Fourteenth Exercise.

1. Repeat the 7's 5 times in each of the two ways, thus:

1 time 7 is ——.	7 times 1 are ——.
2 times 7 are ——.	7 times 2 are ——.
etc., etc.	etc., etc.

2. Repeat the 8's 5 times in each of the two ways, thus:

1 time 8 is ——.	8 times 1 are ——.
2 times 8 are ——.	8 times 2 are ——.
etc., etc.	etc., etc.

3. Answer the following 5 times:

8×7? 8×9? 6×8? 7×6? 8×6? 9×8? 9×7?
7×9? 6×9? 9×6? 7×7? 8×8? 9×9? 7×5?
7×4? 8×3? 3×8? 6×3? 4×6? 3×7? 3×9?

4. If 7 white hens have 8 chickens each, and 8 black hens have 7 chickens each, which have the most chickens, the white hens or the black hens? Why?

5. John earns 6 cents an hour and works 7 hours, and Henry earns 7 cents an hour and works 6 hours. Which earns the most money?

6. Which costs the most, 8 oranges at 9 cents each, or 9 oranges at 8 cents each? Why?

7. In the first column there are 4 words, with 7 letters in each word, and in the second are 7 words, with 4 letters in each word. In which column are there the most letters? Why?

a n s w e r s	l a t e
s c h o l a r	g o e s
f o l l o w s	s a i l
c h i c k e n	c o a t
	f i n d
	s n o w
	r a i n

Fifteenth Exercise.

1. Repeat the 9's 5 times in each of the two ways, thus:

1 time 9 is ——.	9 times 1 are ——.
2 times 9 are ——.	9 times 2 are ——.
etc., etc.	etc., etc.

2. Repeat the 10's 5 times in each of the two ways, thus:

1 time 10 is ——.	10 times 1 are ——.
2 times 10 are ——.	10 times 2 are ——.
etc., etc.	etc., etc.

3. Answer the following 5 times. Write them on your slates in the same way as those on page 97.

9×3? 4×9? 10×7? 8×9? 6×9? 7×9? 9×6?
10×3? 3×10? 9×8? 9×6? 9×7? 3×9? 1×9?

4. Answer the following:

$3 \times 5 =$	$3 \times 7 =$	$2 \times 2 =$
$7 \times 8 =$	$3 \times 2 =$	$3 \times 3 =$
$6 \times 7 =$	$5 \times 8 =$	$4 \times 4 =$
$9 \times 8 =$	$9 \times 4 =$	$5 \times 5 =$
$4 \times 7 =$	$9 \times 3 =$	$6 \times 6 =$
$7 \times 5 =$	$4 \times 9 =$	$7 \times 7 =$
$6 \times 9 =$	$3 \times 9 =$	$8 \times 8 =$
$10 \times 8 =$	$2 \times 8 =$	$9 \times 9 =$
$5 \times 7 =$	$3 \times 8 =$	$10 \times 10 =$
$7 \times 6 =$	$10 \times 4 =$	$1 \times 1 =$
$9 \times 6 =$	$3 \times 10 =$	$5 \times 0 =$
$8 \times 7 =$	$10 \times 10 =$	$0 \times 3 =$

Sixteenth Exercise.

1. How many times must you make 3 stars to have 12 stars? How many times 3 is 12? 4 times 3 are how many?

2. How many times must you make 4 marks to have 20 marks? How many times 4 is 20? 5 times 4 are how many?

3. Three times what number makes 12? Three times what number makes 18?

4. 4 times what number makes 20?
   5 times what number makes 30?
   7 times what number makes 21?
   8 times what number makes 56?

5. Copy the following table on your slates and fill it out:*

$2 \times \quad = 2$	$3 \times \quad = 21$	$4 \times \quad = 20$
$2 \times \quad = 6$	$3 \times \quad = 15$	$4 \times \quad = 16$
$2 \times \quad = 8$	$3 \times \quad = 18$	$4 \times \quad = 4$
$2 \times \quad = 4$	$3 \times \quad = 12$	$4 \times \quad = 12$
$2 \times \quad = 10$	$3 \times \quad = 3$	$4 \times \quad = 24$
$2 \times \quad = 14$	$3 \times \quad = 9$	$4 \times \quad = 40$
$2 \times \quad = 20$	$3 \times \quad = 27$	$4 \times \quad = 8$
$2 \times \quad = 18$	$3 \times \quad = 6$	$4 \times \quad = 36$
$2 \times \quad = 16$	$3 \times \quad = 30$	$4 \times \quad = 28$
$2 \times \quad = 12$	$3 \times \quad = 24$	$4 \times \quad = 32$

6. How many times 5 does it take to make 15? How many 5's are there in 15?

7. How many times 6 does it take to make 24? How many 6's in 24?

* The teacher may need to explain how it is to be done.

Seventeenth Exercise.

1. How many cents do 6 5 cent pieces make? How many 5-cent pieces does it take to make 30 cents? 6 times 5 are how many? 6 times what number makes 30?

2. How many cherries are there in the picture? How many bunches? How many in each bunch? 7 times what number makes 42?
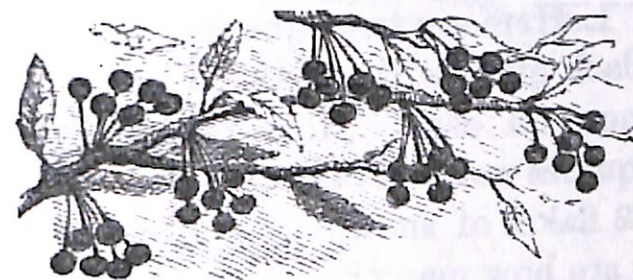
3. Copy the following table on your slates and fill it out:

|		
$5 \times \quad = 15$	$6 \times \quad = 18$	$7 \times \quad = 28$
$5 \times \quad = 10$	$6 \times \quad = 12$	$7 \times \quad = 14$
$5 \times \quad = 20$	$6 \times \quad = 42$	$7 \times \quad = 35$
$5 \times \quad = 35$	$6 \times \quad = 48$	$7 \times \quad = 63$
$5 \times \quad = 50$	$6 \times \quad = 24$	$7 \times \quad = 70$
$5 \times \quad = 45$	$6 \times \quad = 30$	$7 \times \quad = 42$
$5 \times \quad = 5$	$6 \times \quad = 6$	$7 \times \quad = 21$
$5 \times \quad = 25$	$6 \times \quad = 54$	$7 \times \quad = 7$
$5 \times \quad = 30$	$6 \times \quad = 36$	$7 \times \quad = 56$
$5 \times \quad = 40$	$6 \times \quad = 60$	$7 \times \quad = 49$

4. How many times must John bring in 4 eggs at a time, in order to bring in 24 eggs? How many times 4 does it take to make 24?

5. If Henry earns 5 cents an hour, how many cents will he earn in 7 hours?

6. If Henry earns 5 cents an hour, how many hours will it take him to earn 35 cents? Why? *Answer.* Because 7 times 5 are 35.

Eighteenth Exercise.

1. Here are two squares of black glass, with 9 flakes of snow on each. How many squares would it take to have 72 flakes of snow? 8 times 9 are how many?
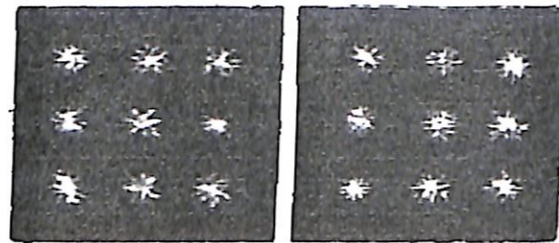
2. A class of boys had 90 fingers, including their thumbs. How many boys were there in the class. How many 10's does it take to make 90? 9 times 10 are how many?

3. Copy the following table on your slates and fill it out:

8× =16	9× =36	10× = 40
8× =40	9× =27	10× = 70
8× =24	9× =18	10× = 90
8× =56	9× =45	10× = 30
8× =64	9× =63	10× = 10
8× = 8	9× =81	10× = 20
8× =72	9× = 9	10× =100
8× =32	9× =54	10× = 50
8× =80	9× =90	10× = 80
8× =48	9× =72	10× = 60

4. If John catches 7 fishes each day, how long will it take him to catch 42 fishes? 6 times 7 are how many?

5. If Moses lays by 10 cents a week, how many weeks will it take him to lay by one dollar, or 100 cents? How many tens does it take to make 100?

Definition Exercise.

1. If one currant bush produces two quarts of currants, how many quarts will 3 currant bushes produce? What is the product of 3 times 2? What is the product of 3 times 7? What is the product of 4 times 5?

2. What number does 6 times 4 make? What is the product of 6 times 4? What is the product of 6 times 7? What is the product of 7 times 6?

3. What is the product of 4 times 8? Ask this question without using the word product.

4. What is the product of 3 and 4? Ask this question without using the word product.

5. How many are 8 times 6? Ask this question and use the word product.

6. What is the product of 7 and 3?
What is the product of 6 and 9?
What is the product of 8 and 7?
What is the product of 3 and 9?
What is the product of 3 and 3?
What is the product of 8 and 8?

7. Supply the proper word in the following:

What is the ———— of 6 and 4?
The ———— of 7 and 5 is what?
9 times 5 gives what ————?
What is the ———— of 2 and 9?

Second Definition Exercise.

1. Here are some curious onions. If you plant a little one like one of those in the first row, it will grow and multiply into 4 or more like those in the second row. If you planted the 3 in the first row, and each one multiplied so as to make 4, how many would you have? How many times as many as you planted? 3 multiplied by 4 produces how many? What is the product of 3 multiplied by 4?
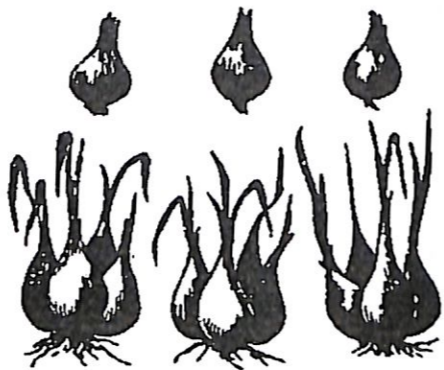
2. If I plant 6 of these curious onions, and each one multiplies into 5, how many times as many shall I have as I planted? 6 multiplied by 5 produces how many?

3. If I multiply 5 by 6, what is the product? When I multiply 6 by 5, what is the product? When I multiply 5 by 6, how many times do I take 5? 6 times 5 are how many?

4. If I multiply 4 by 8, what is the product? Ask this question without using either of the words multiply or product.

5. If I ———— 7 by 3, what is the ————?
If I ———— 6 by 9, what is the ————?
The ———— of 5 ———— by 8 is what?
What is the ———— of 7 ———— by 6?

6. When you multiply 8 by 9, how many times do you take 8? What is the ————?

7. What is the ———— of 8 and 7?
6 ———— by 4 gives what ————?
What ———— does 4 ———— by 10 give?

8. Finding what the product of two numbers is, is called MULTIPLICATION.

9. We have now studied COUNTING, ADDITION, SUBTRACTION, and MULTIPLICATION. When I find out that 6 taken from 11 leaves 5, what is it? When I find out that 5 times 6 is 30, what is it? When I name all the numbers in order from one to twenty—thus, one, two, three, four, etc.—what is it? When I find out that 7 and 8 are 15, what is it?

Drill Exercise.*

1. Add 4 and 3 and 6; from this sum subtract 8; multiply this remainder by 2. What is the result?

2. Add 2 and 6 and 3 and 7; from this sum subtract 9; multiply the remainder by 3. What is the product?

3. Add 5 and 7; from this sum subtract 8; to this remainder add 5; from this sum subtract 7; multiply this remainder by 4; multiply this product by 3; to this product add 6. What is the result?

