	$2+6=8$	$3+5=8$	$4+6=10$
$1+5=6$	$2+2=4$	$2+7=9$	$3+6=9$	$5+5=10$

Subtractions:

$10-9=1$	$9-8=1$	$8-6=2$	$7-4=3$	$5-3=2$
$10-8=2$	$9-7=2$	$8-5=3$	$6-5=1$	$4-3=1$
$10-7=3$	$9-6=3$	$8-4=4$	$6-4=2$	$4-2=2$
$10-6=4$	$9-5=4$	$7-6=1$	$6-3=3$	$3-2=1$
$10-5=5$	$8-7=1$	$7-5=2$	$5-4=1$	$2-1=1$

Multiplications:

$2 \times 2 = 4$	$2 \times 3 = 6$	$2 \times 4 = 8$	$2 \times 5 = 10$	$3 \times 3 = 9$
------------------	------------------	------------------	-------------------	------------------

Divisions:

$10 \div 5 = 2$	$8 \div 4 = 2$	$9 \div 3 = 3$	$6 \div 3 = 2$	$4 \div 2 = 2$
$10 \div 2 = 5$	$8 \div 2 = 4$	$6 \div 2 = 3$	$2 \div 1 = 1$	

1. Three little birds in one nest and three more birds in another nest make —— birds.

2. Six little birds and four big birds make —— birds.

3. Ten leaves on a branch, and the wind blew three away. —— were left.

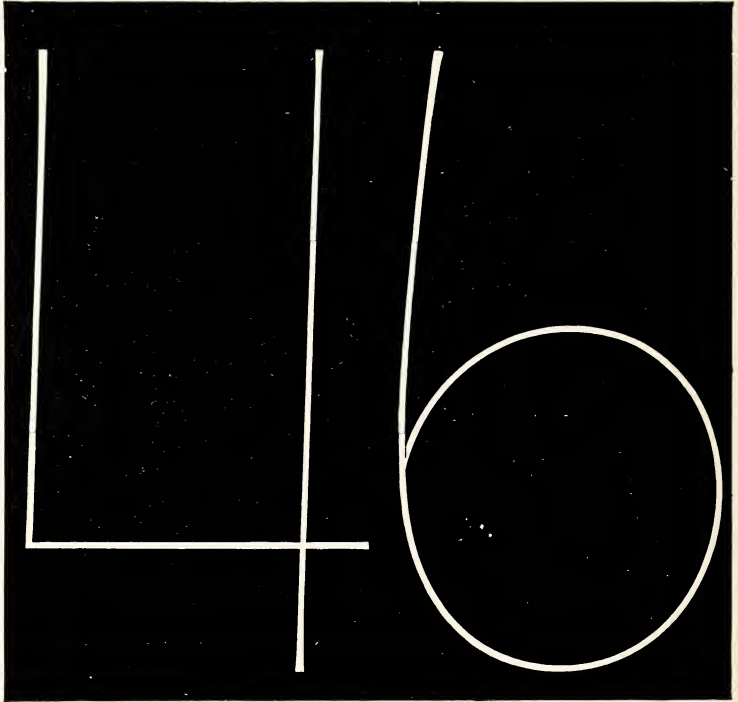
EXERCISES

1. Fold a piece of paper two inches square into four square inches.

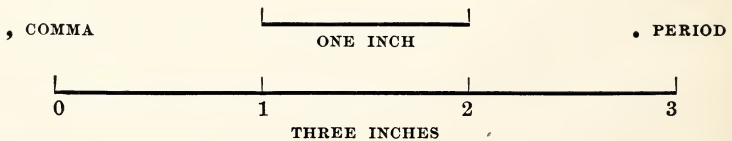
2. Fold a piece of paper three inches square into nine square inches.

BLACKBOARD

With thumb and fingers, hold the chalk crayon under the palm of the hand, and use free arm movements only.



These figures are three inches high.



Write on the blackboard five times with commas and period: 1, 2, 3, 4, 5, 6, 7, 8, 9, 0.

PAPER WITH PENCIL

2 4 6 3 5 7 1 8 9 0

These figures are one half inch high.



Each side of this square measures one half inch. We call this a half inch square.

1. Write 1, 2, 3, 4, 5, 6, 7, 8, 9, 0.
2. Write 0, 9, 8, 7, 6, 5, 4, 3, 2, 1.
3. Write 10, 11, 12, 13, 14, 15, 16, 17, 18, 19.
4. Write 20, 21, 22, 23, 24, 25, 26, 27, 28, 29.
5. Write 30, 31, 32, 33, 34, 35, 36, 37, 38, 39.
6. Write 40, 41, 42, 43, 44, 45, 46, 47, 48, 49.


SPELLING OF THE NUMBER-NAMES

1, one	0, cipher, or zero	20, twenty
2, two	11, eleven	30, thirty
3, three	12, twelve	40, forty
4, four	13, thirteen	50, fifty
5, five	14, fourteen	60, sixty
6, six	15, fifteen	70, seventy
7, seven	16, sixteen	80, eighty
8, eight	17, seventeen	90, ninety
9, nine	18, eighteen	99, ninety-nine
10, ten	19, nineteen	100, one hundred

NUMBER-NAMES ABOVE TEN

We call ten and one, eleven, 11; ten and two, twelve, 12. Ten and three are thirteen, 13. Ten and four are fourteen, 14. Ten and five are fifteen, 15. Ten and six are sixteen, 16. Ten and seven are seventeen, 17. Ten and eight are eighteen, 18. Ten and nine are nineteen, 19.

Read these numbers: 10, 11, 12, 13, 14, 15, 16, 17, 18, 19.

 are ten.

 are two tens.

Two fives we call ten. Two tens we call twenty.

Twenty and one we call twenty-one, 21; twenty and two, twenty-two, 22; twenty and three, twenty-three, 23; then we have twenty-four, 24; twenty-five, 25; twenty-six, 26; twenty-seven, 27; twenty-eight, 28; and twenty-nine, 29.

Give the names for these numbers: 20, 21, 22, 23, 24, 25, 26, 27, 28, 29.

Read these numbers: 25, 24, 26, 28, 22, 27, 21, 29, 20.

Three tens we call thirty, 30. Three tens and one we call thirty-one, 31. Four tens we call forty, 40. Fifty means five tens, 50. Sixty, six tens, 60. Seventy, seven tens, 70. Eighty, eight tens, 80. Ninety, nine tens, 90.

We call ten tens, one hundred, 100.

10 ten	16 sixteen	30 thirty	90 ninety
11 eleven	17 seventeen	40 forty	$90 + 1 = 91$
12 twelve	18 eighteen	50 fifty	$90 + 3 = 93$
13 thirteen	19 nineteen	60 sixty	$90 + 5 = 95$
14 fourteen	20 twenty	70 seventy	$90 + 8 = 98$
15 fifteen	21 twenty-one	80 eighty	100 one hundred

COUNTING

Count by twos, beginning at 2.

2	4	6	8	10	12	14	16	18	20
22	24	26	28	30	32	34	36	38	40
42	44	46	48	50	52	54	56	58	60
62	64	66	68	70	72	74	76	78	80
82	84	86	88	90	92	94	96	98	100

These are called the **even** numbers. 2 divides each of these numbers without remainder.

Count by twos, beginning at 1.

1	3	5	7	9	11	13	15	17	19
21	23	25	27	29	31	33	35	37	39
41	43	45	47	49	51	53	55	57	59
61	63	65	67	69	71	73	75	77	79
81	83	85	87	89	91	93	95	97	99

These are called the **odd** numbers. 2 divides none of these numbers without remainder. One is always left over.

Count by threes, beginning at 3.

3	6	9	12	15	18	21	24	27	30	33
36	39	42	45	48	51	54	57	60	63	66
69	72	75	78	81	84	87	90	93	96	99

Count by fives, beginning at 5.

5	10	15	20	25	30	35	40	45	50
55	60	65	70	75	80	85	90	95	100

Count by sevens, beginning at 7.

7	14	21	28	35	42	49
56	63	70	77	84	91	98

Count by twos, threes, fives, sevens, beginning at various numbers.

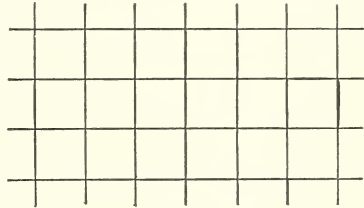
THINGS TO DO

1. Count all the boys in the room, giving them *odd* numbers, and all the girls, giving them *even* numbers. How many children are there in all? Can each boy and girl remember the number given to him or to her?

2. Cut out thirty squares of paper. Write the numbers to thirty, one number on each square.

3. Cut each square into two pieces, and using the other side of the paper, number each of the pieces.

4. Draw lines like these, but longer, so as to make more squares, and number each of the squares. Cut the squares apart.



5. Count the number of panes of glass in all the window sashes of the classroom.

6. Count the number of desks in the room, and then the number of chairs. Write the number for each desk upon a piece of paper, and place it on the desk to which it belongs.

7. Count such objects as marbles, hats, caps, pencils, splints, blocks.

8. Read the numbers of the pages of this book as far as one hundred.

9. Count the number of lines of print upon this page.

10. Write the number of the house where you live.

11. How many chickens, or sparrows, or ducks, or cows, or horses, did you ever count together at one time?

12. Fold paper in squares and number the squares.

NUMBER TABLE

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

1. Write in figures ten, eleven, twelve, thirteen, fourteen, fifteen.

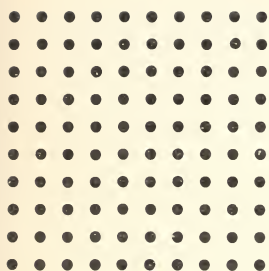
2. Write in figures sixteen, seventeen, eighteen, nineteen, twenty.

3. Write twenty-one, twenty-two, twenty-three, twenty-four.

4. Write twenty-five, twenty-six, twenty-seven, twenty-eight, twenty-nine, thirty.

5. Write forty, fifty, sixty, seventy, eighty, ninety, ninety-nine, one hundred.

THINGS TO DO



We can use instead of dots :

circles like this \bigcirc , or

crosses like this \times , or

angles like this \perp , or

triangles like this ∇ , or

squares like this \square , or

letters


C, F, H, L, N, S, T, V, Y, Z,



or any forms, such as these, —



1. Make 100 dots or squares or circles or angles or letters on paper or on blackboard.

2. Number these dots or squares or circles or angles or letters 1, 2, 3, etc., like this \bullet_1 or this \square_1 or this \bigcirc_1 or this $\textcircled{3}$ or this $\frac{1}{24}$ or this $\sqrt[73]{}$, from 1 to 100.

3. Make lines around every 2 dots like this, .

4. Make lines around every 3 dots,  or .

5. Make lines around every 4 dots, every 5 dots, every 6 dots, every 7 dots, every 8 dots, every 9 dots.

6. Make similar lines around groups of squares or circles or letters.

7. Use red chalk or pencil and mark every alternate dot which has an even number, like this \bullet or this $\textcircled{\bullet}$.

8. Use blue chalk or pencil and mark every alternate dot which has an odd number, like this \bullet or this $\textcircled{\bullet}$.

9. Mark with blue, or yellow, or red chalk every third, every fourth, every fifth, every sixth dot, etc.

Use new sets of \bullet , or \square , or ∇ tables except for 1 and 2.

FORM

With a stick, or a splint, or a pencil, we can represent a line across —, or up and down, | or slanting up to the right, or down to the right,



With two sticks we can make a cross, or a T,



or an angle like this



or this



or this

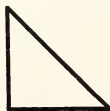


Try and see.

With three sticks we can make a form like this



It is called a triangle because it has three angles.

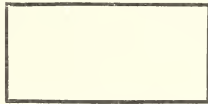


FORM

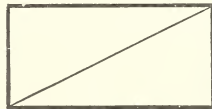
With four sticks each of the same length, we can make squares like this



When we have a pair of sticks of the same length, and another pair of sticks longer than the others, two like these , and two like these , we can make a rectangle like this



If we draw a line through our rectangle to opposite corners, we have two triangles inside the rectangle.

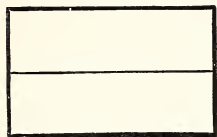


When we have the longer sides twice as long as the shorter sides, then inside our rectangle we have two squares.

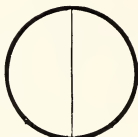


HALVES

When anything is divided into two equal parts, each part is called a half. Two halves make a whole.



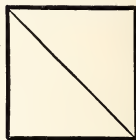
Rectangle in halves



Circle in halves



Triangle in halves



Square in halves

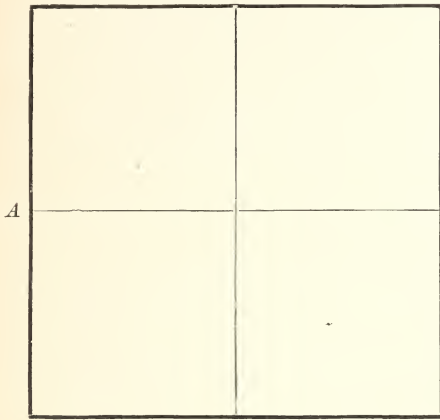
Draw a line 2 inches long. Divide it into halves.

Draw a square. Divide it into halves.

One half is written $\frac{1}{2}$ in figures.

1. How many halves are there in one dollar?
2. How many halves are there in a pie? If a pie cost 10 cents, how much will half a pie cost?
3. James had one dollar. He spent half a dollar for a ball. How much money had he left?
4. If you bought a cookie and ate half of it, how much of it would be left? Would the part of it left be equal to the part you ate?
5. One orange is what part of two oranges?
6. One basket is what part of two baskets?
7. One half of two cents is how much?
8. One half of four cents is how many cents?
9. George earned ten cents by doing errands. He gave half of the money to his sister. How many cents did he give to her?
10. $\frac{1}{2}$ of 10 cents is how many cents?

PARTS OF FORMS



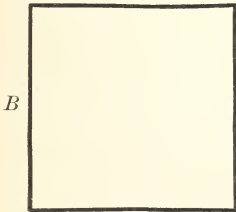
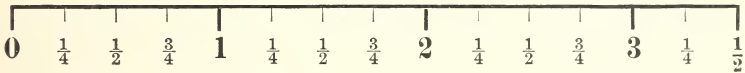
How many little squares do you find in this large square?

This square is two inches wide and two inches high.

When things are exactly like each other in size, we call them **equal**. If you find inside of the square *A* four squares each of the same size,

then all four parts of *A* are equal parts.

MEASURE MARKED IN INCHES



Is this square as large as the square marked *A*? Is it as large as any part of *A* square?

Measure this square *B*, using a ruler marked with inches; cut a square out of paper of the same size as *B*, and see how many little squares as large

as *B* you find in *A* square.

If you find that square *A* is four times as large as the square marked *B*, then it is right to say that *B* is one fourth as large as *A*.

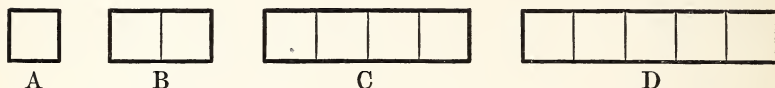
If *A* is four times *B*, then *B* is one fourth of *A*.

If *A* is $4 \times B$, then *B* is $\frac{1}{4}$ of *A*.

EQUAL PARTS OR FRACTIONS

Numbers tell how many of the same kind.

A *fraction* is one or more of the equal parts of some thing.



Here are four forms, *A*, *B*, *C*, and *D*.

Each is of a different size from the others.

D is divided into five parts. *C* is divided into four parts.

B is divided into two parts. *A* is not divided.

Each part of *D*, each part of *C*, and each part of *B* is of the size of *D*.

There are 5 *A*'s in *D*. Count and see.

There are 4 *A*'s in *C*, and 2 *A*'s in *B*.

Each part of *D* is equal to every other part. The five parts are equal.

Each part of *C* is equal to every other part. The four parts are equal.

One part of *B* is equal to the other part.

We call equal parts fractions.

Each part of *B* is a fraction of *B*. There are two parts.

Each part of *B* is one half of *B*. We print this, $\frac{1}{2}$.

Each part of *C* is a fraction of *C*. There are four parts.

Each part of *C* is one fourth of *C*. We print this, $\frac{1}{4}$.

The 1 above the 4 means that we are taking one part.

The 4 means that there are four equal parts in *C*.

Each part of *D* is a fraction of *D*. There are five parts.

Each part of *D* is one part of *D*. We print this, $\frac{1}{5}$.

The 1 above the 5 means that we are taking one part.

The 5 means that there are five equal parts in *D*.

REVIEW

Tell what numbers separate the numbers in 1 to 9:

1. 5-8-11-14. 4. 8-13-18-23. 7. 10-20-30-40.
 2. 5-9-13-17. 5. 11-17-23-29. 8. 6-15-24-33.
 3. 8-12-16-20. 6. 10-17-24-31. 9. 5-13-21-29.

WRITE

10. Copy on the blackboard one or more times:

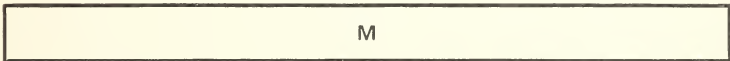
1 2 3 4 5 6 7 8 9 0 9 8 7 6 5 4 3 2 1

11. Copy on the blackboard one or more times:

10, 12, 23, 34, 45, 56, 67, 78, 89, 90.

12. Write on the blackboard five times these numbers:

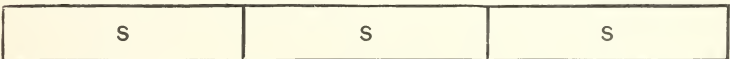
135, 246, 579, 680, 258, 813, 490



This rectangle is not divided into equal parts.



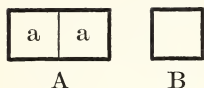
This rectangle is divided into two equal parts.
 Each part is one half the whole rectangle.



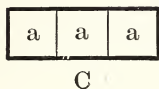
This rectangle is now divided into three equal parts.
 Each part is one third the whole rectangle.

O is $\frac{1}{2}$, one half, of M , for there are 2 O 's in M .
 S is $\frac{1}{3}$, one third, of M . Why?

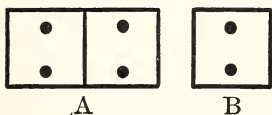
PARTS OF NUMBERS



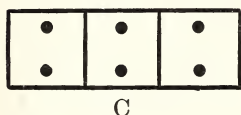
What part of A is a ? $B = a$.
 B is one half of A . A equals 2 B 's.
 B equals A divided in half.



What part of C is a ? $C = 3 B$'s.
 B is one third of C . $a = \frac{1}{3}$ of C .



How many dots do you find in B ?
 How many dots do you find in A ?

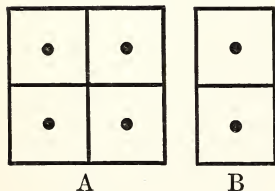


$4 = 2 \times 2$. 4 are twice two.
 $2 = \frac{1}{2}$ of 4. One half of four is two.

$6 = 3 \times 2$. We find 3 2's in C . $B = \frac{1}{3}$ of C .

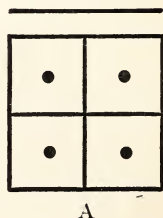
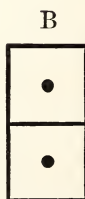
$2 = \frac{1}{3}$ of 6. One third of 6 is two. $\frac{2}{6} = \frac{1}{3}$.

A equals twice B .
 B equals half A .



A is divided into four equal parts.

B is divided into two equal parts.



B equals two fourths of A .
 $B = \frac{1}{2}$ of $A = \frac{2}{4}$ of A . $\frac{1}{2} = \frac{2}{4}$:
 One half equals two fourths.

PARTS

Cut out of paper a square one inch on each side.

Then cut out a rectangle two inches long, one inch high.

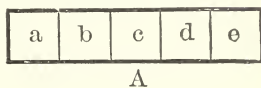
The square is one half as large as the rectangle.

Cut the square into two equal parts, of the size one inch by $\frac{1}{2}$ inch.

Cut the rectangle into four equal parts.

Do you see that the 2 parts of the square are $\frac{2}{4}$ of the rectangle?

There are 5 equal parts in A .
Each is $\frac{1}{5}$ of A .



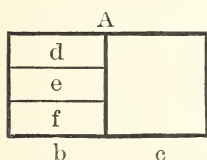
$a + b = 2$ equal fifth parts of A
 $= \frac{2}{5}$ of A .

$a + b + c = 3$ equal fifth parts of $A = \frac{3}{5}$ of A .

$a + b + c + d = 4$ equal fifth parts of $A = \frac{4}{5}$ of A .

$a + b + c + d + e = 5$ equal fifth parts of $A = \frac{5}{5}$ of A .

Then $\frac{5}{5}$ of $A =$ all of $A = A$.



A is divided into two parts, b and c .

$b = \frac{1}{2}$ of A . $c = \frac{1}{2}$ of A .

b is divided into three parts, d , e , f .

$d = \frac{1}{3}$ of b . $e = \frac{1}{3}$ of b . $f = \frac{1}{3}$ of b .

If we divide c into three equal parts, then A will have 6 parts.

When A has 6 equal parts, then $d = \frac{1}{6}$ of A .

$d = \frac{1}{3}$ of $\frac{1}{2}$ of A , because d is $\frac{1}{3}$ of b , which is $\frac{1}{2}$ of A

1. $\frac{1}{5} + \frac{1}{5} + \frac{1}{5} = ?$

4. $\frac{1}{5} + \frac{2}{5} + \frac{2}{5} = ?$

2. $\frac{1}{6} + \frac{1}{6} + \frac{2}{6} + \frac{2}{6} = ?$

5. $\frac{1}{2} + \frac{1}{2} = ?$

3. $\frac{1}{3} + \frac{1}{6} = ?$

6. $\frac{1}{3} - \frac{1}{6} = ?$


Cut or fold pieces of paper to show the answers to these six questions.

PARTS OF NUMBERS

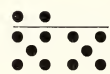
5 names	5 ones	$5 = \text{ }$	$1 = \frac{1}{5}$ of 5
3 names	3 ones	$3 = \text{ }$	$1 = \frac{1}{3}$ of 3
4 names	4 ones	$4 = \text{ }$	$1 = \frac{1}{4}$ of 4
2 names	2 ones	$2 = \text{ }$	$2 = \frac{1}{2}$ of 2

When we say one fifth of anything, we mean that the thing is divided into equal fifth parts, into five equal parts, and that we are talking about one of these parts.

When we say one fifth of any number, we mean that the number is divided into equal fifth parts, into five equal parts, and that we are talking about one of these parts.

Here is a picture  There are 2 columns of 5 dots of the number ten each. 10 is divided into 2 equal parts of 5 each. shown by dots.

There are also 5 rows across of 2 dots each. The 10 dots are divided into 5 equal parts of 2 dots each.

Compare 2 and 10.  $2 = \frac{2}{10}$ of 10.

$$2 \times 5 = 10 \qquad 2 = 10 \div 5 \qquad 2 \text{ is } \frac{1}{5} \text{ of } 10$$

$$5 \times 2 = 10 \qquad 5 = 10 \div 2 \qquad 5 \text{ is } \frac{1}{2} \text{ of } 10 \qquad 5 = \frac{10}{2}$$

1. Add:
$$\begin{array}{r} 8 \\ 2 \\ \hline \end{array} \quad \begin{array}{r} 4 \\ 5 \\ \hline \end{array} \quad \begin{array}{r} 1 \\ 9 \\ \hline \end{array} \quad \begin{array}{r} 2 \\ 8 \\ \hline \end{array} \quad \begin{array}{r} 1 \\ 7 \\ \hline \end{array} \quad \begin{array}{r} 9 \\ 1 \\ \hline \end{array} \quad \begin{array}{r} 7 \\ 3 \\ \hline \end{array} \quad \begin{array}{r} 4 \\ 6 \\ \hline \end{array} \quad \begin{array}{r} 1 \\ 5 \\ \hline \end{array} \quad \begin{array}{r} 3 \\ 4 \\ \hline \end{array}$$

2. Add:
$$\begin{array}{r} 2 \\ 7 \\ \hline \end{array} \quad \begin{array}{r} 5 \\ 2 \\ \hline \end{array} \quad \begin{array}{r} 3 \\ 3 \\ \hline \end{array} \quad \begin{array}{r} 2 \\ 2 \\ \hline \end{array} \quad \begin{array}{r} 4 \\ 1 \\ \hline \end{array} \quad \begin{array}{r} 3 \\ 5 \\ \hline \end{array} \quad \begin{array}{r} 4 \\ 3 \\ \hline \end{array} \quad \begin{array}{r} 2 \\ 6 \\ \hline \end{array} \quad \begin{array}{r} 1 \\ 1 \\ \hline \end{array} \quad \begin{array}{r} 5 \\ 4 \\ \hline \end{array}$$

PARTS OF NUMBERS

When we make three equal parts, we call each part one third: $\frac{1}{3}$. Each part of four equal parts is one fourth, or one quarter: $\frac{1}{4}$. After these we have one fifth: $\frac{1}{5}$.