4. From 8 subtract 3; from this remainder subtract 2; to this remainder add 5 and 7; from this sum subtract 8; to this remainder add 2; multiply this sum by 4. What is the result?

5. Begin with 5, add 2, add 6, subtract 9, multiply by 3, add 5, subtract 8, subtract 6, multiply by 7. What is the result?

6. Begin with 11, subtract 6, subtract 2, multiply by 8, add 5. What is the result?

7. Begin with 6, multiply by 2, subtract 5, add 3, subtract 4, add 1, subtract 6, add 8, multiply by 7. What is the result?

8. Begin with 5, add 7, subtract 3, subtract 4, multiply by 3, add 8. What is the result?

9. Begin with 4, add 9, subtract 7, multiply by 2, subtract 1, subtract 3, multiply by 9. What is the result?

10. Begin with 6, add 8, subtract 7, add 2, multiply by 8. What is the result?

* Drill exercises of this character must be continually kept up as oral exercises. See foot-note on page 76.

Practical Exercises.

1. John bought 2 oranges for 4 cents each, and gave the clerk 10 cents. How much change did he receive?

2. Mary bought 3 spools of thread for 6 cents each, and one yard of calico for 9 cents. How much did she pay for all?

3. Henry worked 3 hours for 5 cents an hour, and the man for whom he worked gave him a ball worth 8 cents, and the remainder in money? How much money did Henry get?

4. How many days are there in one week? How many in 6 weeks? How many days in 4 weeks?

5. John worked 1 week (6 days) and 4 days more? How many days did he work in all? If he earned 4 shillings a day, how many shillings did he earn? How many more days would he have had to work to make 2 weeks? How much more would he have earned if he had worked 2 weeks?

6. Sarah sews 3 hours each day. How many hours does she sew in a week (6 days)?

7. How many days are there in 8 weeks? How many Sundays in 8 weeks? How many work-days in 8 weeks?
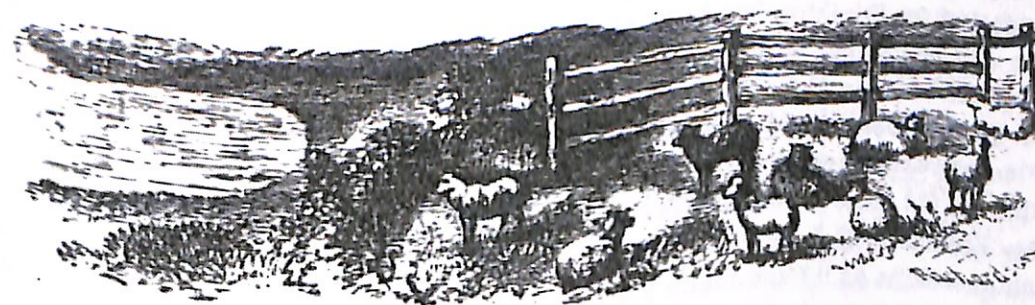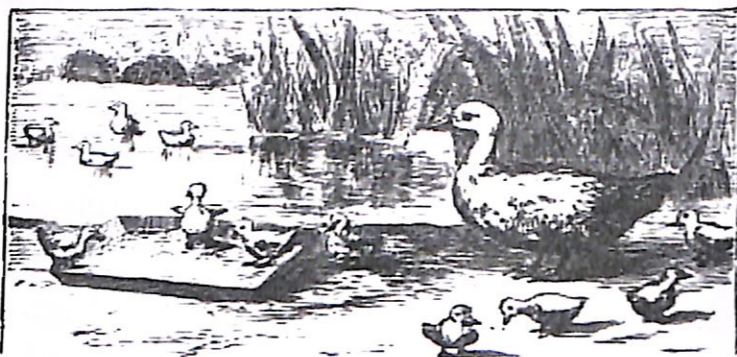
DIVISION.

Purpose.—*To develop the idea of Division in its Two Forms,* and the nature of Division as the converse of Multiplication, and to deduce the quotient of any number less than 100, divided by any number less than 10, from the relation of Division to Multiplication.*

First Exercise.†

1. How many little ducks are there in the picture? Are they all together? In how many groups are they? How many in each group? 3 groups, with 4 in each group, make how many? How many 4's in 12?

2. If you have 12 little ducks and put them in 3 groups, with the same number in each group, how many will

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* There are two essentially different logical processes called *division:*
1. Determining how many times one number is contained in another; and
2. Separating a number into any required number of equal parts, for the purpose of finding how many there are in one of these parts. The former is the more comprehensive view, although the latter gives name to the process. The foundation for Division has been so well laid in Multiplication that but little more will be needed here than to familiarize the *two forms* of conception, and give practice to fix the division table in mind.

† The teacher should carefully observe the character and purpose of the introductory examples in each of these exercises in Division, and give ample examples of *the same kind*, as class exercises, illustrating with the counters and other objects. But be sure and stick to the point of the particular exercise. Such questions as "How many 2's make 4?" "How many 3's make 15?" etc., are of great service in leading the pupil to comprehend the nature of division, and its relation to multiplication.

there be in each group? 12 divided into 3 equal parts makes how many in each part?

3. How many a's are there in the next line?

$$a \quad a \quad a \quad a \quad a \quad a$$

If you divide these 6 a's into groups with 3 in a group, how many groups will there be? | a a a | a a a |. How many 3's in 6? If you divide 6 a's into 2 equal groups, how many will there be in each group? 6 divided by 2 are how many?

4. 3 times what number makes 12? How many times does 4 go in 12? 4 times what number makes 12? How many times does 3 go in 12? 12 divided by 4 are how many? Why?* 12 divided by 3 are how many? Why?

5. 2 times what number make 6? How many are 6 divided by 3? Why? 3 times what number are 6? 6 divided by 2 are how many?

(NOTE.—Teacher, explain that ÷ means "divided by.")

6. Copy, fill out, and learn the following:

2÷2=	3÷3=	8÷2=	4÷2=
4÷2=	6÷3=	9÷3=	30÷3=
6÷2=	9÷3=	10÷2=	14÷2=
8÷2=	12÷3=	6÷3=	16÷2=
10÷2=	15÷3=	6÷2=	21÷3=
12÷2=	18÷3=	12÷3=	2÷2=
14÷2=	21÷3=	12÷2=	3÷3=
16÷2=	24÷3=	15÷3=	27÷3=
18÷2=	27÷3=	20÷2=	18÷2=
20÷2=	30÷3=	18÷3=	24÷3=

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* The point of this question is that the pupil may learn to deduce Division from Multiplication. *Ans.* Because 3 times 4 are 12.

Second Exercise.

1. How many fingers, including thumbs, have two boys? How many 5's in 20? If you divide 20 into 5 equal parts, how many will there be in each part?

2. $20 \div 5 =$ how many?

3. $20 \div 4 =$ how many?

4. How many legs have 6 cats? How many 4's in 24? $24 \div 4 =$ how many? Why?

5. John has 28 cents; how many lemons can he buy at 4 cents each? How many 4's in 28? $28 \div 4 =$ how many? Why?

6. Mary has 15 pansies, and she wishes to make 5 bouquets and put the same number of pansies in each. How many can she put in each bouquet? If you divide 15 things into 5 equal groups, how many will there be in each group? $15 \div 5 =$ how many?

7. Copy, fill out, and learn the following:

$4 \div 4 =$	$5 \div 5 =$	$12 \div 4 =$	
$8 \div 4 =$	$10 \div 5 =$	$15 \div 5 =$	$4 \div 4 =$
$12 \div 4 =$	$15 \div 5 =$	$16 \div 4 =$	$5 \div 5 =$
$16 \div 4 =$	$20 \div 5 =$	$28 \div 4 =$	$10 \div 5 =$
$20 \div 4 =$	$25 \div 5 =$	$25 \div 5 =$	$35 \div 5 =$
$24 \div 4 =$	$30 \div 5 =$	$30 \div 5 =$	$32 \div 4 =$
$28 \div 4 =$	$35 \div 5 =$	$36 \div 4 =$	$40 \div 5 =$
$32 \div 4 =$	$40 \div 5 =$	$20 \div 4 =$	$40 \div 4 =$
$36 \div 4 =$	$45 \div 5 =$	$20 \div 5 =$	$45 \div 5 =$
$40 \div 4 =$	$50 \div 5 =$	$8 \div 4 =$	$24 \div 4 =$
			$50 \div 5 =$

Third Exercise.*

1. This large basket contains 42 eggs. How many times can the little girl fill her small basket from it, if her small basket holds 6 eggs? How many times can she fill her small basket if it holds 7 eggs? How many 6's in 42? How many times 6 make 42? $42 \div 6$ are how many? Why? How many 7's in 42? How many times 7 make 42? $42 \div 7$ make how many? Why?

2. Make 30 **0**'s on your slate, thus:

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

Then rub out 6 **0**'s. Then rub out 6 more. Then another 6. How many times can you rub out 6 **0**'s? How many 6's in 30? How many times 6 make 30? $30 \div 6$ are how many? Why?

3. If John has 45 cents and spends 7 cents each day, how many days before all his money will be spent? $45 \div 7 =$ how many? Why?

4. If Henry has 56 cents, how many oranges can he buy at 7 cents each? $56 \div 7 =$ how many? Why?

* The purpose in this exercise is to show how we may find how many times one number is contained in another by taking the former from the latter as many times as possible; i. e., by subtraction. See note at the bottom of page 108. That process may be made serviceable for this purpose.

Copy, fill out, and learn the following :

$6 \div 6 =$	$7 \div 7 =$	$36 \div 6 =$	$6 \div 6 =$
$12 \div 6 =$	$14 \div 7 =$	$42 \div 7 =$	$7 \div 7 =$
$18 \div 6 =$	$21 \div 7 =$	$42 \div 6 =$	$14 \div 7 =$
$24 \div 6 =$	$28 \div 7 =$	$30 \div 6 =$	$18 \div 6 =$
$30 \div 6 =$	$35 \div 7 =$	$35 \div 7 =$	$21 \div 7 =$
$36 \div 6 =$	$42 \div 7 =$	$49 \div 7 =$	$54 \div 6 =$
$42 \div 6 =$	$49 \div 7 =$	$24 \div 6 =$	$56 \div 7 =$
$48 \div 6 =$	$56 \div 7 =$	$12 \div 6 =$	$48 \div 6 =$
$54 \div 6 =$	$63 \div 7 =$	$70 \div 7 =$	$63 \div 7 =$
$60 \div 6 =$	$70 \div 7 =$	$60 \div 6 =$	$28 \div 7 =$

Fourth Exercise.

1. Make 18 a's on your slate thus :

a a a a a a a a a a a a a a a a a a

Then mark them off into groups of 9 each. How many such groups will you have? How many 9's in 18? How many times 9 are 18? $18 \div 9 =$ how many?

2. Make 36 a's on your slate thus :

a a a a a a a a a a a a a a a a a a
a a a a a a a a a a a a a a a a a a

Then make 9 large circles thus :
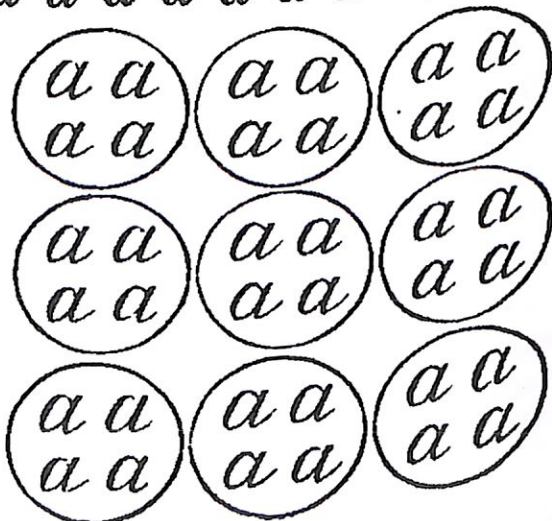
Then rub out one a and put it in one of the circles. Then rub out another a and put it in another circle. Then another and another, till you have one a in each circle. Then go round again and

put another a in each of the circles, till you have 2 a's in each circle. Then go round again, putting another a in each circle, till all the 36 a's are used up. How many a's will there be in each circle? If you divide 36 into 9 equal groups, how many are there in each group? $36 \div 9 =$ how many? Why?