— A

—|—|—|—| C

—|—|—| B

—|—|—|—|—|—| D

B has 2 *A*'s.

$$A = \frac{1}{2} B.$$

Measure these lines

C has 3 *A*'s.

$$A = \frac{1}{3} C.$$

and see if these stories

D has 5 *A*'s.

$$A = \frac{1}{5} D.$$

are true.

When the parts of anything are equal to each other, then we call the equal parts fractions.

There are ten ones in ten. There are three ones in three.

Three are three tenths of ten. $\frac{3}{10}$ $3 = \frac{3}{10}$ of 10.

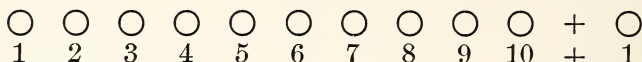
1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

When each of these tenths of the whole figure is $\frac{1}{10}$ inch long, how long are $\frac{4}{10}$ of it?

1. Take $\frac{2}{5}$ of 10 sticks. How many have you?
2. Take $\frac{3}{4}$ of 8 cents. How many are left?
3. Take $\frac{1}{3}$ of 9 cubes. How many thirds are left?
4. Take $\frac{1}{2}$ of 10 squares. What part is left?
5. Take $\frac{2}{3}$ of 6 circles. How many have you?

ELEVEN, 11

When we have ten things and add one thing to them, the name of the number of all these things together is **eleven**.



Ten and one are eleven.

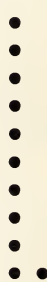
10 + 1 are eleven.

$$\begin{array}{r} 10 \\ + 1 \\ \hline 11 \end{array}$$

We write eleven with the figure 1 used twice: 11.

In the figures 11 for eleven, the unit one, 1, has the place of the zero, 0, in the figures 1 and 0, printed like this: 10, for the number ten.

In the number eleven, printed as 11, the second 1 shows that the first 1 stands not for one, 1, unit, but for one ten, or 10. 11 means 1 ten and 1 unit, like this group of dots:



$$\begin{array}{llll} 8+3=11 & 7+4=11 & 6+5=11 & 11-5=6 \\ 10+1=11 & 9+1+1=11 & 5+5+1=11 & 2+3+5+1=11 \\ 11-1=10 & 11-2=9 & 9+2=11 & 7+2+2=11 \end{array}$$

With splints and counters, show each of the above facts.

1. John had five cents and Tom had six cents. How many cents did they have together?

2. There were ten boys; one of them had two cents, nine of them had each one cent. How many cents did they have together?

ELEVEN, 11

3. Mary had eleven cents. She spent four for apples at one cent each. How many cents were left?

4. Tell number-stories about cents, using these combinations:

11-1, 5+2+4, 10+1, 9+2, 4+7, 11-6, 8+3.

5. Add $\begin{array}{r} 10\ 3\ 6\ 9\ 7 \\ \underline{1\ 8\ 5\ 2\ 4} \end{array}$ 6. Subtract: $\begin{array}{r} 11\ 11\ 11\ 11\ 11 \\ \underline{1\ 3\ 5\ 2\ 7} \end{array}$

7. Is eleven an odd or an even number? Why?

8. What is the next number after 10? before 10?

9. How many more are 11 than 10 things?

10. George had eleven marbles and Charlie had 8. Which had more than the other? How many more did he have?

11. Take 11 splints. Make 2 squares with them and one triangle.

12. How many triangles can you make with eleven splints? How many splints are left over?

13. Add: $\begin{array}{r} 3\ 2\ 5\ 3\ 6\ 4\ 6\ 5\ 6 \\ \underline{6\ 3\ 4\ 7\ 4\ 4\ 3\ 5\ 2} \end{array}$

14. From $\begin{array}{r} 11\ 11\ 11\ 11\ 11\ 11\ 11\ 11\ 11 \\ \text{Take } \underline{6\ 4\ 3\ 9\ 5\ 10\ 8\ 7\ 2} \end{array}$

15. Can you remember several numbers when written on the board and then quickly erased? Try and see.

MEANING OF SIGNS

Adding collects two or more numbers together into their *sum*. The sign of addition is $+$, which is read *and* or *plus*.

Subtracting takes one number from another and finds their *difference*. The sign of subtraction is $-$, which is read *less* or *minus*.

Multiplying takes one number a certain number of times and finds the *product*. The sign of multiplication is \times , which is read *times* or *multiplied by*.

5×2 is read, 5 times 2, or 5 multiplied by 2.

Dividing separates a number into a certain number of parts and finds the *quotient*. The sign of division is \div , which is read *into* or *divided by*.

$10 \div 2$ is read, 2 into 10, or 10 divided by 2.

Throughout this book the signs are to be read: $+$, *and*; $-$, *less*; \times , *times*; \div , *into*.

? asks a question. It is called the *question mark*.

. ends a statement. It is called the *period*.

, separates groups of words or numbers. It is called the *comma*.

1. When we ask $10 \div 1 = ?$, what does the \div mean?

2. What is the answer to $10 \div 2 = ?$

3. What does this . mean? What is its name?

4. What is the name of this mark ,?

5. What does this mark $+$ mean? And this $-$?

6. Read these questions in words:

$3 \times 3 = ?$ $11 = 3 \times ?$ and how many over? $6 + 5 = ?$
 $11 - 9 = ?$ $8 + ? = 11$. $11 - 4 = ?$ $3 + 3 + 2 + 1 + ? = 11$.

TWELVE, 12

If we have ten things and add two things to them, the name of the number of all these things together is **twelve**.



$10 + 2$ are twelve.

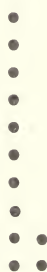
Ten and two are twelve.

$$\begin{array}{r} 10 \\ \quad 2 \\ \hline 12 \end{array}$$

We write twelve with the figures 1 and 2: 12.

In the figures 12 for twelve, 2 has the place of the zero, 0, in the figures 10, for the number ten. In the number twelve, printed as 12, the figure 2 shows that the figure 1 stands not for 1 unit, but for one ten or 10.

12 means 1 ten and 2 units, like this group of dots:



In the numbers eleven and twelve, printed 11 and 12, we say that the 1 in each number where it is the first figure, reading from left to right, is in *tens'* place and that the second figure in each number is in *units'* place.

Twelve things make one dozen.

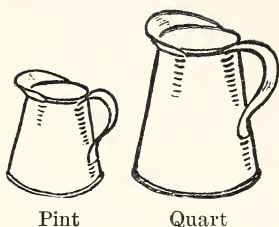
Dozen means two-ten.

When we say, "Mary's mother sent Mary to sell a dozen eggs to the grocer," we mean that Mary carried twelve eggs.

$$\begin{array}{llll} 10 + 2 = 12 & 9 + 3 = 12 & 8 + 4 = 12 & 7 + 5 = 12 \\ 12 - 6 = 6 & 12 - 7 = 5 & 12 - 10 = 2 & 12 - 9 = 3 \end{array}$$

Show each of these facts with counters and dots.

USEFUL FACTS



There are two pints in a quart.

A pint is half a quart.

A dozen is four times three, three times four, six times two, and two times six. A half dozen is six. A third of a dozen is four. A quarter of a dozen is three.

A table drinking-glass holds half a pint.

1. Tell number-stories about cents, or eggs, or marbles.
2. Mary had seven dozen eggs and Susan had five dozen. How many dozen have they together?
3. In twelve pints of milk are how many quarts?
4. William had a dozen tops and lost two. How many had he left?
5. Mary's white hen laid half a dozen eggs last week. How many was that?
6. Ellen and Charles had each a glass of milk. Together they had ——— pint of milk.
7. How many quart bottles can be filled from six pint bottles?
8. How many pint bottles can be filled from six quart bottles?
9. How many glasses can be filled from a quart of milk?
10. Mary had a quarter of a dozen and a third of a dozen eggs. How many had she in all?

CENTS, NICKELS, AND DIMES

1 copper cent is worth 1 cent. The sign, 1¢

1 nickel is worth 5 cents. We can write nickel, 5¢

1 dime is worth 10 cents. We can write dime, 10¢

1. Grace bought half a dozen of cookies at 1¢ apiece. She gave the baker a dime. What change did he give her?

2. I paid a nickel for half a dozen pens. How many nickels would a dozen pens have cost?

3. How many nickels are worth a dime?

4. Which is more money, a dozen cents or a dime?

5. After spending seven cents, how much money did George have left from a dime?

6. A class of children made a pile one inch high with _____ cents.

7. Write on the blackboard a story about cents, nickels, and dimes.

OTHER NUMBERS

$2+7=?$	$5+3=?$	$6+2=?$	$7-4=?$	$3+6=?$
$3+7=?$	$7-5=?$	$9-4=?$	$9-6=?$	$10-9=?$
$7+3=?$	$9-2=?$	$1+9=?$	$9-1=?$	$7+2=?$
$6+4=?$	$10-3=?$	$4+4=?$	$7-4=?$	$8-6=?$
$9+1=?$	$10-4=?$	$4-3=?$	$5+5=?$	$10-2=?$
$9-5=?$	$10-5=?$	$4-6=?$	$10-8=?$	$2+8=?$
$10-1=?$	$8+2=?$	$1+1=?$	$5+1=?$	$5-2=?$
$7=3+?$	$10=5+?$	$3=2+?$	$10=8+?$	$5=3+?$

TELLING LENGTHS

12 inches make 1 foot.

12 in = 1 ft.

in. stands for inch or inches. ft. stands for foot or feet.

3 feet make 1 yard.

3 ft. = 1 yd.

Be sure to place a period after in. for inch, ft. for foot, and yd. for yard.

A foot-rule shows twelve inches.

A yard-stick shows three feet.

A foot is a very common unit of measure. We buy boards at the lumber yard by the foot.

A yard is almost as common a unit of measure. We buy goods for dresses and suits by the yard.

An inch is the unit of measure for small things. We tell how wide and how long a photograph is by inches.

1. Measure 2 inches on a piece of paper with a ruler.

2. Cut squares 2 inches on each side.

3. Measure the size of the first picture in this book.

4. What is the size of your desk? Your teacher's desk?

5. Ask your mother how many yards of cloth she needs to make a dress. Measure that number of yards on the blackboard.

6. Find how many yards long and wide the schoolroom is.



REVIEW QUESTIONS

1. A cube has — faces.
2. A book measured in length two inches less than a foot long. It was — inches long.
3. Four pairs of shoes were in a closet and another was in the room. There were in all — different shoes.
4. Mary has 7 paper dolls and Kate has 4. Together they have — paper dolls.
5. Five apples, three oranges, and two pears make — articles of fruit.
6. Half a dozen and a quarter of a dozen plums make — plums.
7. In Tom's garden the cherry tree was eight years old, and the peach tree two years less. The peach tree was — years old. The apple tree was twice as old as the peach tree. It was — years old.
8. Fold a piece of paper into a dozen squares. Have you 3 rows of — squares or 2 rows of — squares or only 1 row of squares?
9. A wire fence had five rows of wire, a foot apart. The lowest wire was a foot above the ground. The highest wire was — feet above the ground.
10. Ella has in her purse a ten-cent piece, and two cents. She has — cents in all.
11. There are five books on a shelf and four on a table, which make — books in all.
12. There were 7 fish in Edith's globe. One fish died, when her mother gave her two more. Edith then had — fish.

MULTIPLYING AND DIVIDING

$12 = 6 + 6$

$6 \times 2 = 12$

$12 \div 2 = 6$

$$\begin{array}{r} \text{Add } 6 \\ 6 \\ \hline \end{array}$$

$$\begin{array}{r} \text{Subtract } 12 \\ 6 \\ \hline \end{array}$$

1. How many are $4 + 4 + 4$? $3 \times 4 = ?$
2. How many are $3 + 3 + 3 + 3$? $4 \times 3 = ?$
3. In **1** above how many 4's do you count?
4. In **2** above how many 3's do you count?
5. Show **1** and **2** by splints, counters, pennies, or dots.
6. Is it true that $3 \times 4 = 12$ and $4 \times 3 = 12$?

When we find how many fours there are in twelve, we count 4's until we reach 12. $4 + 4$ are 8. $8 + 4$ are 12. There are three fours in twelve.

$12 \div 4 = 3$. We find three fours in twelve.

NUMBER-STORIES

7. Charlie had twelve apples; and when four boys came to see him, he wanted to give each of them the same number. How many could he give to each?

8. There were two boys who had six marbles each. How many did they have together?

9. Lulu had an afternoon tea-party. Her mother gave her a dozen tea-biscuits. She and Clara and Mabel ate them all; each ate as many as the others. How many did each eat?

10. Walter bought 12 shingles and made boats out of them. He sold 6 boats for 2ϕ each. He had — boats left. He received — cents for the boats sold.

MULTIPLYING AND DIVIDING

1. When we ask $5 \times 2 = ?$, what does the \times mean? And what does the $=$ mean? And what does the $?$ mean?

2. What is the answer to $5 \times 2 = ?$

$1 + 1 = 2$; or there are two 1's in 2;
or $1 \times 2 = 2$; or $2 \times 1 = 2$.

3. $1 + 1 + 1 = 3$; or there are three 1's in 3;
or $1 \times 3 = 3$; or $3 \times 1 = 3$.

4. — is the *dash*. Fill in the words or numbers left out as shown by the dashes.

In 5 there are — 1's; or $5 \times 1 = \text{—}$.

4 apples at 1¢ apiece will cost — cents.

In 6 there are — 1's; or $6 \times 1 = \text{—}$.

In 7 there are — 1's; or $7 \times 1 = \text{—}$.

5. $1 + 1 + 1 + 1 = 4$; or four 1's = 4; or there are four 1's in 4; or 4 times 1 are 4; or $4 \times 1 = 4$.

$2 + 2 + 2 + 2 = 8$; or 4 2's = 8; or there are four 2's in 8.

6. $2 \times 2 = ?$ $2 \times 5 = ?$ $5 \times 2 = ?$ $5 \div 2 = ?$

$5 \div 3 = ?$ $8 \div 4 = ?$ $4 \times 2 = ?$ $5 \times 2 = ?$

$10 \div 2 = ?$ $10 = 5 \times ?$ $8 = 2 \times ?$ $3 \times ? = 9$

$9 \div 3 = ?$ $9 \div 5 = ? + ?$ $7 \div 3 = ? + ?$ $6 \div 3 = ?$

$12 \div 3 = ?$ $12 \div 5 = ? + ?$ $12 \div 4 = ?$ $11 \div 3 = ? + ?$

A dozen cents less a dime = how many cents?

7. $1 + 1 + 1 = 3$; or three 1's = 3; or $3 \times 1 = 3$.

$2 + 2 + 2 = 6$; or three 2's = 6; or $3 \times 2 = 6$.

$3 + 3 + 3 = 9$; or three 3's = 9; or $3 \times 3 = 9$.

REVIEW

$$\begin{array}{r}
 \text{1. Subtract: } 5 \quad 7 \quad 9 \quad 8 \quad 10 \quad 10 \quad 6 \quad 10 \\
 \underline{\quad 2} \quad \underline{\quad 3} \quad \underline{\quad 5} \quad \underline{\quad 6} \quad \underline{\quad 4} \quad \underline{\quad 9} \quad \underline{\quad 3} \quad \underline{\quad 1}
 \end{array}$$

$$\begin{array}{r}
 \text{2. Subtract: } 10 \quad 8 \quad 10 \quad 7 \quad 8 \quad 10 \quad 9 \quad 6 \\
 \underline{\quad 3} \quad \underline{\quad 5} \quad \underline{\quad 5} \quad \underline{\quad 2} \quad \underline{\quad 4} \quad \underline{\quad 6} \quad \underline{\quad 4} \quad \underline{\quad 2}
 \end{array}$$

$$\begin{array}{r}
 \text{3. Subtract: } 10 \quad 9 \quad 7 \quad 4 \quad 6 \quad 8 \quad 6 \quad 8 \\
 \underline{\quad 8} \quad \underline{\quad 6} \quad \underline{\quad 4} \quad \underline{\quad 3} \quad \underline{\quad 5} \quad \underline{\quad 3} \quad \underline{\quad 1} \quad \underline{\quad 2}
 \end{array}$$

$$\begin{array}{r}
 \text{4. Add: } 5 \quad 6 \quad 2 \quad 9 \quad 1 \quad \text{5. Subtract: } 12 \quad 12 \quad 12 \quad 12 \quad 12 \\
 \underline{\quad 7} \quad \underline{\quad 6} \quad \underline{\quad 10} \quad \underline{\quad 3} \quad \underline{\quad 11} \quad \underline{\quad 7} \quad \underline{\quad 2} \quad \underline{\quad 3} \quad \underline{\quad 6} \quad \underline{\quad 1}
 \end{array}$$

6. Copy and answer:

$$\begin{array}{l}
 8 - ? = 5 \quad 10 = 6 + ? \quad 10 = 3 + ? \quad 7 + ? = 9 \quad 6 - ? = 2 \\
 5 + ? = 10 \quad 10 = 7 + ? \quad 10 = 4 + ? \quad 10 - 7 = ? \quad 10 - 2 = ? \\
 7 = 3 + ? \quad 4 + ? = 10 \quad 3 + ? = 10 \quad 8 + ? = 10 \quad 7 - 1 = ? \\
 1 + ? = 10 \quad 6 + ? = 8 \quad 10 - ? = 7 \quad 10 - ? = 4 \quad 2 - ? = 5 \\
 7 + ? = 10 \quad 9 - ? = 4 \quad 5 - ? = 2 \quad 6 = ? + 4 \quad 10 - ? = 4
 \end{array}$$

Write in words your answers to these next two questions:

7. Two boys had 5 cents each. Another boy had 2 cents. If they had put them all together, and had then divided them equally, how many would each have had?

8. They did not do this, but when still another boy joined them, they bought for one cent apiece as many doughnuts at the bakery as they had cents, and divided the doughnuts equally, as many to one as to another. How many doughnuts did each have?

9. Tell stories about $12 - 6$, $6 + 6$, $4 + 4 + 4$, and 6×2 .

DIVIDING

Often we write division-questions in this way $2 \overline{)10}$
This means just the same as $10 \div 2 = 5$.

We may read $2 \overline{)10}$ either 10 divided by 2 are how many? or how many 2's are there in 10?

Here are ten dots $\begin{array}{ccccc} \bullet & \bullet & \bullet & \bullet & \bullet \\ \bullet & \bullet & \bullet & \bullet & \bullet \end{array}$ We can show that we may think of them as divided into 5×2 dots or $10 \text{ dots} \div 5$ by drawing lines between every 2 dots $\begin{array}{ccccc} \bullet & | & \bullet & | & \bullet & | & \bullet & | & \bullet \\ \bullet & & \bullet & & \bullet & & \bullet & & \bullet \end{array}$ or as divided into 2×5 dots or $10 \text{ dots} \div 2$ by drawing a line between every 5 dots $\begin{array}{ccccc} \bullet & \bullet & \bullet & \bullet & \bullet \\ \hline \bullet & \bullet & \bullet & \bullet & \bullet \end{array}$

Dividing is the opposite of multiplying.

Dividing separates numbers; multiplying combines numbers.

SOMETHING TO DO

1. Take 12 splints. Separate them into two bunches of six splints each. This is dividing 12 splints by 2. How would you divide 12 splints by 6?

2. Take the 2 bunches, each of 6 splints, and put them together. This is multiplying 6 splints by 2. What would you do to multiply 2 splints by 6?

3. $12 \div 3 = ?$ $12 \div 4 = ?$ $3 \times 4 = ?$ $4 \times 3 = ?$

Answer these questions by dots or counters.

4. $2 \overline{)4}$ $2 \overline{)6}$ $2 \overline{)8}$ $2 \overline{)10}$ $2 \overline{)12}$ $3 \overline{)6}$ $3 \overline{)9}$ $3 \overline{)12}$
 $4 \overline{)8}$ $4 \overline{)12}$

5. From a bushel of onions a grocer sold half a bushel. What part of the bushel did he have left?

6. One half of 6 splints = how many splints?

DIVIDING WITH A NUMBER OVER

1. Find 3's in 7. $2 \times 3 = 6$ $6 + 1 = 7$ $7 \div 3 = (3 \times 2) + 1$.
7 divided by 3 are 2 and 1 over.

2. Find 4's in 11. $2 \times 4 = 8$ $8 + 3 = 11$ $11 \div 4 = (4 \times 2) + 3$.

3. How much is $12 \div 5$? 12 divided by 5 are 2 and 2 over.

4. $5 \overline{)11}$. Five is found in 11 twice and 1 over.
 $5 \overline{)11} = (5 \times 2) + 1$

5. $7 \overline{)12} = (7 \times 1) + 5$ 6. $3 \overline{)10}$ $2 \overline{)9}$ $4 \overline{)9}$ $10 \div 6 = ?$

7. $12 \div 10 = ?$ $8 \div 5 = ?$ $9 \div 8 = ?$ $12 \div 9 = ?$

When you see these marks (), called *parenthesis* marks, around numbers, they mean that we must do first what the sign inside says: $(3 \times 2) + 2 = ?$ means 3×2 , which are 6, then add $2 = ?$ The answer is 8. But the answer to $3 \times (2 + 2)$ is $3 \times 4 = 12$.

REVIEW

8. If I owe you 4¢, and give you a dime, how many cents must you give me back?

9. A piece of ice weighed 10 pounds in the morning. In the evening it weighed 2 pounds less. What was its weight in the evening?

10. Harry bought a bottle of ink for 3¢, a pencil for 1¢. He gave the clerk a nickel. Should the clerk give him any change?

11. Make a story about 3 and 4; about 2 and 5; about 6 less 1; about 3 and 1 and 2; about $12 \div 6$; about $11 \div 5$; $10 \div 4$.

QUESTIONS

1. How many two-cent stamps can we buy for a dime?
How many can we buy for 12 cents?
2. Frank is 10 years old. His brother is 4 years younger. How old is his brother?
3. Edgar has a dime. Willie has a nickel and 3¢.
How many more cents has Edgar than Willie?
4. George earned a nickel on Saturday forenoon and another nickel in the afternoon. On Saturday evening he spent 6¢. How many cents had he left?
5. A post was 10 feet high. 2 feet of it were in the ground. How many feet were above the ground? If Tom is 4 feet tall, how much higher is the post?
6. I buy an orange for 3¢ and hand the fruit-dealer a dime. What change should he give me?
7. There were 10 plum trees in an orchard. 2 of them died. How many lived? How many more would the farmer need to plant so as to have a dozen in all?
8. Arthur gave a dime for a flag and a top. The top cost 4¢. How much did the flag cost?
9. George gave 3 apples to each of 4 boys. How many did he give in all?
10. Alice had 10 pansies. She gave away 3 of them. How many had she left? If she divided the number left among three friends, giving each two, would she then have any pansies for herself?
11. Her father gave Helen a dime. She bought 5¢ worth of braid. How many cents had she left?
12. Louis spelled 3 words and James spelled 4. How many words did both boys spell?

TWOS

1	2	3	4	5	6	7	8	9	10	11	12
13	14	15	16	17	18	19	20	21	22	23	24
$0 + 2 = 2$		$6 + 2 = 8$			$12 + 2 = 14$			$18 + 2 = 20$			
$2 + 2 = 4$		$8 + 2 = 10$			$14 + 2 = 16$			$20 + 2 = 22$			
$4 + 2 = 6$		$10 + 2 = 12$			$16 + 2 = 18$			$22 + 2 = 24$			

Show by counters that each of these facts is true:

2	2	2	2	2	2	2	2	2	2	2	2
	<u>2</u>	2	2	2	2	2	2	2	2	2	2
	<u>4</u>	<u>2</u>	2	2	2	2	2	2	2	2	2
		<u>6</u>	<u>2</u>	2	2	2	2	2	2	2	2
			<u>8</u>	<u>2</u>	2	2	2	2	2	2	2
				<u>10</u>	<u>2</u>	2	2	2	2	2	2
					<u>12</u>	<u>2</u>	2	2	2	2	2
						<u>14</u>	<u>2</u>	2	2	2	2
							<u>16</u>	<u>2</u>	2	2	2
								<u>18</u>	<u>2</u>	2	2
									<u>20</u>	<u>2</u>	2
										<u>22</u>	<u>2</u>
											<u>24</u>

1. Add each column.
2. How many 2's make 18?
3. Ten 2's make ____.
4. A dozen 2's make ____.
5. ____ 2's make 22.

$2 \times 1 = 2$	$2 \times 7 = 14$
$2 \times 2 = 4$	$2 \times 8 = 16$
$2 \times 3 = 6$	$2 \times 9 = 18$
$2 \times 4 = 8$	$2 \times 10 = 20$
$2 \times 5 = 10$	$2 \times 11 = 22$
$2 \times 6 = 12$	$2 \times 12 = 24$

MULTIPLICATION TABLE OF TWOS

TWO'S

We read the Multiplication Table of Two: Two ones are two. Or, Two times one are two. Two twos are four. Or, Two times two are four. Two threes are six. Or, Two times three are six.

$$6 + 6 = 12 \quad \text{Two 6's} = \text{six 2's} \quad 2 + 2 + 2 + 2 + 2 + 2 = 12$$

$$10 + 10 = 20 \quad \text{Two 10's} = \text{ten 2's}$$

$$2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 + 2 = 20$$

1. Copy the Table of Twos on paper.
2. Count by 2's to 24. Write this counting.
3. Show that two 5's are 10, two 9's are 18, two 12's are 24.
4. Show that two 4's are 8, two 7's are 14, two 11's are 22.
5. Since a dozen inches make a foot, what part of a foot do six inches make?
6. How many 2¢ stamps will two dimes buy?
7. How many shoes are there in two dozen pairs?
8. There were five children in a family and there were two years of age between each child and the next. The youngest was six years old. How old was each of the other children?
9. Three little girls were given a basket of six apples to divide equally. How many apples did each receive?
10. Tom drinks 2 glasses of milk at each meal. How many glasses of milk does he drink in a day, for his breakfast, dinner, and supper?

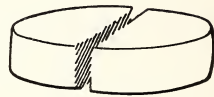
REVIEW

1. Draw nine chairs and two tables. These are — objects.
2. Draw a doll-house, seven boy paper-dolls, and five girl paper-dolls. These are — dolls.
3. 1 cake less $\frac{1}{2}$ cake leaves — cake.
4. Draw five cherries in one bunch and four cherries in another. These are — cherries.
5. Eleven chickens less seven chickens are — chickens.

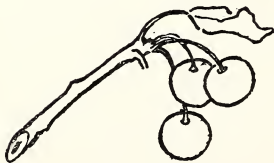
DRAW



chair



cake



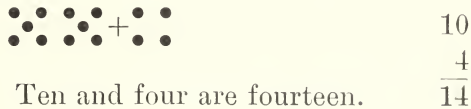
cherries



chicken

FOURTEEN, 14

When we have ten things and add four to them, the name of the number of all these things together is **fourteen**.



$$10 + 4 = 14.$$

Ten and four are fourteen.

We write fourteen with the figures 1 and 4, 14. We put the 1 in the tens' place and the 4 in units' place. 14 means 1 ten and 4 units, like this group of dots:

$$13 + 1 = 14 \quad 12 + 2 = 14$$

A dozen and two are fourteen.

Of what does the syllable "teen" in fourteen remind us?

Show by splints that each of these number-facts is true:
 $11 + 3 = 14$, $9 + 5 = 14$, $8 + 6 = 14$, $7 + 7 = 14$.

1. Tom was fourteen years old. His brother was six years old. How many years older was Tom?

2. Mary was seven years old, and Susan was seven, too. How many years had both lived?

3. Willie and his little brother together had fourteen cents. Willie took eight cents for himself and gave George the rest. How many did George have?

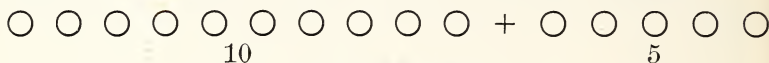
4. Tell number-stories about: $14 - 8$, $9 + 5$, $12 + 2$, $13 - 1$.

5. $14 \div 7 = 2$ $14 \div 2 = ?$ $7 \times 2 = 14$ $2 \times 7 = ?$

Show each of these facts by splints and counters.

FIFTEEN, 15

When we have ten things and add five to them, the name of the number of all of these together is **fifteen**.



We write fifteen with the figures 1 and 5, 15. We put 1 in tens' place at the left of 5 in units' place.

$$10 + 5 = 15. \quad \begin{array}{r} 10 \\ \underline{5} \\ 15 \end{array} \quad \text{Ten and five are fifteen.}$$

$$13 + 2 = 15 \quad 9 + 6 = 15 \quad 12 + 3 = 15$$

$$14 + 1 = 15, \quad 11 + 4 = 15, \quad 8 + 7 = 15, \quad 15 - 5 = 10, \\ 15 - 7 = 8, \quad 15 - 9 = 6, \quad 15 - 12 = 3, \quad 15 - 2 = 13.$$

MONEY

5 cents = 1 nickel. 10 cents = 1 dime. 2 nickels = 1 dime.

1 dime and 1 nickel make 15 cents. 3 nickels = 15 cents.

1. Three boys had three nickels. How many cents could they get for these nickels all together?

2. Willie had 6 cents, Johnny 5, and Charlie enough more to make 15 cents. How many cents did Charlie have?

3. Mary's father gave her 15¢. She spent one nickel for a little china doll, and four cents for a picture card to put in her doll-house. How many cents were left?

4. Louise had a dime, and Sarah a nickel. They spent six cents for car fares, and five cents for cookies. How many cents did they have then?

REVIEW

1. Add: $\begin{array}{r} 11 \\ 3 \\ \hline \end{array}$ $\begin{array}{r} 10 \\ 4 \\ \hline \end{array}$ $\begin{array}{r} 2 \\ 12 \\ \hline \end{array}$ $\begin{array}{r} 9 \\ 5 \\ \hline \end{array}$ $\begin{array}{r} 7 \\ 7 \\ \hline \end{array}$ 2. Subtract: $\begin{array}{r} 14 \\ 5 \\ \hline \end{array}$ $\begin{array}{r} 14 \\ 1 \\ \hline \end{array}$ $\begin{array}{r} 14 \\ 6 \\ \hline \end{array}$ $\begin{array}{r} 14 \\ 2 \\ \hline \end{array}$ $\begin{array}{r} 14 \\ 11 \\ \hline \end{array}$

3. $15 \div 3 = 5$ $5 \times 3 = 15$ Answer $15 \div 5 =$ $3 \times 5 =$

4. Show each of these facts by splints and counters.

5. Add: $\begin{array}{r} 11 \\ 4 \\ \hline \end{array}$ $\begin{array}{r} 12 \\ 3 \\ \hline \end{array}$ $\begin{array}{r} 7 \\ 8 \\ \hline \end{array}$ $\begin{array}{r} 9 \\ 6 \\ \hline \end{array}$ $\begin{array}{r} 14 \\ 1 \\ \hline \end{array}$ 6. Subtract: $\begin{array}{r} 15 \\ 3 \\ \hline \end{array}$ $\begin{array}{r} 15 \\ 4 \\ \hline \end{array}$ $\begin{array}{r} 15 \\ 9 \\ \hline \end{array}$ $\begin{array}{r} 15 \\ 10 \\ \hline \end{array}$ $\begin{array}{r} 15 \\ 12 \\ \hline \end{array}$

7. Subtract: $\begin{array}{r} 8 \\ 5 \\ \hline \end{array}$ $\begin{array}{r} 12 \\ 6 \\ \hline \end{array}$ $\begin{array}{r} 10 \\ 3 \\ \hline \end{array}$ $\begin{array}{r} 9 \\ 2 \\ \hline \end{array}$ $\begin{array}{r} 8 \\ 4 \\ \hline \end{array}$ $\begin{array}{r} 6 \\ 2 \\ \hline \end{array}$ $\begin{array}{r} 5 \\ 3 \\ \hline \end{array}$ $\begin{array}{r} 10 \\ 4 \\ \hline \end{array}$ $\begin{array}{r} 13 \\ 6 \\ \hline \end{array}$

8. Subtract: $\begin{array}{r} 7 \\ 2 \\ \hline \end{array}$ $\begin{array}{r} 13 \\ 2 \\ \hline \end{array}$ $\begin{array}{r} 10 \\ 6 \\ \hline \end{array}$ $\begin{array}{r} 9 \\ 4 \\ \hline \end{array}$ $\begin{array}{r} 8 \\ 3 \\ \hline \end{array}$ $\begin{array}{r} 3 \\ 1 \\ \hline \end{array}$ $\begin{array}{r} 10 \\ 5 \\ \hline \end{array}$ $\begin{array}{r} 7 \\ 4 \\ \hline \end{array}$ $\begin{array}{r} 12 \\ 5 \\ \hline \end{array}$

9. Find $13 \div 2$, $11 \div 2$, $9 \div 2$, $7 \div 2$, $5 \div 2$, $3 \div 2$. Are these odd or even numbers?

10. On his birthday as a present from his father Willie always had one cent for each year he was old, and one cent more to help him grow. One year his father gave him fourteen cents. How old was he on that birthday?

11. Mary found ten eggs when she went to the barn. She broke one, bringing them to the house. But her mother gave her as many more as she needed to make thirteen in all. How many did her mother give her?

12. Write the Multiplication Table of Twos on the blackboard without any copy.

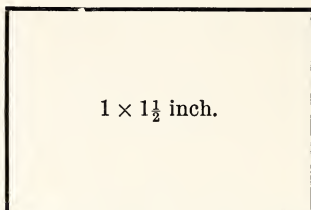
13. Divide each even number from 2 to 24 by 2. Make a division table, beginning it like this:

$2 \div 2 = 1$	$6 \div 2 = 3$	$10 \div 2 =$			
$4 \div 2 = 2$	$8 \div 2 = 4$	$12 \div$			

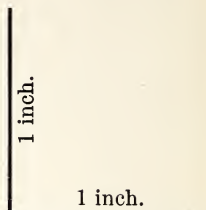
FORMS AND FRACTIONS



Rectangle.
Square.



Rectangle.
Oblong.

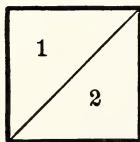


Right
Angle.

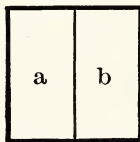
A *rectangle* is a form in which each angle is a right angle. A rectangle always has four sides.

A *square* is a rectangle all of whose sides are equal.

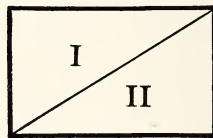
An *oblong* is any rectangle that is not a square. The opposite sides of oblongs are always equal.



A



B



C

1. What is the name of the form *A*? *B*? *C*?
2. What is the name of the form 1? a? I?
3. Point out $\frac{1}{2}$ of *A*. $\frac{1}{2}$ of *B*. $\frac{1}{2}$ of *C*.
4. Point out right angles in *A*, *B*, and *C*.
5. Make an oblong with sides one and two inches long. Divide it into two squares.

6. Make another, and divide it into two triangles.

Each square in 5 and each triangle in 6 is $\frac{1}{2}$ of the oblong.

THREES

3 6 9 12 15 18 21 24 27 30 33 36

$$\begin{array}{lll}
 0 + 3 = 3 & 3 + 3 = 6 & 6 + 3 = 9 \\
 9 + 3 = 12 & 12 + 3 = 15 & 15 + 3 = 18 \\
 18 + 3 = 21 & 21 + 3 = 24 & 24 + 3 = 27 \\
 27 + 3 = 30 & 30 + 3 = 33 & 33 + 3 = 36
 \end{array}$$

Show by splints that each of these facts is true:

3	3	3	3	3	3	3	3	3	3	3	3
	<u>3</u>	3	3	3	3	3	3	3	3	3	3
	6	<u>3</u>	3	3	3	3	3	3	3	3	3
		9	<u>3</u>	3	3	3	3	3	3	3	3
			12	<u>3</u>	3	3	3	3	3	3	3
				15	<u>3</u>	3	3	3	3	3	3
					18	<u>3</u>	3	3	3	3	3
						21	<u>3</u>	3	3	3	3
							24	<u>3</u>	3	3	3
								27	<u>3</u>	3	3
									30	<u>3</u>	3
										33	<u>3</u>
											36

1. Add each column.
2. How many 3's make 18?
3. Ten 3's make ____.
4. A dozen 3's make ____.
5. ____ 3's make 33.

$3 \times 1 = 3$	$3 \times 7 = 21$
$3 \times 2 = 6$	$3 \times 8 = 24$
$3 \times 3 = 9$	$3 \times 9 = 27$
$3 \times 4 = 12$	$3 \times 10 = 30$
$3 \times 5 = 15$	$3 \times 11 = 33$
$3 \times 6 = 18$	$3 \times 12 = 36$

MULTIPLICATION TABLE OF THREES

THREES

We read the Multiplication Table of Three: Three ones are three. Or, Three times one are three. Three twos are six. Or, Three times two are six, etc.

1. Copy the Table of Threes on paper.
2. Count by 3's to 36. Write this counting in words, beginning, three, six, nine, and so on.
3. Write the Table on the blackboard without any copy.
4. Make a division table of threes, beginning it like this:

$3 \div 3 = 1$	$9 \div 3 = 3$				
$6 \div 3 = 2$	$12 \div$				

REVIEW OF TWOS AND THREES

1. Add:

1	2	3	4	5	6	7	8	9	10	11	12
<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>

Of what Multiplication Table do these additions remind us?

2. Add:

1	2	3	4	5	6	7	8	9	10	11	12
<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>

Of what Multiplication Table do these additions remind us?

THIRDS

When anything is divided into three equal parts, each part is called a third. Three thirds equal one whole.



Circle



Rectangle



Square



Square

Into how many parts is the circle divided? the rectangle? each square?

Draw a line three inches long. Divide it into thirds.

One third is written in figures $\frac{1}{3}$.

Two thirds are written in figures $\frac{2}{3}$.

$\frac{3}{3}=1$. Why is this true? Look and see.

1. Eddie bought a cake and ate $\frac{1}{3}$ of it. How much of the cake was left?

2. How many thirds are there in an orange?

3. How many thirds in two oranges? In one orange are three thirds. 2 times $\frac{2}{3}$ are six thirds, $\frac{6}{3}$.

4. $\frac{1}{3}$ of 6 figs = how many figs? There are six times as many thirds in the 6 figs as there are in the one fig. $6 \times \frac{1}{3} = \frac{6}{3}$. $\frac{6}{3} = 2$.

5. What is $\frac{1}{3}$ of 6? $\frac{1}{3}$ of 9? $\frac{1}{3}$ of 12?

6. Which piece is the larger, $\frac{1}{3}$ of a pie or $\frac{1}{2}$ of a pie?

7. How much more does the whole of a cake cost than $\frac{1}{3}$ of it?

8. I started to walk to the depot. After I had walked $\frac{1}{3}$ of the distance, what part of it had I still to walk?

9. If your mother gave you some money and you spent $\frac{2}{3}$ of it, what part of the money would you have left?

TELLING QUANTITIES

We buy and sell butter and cheese by pounds, but we measure potatoes and vinegar by quarts.

A quart measure for dry things like flour is larger than that for liquids like milk. With dry sand find the difference between the liquid and the dry quart. Six quarts of flour would take just a little more space than seven quarts of milk.

2 pints make 1 quart. 2 pt. = 1 qt.

1 pint makes $\frac{1}{2}$ quart. 1 pt. = $\frac{1}{2}$ qt.

1. Mrs. Brown had three quarts of milk, and six hungry children. She gave each $\frac{1}{2}$ pt. in a glass. How many quarts were left?

2. Willie bought a quart of peanuts, and gave one pint to his little brothers. What fraction of the quart did he keep himself?

4 quarts make 1 gallon. 4 qt. = 1 gal.

3. How many quarts are there in three gallons of oil?

4. Susie's mother had one gallon of maple syrup. One morning the family had three pints of maple syrup on the table for buckwheat cakes. How many pints were left in the gallon jug?

8 quarts make 1 peck.

4 pecks make 1 bushel.

8 qt. = 1 pk. 4 pk. = 1 bu. 32 qt. = 1 bu. 64 pt. = 1 bu.

4 qt. = $\frac{1}{2}$ pk. 2 pk. = $\frac{1}{2}$ bu. 16 qt. = $\frac{1}{2}$ bu. 16 pt. = 1 pk.

QUANTITIES

1. Willie bought a bushel of corn for his chickens, and fed them for 16 days 2 quarts each day. How many quarts were then left?

2. George bought 8 pecks of oats for his pony, and the grain dealer sent them in a 2-bushel bag, full. Was this correct?

3. A grocer had a barrel of apples. He sold $\frac{2}{3}$ of them. What part of the barrel of apples did he have left?

4. One boy had two thirds of an apple, another boy had one third, and still another had one half of an apple. Tell how many equal parts of apples they had all together.

5. Two quarts of walnuts will fill how many cups, if each cup holds half a pint?

6. Fill a gallon measure with water, using a pint measure. How many times do you empty the pint measure?

7. How many quarts are there in 2 pecks? Which has more quarts, a peck or a gallon? Are the quarts the same in size?

8. A peck measure is one half full of oats. How many more quarts will it hold?

9. Henry filled a peck measure one quarter full of sand. How many quarts did he put into the measure? How many more quarts would it have held?

10. How many times must you empty a quart measure full of strawberries in order to fill a peck measure?

11. What part of a bushel of wheat is a peck of wheat?

12. What part of 4 is 1? When a bushel of oats costs a dollar, what will a peck of oats cost?

13. How many pints are there in 2 quarts? How many pecks are there in 16 quarts?

QUESTIONS

1. 8 quarts make — gallons.
2. How many pints are there in 3 quarts? 5 quarts?
3. How many pints are there in a gallon and a quart?
4. How many quarts are there in a gallon and a quart?
in a gallon and a pint?
5. If a pint of milk costs 4 cents, what will a quart cost? If a pint costs 3 cents, what will a gallon cost?
6. If milk is 3 cents a pint, what will a quart and a pint cost? At 3 cents a pint, what will two quarts cost?
7. At 2 cents a pint, how many cents will half a gallon of skimmed milk cost?
8. Fred drinks a pint of milk every day. In how many days does he drink a gallon? At 3 cents a pint, how much will his milk cost for one week?
9. If vinegar is 8¢ a quart, how much will $\frac{1}{2}$ pt. cost?
10. My lamp burns a pint of kerosene every night. How many nights will a gallon last me?
11. A milkman has a gallon of cream. How many pint bottles can he fill from it?
12. Should 7 quarts of milk cost more than 2 gallons, or less? Why?
13. A gallon jar is half full of water. I am going to fill it from a pint measure. How many times must I empty the measure?
14. A grocer had 10 quarts of syrup. He sold a gallon. How much syrup had he left?
15. Two gallons of oil will fill how many quart measures?
16. If you were paid 2 cents a pint for picking berries, how much money would you get for picking 3 quarts?

SIXTEEN, 16

We call ten and six things by the number **sixteen**.

$$15 + 1 = 16 \quad 12 + 4 = 16 \quad 10 + 6 = 16 \quad 8 + 8 = 16$$

We write sixteen with the figures 1 and 6, 16.
We put the 1 in tens' place and the 6 in units' place.

Show by splints that each of these number-facts is true: $10 + 6 = 16$, $8 + 8 = 16$, $4 + 12 = 16$, $9 + 7 = 16$, $11 + 5 = 16$.

$4 + 4 + 4 + 4 = 16$. How many 4's are there in 16?

$2 + 2 + 2 + 2 + 2 + 2 + 2 + 2$. How many 2's are there in 16? $8 + 8 = 16$. How many 8's do we find in 16?

$$4 \times 4 = 16 \quad 8 \times 2 = 16 \quad 2 \times 8 = 16 \quad 16 \div 4 = 4 \quad 16 \div 2 = 8$$



Count these dots:



1. If eight girls were sent to the grocery, each with two cents to buy a yeast cake, how many cents would all have together?

2. Four boys spent sixteen cents for fishhooks: each spent as much as the others. How many cents did each spend?

3. Mary had a nickel, Kate a dime, and Annie a cent. How many cents did they have all together?

SEVENTEEN, 17

We call ten and seven things by the number **seventeen**.

Seven and ten make seventeen. $10 + 7 = 17$ ●
 $16 + 1 = 17$ $15 + 2 = 17$ $9 + 8 = 17$ $13 + 4 = 17$ ●

Show each of these facts by splints and counters. ●●

1. We cannot divide 17 by any smaller number without remainder. ●●

2. We can divide 16 by 2, by 4, and by 8. ●●

3. We can divide 15 by 3 and by 5. ●●

4. We can divide 14 by 7 and by 2. ●●

5. We cannot divide 13 without remainder.

6. We can divide 12 by 6, by 2, by 3, and by 4.

7. We cannot divide 11 without remainder.

8. We can divide 10 by 5 and by 2.

9. We can divide 9 by 3.

10. We can divide 8 by 4 and by 2.

11. We cannot divide 7 without remainder.

12. We can divide 6 by 2 and by 3.

13. We cannot divide 5 without remainder.

14. We can divide 4 by 2.

15. Tell number-stories about 17, using cents, marbles, eggs, fish, dolls, apples, or whatever interests you, to show these facts: $10 + 7 = 17$ $15 + 2 = 17$ $17 - 11 = 6$
 $17 - 8 = 9$ $17 - 3 = 14$ $17 - 5 = 12$

16. Add: $\begin{array}{cccccccc} 5 & 6 & 4 & 7 & 3 & 8 & 2 & 1 \\ \hline 12 & 11 & 13 & 10 & 14 & 9 & 15 & 16 \end{array}$

EIGHTEEN, 18

We call ten and eight things by the number **eighteen**.

Eight and ten make eighteen. $10 + 8 = 18$

$15 + 3 = 18$ $16 + 2 = 18$ $9 + 9 = 18$ $12 + 6 = 18$

$18 \div 2 = 9$ $18 \div 9 = 2$ $9 \times 2 = 18$ $2 \times 9 = 18$

$18 \div 6 = 3$ $18 \div 3 = 6$ $6 \times 3 = 18$ $3 \times 6 = 18$

Show each of these facts by splints and counters.

15 are three 5's. 15 are ten and five.

18 are three 6's. 18 are twelve and six.

There are two 6's in 12. $6 \times 2 = 12$. $12 \div 6 = 2$.

This group of dots



A DOZEN

is 2 times this group



A HALF
DOZEN

18 are a dozen and a half dozen more.

12 inches make one foot.

18 inches are 12 inches and 6 inches more.

18 inches are a foot and a half foot.

Show these facts on the yardstick or by blackboard picture.

NUMBER-STORIES

1. John's father asked him to get at the store a dozen and a half of pens. These cost one cent each. How many cents did John pay?

2. When John came home he found a yardstick and measured the kitten, which was 18 inches long from its nose to the end of its tail. How much was that in feet?

3. Then his mother sent him on an errand to sell a dozen and a half of eggs. The grocer gave him a dime a dozen. How many cents did he bring home?

REVIEWS OF NUMBERS AND FORMS

1. Tell number-stories about these facts :

$16 \div 2 = 8$

$16 - 6 = 10$

$16 \div 4 = 4$

$9 + 7 = 16$

$12 + 4 = 16$

$13 + 3 = 16$

2. Add: $\begin{array}{r} 2 \ 5 \ 8 \ 1 \\ 14 \ 11 \ 8 \ 15 \\ \hline \end{array}$

3. Subtract: $\begin{array}{r} 16 \ 16 \ 16 \ 16 \\ 6 \ 9 \ 12 \ 15 \\ \hline \end{array}$

4. Subtract: $\begin{array}{r} 17 \ 17 \ 17 \ 17 \ 17 \ 17 \ 17 \\ 4 \ 3 \ 9 \ 6 \ 2 \ 10 \ 1 \\ \hline \end{array}$

5. Do what the sign tells : $\begin{array}{r} 17 \ 14 \ 16 \ 12 \ 17 \ 17 \\ -7 \ +3 \ +1 \ +5 \ -2 \ -9 \\ \hline \end{array}$

6. Add: $\begin{array}{r} 15 \ 10 \ 9 \ 12 \\ 3 \ 8 \ 9 \ 6 \\ \hline \end{array}$ 7. Subtract: $\begin{array}{r} 18 \ 18 \ 18 \ 18 \\ 2 \ 4 \ 5 \ 11 \\ \hline \end{array}$

8. Divide 18 by 2, by 3, by 6, and by 9.

9. Make stories about :

$16-3$	$18-9$	$17-10$	$11+2$	$13+5$	$18-10$
$15+2$	$18-15$	$17-14$	$10+7$	$15-5$	$15+3$
$18-6$	$17-2$	$15-4$	$17-4$	$16-14$	$15-11$

10. Draw an oblong two inches by three inches. Divide it into halves in several different ways.

11. Divide into thirds another oblong, two inches by three.

12. Draw a triangle with one side of the right angle 2 inches long and the other side 1 inch long.

13. Draw a circle 1 inch in diameter and divide it into halves. A diameter is any straight line through the center of a circle, and extended on both sides to the circumference.