3. Copy, fill out, and learn the following :

$8 \div 8 =$	$9 \div 9 =$	$72 \div 9 =$	$27 \div 9 =$
$16 \div 8 =$	$18 \div 9 =$	$72 \div 8 =$	$32 \div 8 =$
$24 \div 8 =$	$27 \div 9 =$	$8 \div 8 =$	$36 \div 9 =$
$32 \div 8 =$	$36 \div 9 =$	$9 \div 9 =$	$40 \div 8 =$
$40 \div 8 =$	$45 \div 9 =$	$80 \div 8 =$	$45 \div 9 =$
$48 \div 8 =$	$54 \div 9 =$	$90 \div 9 =$	$56 \div 8 =$
$56 \div 8 =$	$63 \div 9 =$	$16 \div 8 =$	$63 \div 9 =$
$64 \div 8 =$	$72 \div 9 =$	$18 \div 9 =$	$64 \div 8 =$
$72 \div 8 =$	$81 \div 9 =$	$24 \div 8 =$	$81 \div 9 =$
$80 \div 8 =$	$90 \div 9 =$	$48 \div 8 =$	$54 \div 9 =$

Fifth Exercise.

1. How many 10's are there in 20? How many in 30? In 40?

2. $40 \div 10 =$ how many? $30 \div 10 =$ how many?

3. How many 1's in 6? $6 \div 1 =$ how many? How many 1's in 7? $7 \div 1 =$ how many?

4. Mary has 80 needles in 8 papers, with the same number in each paper. How many needles in each paper?

5. If Mary puts her 80 needles up in papers of 10 needles each, how many papers will she have? $80 \div 8 =$ how many? $80 \div 10 =$ how many?

6. John has 60 cents in his bank. If he takes out 10 cents each day, how many days before his money will be gone? How many times can you take 10 out of 60? $60 \div 10 =$ how many?

7. Copy, fill out, and learn the following:

$10 \div 10 =$	$1 \div 1 =$	$50 \div 10 =$	$3 \div 1 =$
$20 \div 10 =$	$2 \div 1 =$	$8 \div 1 =$	$2 \div 1 =$
$30 \div 10 =$	$3 \div 1 =$	$30 \div 10 =$	$60 \div 10 =$
$40 \div 10 =$	$4 \div 1 =$	$70 \div 10 =$	$80 \div 10 =$
$50 \div 10 =$	$5 \div 1 =$	$7 \div 1 =$	$5 \div 1 =$
$60 \div 10 =$	$6 \div 1 =$	$4 \div 1 =$	$90 \div 10 =$
$70 \div 10 =$	$7 \div 1 =$	$10 \div 10 =$	$6 \div 1 =$
$80 \div 10 =$	$8 \div 1 =$	$1 \div 1 =$	$9 \div 1 =$
$90 \div 10 =$	$9 \div 1 =$	$20 \div 10 =$	$100 \div 10 =$
$100 \div 10 =$	$10 \div 1 =$	$40 \div 10 =$	$10 \div 1 =$

Sixth Exercise.

1. Here is a beautiful pansy. How many blossoms are there on it? If you make 2 bouquets and put 3 of these pansies in each of them, how many pansies will remain? How many 3's in 8, and how many over?

2. John had 15 cents and gave 4 cents apiece for 3 oranges. How many cents did he have remaining? How many times can you take 4 from 15? How many will remain after you have taken 4 from 15 as many times as you can?

3. Are there 4 2's in 7? How many 2's are there in 7? Is there any remainder after you have taken 3 2's from 7? What is it?

4. How many are 5 times 7? 6 times 7? How many 7's are there in 38, and how many over? How many 7's in 40, and how many over? How many 7's in 37, and how many remaining?

5. If you divide 12 into as many 5's as you can, how many 5's will you have, and how many remaining? If you divide 23 into as many 6's as you can, what will the remainder be? $3 \times 6 =$ how many? $4 \times 6 =$ how many? Are there 4 6's in 23?

6. Say the "3 times" of the Multiplication Table. Are there 2 3's in 17? Are there 3 3's in 17? Are there 4? Are there 5? Are there 6? How many 3's are there in 17, and how many over?

7. Say the "6 times" of the Multiplication Table. Are there 3 6's in 27? Are there 4? Are there 5? If you divide 27 into as many 6's as you can, how many 6's will you have, and what remainder?

8. Say the "8 times" of the Multiplication Table. Are there 3 8's in 47? Are there 4? Are there 5? Are there 6? How many times is 8 contained in 47, and how many remain?

Seventh Exercise.

1. Say the "4 times" of the Multiplication Table. Are there 3 4's in 27? Are there 5 4's in 27? Are there 6? Are there 7? How many 4's in 27, and what is the remainder? $27 \div 4$ are how many, and what is the remainder?

2. John had 35 cents and bought 8 lead-pencils, at 4 cents each. How much money had he left? How many 4's in 35, and how many remain?

3. Copy, and fill out the following:

$14 \div 3 =$ —— and —— remainder.
$22 \div 4 =$ —— and —— remainder.
$18 \div 4 =$ —— and —— remainder.
$37 \div 5 =$ —— and —— remainder.
$40 \div 6 =$ —— and —— remainder.
$51 \div 7 =$ —— and —— remainder.
$78 \div 9 =$ —— and —— remainder.
$67 \div 8 =$ —— and —— remainder.
$80 \div 9 =$ —— and —— remainder.

Drill Exercise.*

1. Add 2, 3, 4, subtract 6, multiply by 7, divide by 3, subtract 5, add 7, divide by 3, multiply by 8, divide by 6, add 9, add 7, divide by 5, divide by 2, add 8, 3, 9, 2, 4, divide by 7. What is the result?

* We repeat that this character of exercise, either wholly oral or by means of blackboard, arithmetical roll, or lattice, must be constantly kept up. No day should pass in a primary school without more or less of this drill in combining numbers.

2. Add 5 to 7, subtract 8, multiply by 3, add 9, divide by 7, add 8, subtract 9, add 6, multiply by 7, add 8, divide by 8. What is the result?

3. From 13 subtract 8, multiply by 4, add 6, add 4, add 2, divide by 4, divide by 2, multiply by 7, add 8, divide by 9. What is the result?

4. Divide 54 by 6, divide by 3, multiply by 9, add 8, add 10, divide by 9, multiply by 6, add 5, divide by 7, multiply by 2, multiply by 7, add 2, divide by 8, multiply by 6, add 9, divide by 7, divide by 9, subtract 1. What is the result?

5. Divide 27 by 9, multiply by 3, add 5, add 4, divide by 6, multiply by 8, add 8, add 4, divide by 6, multiply by 7, add 7, divide by 7, multiply by 9, add 1, divide by 8. What is the result?

6. Divide 56 by 7, multiply by 6, add 6, divide by 9, multiply by 7, add 7, 3, 6, 4, 1, divide by 9, multiply by 8, add 10, 10, 5, divide by 9. What is the result?

7. From 15 subtract 9, add 2, multiply by 8, add 6, divide by 10, multiply by 9, add 1, divide by 8, subtract 1, multiply by 7, add 7, divide by 9. What is the result?

8. Divide 56 by 7, divide by 2, multiply by 8, add 3, divide by 7, add 4, multiply by 6, add 9, divide by 7. What is the result?

9. From 13 subtract 8, multiply by 6, add 6, divide by 9, multiply by 8, add 4, divide by 6, subtract 6, multiply by 3. What is the result?

SECTION III.

FRACTIONS.

Purpose.—*To teach the signification of the fractions ½, ⅓, ¼, ⅔, ¾, ⅕, ⅖, ⅗, ⅘, ⅛, ⅞, etc., to tenths inclusive, and how to get any such fractional part of a number.*

First Exercise.

1. If you cut an apple into 2 parts of just the same size, what do you call one of the parts? If you cut an apple into 2 parts so that one of the parts shall be larger than the other, will either of the parts be a half an apple? In the lower picture, is the part of the apple on the right more than half the apple, or less than half?
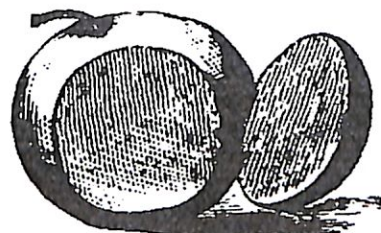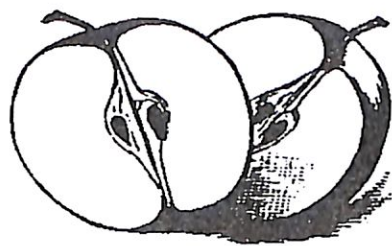
2. When you divide anything into halves, how many parts do you make of it? How many halves in the whole of anything? Which half of an orange is the larger?

3. Into how many parts is this apple divided? Are the parts of equal size? What is one of the 3 equal parts of anything called? *Ans.* One Third.
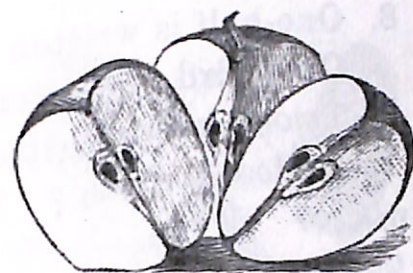
4. Into how many parts is this apple divided? Is this apple divided into thirds? Why not?
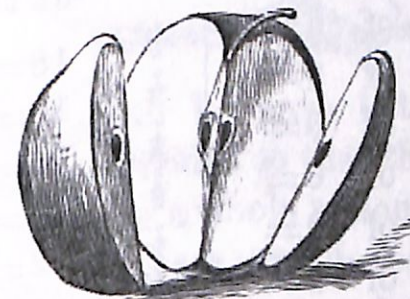
5. How many thirds are there in the whole of anything? Which third of an orange is the largest? If you divide an apple into thirds and give away two of them, how many will you have left? What part of the apple will you have left? What part will you have given away?

6. Here are 10 cherries on a plate. If you divide them equally between two girls, what part of the cherries will each girl have? How many will each girl have? One-half of 10 is how many? $10 \div 2 =$ how many? By what must you divide a number to get one-half of it?

7. Here are 12 nuts. If you divide them equally among 3 boys, what part of the nuts will each boy receive? How many nuts will each boy have? $12 \div 3 =$ how many? By what must we divide a number to get one-third of it?

8. One-half is written $\frac{1}{2}$.

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

Two-thirds is written $\frac{2}{3}$.

What does $\frac{1}{4}$ mean? What does $\frac{1}{3}$ mean? What does $\frac{2}{3}$ mean?

9. Copy and fill out the following:

$\frac{1}{4}$ of 8=	$\frac{1}{2}$ of 18=	$\frac{2}{3}$ of 6=	$\frac{2}{3}$ of 3=
$\frac{1}{3}$ of 9=	$\frac{1}{3}$ of 18=	$\frac{2}{3}$ of 12=	$\frac{2}{3}$ of 15=
$\frac{1}{2}$ of 6=	$\frac{1}{4}$ of 16=	$\frac{2}{3}$ of 9=	$\frac{2}{3}$ of 18=
$\frac{1}{3}$ of 6=	$\frac{1}{3}$ of 21=	$\frac{2}{3}$ of 21=	$\frac{1}{3}$ of 1=
$\frac{1}{2}$ of 10=	$\frac{1}{2}$ of 2=	$\frac{2}{3}$ of 30=	$\frac{1}{3}$ of 1=
$\frac{1}{2}$ of 4=	$\frac{1}{3}$ of 3=	$\frac{2}{3}$ of 27=	$\frac{2}{3}$ of 1=

Second Exercise.