NINETEEN, 19

We call ten and nine things by the number **nineteen**.

Nine and ten make nineteen. $10 + 9 = 19$

$$15 + 4 = 19 \quad 16 + 3 = 19 \quad 12 + 7 = 19 \quad 14 + 5 = 19$$

$$18 + 1 = 19 \quad 5 + 5 + 5 + 4 = 19 \quad 4 + 4 + 4 + 4 + 3 = 19$$

Show each of these facts by splints and counters.



NUMBER-STORIES

1. There were 19 boys in the school yard. 6 of them went home. How many were left?

2. 19 boys came to school early in the morning to play marbles. When they reached the school yard 2 of them found that they had lost their marbles on the way to school. How many had their marbles with them?

3. Nineteen girls were trying to cut paper dolls out of white paper. Fourteen of them made very nice dolls. How many of them were not able to make the dolls?

4. Three times six boys went swimming. One more boy asked his mother if he could go, but she said, "No!" How many boys wanted to go?

5. Eight times two girls walked home from school together in pairs. Three girls walked side by side. How many girls were there in all?

6. Add: $12 \ 11 \ 14$ 7. $3 + 5 + 6 + 5 =$ 8. $10 + 6 + 3 =$
 $\underline{\quad} \ \underline{\quad} \ \underline{\quad}$ 9. $8 + 4 + 3 + 4 =$ 10. $12 + 5 + 2 =$

11. Subtract: $19 \ 19 \ 19 \ 19 \ 19 \ 19 \ 19 \ 19 \ 19$
 $\underline{\quad} \ \underline{\quad} \ \underline{\quad} \ \underline{\quad} \ \underline{\quad} \ \underline{\quad} \ \underline{\quad} \ \underline{\quad} \ \underline{\quad}$

12. Tell number-stories about the combinations in 7, 8, 9, 10, and 11.

PARTITIONS

- 3 $3=2+1$
- 5 $5=3+2$ $5=2+2+1$ $5=4+1$
- 7 $7=5+2$ $7=6+1$ $7=4+3$ $7=3+3+1$
- 11 $11=7+4$ $11=8+3$ $11=9+2$ $11=6+5$
 $11=5+5+1$ $11=3+3+3+1+1$ $11=4+4+3$
- 13 $13=11+2$ $13=8+5$ $13=9+4$ $13=7+6$
 $13=5+5+3$ $13=4+4+4+1$ $13=3+3+3+3+1$
 $13=2+2+2+2+2+2+1$ $13=10+3$
- 17 $17=13+4$ $17=5+5+5+2$ $17=10+7$ $17=15+2$
 $17=8+8+1$ $17=4+4+4+4+1$ $17=12+5$
 $17=3+3+3+3+3+2$ $17=16+1$ $17=7+7+3$
- 19 $19=17+2$ $19=5+5+5+4$ $19=16+3$ $19=14+5$
 $19=4+4+4+4+3$ $19=3+3+3+3+3+3+1$
 $19=9+9+1$ $19=13+6$ $19=11+8$ $19=10+9$

1. Divide 3, 5, 7, 11, 13, 17, and 19 by 2, and show how many ones are left over.

$$\begin{array}{r} 2 \overline{)17} \\ 8 \\ \hline 1 \end{array} + 1, \text{ because } 2 \times 8 = 16, \text{ and } 16 + 1 = 17$$

2. Divide 5, 7, 11, 13, 17, and 19 by 3.

$$\begin{array}{r} 3 \overline{)13} \\ 12 \\ \hline 1 \end{array} + 1, \text{ because } 3 \times 4 = 12, \text{ and } 12 + 1 = 13$$

3. Divide 7, 11, 13, 17, and 19 by 5.

$$\begin{array}{r} 5 \overline{)19} \\ 15 \\ \hline 4 \end{array} + 4, \text{ because } 5 \times 3 = 15, \text{ and } 15 + 4 = 19$$

4. Divide 13, 17, and 19 by 7.

$$\begin{array}{r} 7 \overline{)13} \\ 7 \\ \hline 6 \end{array} + 6, \text{ because } 7 \times 1 = 7, \text{ and } 7 + 6 = 13$$

TWENTY, 20

We call two tens **twenty**.

$$10 + 10 = 20 \quad 15 + 5 = 20 \quad 12 + 6 + 2 = 20$$

$$5 + 5 + 5 + 5 = 20 \quad 6 + 6 + 6 + 2 = 20$$

Show each of these facts by splints and counters.

We write twenty in figures by putting 2 in tens' place, and to show that 2 is in tens' place, we set the zero, 0, in units' place. Write 20.

$$2 \times 10 = 20 \quad 4 \times 5 = 20 \quad 3 \overline{)20} + 2$$

There are six 3's or three 6's in 20 and 2 units over.

We write this: $(3 \times 6) + 2 = 20$ or $(6 \times 3) + 2 = 20$.

We place the marks of parenthesis () around the 6 and 3 to show that 3 multiplies 6, and does not multiply $6 + 2$.

1. Find how many times 20 contains 3, 7, 9, with how many units over.

2. Draw on the blackboard a rectangle containing 20 square inches.

3. Add:

1	3	18	15	13	6	4	12	11	10
19	17	2	5	7	14	16	8	9	10

4. Subtract:

20	20	20	20	20	20	20	20	20	20
18	15	10	12	1	3	4	6	7	9

5. How would you divide twenty apples among five boys? among six boys?

6. Can we divide twenty oranges among seven girls so that each may have as many as any other? How many would have but two oranges each?

FACTS OF NUMBER, 11 TO 20

Additions :

10 + 1 = 11	11 + 2 = 13	12 + 4 = 16	13 + 7 = 20	15 + 5 = 20
10 + 2 = 12	11 + 3 = 14	12 + 5 = 17	14 + 1 = 15	16 + 1 = 17
10 + 3 = 13	11 + 4 = 15	12 + 6 = 18	14 + 2 = 16	16 + 2 = 18
10 + 4 = 14	11 + 5 = 16	12 + 7 = 19	14 + 3 = 17	16 + 3 = 19
10 + 5 = 15	11 + 6 = 17	12 + 8 = 20	14 + 4 = 18	16 + 4 = 20
10 + 6 = 16	11 + 7 = 18	13 + 1 = 14	14 + 5 = 19	17 + 1 = 18
10 + 7 = 17	11 + 8 = 19	13 + 2 = 15	14 + 6 = 20	17 + 2 = 19
10 + 8 = 18	11 + 9 = 20	13 + 3 = 16	15 + 1 = 16	17 + 3 = 20
10 + 9 = 19	12 + 1 = 13	13 + 4 = 17	15 + 2 = 17	18 + 1 = 19
10 + 10 = 20	12 + 2 = 14	13 + 5 = 18	15 + 3 = 18	18 + 2 = 20
11 + 1 = 12	12 + 3 = 15	13 + 6 = 19	15 + 4 = 19	19 + 1 = 20

Multiplications :

2 × 6 = 12	2 × 8 = 16	2 × 10 = 20	3 × 5 = 15	4 × 4 = 16
2 × 7 = 14	2 × 9 = 18	3 × 4 = 12	3 × 6 = 18	4 × 5 = 20

Copy and answer :

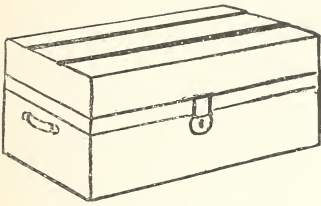
- | | | |
|-------------------|---------------------------|---------------------------|
| 1. $10 \div 5 =$ | 9. $4 \times 4 =$ | 17. $\frac{1}{6}$ of 12 = |
| 2. $9 \div 3 =$ | 10. $18 \div 2 =$ | 18. $\frac{1}{7}$ of 14 = |
| 3. $8 \div 4 =$ | 11. $20 \div 5 =$ | 19. $\frac{2}{3}$ of 9 = |
| 4. $12 \div 6 =$ | 12. $20 \div 10 =$ | 20. $\frac{2}{5}$ of 10 = |
| 5. $15 \div 5 =$ | 13. $\frac{1}{2}$ of 16 = | 21. $\frac{3}{4}$ of 12 = |
| 6. $16 \div 8 =$ | 14. $\frac{1}{3}$ of 18 = | 22. $\frac{3}{5}$ of 15 = |
| 7. $18 \div 6 =$ | 15. $\frac{1}{4}$ of 20 = | 23. $18 - 5 + 6 =$ |
| 8. $7 \times 2 =$ | 16. $\frac{1}{5}$ of 15 = | 24. $14 + 3 - 10 =$ |

25. Subtract from 20 every number from 10 to 19.

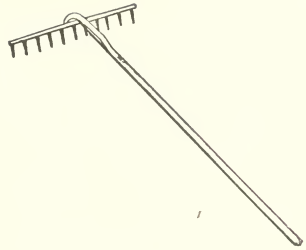
20 20

10 11 and so on.

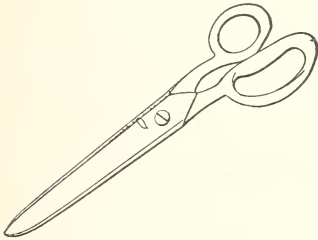
26. 4)16 2)18 4)20 5)15 5)20 6)18 3)12



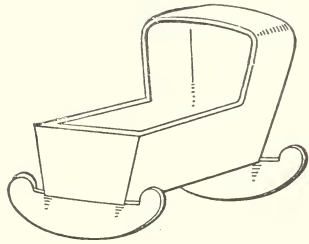
trunk



rake



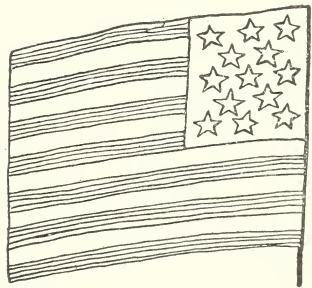
shears



cradle



pitcher



flag

Draw, or cut out of paper, various numbers of these objects.

QUESTIONS

1. A man has a dozen letters to be mailed and only four stamps. How many stamps must he buy?

2. How many cents are 10¢ and 2¢ ? 10¢ and 4¢ ? 16¢ and 1¢ ? 3¢ and 10¢ ? 14¢ and 5¢ ? 13¢ and 3¢ ? 12¢ and 8¢ ? 13¢ less 5¢ ? 19¢ less 7¢ ?

3. Make 12 dots in a row. Make 2 more dots under them. How many dots in all have you made? Add 5 more. How many have you made now?

4. Nine boys have twenty marbles. Four of them have ten marbles all together. Each of the rest has as many as any of the others. How many marbles has each of these?

5. Count by 2's from 1 to 19 and from 19 back to 1.

6. Count by 3's from 19 backwards to 1.

7. Count by 3's from 1 to 19.

8. Count by 4's from 0 to 20 and from 20 back to 0.

9. Count by 4's from 17 back to 1.

10. Count by 2's from 3 to 19 and from 19 back to 3.

11. Count by 3's from 2 to 20 and from 20 back to 2.

12. Count by 4's from 5 to 17.

13. Count backwards by 5's from 20 to 0.

14. Count backwards by 5's from 19 to 4.

15. Count by 6's from 0 to 18 and back from 18 to 0.

16. Begin at 3 and count by 7's to 38.

17. Begin at 4 and count by 5's to 39.

18. Begin at 2 and count by 4's to 38.

REVIEW

1. Lay 1 bundle of 10 splints. Count out ten loose ones and tie them into a bundle. How many splints are there in the two bundles? Write the number 20. What does the zero mean? Have you any loose splints when you show 20 in bundles of ten splints?

2. How many figures do you write for eleven? for twelve? for thirteen? for twenty?

3. In all these numbers, what does the figure on the left show? What does the figure on the right show?

4. While Mary was feeding 7 birds, 4 more birds came. Then how many birds were there?

5. There are 9 cups in 1 row, and 4 cups in another row. How many cups are there in both rows?

6. 10 pencils and 2 pencils are how many pencils?

7. Jennie had a dime and 2¢. She spent $\frac{1}{2}$ of her money. How many cents did she have left?

8. How many marbles must you put with 9 marbles in order to have 14 marbles?

9. I have four dollars. How many more dollars must I get in order to have fifteen dollars?

10. Edwin had 13 marbles. He lost 5. How many had he left?

11. Make 2 triangles. Under them make 2 squares. How many sides are there in the triangles? How many sides in the square? How many sides altogether in all the squares and triangles?

12. An orchard has 10 apple trees and 4 pear trees. How many trees are there in the orchard?

13. Henry has ten cents. How many more cents must he get in order to have 14¢?

QUESTIONS

1. Write the numbers made up of :

One ten and seven units. One ten and three units. One ten and six units. One ten and five units. One ten and eight units. One ten and two units. One ten and one unit. One ten and four units. One ten and nine units. One ten. Two tens.

Seven units. Three units. Eight units. Six units. Five units. Nine units.

2. A farmer had 19 animals in a field. Eight of them were sheep and the rest were cows. How many cows were there in the field?

3. Ella has 11¢ and Maud has 17¢. How many more cents has Maud than Ella?

4. Alice had 19 splints in her hand. She put 7 of them on her desk. How many splints did she keep in her hand?

5. I had 20¢ and lost 6¢. How many cents had I left?

6. Mrs. Smith paid \$16 for a jacket and \$4 for a hat. How many dollars did she spend?

7. A farmer had 19 chickens. He sold 5 of them. How many were left?

8. There were 20 barrels of flour in a store. Six of them were sold. How many were left?

9. One ladder has 19 rungs. Another ladder has 14 rungs. What number tells the difference in rungs between the ladders?

10. I paid 3¢ for a pencil and 16¢ for paper. How many cents did I spend?

11. Emma had 20¢. She paid 2 nickels in car fares. How much money had she left?

12. 12 lemon pies and 7 peach pies are how many pies?

SUBTRACTING

1. John had 10 cents, and spent 7 cents for a whistle. He had three cents left.

2. Mary had 16 paper dolls, and gave away 11. She kept 5 for herself.

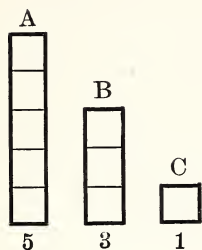
Give each boy and girl one combination to tell or write a story about.

3 - 2	5 - 3	5 - 1	3 - 1	12 - 6
4 - 3	9 - 4	6 - 2	9 - 6	7 - 6
3 - 1	2 - 2	9 - 5	12 - 8	13 - 9
8 - 5	7 - 4	6 - 6	9 - 8	5 - 5
8 - 4	15 - 9	16 - 7	11 - 5	4 - 2
12 - 9	11 - 8	7 - 7	4 - 1	6 - 3
10 - 3	3 - 3	1 - 1	8 - 7	9 - 4
9 - 8	13 - 8	17 - 9	9 - 9	20 - 6
11 - 4	8 - 3	10 - 1	20 - 1	14 - 5
4 - 4	15 - 6	9 - 3	13 - 7	20 - 8
6 - 1	12 - 5	13 - 5	14 - 8	16 - 9
6 - 5	13 - 6	10 - 8	11 - 3	13 - 4
10 - 9	7 - 1	8 - 8	18 - 9	10 - 3
7 - 3	5 - 2	20 - 2	11 - 9	14 - 6
7 - 5	8 - 1	10 - 4	10 - 7	10 - 5
5 - 4	2 - 1	12 - 4	20 - 3	15 - 8
9 - 1	11 - 2	14 - 7	17 - 8	12 - 7
7 - 2	18 - 8	20 - 7	20 - 9	20 - 5
9 - 2	14 - 9	20 - 4	11 - 7	16 - 8
10 - 6	12 - 3	11 - 6	10 - 10	15 - 7

3. Write out the answers to the questions in each column: $3 - 2 = 1$, $5 - 3 = 2$.

4. Tell the answers, taking turns around the class.

COMPARISONS

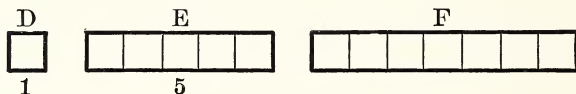


A is $5 \times C$. B is $3 \times C$.

C is $\frac{1}{5}$ of A . C is $\frac{1}{3}$ of B .

What part of A is B ? of B is C ?
 How many times does A contain C ?
 How many does B contain C ?

B is three fifths, $\frac{3}{5}$, of A . A is five thirds, $\frac{5}{3}$, of B .



What part of E is D ? of F is D ? How many times
 D is E ? How many times D is F ?



4 is 4 times 1 2 is 2 times 1

1 is $\frac{1}{4}$ of 4 1 is $\frac{1}{2}$ of 2

6 is 6 times 1

6 is $1\frac{1}{2}$ times 4

1 is $\frac{1}{6}$ of 6

4 is $\frac{4}{6}$ or $\frac{2}{3}$ of 6

6 is 3 times 2

3 is $\frac{1}{2}$ of 6

2 is $\frac{1}{3}$ of 6

4 is 2 times 2

2 is $\frac{1}{2}$ of 4

QUESTIONS

1. I have 3 black chicks and 5 times as many white ones. How many white chicks have I?
2. How many figs are 3 times 4 figs? 5 times 3 figs?
3. 4 pictures cost \$5 apiece. How many dollars did they all cost?
4. A roll of braid costs 16¢. What will be the price of one quarter of the roll?
5. Helen had 12¢. She gave $\frac{1}{4}$ of her money to her sister Alice. How many cents did she give to Alice?
6. If Charles can ride 20 miles in 1 hour on his wheel, how far can he ride in a quarter of an hour?
7. If you bought $\frac{1}{4}$ of a dozen of bananas, how many bananas would you have? how many if you bought $\frac{2}{4}$ of a dozen? how many if you bought $\frac{1}{2}$ of a dozen?
8. A man walks 4 miles an hour. How far does he walk in 4 hours? in 5 hours? in $4\frac{1}{2}$ hours?
9. Edgar had 6¢. Arthur has 3 times as much money as Edgar. How many cents has Arthur?
10. If we use 3 crayons a day in this room, how long will 18 crayons last us?
11. If a man worked only half the working days in a week, how many days would he be idle? How many days would he be at work?
12. If you walk 1 mile every school day, how many miles do you walk in a week? If the walk is 1 mile each way, how many miles do you walk in a week, when you stay at school for noon-recess?
13. During Christmas week I was at home only 2 days. How many days was I away from home?

FOURS

4 8 12 16 20 24 28 32 36 40 44 48

$0 + 4 = 4$	$4 + 4 = 8$	$8 + 4 = 12$
$24 + 4 = 28$	$28 + 4 = 32$	$32 + 4 = 36$
$12 + 4 = 16$	$16 + 4 = 20$	$20 + 4 = 24$
$36 + 4 = 40$	$40 + 4 = 44$	$44 + 4 = 48$

Show by splints that each of these facts is true.

4	4	4	4	4	4	4	4	4	4	4	4
	$\frac{4}{8}$										
		$\frac{4}{12}$									
			$\frac{4}{16}$								
				$\frac{4}{20}$							
					$\frac{4}{24}$						
						$\frac{4}{28}$					
							$\frac{4}{32}$				
								$\frac{4}{36}$			
									$\frac{4}{40}$		
										$\frac{4}{44}$	
											$\frac{4}{48}$

1. Add each column.
2. Add each row.
3. — 4's = 16.
4. How many 4's make 44?
5. A dozen 4's make —.

$4 \times 1 = 4$	$4 \times 7 = 28$
$4 \times 2 = 8$	$4 \times 8 = 32$
$4 \times 3 = 12$	$4 \times 9 = 36$
$4 \times 4 = 16$	$4 \times 10 = 40$
$4 \times 5 = 20$	$4 \times 11 = 44$
$4 \times 6 = 24$	$4 \times 12 = 48$

MULTIPLICATION TABLE OF FOURS

FOURS

1. Copy the Table of Fours on paper. 2. Learn Fours.
3. Show that 4 1's=4, 4 4's=16, 4 7's=28, 4 2's=8, 4 6's=24, 4 9's=36, 4 3's=12, 4 10's=40, 4 11's=44.
4. Write the Table on the blackboard without any copy.
5. Make a division table of fours, beginning it like this:

$4 \div 4 = 1$	$12 \div 4 = 3$	$20 \div$			
$8 \div 4 = 2$	$16 \div 4 = 4$				

6. Add:

1	2	3	4	5	6	7	8	9	10	11	12
1	2	3	4	5	6	7	8	9	10	11	12
1	2	3	4	5	6	7	8	9	10	11	12
<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>

7. How many 4's are there in a dozen?
8. How many dozen are there in 48?
9. Twelve fours are how many times twelve twos?
10. Begin at 2 and count by 4's to 50.
11. Take 30 splints and divide them into 4's. How many are left?
12. John received 4¢ a quart for picking strawberries. He was paid in all 40¢. How many quarts did he pick?
13. A cat has five claws on each front foot and four claws on each hind foot. How many claws in all has a cat?

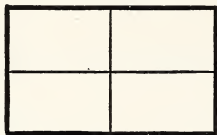
FOURTHS OR QUARTERS

When anything is divided into four equal parts, each part is called a fourth or a quarter.

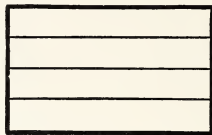
Four fourths or four quarters make one whole. $4 \times \frac{1}{4} = 1$.



Circle



Rectangle



Rectangle



Square

Into how many parts is the circle divided? Each rectangle?

Into how many parts is the square divided?

How many fourths are there in each of these forms?

$\frac{4}{4} = 1$. Four fourths are one. One half of four is 2.
 $4 \div 2 = 2$. One half of four fourths is two fourths.

$\frac{1}{2}$ of $\frac{4}{4} = \frac{2}{4}$; $\frac{2}{2} = 1$; $\frac{3}{3} = 1$; $\frac{4}{4} = 1$; $\frac{1}{2} = \frac{2}{4}$.

Read each of these facts in words.



1. Make three rectangles, each one inch high by two inches long. Cut one rectangle into halves.

Cut the second rectangle into fourths. Place the halves upon the third rectangle, and the fourths upon the halves. Are the two halves equal to the four fourths? Are the two halves and the four fourths equal to the third rectangle?

2. Willie had a quarter of a dollar, his aunt gave him half a dollar. How many quarters of a dollar did he have then? How many fourths of a dollar?

3. A barrel of flour contains how many fourths of a barrel? If $\frac{2}{4}$ of the flour are taken out of the barrel, how much of the flour is left in the barrel?

TELLING WEIGHTS

Did you ever buy anything at a store? Did you ever notice how much heavier 5 pounds of sugar are than 2 pounds of coffee? Did you ever lift a piece of iron weighing just one pound?

We buy some things by their weight or heaviness.

One pound is the standard measure of weight, just as a foot is for length, an hour for time, and a quart for quantity or amount.

16 ounces (oz.) make 1 pound (lb.).

$$1 \text{ oz.} = \frac{1}{16} \text{ lb.}$$

$$1 \text{ lb.} = 16 \text{ oz.}$$

$$\frac{1}{2} \text{ lb.} = 8 \text{ oz.}$$

1. Name five things sold by weight.
2. If a pound of meat costs 20¢, what will $\frac{1}{2}$ of a pound cost?
3. A melon weighs 20 ounces. How many more ounces than 1 pound does it weigh?
4. What part of 16 ounces are 4 ounces?
5. If a pound of candy costs 20¢, how much will a quarter of a pound cost? How much will $\frac{3}{4}$ of a pound cost?
6. If Mr. Brown and his family use 4 pounds of sugar in 4 days, how many ounces do they use in 1 day?
7. How many ounce weights are equal to a quarter of a pound weight?
8. If a quarter of a pound of coffee costs 9¢, how many cents will a pound cost?
9. At 16¢ a pound, what will half a pound of crackers cost?
10. When pepper is 6¢ an ounce, can you buy half a pound of pepper for half a dollar?

REVIEWS

1. A man worked on Thursday, Friday, and Saturday. He was paid two dollars for every day he worked. How many dollars did he get?

2. Arthur and Fred ate $\frac{3}{4}$ of a cake. They gave the rest away. What part of the cake did they give away?

3. Hattie had $\frac{3}{4}$ of a dollar. She spent $\frac{1}{2}$ of a dollar for a doll. How much money had she left?

4. Fred gave $\frac{1}{4}$ of his orange to Willie, and another $\frac{1}{4}$ to Frank. He ate another $\frac{1}{4}$. How much of the orange did he have left?