1. Into how many equal parts is this apple divided? If anything is divided into four equal parts, what are the parts called? *Ans.* Fourths. How many fourths in the whole of anything?
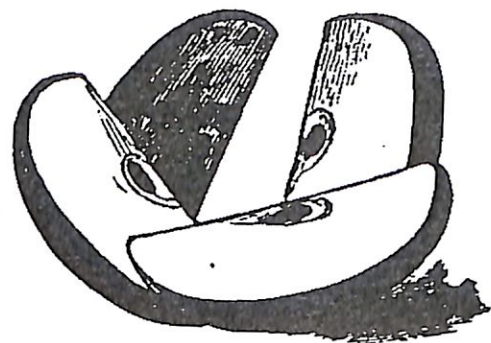
2. If John has a cake and gives one-fourth of it to Henry, one-fourth to Mary, and one-fourth to Jane, how much has he left?

3. If you divide 12 flowers equally among four boys, what part of them all does one boy get? How many flowers does one boy get? One-fourth of 12 is how many? $12 \div 4 =$ how many? By what do you divide to get one-fourth of any number?

4. Into how many parts is this apple divided? Are the parts equal? If anything is divided into 5 equal parts, what is any one of the parts called? *Ans.*, Fifths. How many fifths in the whole of anything?
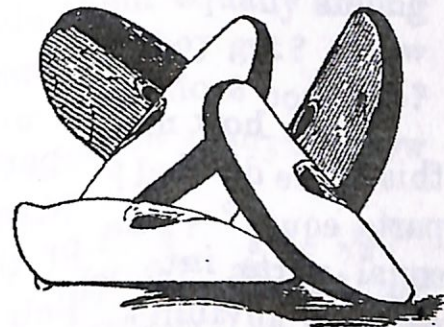
5. If James gives away three-fifths of his melon, how many fifths will he have left? Into how many parts must a melon be divided so that the parts shall be fifths? How many fifths in a whole melon?

6. Henry has 15 nuts, and divides them equally between 5 boys. What part of all the nuts does one boy receive? If 2 of the boys put their shares together, what part of all the nuts will they make? One-fifth and one-fifth make how many fifths?

7. How many nuts are one-fifth of 20 nuts? $20 \div 5 =$ how many?

8. How many are two-fifths of 20 nuts? Three-fifths? By what do you divide to get one-fifth of any number?

9. One-fourth is written $\frac{1}{4}$. One-fifth is written $\frac{1}{5}$. Two-fourths is written $\frac{2}{4}$. Two-fifths is written $\frac{2}{5}$. The number above the short line shows how many fourths or fifths are meant.

10. What does $\frac{3}{5}$ mean? What does $\frac{3}{4}$ mean? What $\frac{4}{5}$?

11. Copy, and fill out the following:

$\frac{1}{4}$ of 12=	$\frac{1}{4}$ of 20=	$\frac{3}{5}$ of 35=	$\frac{2}{5}$ of 30=
$\frac{1}{5}$ of 10=	$\frac{3}{4}$ of 12=	$\frac{1}{5}$ of 45=	$\frac{3}{5}$ of 30=
$\frac{1}{5}$ of 30=	$\frac{3}{4}$ of 32=	$\frac{1}{5}$ of 25=	$\frac{4}{5}$ of 30=
$\frac{1}{4}$ of 40=	$\frac{3}{4}$ of 10=	$\frac{2}{5}$ of 10=	$\frac{3}{5}$ of 30=
$\frac{1}{4}$ of 32=	$\frac{4}{5}$ of 35=	$\frac{2}{5}$ of 15=	$\frac{1}{4}$ of 8=

Third Exercise.

1. Into how many parts is this apple divided? Are the parts equal? One of the 6 equal parts into which the whole of anything may be divided is called a sixth. How many sixths in the whole of anything?
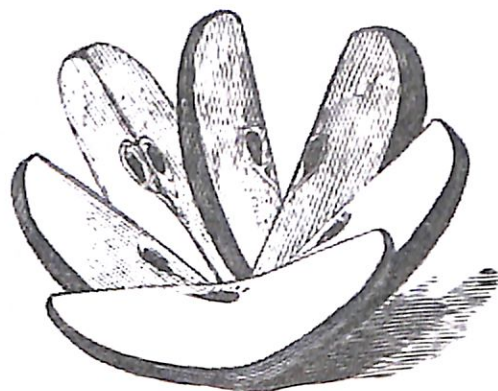
2. One of the six equal parts of the apple is called what? Then 2 of the six equal parts would be what? Three? Four? Five?

3. You see that one-fourth of the whole of anything is one of the 4 equal parts of it. One-fifth is one of 5 equal parts. One-sixth is one of 6 equal parts. What, then, is one-seventh of the whole of anything? One-eighth? One-ninth? One-tenth?

4. If an apple is divided into 7 equal parts, what is one of the parts called? What are 2 of the 7 equal parts called? Three? Four? Five? Six? Seven?

5. Here is the whole of an apple which has been divided into 8 equal pieces. Part of the pieces are on one plate, and part are on the other. How much of the apple is on the upper plate? How much on the lower?
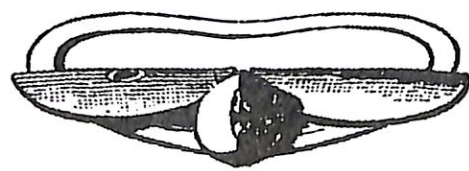
6. If you have 36 nuts and divide them equally among 9 boys, what part of the whole does one boy get? How many nuts does one boy get? How many do 2 boys get? Three boys? Three-ninths of 36 are how many? How do you get one-ninth of any number?

7. What does $\frac{1}{2}$ mean? $\frac{1}{3}$? $\frac{1}{4}$? $\frac{1}{7}$? $\frac{1}{8}$? $\frac{1}{9}$? $\frac{1}{10}$?

8. What does $\frac{2}{3}$ mean? $\frac{3}{4}$? $\frac{3}{4}$? $\frac{5}{6}$? $\frac{4}{8}$? $\frac{3}{8}$? $\frac{4}{7}$? $\frac{2}{8}$? $\frac{4}{7}$? $\frac{4}{7}$? $\frac{2}{8}$? $\frac{5}{8}$? $\frac{4}{8}$? $\frac{3}{8}$? $\frac{3}{8}$? $\frac{5}{8}$? $\frac{3}{10}$? $\frac{5}{10}$? $\frac{7}{10}$? $\frac{8}{10}$?

Fourth Exercise.*

1. Copy, and fill out the following:

$\frac{2}{3}$ of 12 =	$\frac{4}{5}$ of 50 =	$\frac{4}{7}$ of 56 =
$\frac{3}{5}$ of 10 =	$\frac{2}{7}$ of 21 =	$\frac{4}{9}$ of 81 =
$\frac{2}{7}$ of 14 =	$\frac{5}{6}$ of 54 =	$\frac{5}{8}$ of 72 =
$\frac{5}{6}$ of 18 =	$\frac{2}{9}$ of 63 =	$\frac{9}{10}$ of 90 =
$\frac{3}{4}$ of 12 =	$\frac{4}{9}$ of 81 =	$\frac{5}{10}$ of 90 =
$\frac{5}{8}$ of 16 =	$\frac{7}{8}$ of 56 =	$\frac{3}{10}$ of 80 =
$\frac{3}{10}$ of 40 =	$\frac{4}{5}$ of 40 =	$\frac{5}{8}$ of 72 =
$\frac{5}{6}$ of 30 =	$\frac{5}{6}$ of 24 =	$\frac{5}{8}$ of 64 =
$\frac{4}{7}$ of 35 =	$\frac{4}{8}$ of 32 =	$\frac{2}{3}$ of 72 =
$\frac{5}{6}$ of 42 =	$\frac{5}{6}$ of 72 =	$\frac{3}{10}$ of 70 =

2. Write in figures on your slate, one-half, one-third, two-thirds, three-fourths, five-eighths, three-eighths, 5 sixths, 4 sevenths, eight-ninths, 5-ninths, three-tenths, 7-tenths, 4-ninths, 2-ninths, 2-fifths, two-sevenths.

*Exercises of this character should be assigned by writing them on the blackboard until they can be performed with the utmost ease. It affords an excellent drill in division and multiplication.

Fifth Exercise.*

1. Here are how many whole apples? How many half apples? How many in all? We write Three and a half thus: $3\frac{1}{2}$.
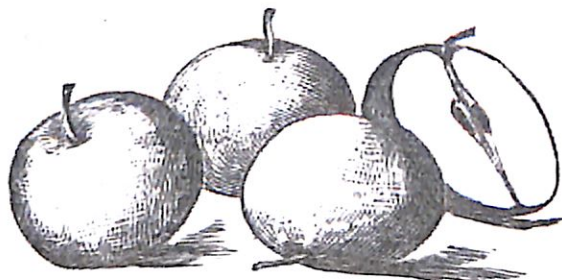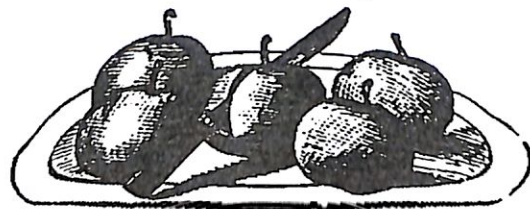
2. How many whole apples are there in this picture? How many pieces? What are the pieces—halves, thirds, or quarters? The number of apples in this picture is written thus: $2\frac{2}{3}$. Can you tell what $2\frac{2}{3}$ means?
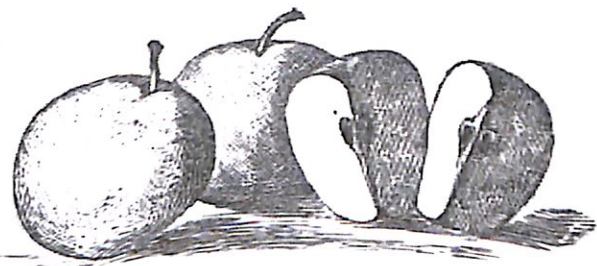
3. Read the following: $1\frac{1}{2}$, $2\frac{1}{2}$, $4\frac{1}{3}$, $5\frac{2}{3}$, $3\frac{7}{8}$, $6\frac{5}{8}$, $10\frac{4}{7}$.

4. There are 5 apples on the plate. If John takes half and Henry half, how many will each have? Write the number.

5. If 7 apples are divided equally among 3 boys, how many will each boy have? If each boy takes 3, how many will remain? What must they do with that? What does $3\frac{1}{3}$ mean?

6. If 15 apples are to be divided equally between 4 boys,

how many will each boy have? If each boy takes 3 apples, how many will be left? If now these 3 apples which are left be divided into fourths, how many fourths will they make? Now if these 12 pieces are divided equally among the 4 boys, how many of them will each boy get? How many whole apples will each boy have? How many fourths? What is $4\frac{3}{4}$?

7. If 14 apples are divided equally among 3 boys, how many whole apples and how many thirds will each boy get? $14 \div 3 =$ how many, and how many over?

8. If 30 apples are divided equally among 7 boys, how many whole apples will each boy have? $30 \div 7 =$ how many, and what remainder? After each boy has received his 4 whole apples, how many apples are there left? In order to divide an apple equally among 7 boys, into what parts must it be divided? If each of 2 apples is divided into 7 parts, how many parts are there? How many whole apples and how many sevenths will each boy have?

9. If 35 oranges are divided equally among 8 boys, how many will each boy have? Will he have $4\frac{5}{8}$ or $4\frac{3}{8}$?

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Practical Exercises.

1. John and James bought a melon worth 8 cents, which they are to share equally. How much ought each to pay? What part of the price must John pay? $\frac{1}{2}$ of 8 is how much? How do you get $\frac{1}{2}$ of any number?

2. John, James, and Henry bought a pie worth 12 cents, which they are to share equally. How much must each pay? What part of the price must Henry pay? How

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* The purpose of this exercise is to teach the meaning of such mixed numbers as $4\frac{1}{3}$, $3\frac{2}{3}$, $10\frac{3}{7}$, $1\frac{2}{3}$, etc., and how to read them.

do you get ⅛ of any number? How much must John and James together pay? What part of the pie do John and James together own? ⅜ of 12 = how much?

3. Mary and Jane bought a doll for 63 cents. Mary paid ⅜ of the price. What part of the price did Jane pay? ⅜ of 63 = how much? ⅜ of 63 = how much? How many cents did Mary pay? How many did Jane pay?

4. Henry started to market with 56 eggs, but broke ¼ of them. How many did he break? What part of the eggs remained unbroken? How many eggs were unbroken?

5. Mary's hen had a brood of 12 chickens, but a hawk caught ⅓ of them. How many had she left? If ⅓ were caught, how many thirds remained? ⅓ of 12 = how many?

6. John's suit—coat, vest, and pantaloons—cost 9 dollars. The coat and vest cost ⅔ of the whole. What part of the whole did the pantaloons cost? How many dollars did the pantaloons cost?

7. Mary has ⅜ of an apple, Jane ⅖, and Henry the rest. How much of the apple has Henry?

8. If one cord of wood costs 6 dollars, how much will ⅓ of a cord cost? ½ of a cord? ⅔ of a cord?

9. I had 21 dollars, and spent ⅖ of it for a pair of boots, and ⅓ for a coat. What part of my money had I left? How many dollars?

10. Our cistern was entirely dry on Saturday. But it rained on Sunday, and filled it ¼ full. On Monday it rained again, and the cistern filled up so that it was ⅘ full. How much ran in on Monday?

SECTION IV.

DENOMINATE NUMBERS.

Purpose.—*To teach a few of the more common denominations of measure, weight, and money, so that the pupil shall have a clear conception of each, and a knowledge of their mutual relations.*

First Exercise.

UNITED STATES MONEY.

1. What is this a picture of? What is such a piece of money made of?

Answer.—This is a picture of our common cent, which is made of bronze. Bronze is copper and tin melted together.

2. What is this a picture of? What is such a piece of money made of? How many cents is such a piece worth?

3. How many cents is a half dime? How many cents in 2 dimes? In 1½ dimes?

4. Here are two pieces of money. What are they? Which is the most? If they are both dollars, why is it that one is so much larger than the other? Will the little one buy just as much as the big one? How many cents is a dollar worth? How many dimes in 100 cents? How many dimes make a dollar?

$100 \div 10 =$ how many?

5. What piece of money is this? What is it made of? How many dimes in a dollar? Then how many dimes is a half-dollar worth? Five dimes are how many cents? How many cents in a half-dollar?

6. What are these pieces? Which is worth the most? Why is one so much larger than the other? How many dimes in a half-dollar? Then how many 5-cent nickels does it take to make half a half-dollar? How many half-dimes make a dollar?

7. Here is a quarter of a dollar. How many quarters of a dollar does it take to make a half-dollar? What part of a half-dollar is a quarter-dollar? How many 5-cent nickels does it take for half a dollar? Then how many for

a quarter of a dollar? How many cents in a half-dime? How many half-dimes in a quarter-dollar? How many cents in a quarter-dollar?

8. What is a ten-cent piece called? What is a 50-cent piece called? What is a 25-cent piece called?

9. Learn this

TABLE OF UNITED STATES MONEY.

10 *cents* = 1 *dime.*
10 *dimes* = 1 *dollar.*
25 *cents* = ¼ *dollar.*
50 *cents* = ½ *dollar.*

9. John bought an arithmetic for half a dollar, a slate for 2 dimes, a sponge for half a dime, and a pencil for a cent. How much did all cost him?

10. The character $ signifies dollars, and is written before the figure or figures telling how many. Thus, $8, means 8 dollars. $23 means 23 dollars, etc.

11. Figures representing cents are written right after those representing dollars, with a period, called a *Decimal Point*, between the dollars and cents. Thus, $12.15 means 12 dollars and 15 cents. $58.37 means 58 dollars and 37 cents. *c.*, or *ct.*, is used as an abbreviation for cents. Thus, 28 *c.*, or 28 *ct.*, is 28 cents.

12. Read $62.25; $5.18; $7.30; $19.03. The last is 19 dollars and 3 cents, since 03 is just the same as 3. We have to put the 0 before the 3 when we write dollars and cents together; otherwise we could not tell whether the 3 did not mean 30 cents. Thus, $19.3 would be the same as $19.30.

13. Read $8.05; $8.50; $10.10; $10.01; $0.58; $0.23; $100; $100.05.

Second Exercise.*

MEASURES OF LENGTH.†

1. When we wish to tell how long anything is, we say it is so many inches, feet, yards, rods, or miles. You will need to learn just how long each of these measures is. This short line is 1 inch long, and the long one is 3 inches long.

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                1 INCH
        ├────────────────┤


                3 INCHES
    ├────────────────────────────────┤
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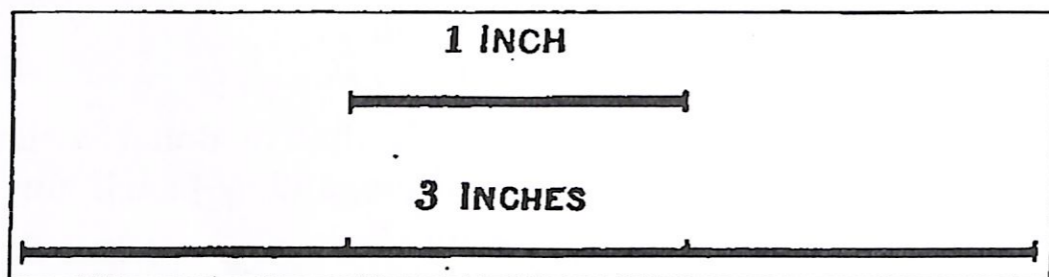
2. Get a little stick, or a little narrow slip of paper, and cut it off just 1 inch long; that is, just as long as the short mark. Then make a mark on your slate 4 times as long as your inch measure. Make another 5 times as long. Make another 6 inches long. Another 7 inches long.

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* The exercises following these tables are only given as specimens of what the teacher should do in connection with the memorizing of the tables by the pupils. It is specially true on this subject that no book can supply what the pupil needs. He must learn to judge of measures and weights—*i. e.*, to have some just conception of magnitudes and quantities, and to measure them by the proper apparatus, as measuring-rulers, rods, cups, weights, etc.

† No good work can be done in this subject without a little apparatus. Thus, for length, a foot-ruler, divided into inches, and a yard-stick, divided on one side into feet and on the other into halves, quarters, and eighths, as on the dry-goods merchant's counter. These the pupils must handle and apply. Practice in guessing, and then testing the guess, will be entertaining and profitable. The apparatus needed for other uses will be specified in its place.

3. Is this page 5 inches wide? Is it 4 inches wide? Is it any more than 4 inches wide? How long is this page?

4. Get another stick long enough so that you can cut off a piece just 12 times as long as your inch measure.* A stick that is 12 inches long is just a foot long. So we say, 12 inches make 1 foot. Or we write it, 12 inches = 1 foot.

5. How many inches long is your desk? Do you think it is a foot long? Is it a foot wide?

6. Learn the following

TABLE OF LINEAR MEASURES.

$$12 \quad inches = 1 \; foot.$$
$$3 \quad feet \;\; = 1 \; yard.$$
$$5\tfrac{1}{2} \; yards = 1 \; rod.$$
$$320 \quad rods \;\; = 1 \; mile.$$

Abbreviations.—*in.* stands for inch, or inches; *ft.* for foot, or feet; *yd.* for yard, or yards; *rd.* for rod, or rods; and *mi.* for mile, or miles.

7. Do you think the door is a yard wide? How many yards high do you think it is?

8. If a door is two *yds.* high, how many *feet* high is it? How many feet long is a blackboard that is 3 *yds.* long?

9. How many yards make a rod? Do you think this room is a rod wide? Is it more than a rod wide? How many rods long do you think it is?

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* The teacher should allow (*require,* if necessary) each pupil to have such sticks, and measure with them.

10. How many rods wide do you think the school-yard is? If you had a stick 1 yard long, could you measure and find out how wide the yard is? How many times the length of the yard-stick does it take to make a rod?

11. How many feet long is a yard? How many feet is a half a yard? How many inches in a foot? How many inches in one foot and a half? How many inches in half a yard?

12. This ruler is divided as a yard-stick is usually, only it is but 3 *in.* long instead of 3 *ft.* What part of the
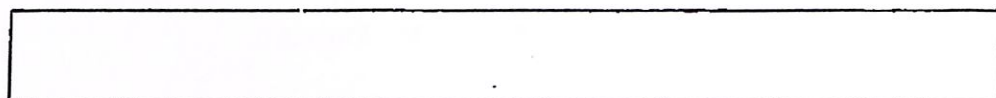
whole length is it from either end to the two dots? What part from either end to the one dot nearest that end? What part is it from the one dot to the two dots? How many fourths of a yard in a half-yard?

13. Do you know what other name we give to one-fourth of anything? We often call it a quarter. How many inches in a half a yard? How many in a quarter of a yard?

14. If there are 9 *in.* in a quarter of a yard, and 4 quarters in a yard, how many inches are there in a yard?

15. How many inches in a half a foot? How many in a quarter of a foot?

16. How many inches in $1\frac{1}{2}$ *ft.*? In $1\frac{1}{4}$ *ft.*?

NOTE.—The teacher should give the pupils as good an idea of a mile as possible, by referring to distances with which they are familiar, as to some house a mile off, a half-mile off, 2 miles off, etc. Also by the time it takes them to walk a mile, etc. Such questions as this will help: Would it tire you to walk a rod? Two rods? A mile? Two miles?