5. John was sent to the grocery to buy 8 ounces of pepper, 1 pound of coffee, $\frac{1}{2}$ pound of tea, $\frac{1}{2}$ pound of cinnamon, and 3 pounds of sugar. How many pounds did he carry home to his mother?

6. Mary had 25 cents with which to buy 4 lbs. of sugar at 5¢ a pound, and $\frac{1}{4}$ lb. of chocolate cream candy at 20¢ a pound. Did she have enough money to buy these things?

7. George made a checkerboard 8 inches by 8 inches, and marked on it — inch squares. Draw the board on the blackboard and count the squares.

8. Fold a piece of paper into an inch cube. How many faces has it? Mark the — faces with numbers.

9. Fold a piece of strong paper into a box (rectangular prism), six inches long, two inches wide, and two inches high. Roll another piece of strong paper into a cylinder, six inches long, two inches in diameter. With dry sand find whether the box or the cylinder is the larger.

NUMBERS TWENTY-ONE TO TWENTY-THREE

21

Twenty things and one thing we call by the number **twenty-one**.

$$10 + 10 + 1 = 21 \quad 20 + 1 = 21 \quad 16 + 5 = 21$$

$$15 + 6 = 21 \quad 10 + 11 = 21 \quad 12 + 9 = 21 \quad 18 + 3 = 21$$

We write the two in tens' place and the 1 in units' place.



22

Twenty and two we call **twenty-two**.

$$10 + 10 + 2 = 22 \quad 20 + 2 = 22 \quad 16 + 6 = 22$$

$$15 + 7 = 22 \quad 10 + 12 = 22 \quad 18 + 4 = 22$$

$$14 + 8 = 22 \quad 2 \times 11 = 22 \quad 22 \div 11 = 2$$



23

Twenty and three we call **twenty-three**.

$$10 + 10 + 3 = 23 \quad 20 + 3 = 23 \quad 16 + 7 = 23$$


$$15 + 8 = 23 \quad 10 + 13 = 23 \quad 18 + 5 = 23$$

$$14 + 9 = 23 \quad 23 = (4 \times 5) + 3 \quad 23 = (6 \times 3) + 5$$



NUMBERS TWENTY-FOUR TO TWENTY-SIX

24


 Twenty things and four things we call by the number **twenty-four**.

$$10 + 10 + 4 = 24 \quad 20 + 4 = 24 \quad 16 + 8 = 24$$

$$15 + 9 = 24 \quad 10 + 14 = 24 \quad 18 + 6 = 24$$

$$14 + 10 = 24 \quad 6 \times 4 = 24 \quad 12 \times 2 = 24$$

25

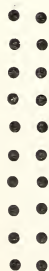
Twenty and five we call **twenty-five**.


 5 5's are 25.

$$10 + 10 + 5 = 25 \quad 5 \times 5 = 25 \quad 25 \div 5 = 5 \quad 24 + 1 = 25$$

$$(6 \times 4) + 1 = 25 \quad (3 \times 7) + 4 = 25 \quad (8 \times 3) + 1 = 25$$

26


 Twenty and six we call **twenty-six**.

$$10 + 10 + 6 = 26 \quad 20 + 6 = 26 \quad 16 + 10 = 26$$

$$15 + 11 = 26 \quad 12 + 14 = 26 \quad 18 + 8 = 26$$

$$19 + 7 = 26 \quad 26 = (5 \times 5) + 1 \quad 26 = (8 \times 3) + 2$$

QUESTIONS

One quarter of a dollar = 25¢

1. How many quarters of a dollar make a dollar? a dollar and a quarter? a dollar and a half? a dollar and three quarters? two dollars?
2. Two halves of a pie were each cut into two equal parts. Henry ate one of those parts. What part of the whole pie was left?
3. Mary bought a yard of ribbon, and used $\frac{2}{3}$ of it. What part of the yard of ribbon was left?
4. Willie is twice as old as Charles. Willie is 14 years old. How old is Charles?
5. Mr. Jones divided 18 boxes of figs equally among 6 children. How many boxes did each child get?
6. A farmer sold half a bushel of pears to one man and a fourth of a bushel to another man. How many fourths in all did he sell?
7. Etta bought 8 lead pencils at 3¢ apiece. She gave the clerk a quarter. What change should she get?
8. Mrs. Brown bought 3 pounds of currants at 8¢ a pound. She gave the clerk 2 dimes and a nickel. What change should she get?
9. At 3¢ a yard, how much will 7 yards of braid cost? at 4¢ a yard? at 5¢? at 6¢?
10. Irene had 9¢. She spent $\frac{1}{3}$ of her money, and gave another $\frac{1}{3}$ to her brother. What part of her money had she left? How many cents had she left?
11. In an orchard there are 15 peach trees and 12 pear trees. How many trees are there in the orchard?
12. In a can there are 2 gallons of milk. How many pints are there?

20 AND 25

1. $2 \times 10 = ?$ $10 \times 2 = ?$ $20 \div 10 = ?$ $20 \div 2 = ?$
2. What is $\frac{1}{2}$ of 20? $\frac{1}{10}$ of 20? $\frac{2}{10}$ of 20? $\frac{3}{10}$ of 20?
 $\frac{4}{10}$ of 20? $\frac{6}{10}$ of 20? $\frac{8}{10}$ of 20? $\frac{9}{10}$ of 20?
3. What is the ratio of 20 to 10? of 10 to 20?
4. Edna bought a yard of lace for 18¢. She gave the clerk 2 dimes. What change should he give her?
5. How many dots are there in each of these rows? How many rows are there?
 How many dots are there in all?

•	•	•	•	•
•	•	•	•	•
•	•	•	•	•
•	•	•	•	•
•	•	•	•	•
6. $5 \times 5 = ?$ How many 5's are there in 25? How many 5's are there in 20?
7. What is the ratio of 25 to 5? of 20 to 5? of 5 to 20? of 5 to 25?
8. $25 \div 5 = ?$ $20 \div 5 = ?$ $10 \div 5 = ?$
9. At 5¢ each, how many cents will 5 oranges cost?
10. How many nickels equal a quarter of a dollar?
11. $7 + 8 + 10 - 5 = ?$ $25 - 5 - 5 - 5 = ?$
12. $1 + 17 - 10 - 5 + 2 = ?$ $23 - 3 - 5 + 4 + 1 = ?$
13. $16 + 4 + 5 - 6 - 4 = ?$ $24 - 3 - 2 + 6 = ?$
14. If one table costs \$5, how many dollars will 2 tables cost? How many \$5 in \$10?
15. What is the cost of 5 hats at \$4 each?
16. Ella has 25¢. How many paper dolls at 2¢ apiece can she buy?
17. How much money will she have left, after buying all the dolls she can at that price?
18. Multiply 1, 3, 7, 2, 9, 8, 4, 6, 5, 10, 12, 11, by 2.
19. Multiply 1, 4, 7, 9, 6, 8, 5, 3, 2, by 3.
20. Multiply 5, 2, 1, 4, 3, by 5.

QUESTIONS

1. $3 + 4 + 4 + 3 = ?$ $28 - 8 - 5 - 5 = ?$

$18 - 8 - 5 - 5 = ?$ $29 - 1 - 7 - 1 = ?$

$29 - 8 + 1 - 2 - 10 - 4 - 1 = ?$

$28 - 8 + 1 + 2 + 2 - 4 - 1 = ?$

$20 - 10 + 2 - 3 + 4 - 1 + 5 - 3 = ?$

$22 - 20 + 4 + 10 - 2 - 3 + 1 - 7 = ?$

$1 + 7 + 9 + 3 + 9 - 8 - 1 - 5 - 4 - 3 = ?$

2. Add:	5	3	2	3	9	5	7	5
	11	1	-6	7	1	4	2	8
	1	4	2	4	4	3	3	6
	2	7	1	2	3	6	6	7
	<u>1</u>	<u>2</u>	<u>5</u>	<u>1</u>	<u>6</u>	<u>5</u>	<u>1</u>	<u>3</u>

3. Count from:	0 by 3's to 27	0 by 4's to 28
	0 by 8's to 24	0 by 7's to 28
	0 by 11's to 22	0 by 10's to 20
	1 by 3's to 25	1 by 3's to 22
	1 by 6's to 25	2 by 4's to 26
	4 by 3's to 25	1 by 5's to 26
	6 by 3's to 27	1 by 7's to 29
	5 by 6's to 29	3 by 2's to 29
	5 by 2's to 29	2 by 7's to 23
	2 by 5's to 27	3 by 4's to 27

4. How many:

2's in 8?	10?	16?	20?	14?	12?	24?	22?
3's in 9?	27?	18?	12?	24?	15?	21?	
4's in 12?	24?	16?	20?	28?			
5's in 10?	25?	15?	20?		6's in 18?	24?	12?
7's in 21?	14?	28?			8's in 24?	16?	8?
9's in 27?	18?	9?			10's in 20?	10?	
11's in 22?					12's in 24?		

1 TO 29

Copy and add by rows and columns :

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

Copy and complete :

3.	4.	5.	6.
$12 = ? \times 6$	$8 = ? \times 4$	$18 = ? \times 9$	$22 = 11 \times ?$
$14 = ? \times 7$	$28 = ? \times 7$	$15 = 5 \times ?$	$25 = 5 \times ?$
$10 = ? \times 5$	$12 = 4 \times ?$	$9 = 3 \times ?$	$16 = ? \times 4$
$20 = 5 \times ?$	$14 = ? \times 7$	$6 = 2 \times ?$	$18 = 2 \times ?$
$10 = 2 \times ?$	$12 = 3 \times ?$	$14 = 2 \times ?$	$18 = ? \times 6$
$20 = 10 \times ?$	$28 = 4 \times ?$	$27 = 3 \times ?$	$24 = ? \times 8$

7. $9 - 1 + 2 - 3 - 4 + 6 + 8 - 10 = \text{---}$.

$27 - 6 - 1 - 10 + 2 - 8 + 4 - 2 = \text{---}$.

$19 + 1 - 2 - 8 - 8 + 8 - 9 + 1 = \text{---}$.

8. $24 - 12 - 6 - 3 - 2 + 1 - 2 = \text{---}$.

$19 - 8 - 10 + 7 + 6 - 3 - 6 = \text{---}$.

$23 - 17 + 6 - 10 + 2 + 2 + 2 = \text{---}$.

9. $28 - 8 - 4 - 3 - 3 - 3 - 3 = \text{---}$.

$26 - 6 - 5 - 4 - 3 - 2 - 1 = \text{---}$.

$29 - 9 - 8 + 12 - 4 - 10 - 10 = \text{---}$.

10. Try these questions: $(25 \div 5) + 3 = ?$
 $(5 \times 2) + 6 = ?$ $2 + (3 \times 6) = 10 \times ?$

REVIEW

We found that of the numbers below 20, these cannot be evenly divided by any other number,—1, 2, 3, 5, 7, 11, 13, 17, 19. Of the numbers 20 to 29, these cannot be divided by any other number,—23, 29. By “evenly divided” we mean that the number can be divided with no units left over.

QUESTIONS

1. A table is 4 feet in length. A bench is 4 times as long. How long is the bench?

2. George is 27 years old. James is 6 years younger. How old is James?

3. Since a gallon of water weighs 10 pounds, how many pounds do ten gallons of water weigh? How many pounds does half a gallon weigh? How many pounds does 1 quart weigh?

4. How many ounces are there in half a pound of meat?

5.	6.	7.	8.	9.
$2 \times 9 = ?$	$2 \times 11 = ?$	$2 \times 3 = ?$	$2 \times 7 = ?$	$5 \times 5 = ?$
$2 \times 4 = ?$	$2 \times 8 = ?$	$2 \times 6 = ?$	$2 \times 10 = ?$	$6 \times 4 = ?$
$2 \times 2 = ?$	$2 \times 5 = ?$	$2 \times 12 = ?$	$3 \times 8 = ?$	$2 \times 5 = ?$
$6 \times 3 = ?$	$4 \times 5 = ?$	$3 \times 5 = ?$	$9 \times 2 = ?$	$2 \times 7 = ?$
$5 \times 5 = ?$	$2 \times 3 = ?$	$5 \times 2 = ?$	$4 \times 4 = ?$	$2 \times 2 = ?$
$3 \times 3 = ?$	$6 \times 4 = ?$	$2 \times 2 = ?$	$5 \times 4 = ?$	$3 \times 1 = ?$
$4 \times 7 = ?$	$3 \times 7 = ?$	$3 \times 2 = ?$	$2 \times 9 = ?$	$4 \times 6 = ?$
$4 \times 3 = ?$	$8 \times 2 = ?$	$2 \times 8 = ?$	$6 \times 2 = ?$	$3 \times 3 = ?$
$5 \times 3 = ?$	$3 \times 3 = ?$	$2 \times 5 = ?$	$7 \times 3 = ?$	$4 \times 2 = ?$
$8 \times 3 = ?$	$7 \times 2 = ?$	$2 \times 4 = ?$	$3 \times 4 = ?$	$4 \times 4 = ?$
$3 \times 6 = ?$	$7 \times 4 = ?$	$3 \times 9 = ?$	$2 \times 2 = ?$	$5 \times 3 = ?$

TENS AND ONE HUNDRED

We write:

Nine 9	Forty 40
Ten 10	Fifty 50
Nineteen 19	Sixty 60
Twenty 20	Seventy 70
Twenty-nine 29	Eighty 80
Thirty 30	Ninety 90
But after ninety-nine, 99, we write one hundred, 100	

1 ten is written 10	6 tens 60
2 tens are written 20	7 tens 70
3 tens 30	8 tens 80
4 tens 40	9 tens 90
5 tens 50	10 tens are written 100

1. Write in figures: thirty-two, forty-four, fifty-six, sixty-three, seventy-nine, eighty-seven, ninety-eight.

2. Write in words: 37, 84, 76, 53, 45, 92, 69, 100.

3. Add:

20	80	70	10	40	50	60	30	40
<u>50</u>	<u>10</u>	<u>20</u>	<u>60</u>	<u>10</u>	<u>40</u>	<u>30</u>	<u>50</u>	<u>60</u>

QUESTIONS

1. If 20 barrels of apples cost \$40, how much will 1 barrel cost?
2. Charles had 47¢. He paid 5¢ for car fare. How many cents had he left?
3. A grocer had 66 eggs. He sold half a dozen. How many eggs did he have left?
4. At 50¢ a dozen, how many oranges can you buy for 100¢, or \$1?
5. I bought 9 rocking-chairs at \$10 each, and 1 table for \$8. How much money did I spend?
6. Mrs. Smith bought 3 pounds of coffee for 30¢ a pound, and 1 cake of soap for 5¢. She gave the clerk a dollar bill. What change should she get?
7. At 20¢ a dozen, what will be the cost of 4 dozens of eggs?
8. Ella bought 2 pounds of meat at 20¢ a pound. What change should she get out of a fifty-cent piece which she gave in payment?
9. A rug cost thirty dollars and a bookcase forty dollars. What was the cost of both articles?
10. If a train goes 30 miles in an hour, how many miles will it go in three hours?
11. I had 57¢ and spent 6¢. What had I left?
12. If a bushel of peas weighs 60 pounds, how many pounds does half a bushel weigh? How many pounds does a bushel and a half weigh?
13. A yard of silk cost \$1. How many cents will half a yard cost?
14. George had 80¢. He spent $\frac{1}{4}$ of his money. How many cents did he spend?

REVIEW

1. Count forward to 100, beginning at 1.
2. Count backward to 1, beginning at 100.
3. Make tables of tens, adding various numbers of units.
4. Count to one hundred in writing, using words, not figures.
5. How many 2's are there in 10, 12, 24, 20, 16?
6. How many 3's are there in 9, 27, 15, 21, 18?
7. How many 4's are there in 16, 24, 20, 8, 12?
8. How many 5's are there in 10, 20, 15, 25?
9. How many 6's are there in 24, 12, 18?

10.	11.	12.	13.	14.
$12 \div 2 = ?$	$6 \div 3 = ?$	$24 \div 2 = ?$	$24 \div 3 = ?$	$24 \div 12 = ?$
$24 \div 4 = ?$	$15 \div 5 = ?$	$18 \div 3 = ?$	$12 \div 4 = ?$	$18 \div 2 = ?$
$20 \div 4 = ?$	$6 \div 3 = ?$	$8 \div 2 = ?$	$22 \div 11 = ?$	$16 \div 6 = ?$
$24 \div 6 = ?$	$10 \div 2 = ?$	$16 \div 2 = ?$	$25 \div 5 = ?$	$18 \div 6 = ?$
$21 \div 7 = ?$	$12 \div 3 = ?$	$28 \div 7 = ?$	$27 \div 9 = ?$	$20 \div 10 = ?$
$12 \div 1 = ?$	$10 \div 5 = ?$	$21 \div 3 = ?$	$22 \div 2 = ?$	$12 \div 12 = ?$
$24 \div 8 = ?$	$27 \div 3 = ?$	$28 \div 4 = ?$	$14 \div 7 = ?$	$20 \div 2 = ?$

15. Mr. Brown is 37 years old, and his son Fred is 6 years old. How many years older than Fred is his father?

16. Charles wants to buy a ball that costs 15¢. He has a dime. How many more cents does he need to buy the ball?

17. A teacher had 16 pens. She gave 10 of them to her pupils. How many pens did she keep?

18. From a ribbon 17 inches in length 13 inches were cut off. How many inches were left?

SUBTRACTING

73
28
45

In subtracting when the figure to be subtracted is larger than the figure from which it is to be subtracted, we add ten to the latter.
8 is larger than 3.
 $8 + 5 = 13.$

Set down 5 in units' place.

We now add 1 (ten) to 28 : making it 38.

$3 \text{ (tens)} + 4 \text{ (tens)} = 7 \text{ tens.}$

Set down 4 in tens' place. See page 35.

1. A peach orchard yielded 95 bushels of peaches. 68 bushels were sold. How many bushels were not sold?

2. In a school there were 87 pupils. 49 were boys. How many were girls?

3. A man had \$75. He paid \$41 for a bicycle and \$18 for a suit of clothes. How many dollars had he left?

4. There are 27 sheep in one pen and 22 in another. How many sheep in both pens? 19 of them were sold. How many sheep were left?

5. Subtract :

91	73	43	91	23	72	55	93	45	80
<u>26</u>	<u>38</u>	<u>28</u>	<u>46</u>	<u>19</u>	<u>53</u>	<u>27</u>	<u>46</u>	<u>26</u>	<u>34</u>
95	100	66	89	74	40	70	60	38	27
<u>37</u>	<u>25</u>	<u>17</u>	<u>39</u>	<u>29</u>	<u>11</u>	<u>26</u>	<u>19</u>	<u>29</u>	<u>22</u>
98	64	83	44	77	81	82	53	75	46
<u>45</u>	<u>28</u>	<u>29</u>	<u>26</u>	<u>58</u>	<u>62</u>	<u>37</u>	<u>36</u>	<u>38</u>	<u>18</u>

FRACTIONS

$\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, $\frac{1}{10}$, $\frac{1}{12}$ are fractions. So also are $\frac{2}{3}$, $\frac{2}{4}$, $\frac{3}{4}$, $\frac{2}{5}$, $\frac{3}{5}$, $\frac{4}{5}$, $\frac{2}{6}$, $\frac{3}{6}$, $\frac{4}{6}$, $\frac{5}{6}$, $\frac{2}{10}$, $\frac{3}{10}$, $\frac{4}{10}$, $\frac{5}{10}$, $\frac{6}{10}$, $\frac{7}{10}$, $\frac{8}{10}$, $\frac{9}{10}$. Read these.

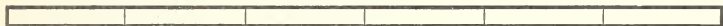
When fractions are written in figures, the number below the line tells into how many parts the thing is divided, and the number above the line tells how many parts we are talking about. $\frac{5}{12}$ means that there are 12 equal parts, and we are talking about 5 of them.



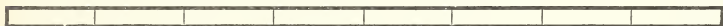
Point out halves and quarters.



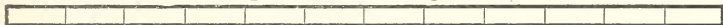
Point out fifths and tenths.



Point out thirds and sixths.



Point out halves, quarters, and eighths.



Point out halves, thirds, fourths, and twelfths.



Point out sevenths.



Point out thirds and ninths.



Point out twentieths, tenths, and fifths.

1. Draw on the blackboard forms of figures showing halves, thirds, quarters, fifths, sixths, sevenths, eighths, ninths, tenths, twelfths, twentieths, and fortieths.

2. Tell why the larger the number of equal parts of anything the smaller each part is.

3. What is $\frac{1}{2}$ of $\frac{1}{2}$? $\frac{1}{2}$ of $\frac{1}{3}$? $\frac{1}{3}$ of $\frac{1}{2}$? $\frac{1}{4}$ of $\frac{1}{2}$? $\frac{1}{2}$ of $\frac{1}{4}$? $\frac{1}{5}$ of $\frac{1}{2}$? $\frac{1}{2}$ of $\frac{1}{5}$? $\frac{1}{4}$ of $\frac{1}{5}$? $\frac{1}{5}$ of $\frac{1}{4}$? $\frac{1}{3}$ of $\frac{1}{3}$? $\frac{1}{2}$ of $\frac{1}{6}$? $\frac{1}{2}$ of $\frac{2}{6}$? $\frac{1}{2}$ of $\frac{3}{6}$? $\frac{2}{3}$ of $\frac{1}{2}$? $\frac{2}{3}$ of $\frac{1}{4}$?

4. Fold or cut paper to show fractions.

FRACTIONS

The equal parts of numbers are called **fractions**.

Fold or cut paper or make drawings to show these facts.

1. $\frac{1}{2}$ of 6 = $\frac{6}{2}$. Six halves are three wholes or units, because two halves equal one whole, and six are three times two. $\frac{6}{2} = 3$. $\frac{1}{2}$ of 6 = 3. $\frac{1}{2} \times 6 = \frac{6}{2} = 3$.

2. $\frac{1}{2}$ of 8 = $\frac{8}{2}$. $\frac{8}{2} = 4$. $\frac{1}{2}$ of 8 = 4. $\frac{1}{2} \times 8 = 4$.

3. $\frac{1}{3}$ of 6 = $\frac{6}{3}$. Six thirds are two wholes, or units, because three thirds equal one whole, and six are two times three. $\frac{6}{3} = 2$. $\frac{1}{3}$ of 6 = 2. $\frac{1}{3} \times 6 = \frac{6}{3} = 2$.

4. $\frac{1}{3}$ of 9 = $\frac{9}{3}$. $\frac{9}{3} = 3$. $\frac{1}{3}$ of 9 = 3. $\frac{1}{3} \times 9 = 3$.

5. What part of 10 is 5?

9. $\frac{1}{3}$ of 12 = ?

6. What part of 12 is 6?

10. $\frac{1}{3}$ of 15 = ?

7. What part of 14 is 7?

11. $\frac{1}{3}$ of 18 = ?

8. $\frac{1}{2}$ of 16 = ?

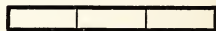
12. $\frac{1}{3}$ of 21 = ?

13. $\frac{2}{3}$ of 9 = ? $\frac{2}{3} \times 9 = \frac{18}{3}$ because 9 times two thirds are 18 thirds. $\frac{18}{3} = 6$, because $18 \div 3 = 6$.

14. $\frac{2}{3}$ of 12 = ? $\frac{2}{3} \times 12 = \frac{24}{3} = 8$.

15. $\frac{1}{4}$ of 8 = ? $\frac{1}{4} \times 8 = \frac{8}{4} = 2$.

16. Find $\frac{3}{4}$ of 8, $\frac{3}{4}$ of 12, $\frac{3}{4}$ of 16, $\frac{3}{4}$ of 20.



Count and see.

17. Find $\frac{2}{5}$ of 10, $\frac{2}{5}$ of 15, $\frac{2}{5}$ of 20, $\frac{2}{5}$ of 25.

18. Find $\frac{3}{5}$ of 15, $\frac{4}{5}$ of 20, $\frac{3}{5}$ of 30, $\frac{2}{5}$ of 40.

19. What number is $\frac{2}{3}$ of 18? 15? 6? 9? 21? 24? 27? 30?

20. Find $\frac{4}{5}$ of 20, 10, 15, 5, 25, 30, 35, 40.

21. Find $\frac{2}{6}$, $\frac{4}{6}$, and $\frac{5}{6}$ of 18, 6, 12, 24, 30, 36, 42, 48.

22. Find $\frac{2}{7}$, $\frac{3}{7}$, $\frac{4}{7}$, $\frac{5}{7}$, and $\frac{6}{7}$ of 14, 7, 21, 28.

23. What are $\frac{2}{8}$, $\frac{3}{8}$, $\frac{4}{8}$, $\frac{5}{8}$, $\frac{6}{8}$, and $\frac{7}{8}$ of 16, 8, 24, 32, 40?