Third Exercise.*

MEASURES FOR LIQUIDS.
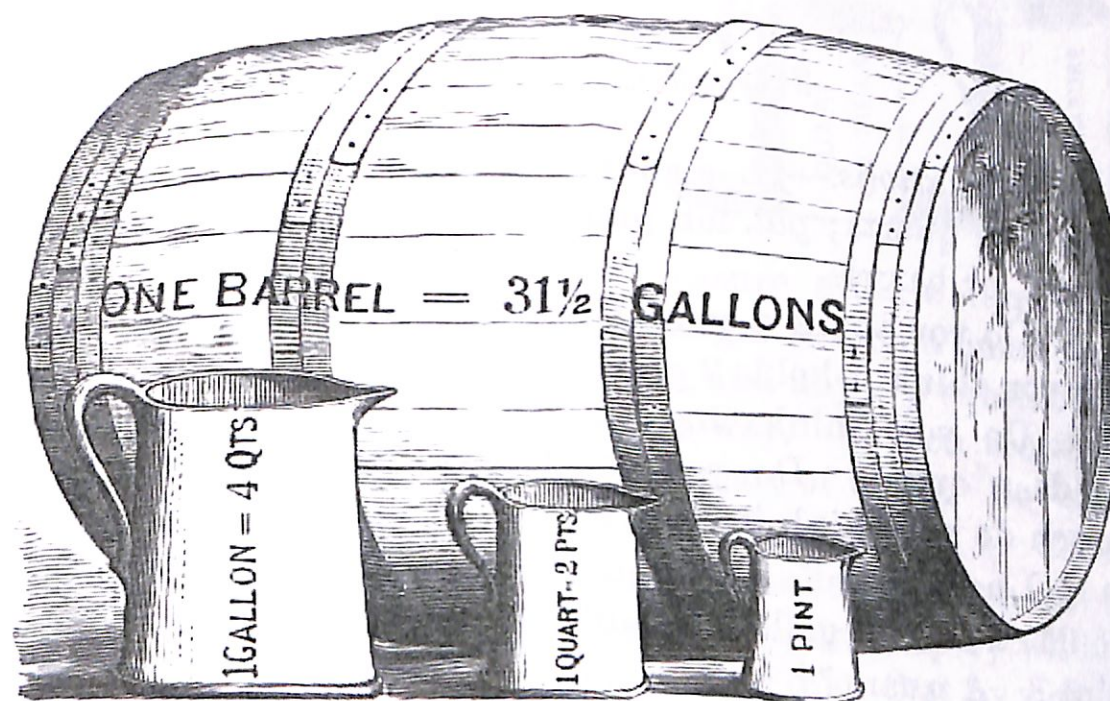
1. If you were to go to the grocery to buy molasses, or kerosene, or vinegar, how would you tell the groceryman how much you wanted? Which is the more, a pint or a quart? Which is the more, a quart or a gallon? Do you know about how large a cup it takes to hold a pint? A pint cup will hold about twice as much as a common tea-cup.

* To teach this subject properly, a gallon measure, quart measure, and pint measure are essential. Fill the quart measure from the pint, and *vice versa.* Also the gallon from the quart, etc. Half-gallons and half-pints are useful also.

2. Learn the following

TABLE OF LIQUID MEASURES.

2 *pints*   = 1 *quart*.
4 *quarts* = 1 *gallon*.
31½ *gallons* = 1 *barrel*.

Abbreviations.—pt. stands for pint, or pints; *qt.* for quart, or quarts; *gal.* for gallon, or gallons; and *bbl.* for barrel, or barrels.

3. Do you think a common water-pail holds a gallon? Do you think it holds 2 *gal.*? 3 *gal.*? 4 *gal.*?

4. Do you think that a common drinking tumbler holds a quart? Do you think it holds a pint? How much do you think it holds?

5. I have heard a boy who was very thirsty say that he could drink a gallon. Could he? Could he drink a pint? A quart?*

6. If you wanted to measure out a gallon of water and had nothing but a pint cup to measure with, how many cupfuls would you have to take?

7. What part of a quart is a pint? What part of a gallon is a quart?

8. How many pints in 7 *qt.*?

9. How many quarts in 10 *pt.*?

10. How many quarts in 10 *gal.*?

11. How many pints in 3 *gal.*?

---

* In such ways and by allowing (requiring) the pupils to use the measures, seek to give them correct notions of these measures. Let them find out by actual trial that 2 pints = 1 quart, and that 4 quarts = 1 gallon.

Fourth Exercise.*

MEASURES FOR GRAINS, SEEDS, ETC.

1. Here are two cups, and each is called a quart cup. Are they of the same size? Measure them and see which is the wider. Which is the higher? Well, the smaller one is such a quart cup as we measure milk, water, vinegar, or any liquid in; while the larger is such a quart cup as we use to measure seeds, grain, and any *dry* substances which we wish to measure in this way. So you see that a quart of wheat is more than a quart of water. So also a pint of corn is more than a pint of milk. It takes about 7 quarts of liquid measure to make as much as 6 quarts of dry measure;† because the quart cup by which we measure liquids is so much smaller than that by which we measure grain, seeds, and other dry substances.
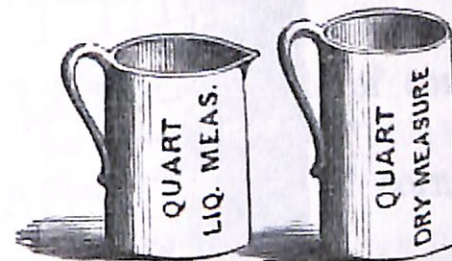
2. Learn the following

TABLE OF DRY MEASURES.

2 *pints*   = 1 *quart*.
8 *quarts* = 1 *peck*.
4 *pecks*   = 1 *bushel*.

---

* For teaching the *Dry Measures*, a pint measure, a quart measure, a four-quart measure, peck measure, and half-bushel measure are important. A bushel basket would also be well.

† By all means have the pupils see this and all kindred facts exemplified with the measures themselves.

BUSHEL BASKET. 4 PECKS

1 PECK 8 QUARTS

HALF BUSHEL = 2 PECKS

1 PINT

1 QUART 2 PINTS

HALF PECK 4 QUARTS
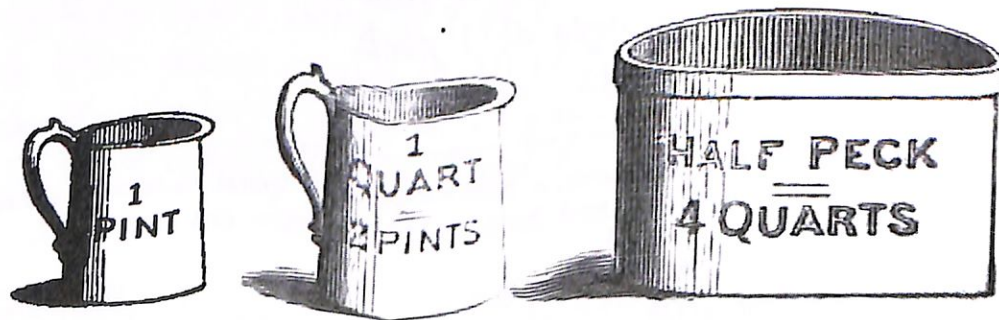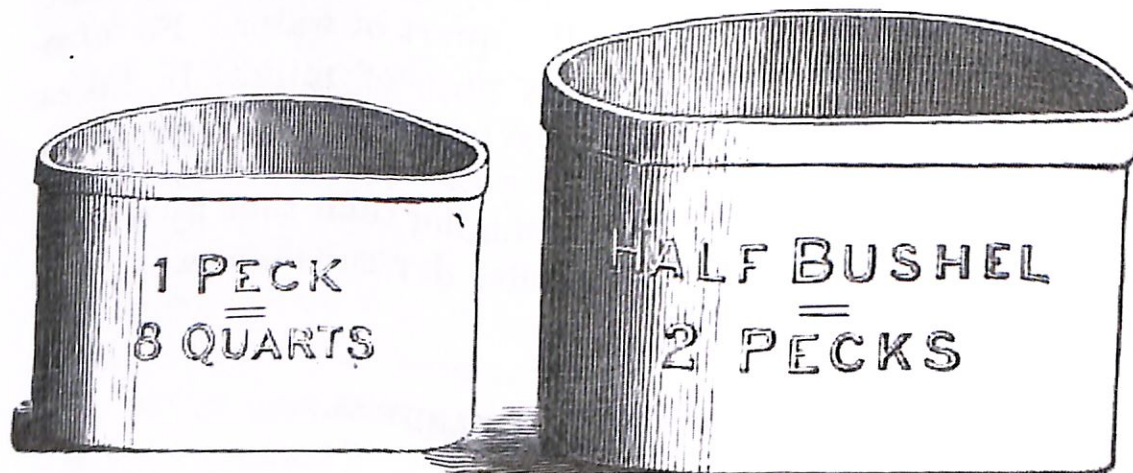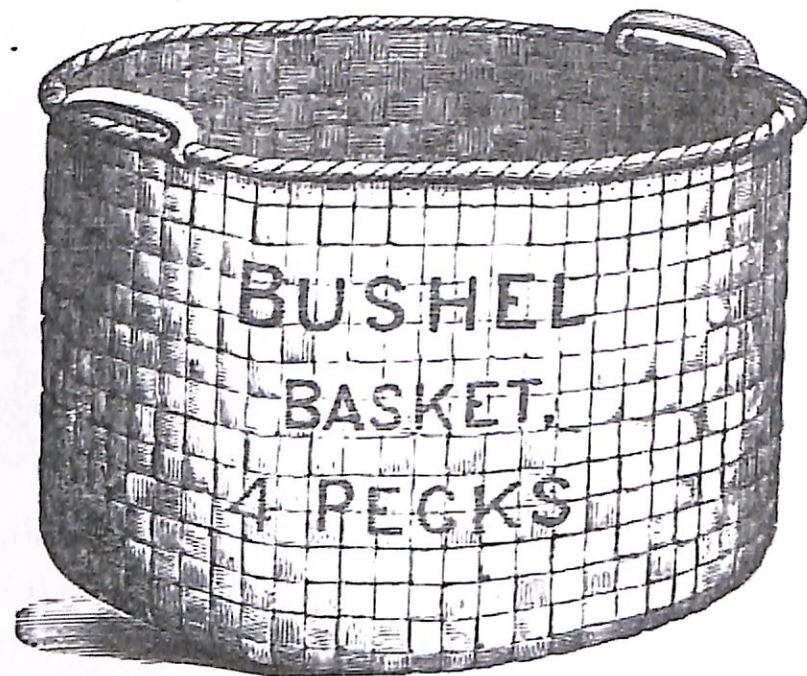
Abbreviations.—pk. stands for peck, or pecks; and *bu.* for bushel, or bushels.

3. Do you think a common wooden water-pail will hold a bushel? Will it hold a half-bushel? Will it hold a peck?*

4. How many common wooden water-pailfuls of corn do you think it would take to fill a bushel basket?

5. Do you think you could carry a peck of corn? Could you carry a bushel? Two bushels?

6. You have seen flour-barrels, have you not? How many bushels do you think a flour-barrel holds? 2 *bu.*? 3 *bu.*? 4 *bu.*?†

7. Do you think that a boy can put a peck of nuts in his pocket? Can he put a bushel of nuts in his pocket? Can he put a quart in? A pint?

8. How many pints does it take to make a peck?

9. How many pecks in 5 *bu.*?

10. How many half-bushel measures full does it take to fill a two-bushel bag?

11. If I want to measure out a bushel of wheat and have only a quart cup to do it with, how many cupfuls must I take?

12. If I wish to measure out $5\frac{1}{2}$ *bu.* of corn, how many times must I fill the half-bushel measure?

13. What part of a quart is a pint?

14. What part of a peck is a quart?

15. What part of a peck is 2 *qt.*? Three quarts? 4 *qt.*? 5 *qt.*? 6 *qt.*? 7 *qt.*? 8 *qt.*?

---

* Such a pail holds about 10 liquid quarts, or about a pint over a peck.

† Such a barrel is 27 inches deep and about 18 inches in diameter, and hence holds about 104 dry quarts.

16. What part of a bushel is a peck?　2 *pk.*?　3 *pk.*?

17. How many pecks in a half-bushel?

18. How many times will you have to fill the 4-quart measure to make a half-bushel?　How many times to make a bushel?

Fifth Exercise.

WEIGHTS AND WEIGHING.

1. If you were to go to the grocery to buy some *tea*, coffee, or sugar, how would you tell the groceryman how much you wanted? Would you tell him that you wanted a pint of tea, or a yard of coffee, or a gallon of sugar? How would you tell him? Would a pound of sugar fill a gallon measure? Which measure do you think a pound of sugar would come nearest to filling—a pint, quart, or gallon measure? What would the groceryman use to determine how much sugar he gave you?　(Scales.)

2. Learn this

TABLE OF AVOIRDUPOIS* WEIGHTS.

16 *ounces*	= 1 *pound.*
100 *pounds*	= 1 *hundred-weight.*
20 *hundred-weight*	= 1 *ton.*

---

* If the teacher thinks best, she can explain that this long word is three French words (*avoir du poids*) put together, and means *to have weight.*

Abbreviations.—*oz.* stands for ounce, or ounces; *lb.* for pound, or pounds; *cwt.* for hundred-weight; and *T.* for ton, or tons.

3. How many 5-cent nickels do you think it takes to make an ounce?* How many to make a pound?

4. How much do you think a pint of water weighs?† It weighs just about a pound. How many ounces, then, does a common teacupful of water weigh? What part of a pound?

5. How much does a quart of water weigh?‡ How much does a gallon of water weigh? How much does a common wooden pailful of water weigh? You remember that we learned that such a pail holds about 10 quarts.

6. How much do you weigh? Do you weigh a ton? A hundred-weight? How many boys who weigh 50 *lb.* each does it take to weigh a hundred-weight?§ How many to weigh a ton?

7. Did you ever see a large load of hay drawn by two horses? Do you think such a load weighs a hundred-weight? Do you think a span of horses could draw a ton of hay? Can a span of horses draw a ton of boys and girls?

8. How many ounces in a pound? How many in a half-pound? How many in a quarter of a pound?

9. Four ounces is what part of a pound? 8 oz. is what part of a pound? 2 oz. is what part of a pound?

---

* An avoirdupois ounce = 437.5 grains, and a 5-cent nickel weighs 77.16 grs.

† A quart weighs 2.0843 + lbs. A pint of water, therefore, is an excellent object with which to teach the pupil what a pound is.

‡ Teach them to say *nearly* in such cases; also that the vessel is not included.

§ This is beyond what the pupil has been taught; but it affords so good an illustration, that it will be well for the teacher to explain it; *first, however, letting the class try their full strength on it.* Very likely they can get it out.

10. How many 2-*oz.* weights would it take to make a pound? How many 4-*oz.* weights? How many 8-*oz.* weights?

11. How many ounces in ¾ *lb.*? How many in 1½ *lb.*?

12. Four ounces and 5 ounces and six ounces together lack how many ounces of being a pound?

13. How many hundred-weight make a ton? How many make a quarter of a ton? How many make a half ton? 40 *cwt.* are how many tons?

Sixth Exercise.

WEIGHING WITH BALANCE.*

1. Here is a *Balance.* It is the simplest machine used for weighing? All you have to do is to put into one pan such weights as are equal to the amount you want to weigh, and pour the thing to be weighed into the other pan till the pans balance.
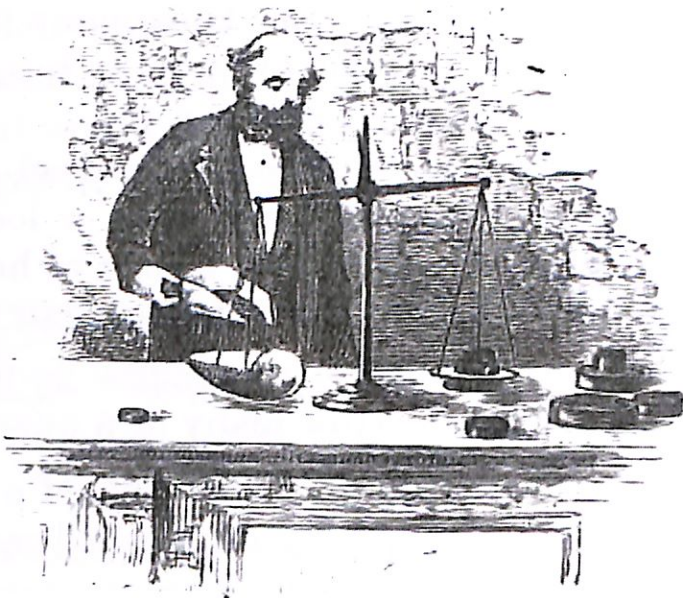
2. If the man in the picture has a 2-pound weight and

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* The purpose of this and the two following exercises is to teach the pupils how to weigh. Every primary school should have a balance with weights, a pair of steel-yards, and a set of grocer's scales, and the pupils should be taught to use them.

a 4-pound weight in one pan, how much coffee will he have in the other to make them balance?

3. I wanted to find out how much a dressed chicken weighed, and put it into one pan, and then put into the other pan a 2-pound weight, and a 1-pound weight, and an 8-*oz.* weight, and a 4-*oz.* weight. How much did the chicken weigh?

4. On weighing a turkey, I found that I had a 5-pound weight, a 2-pound weight, a 1-pound weight, and an 8-*oz.* weight. How much did the turkey weigh?

5. A grocer, in weighing a roll of butter, put on a 2-*lb.* weight, a 1-*lb.* weight, an 8-*oz.* weight, and a 4-*oz.* weight. He said the butter weighed 1¾ *lb.*? Was he right?

Seventh Exercise.

WEIGHING WITH STEEL-YARDS.
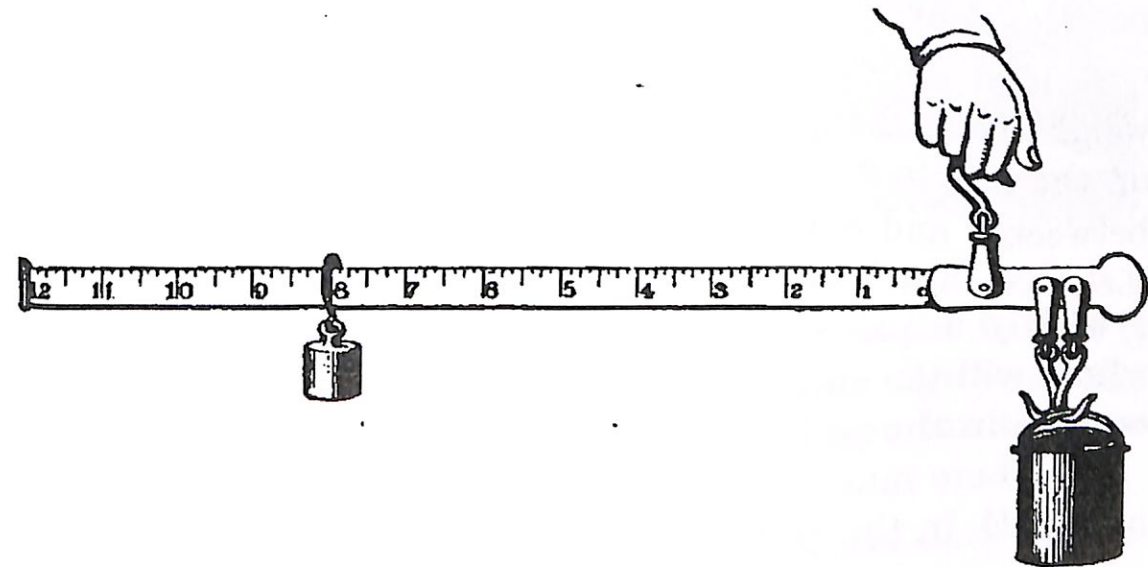
1. Here is a pair of steel-yards for weighing. A pail of butter is being weighed. You see that the pail is hung

7

on the hook nearest the large end of the bar, and the man holds it up by one of the other hooks. If you were to take the small weight off the long bar, would the pail of butter stay up? The small weight balances the large pail of butter just as a small boy can balance a large one on a see-saw. How is that? If you put the weight nearer the hook, how will the steel-yards act? If you put it further away than it now is? At what figure does the weight balance the butter? Then the pail and butter weigh how much?*

2. Count the large divisions of the bar. Each of these indicates a pound. Into how many small divisions is each of the larger divisions divided? One-eighth of a pound is how many ounces? Then each of the small divisions indicates how many ounces?

3. In weighing a package, I found that the steel-yards balanced when the small weight was at the middle mark between 5 and 6. How much did the package weigh?

4. How much does a package weigh which requires the weight to be 2 small divisions beyond 10 toward the end of the bar, to balance it? How much if the weight is between 7 and 8 and within 2 divisions of 8? How much if it is within 3 divisions of 8?

5. If your pail weighs 2 *lb.* and you want 5 *lb.* of butter, where will the small weight be on the arm when you have enough in the pail?

6. Where must the small weight be so that you shall have 4 *lb.* in the pail, if the pail weighs 1½ *lb.?*

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* Doubtless a fuller explanation may be needed for many pupils, but the teacher can readily supply it, having the instrument before them.

Eighth Exercise.

WEIGHING WITH SCALES.
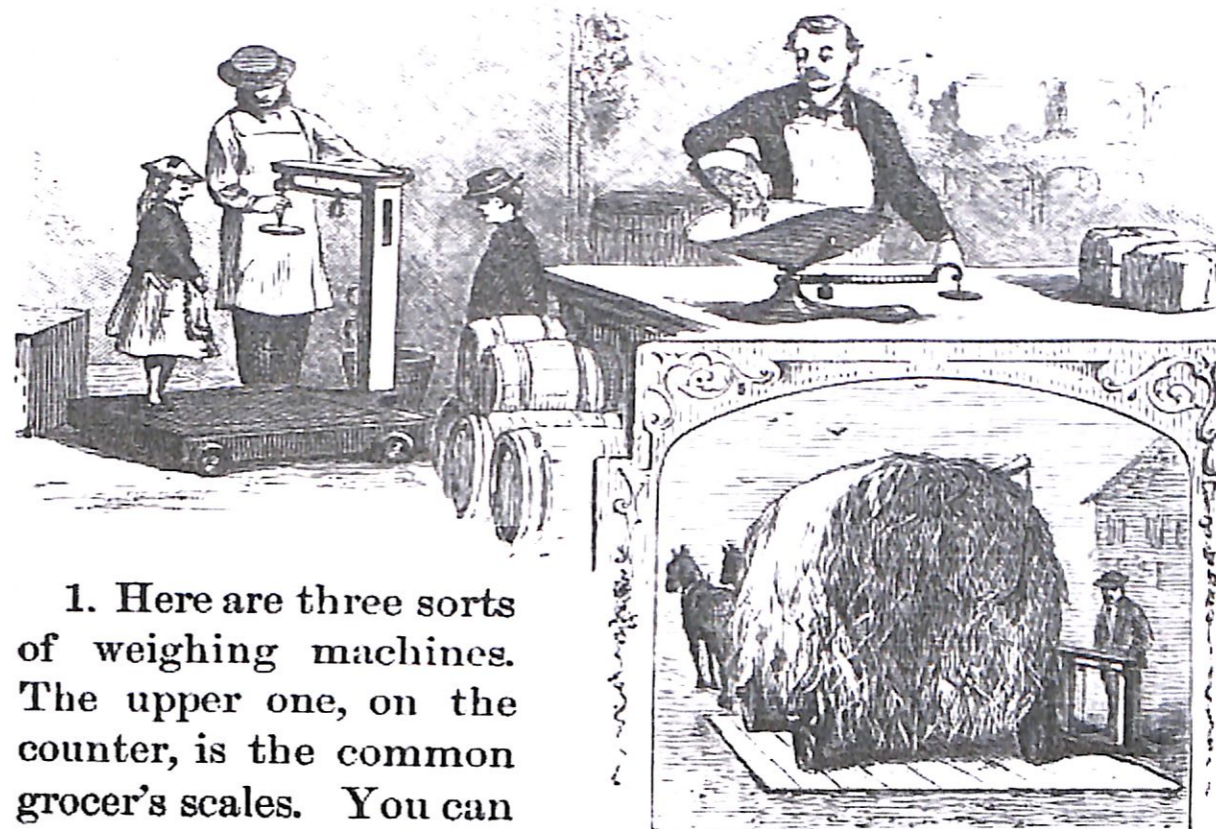
1. Here are three sorts of weighing machines. The upper one, on the counter, is the common grocer's scales. You can see them at the grocery-store. The things to be weighed are put into the scale-pan, and then the small weight is moved on the bar till it balances what is in the pan. There are figures on the bar just as on the steel-yards, by which you can tell how much is weighed.*

---

* If the teacher has no scales, it will create much interest and good feeling to take the little ones to the store where these can be seen, and let them learn how they work.