QUESTIONS

1. If a bushel of corn cost 80¢, what will 8 quarts cost? What will a peck cost?
2. If a quart of onions cost 9¢, how many cents will 3 quarts cost?
3. How many dimes equal 90¢?
4. A man bought 2 rugs at \$9 apiece. What change should he get back, if he gave the clerk a twenty-dollar bill?
5. 45¢ was divided equally among 9 children. How many cents did each child get?
6. In 2 hours Fred can ride 30 miles on his wheel. How many miles can he ride in 1 hour? in 3 hours?
7. In a school of 84 children there were 12 over 9 years of age. How many children were under 9 years? What fraction tells the number of children over 9 years old?
8. Mr. Brown put into his pocketbook 6 ten-dollar bills, 3 five-dollar bills, and 4 two-dollar bills. How many dollars did he put into the pocketbook?
9. What part of 10 is 5?
10. If 5 oranges cost 20¢, how many cents will 10 oranges cost?
11. What part of 6 is 2?
12. If 2 pencils cost 8¢, what will 6 pencils cost?
13. Henry has 60¢ in nickels. How many car rides can he take at 5¢ a ride?
14. A baker sold 12 loaves of bread a 4¢ a loaf and a dozen of cookies for 8¢. How much money did he get?
15. Emma bought 3 paper dolls for 10¢, and Laura bought 2 skeins of thread for a nickel. How many cents did both girls spend?

QUESTIONS

1. $\frac{2}{4}$ of 8 = ? $\frac{1}{2}$ of 8 = ? $\frac{1}{2}$ of 20 = ? $\frac{2}{4}$ of 20 = ?
 $\frac{1}{2}$ of 44 = ? $\frac{2}{4}$ of 44 = ? $\frac{1}{2}$ of 28 = ? $\frac{2}{4}$ of 28 = ?
2. One half equals how many fourths ?
3. How many times 4 is 28 ? What part of 28 is 4 ?
4. Compare 4 with 36. 4 is $\frac{1}{9}$ of 36. 36 is 4 times 9.
5. 24 is — times 4 ; — times 6 ; — times 12.
6. What part is 4 of : 8 ? 32 ? 16 ? 40 ? 48 ? 44 ? 24 ? 20 ? 12 ? 4 ?
7. How many times 4 is each number in 6 ?
8. If a hat costs \$4, what will a dozen hats cost ?
9. Divide 24 pears equally among 6 boys. How many pears will each boy get ?
10. There were 2 dozen eggs in a basket. One third of them were used for breakfast. How many were left ?
11. James had 28¢. He spent $\frac{1}{4}$ of his money. How many cents had he left ?
12. Three tops cost 18¢. What was the price of one top ?
13. Eddie bought 9 apples at 2¢ each. How many cents did he pay for them ?
14. Katie got 4 spools of thread at 3¢ apiece. How many cents did she pay for the 4 spools ?
15. George has 3 nickels. How many cents has he ?
16. Alice had 14 cherries. She gave $\frac{1}{7}$ of them to Lucy. How many cherries did Lucy get ?
17. It is 18 miles from Brooklyn to Garden City. I walked $\frac{1}{6}$ of that distance. How many miles did I walk ?
 Illustrate on the blackboard, calling a foot one mile.

QUESTIONS

1. How many pints are there in $\frac{1}{5}$ of 5 gallons?
2. 6 is how many times 2? 2 is what part of 6?
3. If 6 boxes of candy weigh 3 pounds, what will 2 boxes weigh?
4. What will 12 yards of cloth cost at \$4 a yard?
5. What part of 18 is 6? How many times 6 is 18?
6. If a newspaper costs 2¢, how many cents will 7 newspapers cost?
7. A man had 18 oranges. He divided them equally among 6 children. How many oranges did each child receive?
8. If syrup is 80¢ a gallon, how many cents must be paid for a pint?
9. When 8 pounds of sugar cost 40¢, 1 pound of sugar will cost $\frac{1}{8}$ of 40¢, or —.
10. When 7 yards of silk cost \$21, a yard will cost $\frac{1}{7}$ of \$21, or — dollars. 4 yards will cost $4 \times$ — dollars, or — dollars.
11. If 9 bushels of apples cost \$18, 1 bushel will cost $\frac{1}{9}$ of \$18, or — dollars. 4 bushels will cost $4 \times$ — dollars.
12. If a dozen oranges cost 60¢, what will be the cost of 1 orange? of 3 oranges? of 5 oranges?
13. When 5 pounds of meat cost 45¢, what will 1 pound cost? 2 pounds?
14. When 5 quarts of milk cost 35¢, what will 2 quarts cost?
15. If 4 lemons cost 8¢, what will 1 lemon cost? 2 lemons? What will a dozen lemons cost? A half dozen?

QUESTIONS

1. A bushel basket is half full of potatoes. How many more pecks of potatoes will it hold?

2. How many quarts are there in a bushel of chestnuts? in a bushel of corn? in a bushel of apples?

3. If a bushel of wheat weighs 60 pounds, how many pounds does a peck of wheat weigh?

4. 8 quarts are what part of a bushel? 2 pecks make what part of a bushel?

5. If 2 bushels of apples cost four dollars, what will 2 pecks cost?

6. How many bushels are there in 64 quarts?

7. How many bushels are there in 72 quarts?

8. Arthur gathered half a bushel of chestnuts. He sold a peck of the nuts and then gave a quart each to five boys. He had — quarts left.

9. How many quarts are there in a bushel? in half a bushel? How many quarts are there in a quarter of a bushel? How many quarts in 2 quarters of a bushel? in $\frac{3}{4}$ of a bushel?

10. If you had $\frac{1}{8}$ of a bushel of berries, how many quarts would you have?

11. If a pint of walnuts costs 6 cents, what will 4 quarts cost? What will half a peck cost?

12. A dish holds 3 pints of berries. How many quarts will 6 such dishes hold?

13. At 9¢ a qt., what will a pk. of cranberries cost?

14. At 5 cents a quart, what will 1 peck of beans cost?

15. How many pecks are there in 9 bushels? in 6 bushels? in 3 bushels? in 5 bushels?

REVIEW

1. What number is $\frac{2}{9}$ of 18? $\frac{3}{9}$? $\frac{4}{9}$? $\frac{5}{9}$? $\frac{6}{9}$? $\frac{9}{9}$?
2. What part of 9 is 1? $\frac{8}{9}$ of 9 = ? $\frac{1}{2}$ of 10 = ?
3. $\frac{5}{10}$ of 10 = ? $\frac{1}{2}$ of 20 = ? $\frac{5}{10}$ of 20 = ? $\frac{5}{10}$ of 100 = ?
4. A string was 12 yds. 1 ft. long. 2 yds. 1 ft. were cut off. How many yards were left? how many feet?
5. A tank contained 38 gallons of water. 62 gallons more were poured in. Then 47 gallons were pumped out. How many gallons were left?
6. A milkman has 7 cans, each holding 12 gallons of milk. He sells 48 gallons. How many gallons has he left?
7. James earned 40¢ in one week, and Arthur earned 55¢. How many cents did both boys earn?
8. If James spent 29¢, and Arthur spent 36¢, how many cents did each boy have left?
9. A man having \$56 bought a suit of clothes for \$28. What part of his money did he spend? How many dollars did he have left?
10. At 6¢ a quart, how much money will 6 pints of milk cost? 9 pints? 3 gallons?
11. At 4¢ a pint, how many pints of berries can you buy for 20¢? for 80¢?
12. How many inches long is your shoe? How long are your skates?
13. How many feet or inches wide is the ring you use for marbles?
14. If a bushel of peaches costs four dollars, how much will a peck cost?
15. What will a bushel of potatoes cost at 20¢ a peck?

QUESTIONS

1. How many inches are there in a quarter of a yard? in $\frac{3}{4}$ of a yard? in $\frac{1}{2}$ of a yard? Look and see.

2. Harriet bought a yard of ribbon and divided it equally, for dress trimming, among her six dolls. How many inches of ribbon did she cut off for each doll?

3. If you drew a line a foot long and divided it into 12 equal parts, what would be the name of any of those parts?

4. George drew a triangle that was $\frac{1}{4}$ of a foot on each side. How many inches was it around the triangle?

5. How many inches are there in $\frac{1}{6}$ of a foot?

6. How many inches is it around a desk top 2 feet long and 18 inches wide?

7. A ribbon was 3 feet in length. How many inches long was it?

8. If it takes 7 yards of lace to trim a dress, how many yards will it take to trim 9 dresses?

9. A log of walnut was 30 feet long, but $\frac{1}{3}$ of it was cut off. How many feet were cut off?

10. Mrs. Smith bought 10 yards of silk at \$1 a yard. She used $\frac{1}{2}$ of the silk. How many yards were left? What was the value of the piece of silk she used?

11. A bench is 12 feet long and 16 feet wide. How many yards long is each side of the bench?

12. How many feet are there in 28 inches? How many inches over?

13. A square room has sides 5 yards and 1 foot long. How many feet is it around the room?

14. A string 1 foot long is to be cut into inch pieces. How many pieces will there be?

QUESTIONS

1. Draw a rectangle 2 inches wide and 4 inches long. Divide it into 1-inch squares. How many squares are there in the oblong?

2. A room is 3 yards and 1 foot wide. How many steps will a boy take in crossing the room if he steps 2 feet at each step?

3. Measure the distance between 2 windows in your room. Measure the length and the width of the room.

4. In a room the distance between a door and a window was measured and found to be 3 yards and 1 foot. How many feet were there in that distance?

5. Louise bought a roll of braid, and, on measuring it, found that there were 9 feet in the roll. How many yards were there in it?

6. Mrs. Smith bought 9 yards of silk. She used $\frac{1}{3}$ of it. How many feet were in the piece she used?

7. Draw a square with sides 3 inches long. Mark the inches on its sides. Divide the square into 9 smaller squares.

8. Draw a rectangle 1 inch wide and 4 inches long. How many 1-inch squares can you make in it?

9. On the board make 2 dots, 1 foot apart, guessing the distance. Measure the distance between the dots.

10. Judge a distance of 1 yard, making the distance by putting 2 dots on the board. Measure the distance guessed.

11. Draw a line that you think is 3 inches long. Measure it.

12. Draw a square that you judge to be $\frac{1}{2}$ of a foot in length. Measure the square.

HUNDREDS

We call ten tens one hundred.

$$10 \times 10 = 100 \quad 99 + 1 = 100 \quad 50 + 50 = 100$$

We write one hundred in figures, 100. We put the 1 in hundreds' place by setting two zeros, 00, at the right to show that the 1 is neither in units' place nor in tens' place.

We call twenty tens two hundred, and write two hundred in figures with a 2 in hundreds' place.

$$100 + 100 = 200 \quad 20 \times 10 = 200$$

Two hundred and one hundred are three hundred.

$$100 + 100 + 100 = 300 \quad 200 + 100 = 300$$

Four hundred, 400. Five hundred, 500.

Six hundred, 600. Seven hundred, 700.

Eight hundred, 800. Nine hundred, 900.

Above one hundred we count units and tens as we do below one hundred.

We write one hundred eleven in figures, 111.

We write six hundred ninety-two in figures, 692.

1. $90 + 11 = 101$. $11 = 10 + 1$. Nine tens and one ten make ten tens. Ten tens are one hundred. The unit we set in units' place.

2. $84 + 20 = 104$. $84 = 80 + 4$. Eight tens and two tens make ten tens. Ten tens are one hundred. The four we set in units' place.

$$3. 70 + 42 = ? \quad 42 = 30 + 12 \quad 70 + 30 = ?$$

ADDITION

24	27	19	36	28	49	36	42
10	14	21	17	12	14	21	3
<u>31</u>	<u>36</u>	<u>18</u>	<u>37</u>	<u>34</u>	<u>6</u>	<u>9</u>	<u>55</u>
13	24	31	44	51	46	21	24
12	11	19	6	22	11	13	14
<u>40</u>	<u>16</u>	<u>8</u>	<u>22</u>	<u>38</u>	<u>9</u>	<u>16</u>	<u>12</u>
17	16	11	18	31	27	14	18
13	19	31	22	48	33	15	13
<u>60</u>	<u>34</u>	<u>29</u>	<u>33</u>	<u>17</u>	<u>6</u>	<u>16</u>	<u>19</u>
14	29	35	14	24	17	14	101
31	40	7	24	16	20	31	2
22	18	22	14	12	31	19	13
<u>60</u>	<u>11</u>	<u>13</u>	<u>6</u>	<u>8</u>	<u>19</u>	<u>20</u>	<u>17</u>
8	13	19	26	13	11	20	17
12	20	31	10	21	23	8	24
5	2	4	19	21	28	21	23
14	8	14	22	27	14	12	8
<u>3</u>	<u>2</u>	<u>3</u>	<u>2</u>	<u>1</u>	<u>20</u>	<u>3</u>	<u>1</u>
41	33	10	66	31	25	3	7
11	27	16	10	13	13	41	2
19	3	21	5	14	12	4	3
7	2	37	3	27	21	21	5
<u>2</u>	<u>5</u>	<u>12</u>	<u>14</u>	<u>10</u>	<u>17</u>	<u>3</u>	<u>66</u>
7	12	46	16	26	18	15	14
19	12	21	17	9	8	17	60
32	6	10	5	30	2	20	0
100	8	17	2	15	37	31	72
<u>18</u>	<u>7</u>	<u>6</u>	<u>38</u>	<u>10</u>	<u>21</u>	<u>19</u>	<u>8</u>

METAL MONEY

One dollar is equal to one hundred cents.

\$ is the sign for one dollar, or 100 cents.

A half dollar is half 100 cents, or 50 cents.

A quarter dollar is equal to a fourth, or quarter, of 100 cents, or 25 cents. ¢ is the sign for cents.

A dime is one tenth of one dollar. $100 \div 10 = 10$.

A dime is worth ten cents. Ten dimes equal a dollar.

The coins for dollars, half dollars, quarter dollars, and dimes are made of nearly pure silver metal by *Our Country*. That is one important thing *Our Country*, whose flag we know so well, does for us.

A nickel is equal to five cents, 5¢.

The penny is one cent, one hundredth part of one dollar.

$$\$1 = 100¢. \quad 100¢ \div 100 = 1¢ = \text{one cent.}$$

Nickels are made of nickel metal. Cents, sometimes called pennies, are made of copper and nickel.

1. Two quarter dollars equal how many half dollars?
2. How many cents are three quarter dollars worth?
3. Which is more, seven dimes or three quarter dollars?
By how much?
4. How many cents are there in four dimes and a nickel?
5. When we divide a dollar into one hundred parts, what is the value of each hundredth part?
6. How many dimes equal a half dollar?

NUMBER-STORIES

1. Mary and Tom are at the grocery. They have three quarters to spend. Mother wishes them to ask the grocer for three pounds of sugar, half a pound of tea, and a dozen eggs. The grocer tells them that sugar is five cents a pound, tea is forty cents a pound, and eggs are twenty-five cents a dozen. Tom will carry the things home in the basket. Why does the grocer weigh the sugar? When Mary takes the "change," or money, he gives back to her with the packages and the eggs, how many cents does she have to take home to mother?

3 quarters = three 25ϕ pieces of silver. $3 \times 25\phi = 75\phi$.

3 pounds of sugar at 5ϕ a pound cost three times 5ϕ .
 $3 \times 5\phi = 15\phi$.

$\frac{1}{2}$ pound of tea at 40ϕ a pound costs one half of 40ϕ .
 $\frac{1}{2}$ of $40\phi = 20\phi$. The eggs cost 25ϕ .

$15\phi + 20\phi + 25\phi = 60\phi$. $75\phi - 60\phi = 15\phi$.

Mary has fifteen cents to take back to her mother.

Do you see now why we have to learn about numbers?

2. Tell a number-story about Charlie and Susan. They have fifty cents. They wish to buy two pounds of sugar at five cents a pound, a loaf of bread at eight cents, and a pound of butter at twenty-eight cents. How much will they have left?

3. Make up a story about Willie and Jennie, who have one hundred cents. They ask the grocer for half a dozen eggs, two pounds of butter, and three large loaves of bread. He asks them twenty-eight cents a dozen for his very best eggs and twenty-eight cents a pound for table butter and ten cents for large loaves of bread. They gave him a silver dollar. Was this correct?

QUESTIONS

1. 6 is what part of: 12? 36? 72? 48? 54?
2. How many times 6 is: 24? 60? 48? 66? 72?
3. If 6 dozen apples cost 72¢, how many cents will 1 dozen cost?
4. How many minutes past the hour is it when the minute hand points to III? 15 minutes are what part of an hour? 30 minutes are what part of an hour?
5. A farm of 72 acres is one sixth woodland. How many acres are woodland?
6. A table is 48 inches long and 36 inches wide. How many inches is it around the table?
7. When 4 dozen apples cost 96¢, at the same rate what do one dozen cost? What do 6 cost?
8. The price of a sofa was \$66. It was reduced $\frac{1}{3}$ in price and was then sold. What was the selling price?
9. A woman had 5 ten-dollar bills and 3 two-dollar bills. She bought 8 yards of velvet at \$6 a yard and 1 yard of silk for \$3. How many dollars did she spend? How many dollars did she have left?
10. A grocer paid \$60 for 30 barrels of apples. What was the cost a barrel? He sold the apples for \$90. How much did he get a barrel? How much did he gain on each barrel? How much did he gain on the 30 barrels?
11. A pail holds 12 quarts. How much will it cost to fill it with milk at 6¢ a quart? After $\frac{1}{6}$ of the milk is used, how many pints are left?
12. In one day Mr. Smith rode 80 miles on his wheel. He rode $\frac{1}{8}$ of the distance in half an hour. How many miles did he ride in that time?

READING AND WRITING HUNDREDS

$$\begin{array}{r}
 \text{Hundreds} \\
 \text{Tens} \\
 \text{Units} \\
 7 \ 0 \ 0 \\
 \ 7 \ 0 \\
 \ 7 \\
 \hline
 7 \ 7 \ 7
 \end{array}$$

$$\begin{array}{r}
 \text{Hundreds} \\
 \text{Tens} \\
 \text{Units} \\
 4 \ 0 \ 0 \\
 \ 2 \ 0 \\
 \ 2 \\
 \hline
 4 \ 2 \ 2
 \end{array}$$

$$\begin{array}{r}
 \text{Hundreds} \\
 \text{Tens} \\
 \text{Units} \\
 4 \ 0 \ 0 \\
 \ 5 \ 0 \\
 \ 1 \\
 \hline
 4 \ 5 \ 1
 \end{array}$$

$$\begin{array}{r}
 \text{Hundreds} \\
 \text{Tens} \\
 \text{Units} \\
 9 \ 0 \ 0 \\
 \ 8 \ 0 \\
 \ 7 \\
 \hline
 9 \ 8 \ 7
 \end{array}$$

1. Read the numbers: 299, 643, 110, 444, 770, 801, 999.
2. How many more hundreds has 897 than 153? how many more tens has 897? how many more units?
3. Tell how many hundreds, how many tens, and how many units there are in:

393	406	744	985	112	630	808	299	681
515	600	401	642	371	755	433	691	717
350	404	199	878	555	802	576	603	979
611	225	111	226	414	901	584	717	205
660	218	922	660	832	961	321	201	1000

4. Write by figures:

One hundred twenty-five.

One hundred ninety-nine.

One hundred six.

Two hundred forty-six.

Two hundred eighteen.

Two hundred two.

Three hundred eleven.

Three hundred thirteen.

Four hundred twenty-eight.

Four hundred eighty-one.

Four hundred ninety.

Five hundred five.

Five hundred fifty-five.

Six hundred ninety.

Six hundred eight.

Seven hundred seventeen.

Seven hundred seven.

Eight hundred forty-eight.

Eight hundred thirty-six.

Nine hundred twenty-one.

Nine hundred fifty.

Nine hundred ninety-one.

REVIEW OF HUNDREDS

1. How many figures are needed to express units, or ones? to express tens? to express hundreds?

2. How many 10's are there in 200? 300? 400? 500? 600? 700? 800? 900? 1000?

3. 5×2 tens = ? 5×2 tens = ? 6×2 tens = ?
 2×6 tens = ? 4×4 tens = ? 4×4 tens = ?
 5×5 tens = ? 8×6 tens = ? 5×5 tens = ?
 8×6 tens = ? 9×3 tens = ? 3×9 tens = ?
 8×4 tens = ? 6×6 tens = ? 4×8 tens = ?
 6×6 tens = ? 2×7 tens = ? 7×2 tens = ?

4. Write these numbers in figures: 7 hundreds. 7 hundreds 2 tens 8 units. 3 hundreds 6 tens 7 units. 4 hundreds 1 ten 1 unit. 8 hundreds 5 tens 5 units. 2 hundreds 3 tens 2 units. 1 hundred 4 tens 3 units. 5 hundreds 7 tens 4 units. 9 hundreds 8 tens 6 units. 3 hundreds 1 unit. 6 hundreds 5 tens 2 units.

5. $220 = 110 + ?$ $345 = 140 + ?$ $725 + ? = 930$
 $425 = 200 + ?$ $250 = 40 + ?$ $525 + ? = 835$
 $630 = 220 + ?$ $610 + ? = 820$ $330 + ? = 640$
 $535 = 130 + ?$ $115 + ? = 720$ $835 + ? = 940$
 $840 = 235 + ?$ $200 + ? = 325$ $749 + ? = 957$

6. Write a 10's Table to 1000, in ten parts, 1 to 100, 101 to 200, 201 to 300, 301 to 400, 401 to 500, 501 to 600, 601 to 700, 701 to 800, 801 to 900, 901 to 1000.

THOUSANDS

We call ten hundreds a **thousand**.

$$10 \times 100 = 1000 \quad 999 + 1 = 1000 \quad 500 + 500 = 1000$$

We write one thousand in figures, 1000 . The three zeros, 000 , at the right show that the 1 is neither in units' place nor in tens' place nor in hundreds' place.

We call twenty hundreds two thousand and write two thousand in figures with a 2 in thousands' place.

$$1000 + 1000 = 2000 \quad 20 \times 100 = 2000$$

Two thousand and one thousand are three thousand.

$$1000 + 1000 + 1000 = 3000 \quad 2000 + 1000 = 3000$$

We write:

Four thousand, 4000 Seven thousand, 7000

Five thousand, 5000 Eight thousand, 8000

Six thousand, 6000 Nine thousand, 9000

We write one hundred 100 . We may write one thousand 1000 . The comma is to help us see that there are three zeros, and to read thousands quickly.

1. Add:

$$\begin{array}{r} 100 \\ \hline 200 \end{array} \quad \begin{array}{r} 200 \\ \hline 200 \end{array} \quad \begin{array}{r} 200 \\ \hline 300 \end{array} \quad \begin{array}{r} 200 \\ \hline 400 \end{array} \quad \begin{array}{r} 300 \\ \hline 400 \end{array} \quad \begin{array}{r} 200 \\ \hline 500 \end{array}$$

2. Add:

$$\begin{array}{r} 400 \\ \hline 400 \end{array} \quad \begin{array}{r} 400 \\ \hline 500 \end{array} \quad \begin{array}{r} 500 \\ \hline 500 \end{array} \quad \begin{array}{r} 300 \\ \hline 600 \end{array} \quad \begin{array}{r} 200 \\ \hline 800 \end{array} \quad \begin{array}{r} 300 \\ \hline 700 \end{array}$$

3. Subtract:

$$\begin{array}{r} 1000 \\ \hline 900 \end{array} \quad \begin{array}{r} 1000 \\ \hline 100 \end{array} \quad \begin{array}{r} 1000 \\ \hline 200 \end{array} \quad \begin{array}{r} 1000 \\ \hline 300 \end{array} \quad \begin{array}{r} 1000 \\ \hline 400 \end{array} \quad \begin{array}{r} 1000 \\ \hline 500 \end{array}$$

THOUSANDS

1. One thousand one, 1001. One thousand nine, 1009.
One thousand ten, 1010. One thousand eighteen, 1018.
One thousand one hundred eighteen, 1118.
Two thousand seven hundred four, 2704.
Three thousand thirty-six, 3036.
Five thousand six hundred sixty, 5660.
Seven thousand seven hundred seventy-seven, 7777.
Eight thousand one hundred one, 8101.
Eight thousand eight hundred fifteen, 8815.
Nine thousand four hundred ninety-seven, 9497.
2. Read : 1246, 9223, 4780, 6111, 4644, 8707, 3136,
4598, 9610, 7000, 3688, 2080, 6202, 7100, 8004, 9110,
7333, 9909, 4707, 8118, 7656, 8771, 4919, 7223, 2743,
4339, 4716, 3188, 7007, 3010.
3. Write by figures: one thousand two hundred sixteen;
three thousand seven hundred twenty-eight; nine thou-
sand four hundred sixty-three; seven thousand seven
hundred; eight thousand nine hundred seventy; two
thousand seventy-five; four thousand four; six thousand
six hundred sixty-six; nine thousand ten; eight thousand;
three thousand one hundred forty-four; five thousand
eight hundred eighty-one.
4. Write in words : 7414, 3602, 8433, 1014, 5005, 2110,
6116, 9711, 4419, 2829, 1990, 3333, 5208.
5. Give the number of thousands, of tens, and of ones
in each of the numbers in 2 and 4.
6. Count by hundreds from 1000 to 2000.
7. Count by thousands from 2000 to 9000.
8. What is the greatest number that can be expressed
by three figures? by four figures?