2. The scales in the left-hand side of the picture are called platform scales. The little girl who is standing on the platform of the scales is being weighed. The man is moving the small weight on the bar to find just where it balances, as you do on the bar of the steel-yards. How much do you think the little girl will weigh? May be your teacher can go with you to some place where they have such scales and teach you how to weigh each other. Such scales are used for weighing heavy articles, like barrels of flour, quarters of beef, dressed hogs, etc.

3. The other scales in the picture are called hay-scales. You see that they are just like the platform-scales, only larger. The platform is large enough so that a wagon loaded with hay can stand on it. The man stands at the bar to put the weight in the right place to make it balance. You see that the wagon is weighed with the hay. How shall the man find out how much the hay weighs without the wagon? If the wagon and hay together weigh 29 *cwt.*, and the wagon alone weighs 7 *cwt.*, is there a ton of hay?*

4. If the little girl on the platform scales has a package in her left hand which weighs 3 *lb.*, and the man finds that she, with the package, weighs 48 *lb.*, how much does the girl weigh?

5. If the groceryman puts up for me 5 *lb.* of sugar worth 9 cents per pound, how much must I pay him?

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* Such questions which are a little in advance of the pupils' study should be thrown in occasionally to create or keep alive a desire to go forward and learn new things.

Ninth Exercise.

MEASURES OF TIME.

1. Here is a picture of a clock-face. How many numbers are there around it? Into how many equal parts is the ring around the edge divided by the heavy marks? Into how many equal parts are the spaces between the heavy marks divided by the light marks?
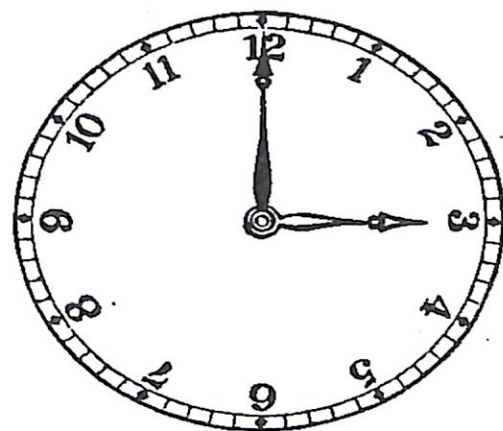
2. How many pointers are there on the face of the clock? Are both of the same length? Which is the longer, the one which points to 3 or the one which points to 12? These pointers are called hands. You can watch the clock and see that the hands move around the face. The long hand is called the *Minute Hand,* and the short one the *Hour Hand.* To what number does the minute hand point? To what number does the hour hand point? Show in each of the clock-faces in the next exercise which is the minute hand and which the hour hand.

3. Watch the clock in the room a little while and see which hand goes the faster. Can you see either of them go? Watch the minute hand awhile and see if it does not go. Which goes the faster? See how many you can count while the minute hand is going from one of the fine marks to the next. Can you count a hundred while the minute hand goes over one of these small spaces? It takes it just 1 minute to go over one of these spaces.

4. Is a minute a long time, or a short time? Could you go home in a minute? Could you go to the door and back in a minute?

5. If it takes the minute hand 1 minute to go over one of the small spaces, how long will it take it to go from 12 to 1? From 1 to 2? From 2 to 3? How long to go from 12 to 6? How long to go from 12 to 3? How long to go clear around?

6. If you can have patience to watch, you will find that the hour hand goes from any figure to the next while the minute hand goes clear around. It is just an *Hour* while the hour hand is going from any figure to the next one. How many minutes in an hour?

7. How long does it take the minute hand to go from 12 to 3? What part of the whole way around is it from 12 to 3? How many minutes in a quarter of an hour?

8. How long does it take the minute hand to go from 12 to 1? How many times as long does it take it to go from 12 to 6? How many minutes does it take for the minute hand to go from 12 to 6? How many minutes in half an hour?

9. How many minutes does it take the minute hand to go from 12 to 2? From 12 to 4? From 12 to 5? From 11 to 12? From 10 to 12? From 9 to 12? From 8 to 12? From 7 to 12?

10. From midnight to noon the hour hand goes just once around from 12 to 12. How long does it take the hour hand to go from 12 to 1? From 1 to 2? How many hours to go clear around? Then from noon to midnight the hour hand goes around again. How many hours is it from noon to midnight?

11. From midnight to midnight again is called a day. How many hours in such a day? About how much of the day is it light? About how much is it dark?

12. If you have some kernels of corn in a cup and count them out one by one, picking them out with your fingers and laying them on the table as fast as you conveniently can, you will find that you can count out about 60 in a minute. If you count out just 60 in a minute, the time it takes you to count out 1 is a second. How many seconds in a minute?

13. Learn the following

TABLE OF MEASURES OF TIME.

60 *seconds* = 1 *minute.*
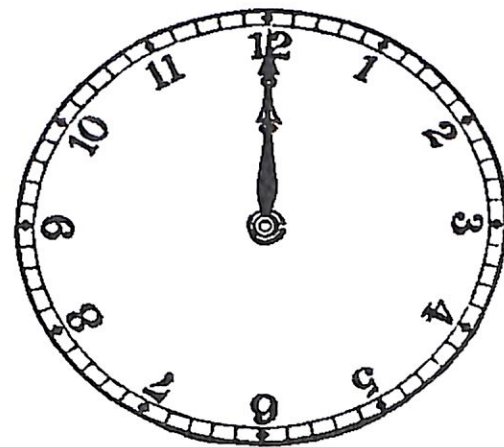60 *minutes* = 1 *hour.*
24 *hours* = 1 *day.*

Tenth Exercise.

HOW TO TELL THE TIME OF DAY BY THE CLOCK.

1. At noon the hands are both together at the number 12. It is then 12 o'clock. One hour after noon the hour hand has gone on to 1, and the minute hand has gone clear around. It is then 1 o'clock. When the hour hand is at 2, where is the minute hand? What o'clock

is it then? What o'clock is it when the hands are as on page 145? How long after 12 o'clock is 3 o'clock? What time is it when the hands are as in this picture? How long is it from 8 o'clock on to 12 o'clock?*

2. What time is it when the minute hand is at 12, and the hour hand at 10?

3. Where is the hour hand in this picture? Is it before or after 11? When the hour hand was at 11, where was the minute hand? How many minutes does it take the minute hand to go from 12 to where it is in this picture? How many minutes is it then past 11 o'clock?

4. What hour is the hour hand nearest in this picture? Is it before or after 2 o'clock? How long will it take the minute hand to get from where it is to 12? Where will the hour hand be then? What time will it be then? Then what time is indicated in this picture? How long before 2 o'clock?
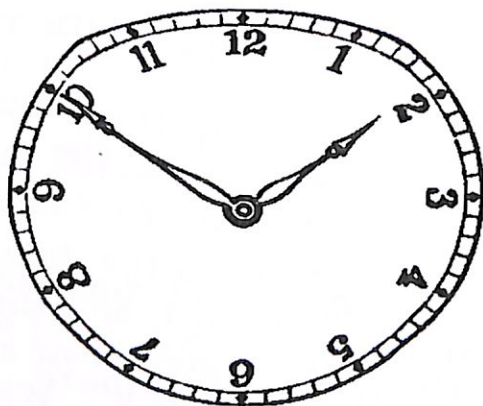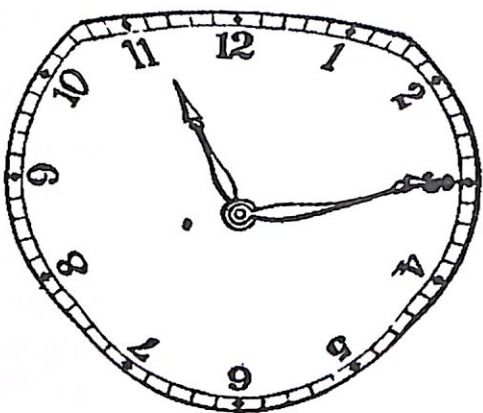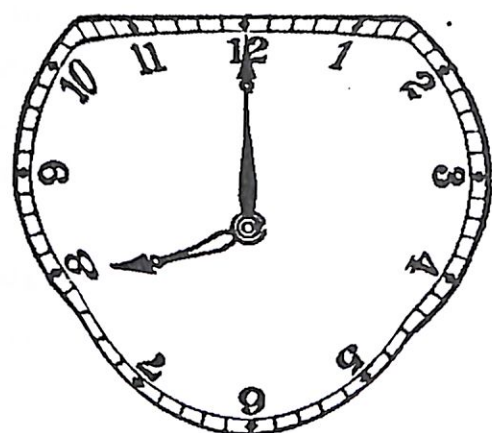
*These and the following are only given as specimen questions indicating the manner of procedure.

5. What hour is the hour hand in this picture nearest? Is it before or after 5 o'clock? How long will it take the minute hand to get from where it is to 8? How long to get from 8 to 12? Then how long will it take the minute hand to get from where it is in the picture to 12? Where will the hour hand be then? How long is it then before 5 o'clock?
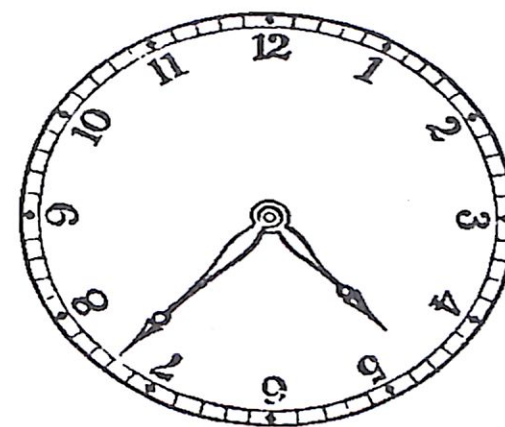
Concluding Lesson.

1. DAYS OF THE WEEK.—How many days in a week? What are their names? *Ans.* Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday. What day comes after Tuesday? What day comes before Friday? What day comes after Thursday?

2. MONTHS.—A month is generally a little more than 4 weeks. How many months are there in a year? *Ans.* 12. Name the months thus: January, February, March, April, May, June, July, August, September, October, November, December. What month comes after March? What month after October? What before July? What before May?

3. The months are not all of the same length, but this little verse will enable you to remember the number of days in each:

7*

> Thirty days hath September,
> April, June, and November.
> By one more others vary,
> Save the month February :
> Twenty-eight this receiveth,
> Until leap-year* one more giveth.

4. How many months have 30 days each ? How many have 31 days each ? Which is the shortest month ? How many days has the shortest month ?

5. Which month is usually just 4 weeks long ? How many days over 4 weeks do the long months have ? In how many places do two long months come together ?

6. January has how many days?

February has how many days ?

March has how many days?

April has how many days ?

May has how many days ?

June has how many days ?

July has how many days ?

August has how many days ?

September has how many days ?

October has how many days?

November has how many days ?

December has how many days ?

7. Now who of you all can tell how many $31 + 28 + 31 + 30 + 31 + 30 + 31 + 31 + 30 + 31 + 30 + 31$ make ? That is, how many days are there in a year ? This is a pretty difficult question for you, and you have not been taught in this book how to solve it. But the next book will teach you this and much more about numbers.

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* The teacher should explain what is meant by leap-year—*i. e.*, in general, every 4th year.

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