FIVES

5 10 15 20 25 30 35 40 45 50 55 60

$$\begin{array}{lll}
 0 + 5 = 5 & 5 + 5 = 10 & 10 + 5 = 15 \\
 15 + 5 = 20 & 20 + 5 = 25 & 25 + 5 = 30 \\
 30 + 5 = 35 & 35 + 5 = 40 & 40 + 5 = 45 \\
 45 + 5 = 50 & 50 + 5 = 55 & 55 + 5 = 60
 \end{array}$$

5	5	5	5	5	5	5	5	5	5	5	5	
	<u>5</u>	5	5	5	5	5	5	5	5	5	5	
	10	<u>5</u>	5	5	5	5	5	5	5	5	5	
		15	<u>5</u>	5	5	5	5	5	5	5	5	
			20	<u>5</u>	5	5	5	5	5	5	5	
				25	<u>5</u>	5	5	5	5	5	5	
					30	<u>5</u>	5	5	5	5	5	
						35	<u>5</u>	5	5	5	5	
							40	<u>5</u>	5	5	5	
1.	Add each column.								45	<u>5</u>	5	5
2.	Add each row.									50	<u>5</u>	5
3.	How many 5's are there in 40?										55	<u>5</u>
4.	—— 5's = 55.											60
5.	A dozen 5's = ?											

$5 \times 1 = 5$	$5 \times 7 = 35$
$5 \times 2 = 10$	$5 \times 8 = 40$
$5 \times 3 = 15$	$5 \times 9 = 45$
$5 \times 4 = 20$	$5 \times 10 = 50$
$5 \times 5 = 25$	$5 \times 11 = 55$
$5 \times 6 = 30$	$5 \times 12 = 60$

MULTIPLICATION TABLE OF FIVES

FIVES

1. Add: 1 2 3 4 5 6 7 8 9 10 11 12
 1 2 3 4 5 6 7 8 9 10 11 12
 1 2 3 4 5 6 7 8 9 10 11 12
 1 2 3 4 5 6 7 8 9 10 11 12
 1 2 3 4 5 6 7 8 9 10 11 12

2. Make a division table, beginning it like this :

$5 \div 5 = 1$	$15 \div 5$				
$10 \div 5 = 2$	$20 \div$				

TENS

10 20 30 40 50 60 70 80 90 100 110 120

- $0 + 10 = 10$ $10 + 10 = 20$ $20 + 10 = 30$
 $30 + 10 = 40$ $40 + 10 = 50$ $50 + 10 = 60$
 $60 + 10 = 70$ $70 + 10 = 80$ $80 + 10 = 90$
 $90 + 10 = 100$ $100 + 10 = 110$ $110 + 10 = 120$

$10 \times 1 = 10$	$10 \times 7 = 70$
$10 \times 2 = 20$	$10 \times 8 = 80$
$10 \times 3 = 30$	$10 \times 9 = 90$
$10 \times 4 = 40$	$10 \times 10 = 100$
$10 \times 5 = 50$	$10 \times 11 = 110$
$10 \times 6 = 60$	$10 \times 12 = 120$

MULTIPLICATION TABLE OF TENS

3. Make columns of 10's, and add.
 4. Make columns of ten 1's, ten 2's, etc., and add.

FIFTHS AND TENTHS

When anything is divided into five equal parts, we call each part one fifth. Five fifths make one whole.



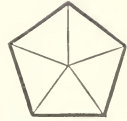
Circle



Square



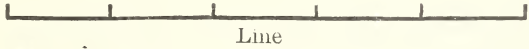
Rectangle



Pentagon



Star



Line



Rectangle

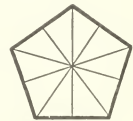
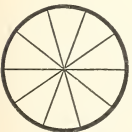
Into how many equal parts is each of these forms divided ?

1. Point out two fifths of each of these forms ; three fifths ; four fifths.

2. Make drawings like these forms on paper but larger.

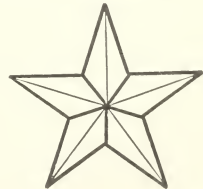
3. Make drawings like these forms on the blackboard.

When anything is divided into tenths, it has ten equal parts. Ten tenths make one whole.



Into how many parts is each of these forms divided ? Count and show the parts.

Make drawings like these forms both on paper and on blackboard.



SIXES

6 12 18 24 30 36 42 48 54 60 66 72

$0+6=6$ $6+6=12$ $12+6=18$ $18+6=24$
 $24+6=30$ $30+6=36$ $36+6=42$ $42+6=48$
 $48+6=54$ $54+6=60$ $60+6=66$ $66+6=72$

6	6	6	6	6	6	6	6	6	6	6	6
	6	6	6	6	6	6	6	6	6	6	6
		6	6	6	6	6	6	6	6	6	6
			6	6	6	6	6	6	6	6	6
				6	6	6	6	6	6	6	6
					6	6	6	6	6	6	6
						6	6	6	6	6	6
							6	6	6	6	6
								6	6	6	6
									6	6	6
										6	6
											6

1. Add each row.
2. Add each column.
3. Learn the Table of Sixes.

$6 \times 1 = 6$	$6 \times 7 = 42$
$6 \times 2 = 12$	$6 \times 8 = 48$
$6 \times 3 = 18$	$6 \times 9 = 54$
$6 \times 4 = 24$	$6 \times 10 = 60$
$6 \times 5 = 30$	$6 \times 11 = 66$
$6 \times 6 = 36$	$6 \times 12 = 72$

MULTIPLICATION TABLE OF SIXES

TWELVES

12 24 36 48 60 72 84 96 108 120 132 144

$0+12=12$ $12+12=24$ $24+12=36$ $36+12=48$
 $48+12=60$ $60+12=72$ $72+12=84$ $84+12=96$
 $96+12=108$ $108+12=120$ $120+12=132$ $132+12=144$

Make up bundles of splints, each with twelve splints, and show that these facts are true.

12	12	12	12	12	12	12	12	12	12	12	12
	12	12	12	12	12	12	12	12	12	12	12
		12	12	12	12	12	12	12	12	12	12

Complete this series to twelve numbers and add by rows and columns.

$12 \times 1 = 12$	$12 \times 7 = 84$
$12 \times 2 = 24$	$12 \times 8 = 96$
$12 \times 3 = 36$	$12 \times 9 = 108$
$12 \times 4 = 48$	$12 \times 10 = 120$
$12 \times 5 = 60$	$12 \times 11 = 132$
$12 \times 6 = 72$	$12 \times 12 = 144$

MULTIPLICATION TABLE OF TWELVES OR DOZENS

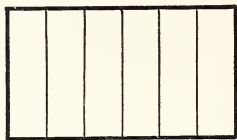
Add in columns twelve ones, twelve twos, etc., to twelve twelves.

SIXTHS AND TWELFTHS

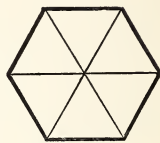
When anything is divided into six equal parts, we call the parts sixths. Six sixths make one whole.



Circle



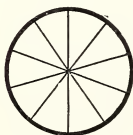
Rectangle



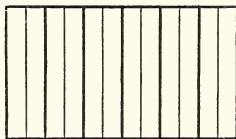
Hexagon

1. Show that each of these forms is divided into halves.
2. Show that each is divided into thirds; into sixths.
3. Make larger drawings of each of these forms on paper; on the blackboard.

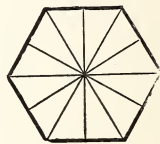
When anything is divided into twelve equal parts, we call the parts twelfths. Twelve twelfths make one whole.



Circle



Rectangle



Hexagon

1. Show the various halves in the circle and hexagon.
2. Show thirds of each of these forms.
3. Show fourths of each.
4. Show sixths of each.
5. Make larger drawings of each of these forms on paper; on the blackboard.
6. $\frac{6}{6} = 1$; $\frac{12}{12} = 1$; $\frac{3}{3} = 1$; $\frac{4}{4} = 1$. Read these facts.
7. Which is larger, $\frac{1}{3}$ or $\frac{1}{6}$? Why? $\frac{1}{6}$ or $\frac{1}{12}$? Why?
8. Cut out forms to show the answers to 6 and to 7.
9. Which is larger, $\frac{1}{6}$ or $\frac{2}{12}$? $\frac{2}{6}$ or $\frac{1}{3}$? $\frac{1}{3}$ or $\frac{4}{12}$?

DIVISION TABLES

Make a division table, beginning it like this :

$10 \div 10 = 1$	$30 \div 10 = 3$				
$20 \div 10 = 2$	$40 \div$				

Make a division table, beginning it like this :

$6 \div 6 = 1$	$18 \div 6 =$				
$12 \div 6 = 2$	$24 \div$				

Make a division table, beginning it like this :

$12 \div 12 = 1$	$36 \div 12 = 3$				
$24 \div 12 = 2$	$48 \div 12 =$				

RECITE

QUESTIONS

1. How many school days are there in 4 weeks? How many working days?
2. How many hours are there in a quarter of a day?
3. Which is the greater fraction, $\frac{1}{4}$ or $\frac{1}{5}$?
4. A cake is cut into sevenths. Another cake of equal size is cut into tenths. Would one of these sevenths be a larger or smaller piece of cake than a tenth?
5. How many 10's are there in 96? how many units?
6. If a can of peaches cost 25¢, how many cans will \$1 buy? 75¢?
7. What part of 48 is 6? How many times 6 is 48?
8. If 2 yards of tape cost 24¢, what will 1 yard cost? what will $\frac{1}{4}$ of a yard cost?
9. A strip of carpeting is $\frac{3}{4}$ of a yard wide. How many inches wide is the carpeting?

QUESTIONS

1. What part of 12 is 6? of 27 is 9?
2. How many cents are there in a dollar?
3. At \$6 a ton, how many tons of coal can you buy for \$24? What will half a ton cost?
4. Compare 18 and 36; 24 and 12; 20 and 60.
5. How many nickels are equal to 40¢?
6. If you had a fifty-cent piece, a dime, and 2 nickels, how many cents would you have? How many more cents would you need to make a dollar?
7. A dealer paid \$96 a dozen for lamps. What was the cost of 1 lamp?
8. A girl bought 8 yd. of braid at 6¢ a yard. She gave the clerk a 50¢ coin. What change should she get?
9. If a blank book cost 7¢, how many blank books can you buy with 3 dimes? How many cents would you have left after paying for the books?
10. Louis bought half a dozen little flags at 12¢ apiece. He gave the clerk a half dollar and a silver quarter. What change should the clerk give Louis?
11. A boy works in a garden at 10¢ an hour. How many hours must he work in order to earn \$1?
12. If a dozen oranges cost 50¢, how much will half a dozen cost? two dozen?
13. A man bought a pound of cheese for 15¢. He ate $\frac{1}{5}$ of it. What was the value of the part he ate?
14. If 3 crates of peaches cost \$40, what will 18 crates cost? How many crates would \$80 buy?
15. Mrs. Brown bought 9 yards of sheeting at 7¢ a yard and 3 yards of calico at 5¢ a yard. She gave the clerk a dollar bill. What change should she get?

REVIEW

1. Add:	200	100	200	100	200	500	600
	300	300	200	400	100	300	100
	<u>400</u>	<u>500</u>	<u>300</u>	<u>400</u>	<u>500</u>	<u>100</u>	<u>200</u>

2. Subtract:	900	700	800	600	800	500	900
	<u>400</u>	<u>400</u>	<u>500</u>	<u>300</u>	<u>200</u>	<u>400</u>	<u>200</u>

3. Write in figures two thousand three hundred fifty-six, four thousand nine hundred ninety, six thousand two hundred sixty-two, eight thousand eight hundred.

4. Is either larger, $\frac{2}{10}$ or $\frac{1}{5}$? $\frac{4}{10}$ or $\frac{2}{5}$? $\frac{6}{10}$ or $\frac{3}{5}$? $\frac{8}{10}$ or $\frac{4}{5}$? Show the answers by drawing forms.

5. Which is larger, one tenth or one twentieth of anything? Do you see that equal parts grow smaller as the number-names grow higher? Ten is higher than four, but one tenth is smaller than one fourth. Why?

6. Compare $\frac{1}{3}$ and $\frac{1}{4}$ by drawings. $\frac{1}{4}$ and $\frac{1}{6}$. $\frac{1}{2}$ and $\frac{1}{12}$.

7. Compare $\frac{2}{3}$ and $\frac{3}{4}$. How much larger is the $\frac{3}{4}$? Show your answer by a rectangle divided into twelfths.

8. What is the ratio of 8 to 16? of 12 to 24?

9. When 16 pounds of oatmeal cost 40¢, what do 8 pounds cost? 32 pounds?

10. Mr. Brown bought 4 dozen pears. Three of the pears were bad. The good ones were divided equally among 9 children. How many pears did each child get?

11. From a door to a window the distance is 2 yards and 1 foot. How many feet is the distance?

12. Carrie bought a yard and a quarter of red ribbon and $\frac{3}{4}$ of a yard of white ribbon. How many yards in all did she buy?

DATES

There are always seven days in every week. There are always at least four weeks or twenty-eight days in every month. There are twelve months in every year. When we write letters, we put three facts at the top, called the date. We tell the year, the month, and the day of the

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

month; sometimes we tell also the day of the week. We may write the date, December 31, 1903, or Thursday, December 31, 1903. The **calendar** tells us how to know the month, the day of the month, the year, and the day of the week.

This calendar is true for any month when the first day of the month falls on Sunday and when the month has 31 days. This calendar represents March, 1903, and August, 1904. If the 31st day were omitted, it would represent November, 1903, also.

The names of the months are: January, February, March, April, May, June, July, August, September, October, November, December.

The year has 365 days, except "leap year," which has 366 days. Leap year comes every four years; then February gains another day.

Thirty days hath September,
 April, June, and November.
 All the rest have thirty-one,
 Excepting February alone.
 Twenty-eight are all its store
 Till leap year gives it one day more.

THE CALENDAR

1. Get a calendar for the present year. On what week day did the first day of this month fall? On what week day will the first days of all the rest of the months of the year fall? On what week day did the first days of the past months fall?

2. What months of each year usually have the same days of the months on the same days of the week? Why is this not true in leap year?

3. Tell the names of the longest months.

4. How many days are there in seven weeks? in three weeks? in eleven weeks?

5. How many weeks are there in thirty-five days? in forty-nine days? in eighty-four days?

6. Which is the longer time, six weeks or two months? ten weeks or three months? one hundred days or three months?

7. Make a rectangle upon a sheet of paper seven inches long, five inches high. Mark the inch spaces on it on each side. Draw lines across and up and down so as to make thirty-five squares, one inch on each side.

8. Cut out thirty-one squares; number them from 1 to 31.

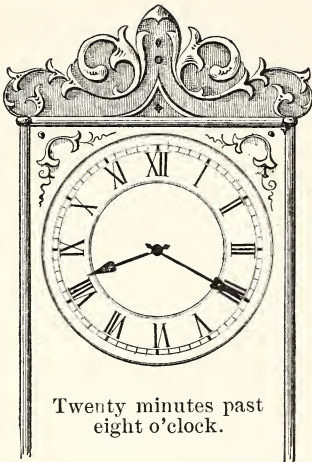
9. Place these squares on the sheet of paper to show the present month. Write at the top of the calendar, S for Sunday, M for Monday, T for Tuesday, W for Wednesday, T for Thursday, F for Friday, S for Saturday.

10. Make a large monthly calendar on the blackboard.

11. Make with the squares, as in 1 above, a calendar for the next month; the last month.

12. Make February of this year; of the next leap year.

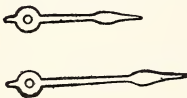
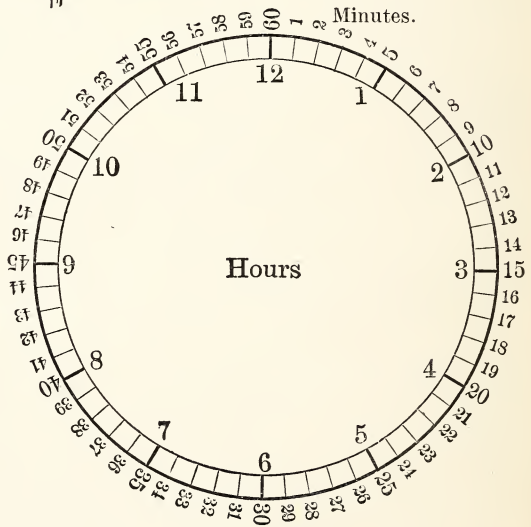
TELLING TIME



There are 24 hours in a day. We call the end of one day and the beginning of another *midnight*. Then we count 12 hours: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12. We call the middle of each day *noon*. Then we begin over again, and count 1, 2, 3, to 12, when it is midnight again.

Noon means 12 o'clock in the daytime. **Midnight** means 12 o'clock in the night.

1	one	I
2	two	II
3	three	III
4	four	IIII
5	five	V
6	six	VI
7	seven	VII
8	eight	VIII
9	nine	IX
10	ten	X
11	eleven	XI
12	twelve	XII



Key to clock face.

1 hour is the same place as 5 minutes. There are two hands on every clock, the hour hand and the minute hand.

The hour hand is always shorter than the minute hand.

TELLING TIME

$I = 1$; $V = 5$; $X = 10$. I after V means $V + I$. I before X means $X - I$.

60 minutes make 1 hour. Sign for morning hours, A.M.
 12 hours make 1 half day. Sign for afternoon and even-
 24 hours make 1 day. ing hours, P.M.

When we studied the fives' table, we found that $5 \times 12 = 60$. There are 60 minutes in every hour, and 12 hours in every day.

The hour hand goes from XII to I in one hour, but the minute hand every hour goes all the way around from XII past I, II, III, and so on to XII. The minute hand goes twelve times as fast as the hour hand.

There are twelve numbers on the clock face to mark 60 minutes. Each number means in minutes just 5 times as much as it does in hours, on the clock.

I means in hours 1, but in minutes it means 5, $5 \times 1 = 5$.

II means in hours 2, but in minutes it means 10.

III means in hours 3, but in minutes it means 15.

IIII means in hours 4, but in minutes it means 20.

V means in hours 5, but in minutes it means 25.

VI means in hours 6, but in minutes it means 30.

VII means in hours 7, but in minutes it means 35.

VIII means in hours 8, but in minutes it means 40.

6 hours 40 minutes are twenty minutes before 7 hours.

IX means in hours 9, but in minutes it means 45.

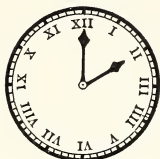
X means in hours 10, but in minutes it means 50.

XI means in hours 11, but in minutes it means 55.

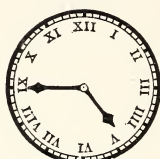
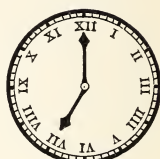
XII means 12 hours, or 60 minutes, or 0 (no) minutes.

TELLING TIME

We say, "It is two o'clock." This means "It is two hours of the clock." When it is 2 o'clock, we find the minute hand at XII hours or 60 or 0 minutes.

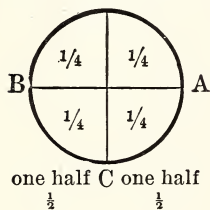


2 o'clock

10:20 o'clock
twenty minutes
after ten4:45 o'clock
quarter of
five o'clock

7 o'clock

This circle is divided into quarters. When the minute hand reaches 15 minutes after XII or 60, we say it is quarter past whatever hour the hour hand is nearest. *A* is at III or 15 minutes. When the minute hand reaches 45 minutes after XII or 15 minutes ($60 - 45 = 15$) before XII, we say it is quarter before the hour the hour hand is nearest: that is, the hour toward which the hour hand is traveling. When the minute hand is at VI or 30 minutes, we say it is half past. $30 = 60 \div 2$. $30 = \frac{1}{2}$ of 60.



1. Where should the hands be to show quarter past 9; quarter to 11; half past 9; quarter to 12; quarter past 10; half past 8; half past 3; half past 7; quarter to 12; quarter past 1; quarter past 6; half past 5?

2. Where is each hand at quarter past 12? at quarter past 2? at quarter to 3? at half past 4? at half past 6? at quarter to 9? at half past 11? at quarter to 8? at half past 3? at 10 minutes after 10?

TELLING TIME

1. Make a large clock face on thick paper or cardboard, or on the blackboard.

2. Draw the hands to show 5 minutes past 9 o'clock, 10 minutes past 10 o'clock, 15 minutes past 11 o'clock, 20 minutes past 12 o'clock, 25 minutes past 1 o'clock.

3. Draw the hands to show 25 minutes of 3 o'clock, 20 minutes of 4 o'clock, 15 minutes of 5 o'clock, 10 minutes of 6 o'clock, 5 minutes of 7 o'clock, and 8 o'clock.

4. Draw quarter past nine o'clock, half past ten o'clock, quarter of eleven o'clock, and six o'clock.

5. Draw each one of the hours one o'clock, two, three, four, five, six, seven, eight, nine, ten, eleven.

6. Make out of cardboard a clock face, and hands out of cardboard or wood, and set the time to suit your own ideas. Make all the different times o'clock in 2, 3, 4, and 5 above.

7. Draw a picture of the clock in your schoolroom. What time does it tell? Perhaps it took you quite a long time to draw that picture. Draw another, telling what time it is now. How many minutes apart are the two times on the two clocks?

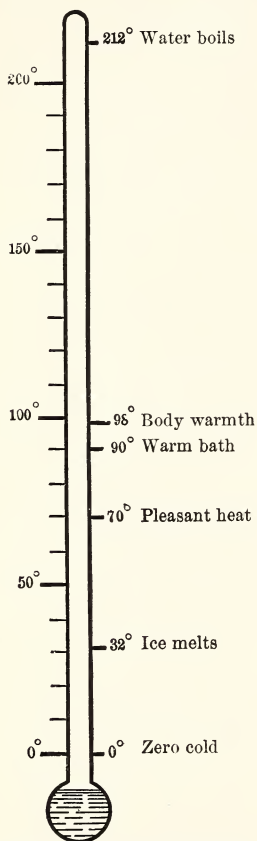
8. School begins at — o'clock. Recess is at — o'clock. Recess is over at — o'clock. The morning session ends at — o'clock. Draw four clock faces to show these times.

9. Do you have a daily program at school? When did this lesson begin? When will it end? Make clock faces to show these times. Show the times for other lessons.

10. Make clock faces showing the time when you get up in the morning, when you eat breakfast and other meals, and when you go to bed at night.

TELLING HEAT AND COLD

In the winter, when the fire goes out, we feel cold. In the summer we are often very warm. Sometimes in



Fahrenheit thermometer.
The spaces are called *degrees*. This means equal parts of space.
The sign for degree is °.

winter the fire is very hot, and our rooms are too warm. It is hot near bonfires or the fire in the blacksmith's shop. It is warmer in the sunshine than in the shade.

We have thermometers to tell us how warm or how cold it is. When the thermometer is put in water with broken ice in it, the quicksilver goes to 32°. When we hold the bulb or thick end tight in one hand, the quicksilver goes nearly to 98°. In boiling water the quicksilver marks 212°. Hot weather is when the air is as warm as our bodies, 98°.

We like to have the air in our rooms at 70°, but in winter, to make the air pleasant at that temperature we must have water vapor in it. That is why we put water on our stoves or in our furnaces, or let steam out of the steampipes into our rooms.

Temperature is heat and cold. Thermometers tell the temperature. Where do you see thermometers?

Draw thermometers to show: 60°; 70°; 10°; 45°; 65°; 90°; 110°; 100°; 30°; 80°; 20°; 120°.

TELLING HEAT AND COLD

1. How many degrees do you find between melting ice and body warmth? $98^{\circ} - 32^{\circ} =$

2. How many degrees do you find between melting ice and the warm bath? $90^{\circ} - 32^{\circ} =$

3. Would you like to go swimming in a river full of floating blocks of ice? How cold would the water be?

4. Do you like to drink ice water when warm? How cold is the water?

5. We like to go swimming in salt sea water at 68° . How many degrees is that colder than our bodies?

6. Is ice ever as warm as 50° ?

7. Cool water, 55° , is very pleasant and good to drink in summer when our bodies become very warm in the hot air. How much cooler is the water than our bodies if our temperature is 99° ?

8. When we are sick, we usually have fever. Over 100° may be a fever. If our body warmth is 104° , our doctor is very anxious. How many degrees too warm is this? $104^{\circ} - 98^{\circ} =$

9. Sometimes we have a chill. If our body warmth falls three degrees, 3° , how warm are we? $98^{\circ} - 3^{\circ} =$

10. The temperature inside the mouth is 98° or 99° ; that of ice cream is usually 32° . Why does it seem so cold?

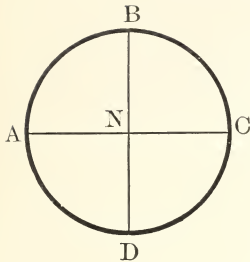
11. Is water ever as cold as zero?

12. How many degrees warmer is 85° in the shade on a hot day and 110° in the sun?

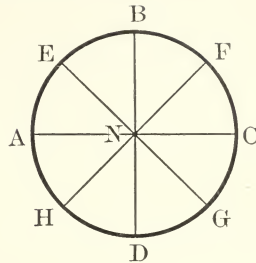
QUESTIONS

1. What part is: 3 of 6? 5 of 15? 8 of 40? 12 of 60? 11 of 44?
2. How many times does 72 contain 6?
3. A mason can build a wall in 30 days. What part of it can he build in 5 days? in 6 days? in 15 days?
4. George can ride 50 miles in 5 hours on his wheel. What part of that distance can he ride in 1 hour? in 3 hours? in 4 hours?
5. How many feet are there in 18 inches? in 30 inches? in 60 inches?
6. Esther bought 9 yards of braid at 5¢ a yard. She gave the clerk a fifty-cent piece. What change was due her?
7. How much money will 5 gallons of kerosene cost at 12¢ a gallon?
8. Walter paid 40¢ for 2 quarts of molasses. How much would a pint cost at the same rate?
9. At 11¢ a quart, how many quarts of berries can you buy for 55¢?
10. Mr. Brown wishes to divide 40¢ equally among his four children. How many cents must he give to each child?
11. In a pond there were 36 lilies. A boy picked 9 of them. What part of all the lilies did he pick?
12. A florist had 44 roses. $\frac{1}{4}$ of them were white, $\frac{1}{2}$ were red, and the rest were yellow. How many roses were white? How many were red? How many were yellow?
13. Fold a piece of paper 10 inches by 5 inches into — inch squares.
14. One half of the above piece of paper has — inch squares.

TELLING ANGLES



A circle with 4 quarters
and 4 right angles

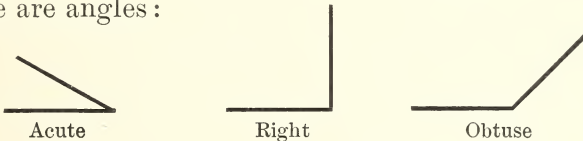


A circle with 8 eighths
and many different angles

AC is a diameter. It divides the circle into halves because it is a straight line through the center of the circle and is extended on both sides to the circumference.

BD is a diameter. It divides each of the circle's halves into two equal parts: $\frac{1}{2}$ of $\frac{1}{2} = \frac{1}{4}$.

These are angles :



Acute

Right

Obtuse

Angles are formed by the meeting of lines. ANB is an angle. Trace it.

Two diameters crossing each other so as to divide a circle into quarters make right angles with each other.

We say that BN is perpendicular to AN because it forms the right angle ANB .

We call angles smaller than right angles *acute* angles.

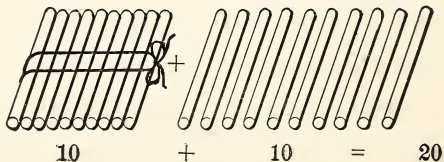
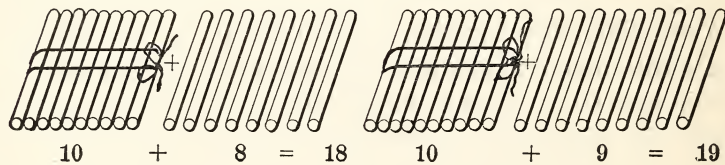
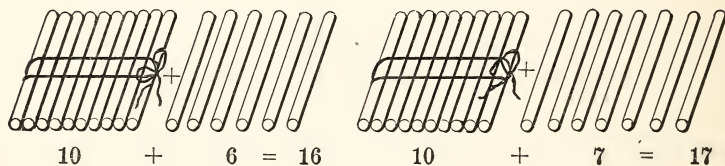
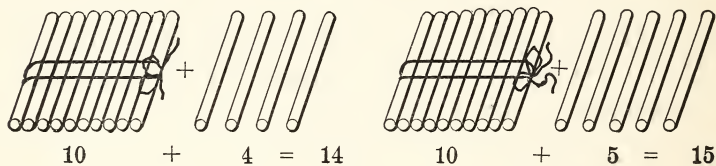
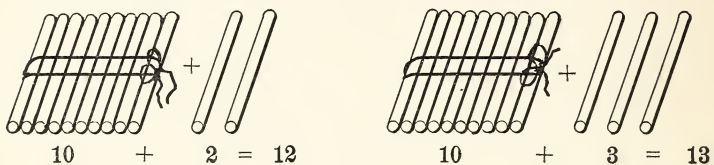
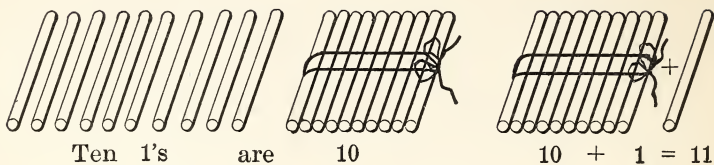
We call angles larger than right angles *obtuse* angles.

We call this a *horizontal* line : _____.

And this we call a *vertical* line : |.

$ABCD$ is the *perimeter* or *circumference* of the circle.

REVIEW OF NUMBERS 10 TO 20



REVIEW

1. With a thermometer take the temperature out of doors at 8.30 A.M., at 12 M., and at 3 P.M. Tell the differences. Do this for five school days.

2. Take the temperature in the schoolroom every hour all day.

3. Draw pictures of thermometers, showing the quicksilver at 98° , at 32° , at zero, at 212° , at 70° , at 90° , at 100° .

4. Draw pictures of thermometers, telling when ice melts, when water boils, when the heat is pleasant, how warm the body is when one is well, when one has a fever, when one has a chill, how warm a bath should be, and how low the mercury is when it is very, very cold, below zero.

5. Draw a picture of the clock face to show the time when school begins in the morning; in the afternoon; when school closes in the morning; in the afternoon.

6. Draw a flag showing thirteen stripes and forty-five stars.



7. Write in words all the numbers from one to thirty; all from thirty to sixty; all from sixty to a hundred.

8. Do as the sign tells :

$\begin{array}{r} 28 \\ +44 \\ \hline \end{array}$	$\begin{array}{r} 74 \\ -39 \\ \hline \end{array}$	$\begin{array}{r} 43 \\ +57 \\ \hline \end{array}$	$\begin{array}{r} 12 \\ \times 9 \\ \hline \end{array}$	$\begin{array}{r} 5 \overline{)60} \\ \hline \end{array}$	$\begin{array}{r} 83 \\ -18 \\ \hline \end{array}$
--	--	--	---	---	--

9. Write columns of three numbers of two figures each and add them.

10. Write the Multiplication Table of : 2, 3, 4, 5, 6, 10, 12.

ORAL

1. Begin at 0 and count by four to one hundred.
2. How many are $15 - 4 + 8 + 9 + 3 - 10 - 2 - 7 \times 2$?
3. How many dimes are there in half a dollar?
4. How much is $\frac{1}{2}$ of $\frac{1}{3}$? $\frac{1}{3}$ of $\frac{1}{3}$?
5. Is $\frac{1}{3}$ more or less than $\frac{1}{2}$? $\frac{1}{6}$ than $\frac{1}{9}$? $\frac{1}{5}$ than $\frac{1}{3}$? Why?
6. Give the multiplication table of threes.
7. How many pints are there in a gallon? in a peck?
8. Measure the size of the schoolroom in feet.
9. Read the calendar for to-day.
10. Tell a number-story about 24 cents, 4 boys, and two dozen apples that cost a dime a dozen.

WRITTEN

- | | |
|---|--|
| <p>1. Add: $\begin{array}{r} 15 \\ 7 \\ \hline 12 \end{array}$ $\begin{array}{r} 31 \\ 10 \\ \hline 9 \end{array}$ $\begin{array}{r} 44 \\ 16 \\ \hline 8 \end{array}$</p> | <p>2. Subtract: $\begin{array}{r} 46 \\ 17 \\ \hline \end{array}$ $\begin{array}{r} 92 \\ 14 \\ \hline \end{array}$ $\begin{array}{r} 74 \\ 65 \\ \hline \end{array}$</p> |
|---|--|

3. Write the Number Table of One Hundred, showing very plainly every number containing 7.
4. Draw a clock face, showing 5.20 o'clock.
5. Draw a rectangle divided into sixths.
6. Write in words 2671, 4203, 3031, 1850.
7. Answer $5 + (4 \times 2) = ?$ $(3 \times 3) + 9 = ?$ $(18 \div 6) + 7 = ?$
8. John had one dollar. He spent a quarter for a cap, forty cents for a bantam hen, and a nickel for chestnuts. How much money did he have left?
9. What part of 9 is 6? of 12 is 4?
10. Write the day of the week, month, and year.

APPENDIX

THE following pages are for such use by teachers in their practical classroom work as may seem expedient.

This book is intended for children from seven to nine years of age in not less than their third year at school. Parts of it are much too easy for the stronger pupils, while other parts are much too hard for the weaker. The book is intended, as is every other book in this Series, to afford a wide range and a great variety of topics, lessons, exercises, and methods. This Appendix still further enlarges the range and variety.

For the general principles upon which this Series is based, see the author's essay, "Elementary School Mathematics: Theory of Method."

NOTES

PAGES 14, 15. The sizes suggested for figures on blackboard and on paper are those best for the child's arm, wrist, and fingers, and for his eyesight. Children develop earliest the larger muscles. In lower grades children of defective eyesight do not yet wear glasses, and unrecognized eye troubles are common. Freedom of movement, legibility, and facility in writing, together with the demonstrated facts of child physiology, conspire to enforce the requirement of large letters and figures from children under ten years of age.

PAGE 49. Thirteen, fourteen, etc., are obviously derived from three-ten, four-ten, etc.

PAGE 67. Twain, from which twenty, twain-tens, is derived, is the ancient form of the number two.

PAGE 66. Practice varies greatly as to the preference between the two forms, $\frac{5}{2 \overline{)10}}$ and $\frac{2 \overline{)10}}{5}$, for short division. There are advantages to each. The first form is later and is at present gaining vogue. The second has been retained in this book because it is in more general use, because to write above what is first written is unlike our writing style for words, and because children who practice it are not so likely to crowd their pages as with the other form. Further, in business bookkeeping all results are placed below or at the left. See also Appendix, Book Two, of this Series.

PAGE 26. Fractions may be represented in picture forms.

$$\frac{2}{5} = \frac{\begin{array}{c} \bullet \bullet \\ \bullet \bullet \bullet \end{array}}{\bullet \bullet \bullet \bullet \bullet} \quad \frac{3}{10} = \frac{\begin{array}{c} \bullet \bullet \bullet \\ \bullet \bullet \bullet \bullet \bullet \end{array}}{\bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet \bullet} \quad \frac{2}{6} = \frac{\begin{array}{|c|} \hline \bullet \bullet \\ \hline \end{array}}{\begin{array}{|c|c|c|} \hline \bullet \bullet & \bullet \bullet & \bullet \bullet \\ \hline \end{array}}$$

For the general principles of visualization of numbers see the author's *Primer of Numbers* and *Theory of Method*.

PAGE 66. A distinction between partition and division is this: True division finds equal parts. Partition merely separates into any parts. True partition separates into equal parts with remainder.

PAGE 66. Partition of 19 may be said to give $7 + 3 + 3 + 3 + 3$, or $5 + 5 + 5 + 2 + 2$.

True partition of 19 gives $4 + 4 + 4 + 4 + 3$, or $6 + 6 + 6 + 1$.

True division of 19 by 3, gives $6\frac{1}{3}$.

For other distinctions, see *Theory of Method*.

PAGE 74. For a general discussion of the ratio theory, see *Theory of Method*. Undoubtedly children find it hard

to understand the word "ratio," since they never hear it used in ordinary life. Ratio is an abstract idea. However, this text retains the ratio principle, and this Appendix adds material for its illustration and elaboration by those teachers who have time and inclination to use ratio practically. Its actual value in assisting to a clear understanding of arithmetic is unquestionably great. Counting and ratio are the two pillars that support the science of numbers.

PAGE 94. There are three good methods to develop subtraction. The text incorporates the one actually used by the great majority of business men.

A second method is as follows, viz. :

73	} Concrete statement.
$\frac{28}{45}$	
45	
Lay out 73 splints, 7 bundles of ten, and 3 loose splints. Untie 1 bundle, leaving 6 bundles tied. Add the untied 10 to the 3 loose splints, making 13 splints. Take 8 away from 13, 5 are left. Take 2 bundles away from the 6 bundles, 4 are left. 4 bundles of 10 splints and 5 loose splints are 45 splints. (4 tens and 5 units are 45.)	

73	} Abstract statement.
$\frac{28}{45}$	
45	
3 is less than 8. Take 10 from 70, and add it to 3. 13 less 8 is 5. 70 less 10 is 60. 60 less 20 is 40. Or, 7 (tens) less 1 (ten) is 6 (tens). 6 (tens) less 2 (tens) is 4 (tens).	

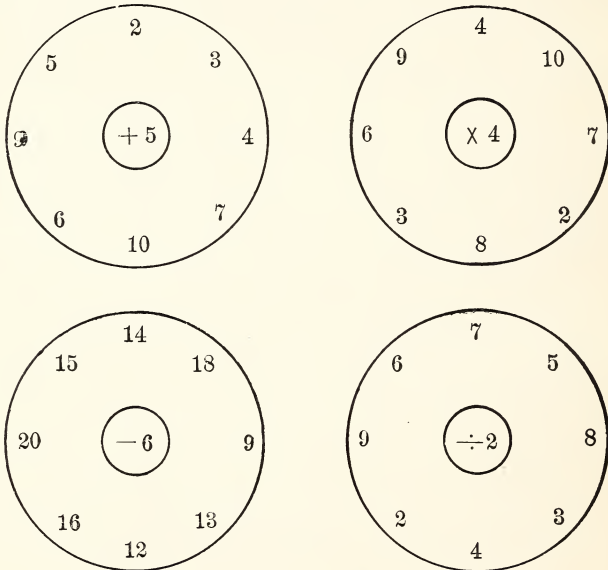
A third method is as follows, viz. :

73	} Simplest abstract statement.
$\frac{28}{45}$	
45	
8 from 13 is 5. Add 1 to 2, making it 3. 3 from 7 is 4.	

PAGE 106. Owing to the stringent laws against counterfeiting it is not possible to reproduce in the text pictures of United States Money. The dies might be used for illegal purposes. It is desirable that the actual coins should be shown to the children sufficiently often for them to be familiar with them.

PAGE 107. For busy work the children may be required to write stories using the number combinations.

PAGE 118. An extremely useful device for drilling children in numbers may be illustrated thus, viz.:



Disks are made about 15 or 18 inches in diameter. The inner circles may be constantly changed. The teacher, with the disks on the blackboard, may point to one number and another, going rapidly about the class. The device may be employed in many different ways.

PAGE 122. In using the calendar let the children mark

off the days as they pass, making, if they choose, comments on the weather. Measuring time has been said frequently to be the greatest service of arithmetic to mankind.

PAGE 124. An interesting story may serve to help the child learn how to tell time. The hour hand may be called the little boy who walks slowly while his big brother goes fast. Or, the hour hand may be called an old man and the minute a vigorous young man. Or, again, the hour hand may be called a tortoise and the minute hand a hare.

In teaching the subject of time it may be well to explain these additional facts.

When the minute hand points to more than 30, we usually read the number of minutes before the next hour.

6 o'clock and 35 minutes we usually call 25 minutes before 7. 60 minutes less 35 minutes are 25 minutes.

Railroads read this time 6 hours 35 minutes.

VIII means in hours 8, but in minutes it means 40.

6 hours 40 minutes are 20 minutes before 7 hours.

PAGE 142. How far to carry concrete illustrative work is not always easy to determine. Upon page 132 there is presented a comparison of the numbers ten to twenty that may prove helpful to classes that find difficulty in the "teens." The method may be greatly extended. There are classes that are helped by concrete illustration work in the hundreds.

In general, imaginative children need little or no concrete illustrative work beyond twelve. The reason why they enjoy problems about birds, dolls, flowers, fruit, is extrinsic from arithmetic. They enjoy any subject that refers to the bright and attractive things of life. It often happens that children are delayed in their progress in arithmetic by too much paper-folding, block-building, and black-board drawing.

Counting by 3's.

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

Counting by 6's.

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

Counting by 4's.

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

Counting by 8's.

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

Counting by 5's.

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

Counting by 7's.

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

The 10's are at the ends of the rows.

Counting by 9's.

1	2	3	4	5	6	7	8	9	10	11	12	Notice that
13	14	15	16	17	18	19	20	21	22	23	24	the 2 figures in
25	26	27	28	29	30	31	32	33	34	35	36	each number
37	38	39	40	41	42	43	44	45	46	47	48	which contains
49	50	51	52	53	54	55	56	57	58	59	60	9 always add
61	62	63	64	65	66	67	68	69	70	71	72	together 9, ex-
73	74	75	76	77	78	79	80	81	82	83	84	cept 99. $9 + 9$
85	86	87	88	89	90	91	92	93	94	95	96	$= 18, 1 + 8 = 9.$
97	98	99	100	101	102	103	104	105	106	107	108	Notice also that
109	110	111	112	113	114	115	116	117	118	119	120	the unit figure
121	122	123	124	125	126	127	128	129	130	131	132	of each larger
133	134	135	136	137	138	139	140	141	142	143	144	multiple of 9 is
												always 1 less,
												18, 27, 36, and
												so on.

Counting by 11's.

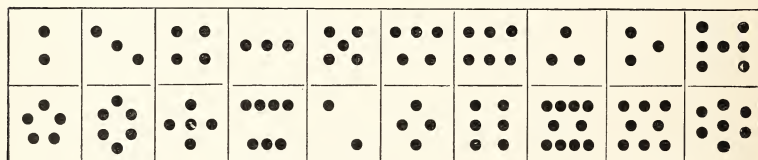
1	2	3	4	5	6	7	8	9	10	11	12	Notice that
13	14	15	16	17	18	19	20	21	22	23	24	from 1 to 100
25	26	27	28	29	30	31	32	33	34	35	36	the 2 figures in
37	38	39	40	41	42	43	44	45	46	47	48	each multiple of
49	50	51	52	53	54	55	56	57	58	59	60	11 are always
61	62	63	64	65	66	67	68	69	70	71	72	the same, and
73	74	75	76	77	78	79	80	81	82	83	84	that above 100
85	86	87	88	89	90	91	92	93	94	95	96	the number of
97	98	99	100	101	102	103	104	105	106	107	108	tens always in-
109	110	111	112	113	114	115	116	117	118	119	120	creases 1, 110,
121	122	123	124	125	126	127	128	129	130	131	132	121, and so on,
133	134	135	136	137	138	139	140	141	142	143	144	and the num-
												ber of units al-
												ways increases
												1, 121, 132, 143.

1. Copy these Number Tables in red and blue pencil on paper, or in red and blue chalk on the blackboard.

2. Read these Tables in class, explaining them.

The teacher may make sight number cards, using ordinary paper or, better, drawing paper, 4×5 in. or 4×6 in. size. The figures should be as large as those on page 4 for blackboard writing. They may be drawn with brush and diluted ink or with blue pencil. The children may make sets for themselves, either as large as the teacher's set, or much smaller, 2×3 in., with figures as large as those on page 5. These sets of sight cards should review all the number facts as high as 20, and drill the pupil in quick recognition of number groups as high as 7 or even 10. The teacher with a set of cards in her hand may call for answers in various ways. The answers are to be remembered instantly and with certainty.

For a set of sight-counting cards:



Cards involving 10 may be written like these:

$10+1=$	$10+2=$	$10+3=$	$10+4=$	$10+5=$	$10+6=$	$10+7=$	$10+8=$	$10+9=$	$10+10=$
$10 \times 2=$	$\frac{1}{2} 10=$	$2)10$	$5)10$	$10 \div 2=$	$10-1=$	$10-2=$	$10-3=$	$10-4=$	$10-5=$
$10-6=$	$10-7=$	$10-8=$	$10-9=$	$10)10$	$5+5=$	$5 \times 2=$	$2 \times 5=$	$9+1=$	$8+2=$
$7+3=$	$6+4=$	$18-8=$	$19-9=$	$17-7=$	$16-6=$	$15-5=$	$14-4=$	$13-3=$	$12-2=$

The variety of possible ways to use the numbers to 20 in combinations producing not more than 20 and using no partition facts or fractions over $\frac{1}{2}$ is too great to permit of complete illustration. Not all the combinations or forms of signs to indicate operations involving 10 are indicated even in these forty spaces.

ILLUSTRATIVE TESTS OF SUCCESS

I is to be copied and completed: partly "busy work."

II illustrates abstract work in number-computation: "figuring."

III is concrete work: chiefly "busy work."

IV is especially difficult because it involves both reasoning and imaging. Yet some children in the Grade will be able to do all or most of the problems.

I

1. There are — pecks in a bushel (or, pk. in 1 bu.).
2. There are — minutes in an hour (or, min. in 1 hr.).
3. 92° is — degrees above freezing (or, $-^{\circ}$ above 32°).
4. A gallon of water weighs — pounds (or, 1 gal. of water = — lb.).
5. — cents make one dime (or, — ϕ = 1 dime).
6. A square has — sides and — angles.
7. 50 ϕ make — of a dollar (or, 50 ϕ = — of \$1).
8. Twenty less two dozen is —.
9. A fraction is one or more of the — parts of something.
10. There are — pints in a gallon (or, pt. in 1 gal.).

II

- | | |
|---------------------------------|----------------------------------|
| 1. Add: 50, 100, 200, 50. | 2. From 78 take 49. |
| 3. Divide 84 by 12. | 4. Multiply 19 by 4. |
| 5. $12 + 16 + 19 + 23 + 31 = ?$ | 6. $66 \div 3 = ?$ |
| 7. $1000 - 700 = ?$ | 8. $8 \div 4 + 3 \div 5 - 1 = ?$ |
| 9. \$1 less 45 = ϕ ? | 10. 3 qt. - 5 pt. = ? |

III

1. Draw a rectangle measuring 3 in. by 2 in.
2. Write a number table from 1 to 100, marking plainly the numbers that are products of 9.
3. Draw a clock face to show 11.45 o'clock.
4. Draw a thermometer to show 96° .
5. Draw a square divided into sixteen equal squares.
6. Show by drawings that $\frac{1}{3} = \frac{2}{6} = \frac{3}{9}$.
7. Design a disk to use in teaching the products of 11.
8. Draw a hexagon divided into eighths.
9. Make a Division Table of Twelves.
10. Draw chairs or anything else to represent the difference between a dozen and a half and two thirds of a dozen.

IV

1. 8.45 A.M. + 3 hr. 30 min. = what time A.M. or P.M.?
2. Draw any square and take from it $\frac{3}{8}$ of itself.
3. Mr. Somers had \$1000. He gave a tenth to his son and two tenths to his wife. How much was left?
4. How much more is $\frac{1}{4}$ of 100 than $\frac{1}{3}$ of 60?
5. Draw a rectangle equal to five squares.
6. $\$75 + \$35 \div 5 =$ how many dollars?
7. $5\frac{1}{2}$ ft. - $1\frac{1}{2}$ yd. = how many inches?
8. George walks a mile in 20 min. What time does he need to go $3\frac{1}{2}$ miles?
9. One year two pairs of robins raised in the spring six little robins. How many pairs of robins were there then? Next year each pair of robins raised three little robins more. If all lived, how many robins were there then?
10. Each year it costs \$3 a child to buy books, paper, tools, and other things for the schools in the city of B——. What does it cost for a school of 2000 children?

