

## Grade 3 Math Parent/Student Resource Division

### Enduring Understandings:

- Multiplication and division situations involve equal-size groups, arrays, and/or area models.
- Multiplication and division are inverse operations.

The commutative, associative, and distributive properties can be used to develop efficient strategies to Multiply and divide.

### Essential Questions:

- What is the relationship between products & sums, quotients & differences?
  - What strategies can be used to solve multiplication/division problems?
- How can the properties of operations be used to explain/justify answers?

### Knowledge and Skills:

**Represent and solve problems involving multiplication and division.**  
**Students will know and be able to:**

- Interpret whole-number quotients of whole numbers,  
(Ex: interpret  $56 \div 8$  as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each. (For example, describe a context in which a number of shares or a number of groups can be expressed as  $56 \div 8$ .)
- Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, (ex: by using drawings and equations with a symbol for the unknown number to represent the problem).
- Determine the unknown whole number in a division equation relating three whole numbers. (For example, determine the unknown number that makes the equation true in each of the equations  $8 \times ? = 48$ ,  $5 = \heartsuit \div 3$ ,  $6 \times 6 = ?$ .)

**Understand properties of multiplication and the relationship between multiplication and division.**

- Apply properties of operations as strategies to divide
- Understand division as an unknown-factor problem. For example, find  $32 \div 8$  by finding the number that makes 32 when multiplied by 8.

## Multiply and Divide within 100

- Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (Ex: Knowing that  $8 \times 5 = 40$ , one knows  $40 \div 5 = 8$ ) or properties of operations.
- Solve problems involving the four operations, and identify and explain patterns in arithmetic.
- Solve two-step-word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity. **Assess the reasonableness of answers using mental computations and estimation strategies including rounding.**

### Vocabulary

inverse operation

Quotient

Divisor

Dividend

**Divisor-** A number by which another number is to be divided.

**Example:** in  $12 \div 3 = 4$ , 3 is the **divisor**

**Dividend-** is the number to be divided.

**Example:** in  $12 \div 3 = 4$ , 12 is the **dividend**

**Quotient-** The answer after you divide one number by another (dividend  $\div$  divisor = quotient). **Example:** in  $12 \div 3 = 4$ , 4 is the **quotient**

**Inverse operations-** Multiplication is the inverse of Division.

# Problem Solving • Model Division

There are 35 people going to the amusement park. They will all travel in 5 vans with the same number of people in each van. How many people will travel in each van?

Read the Problem	Solve the Problem
<p><b>What do I need to find?</b></p> <p>I need to find the number of <u>people</u> who will travel in each van.</p>	<p><b>Describe how to act out the problem to solve.</b></p> <p><b>Step 1</b> Start with 35 counters.</p>
<p><b>What information do I need to use?</b></p> <p>There are <u>35</u> people. <u>5</u> vans are taking all the people to the amusement park.</p>	<p><b>Step 2</b> Make 5 equal groups. Place 1 counter at a time in each group until all 35 counters are used.</p> <p><b>Step 3</b> Count the number of counters in each group. <u>7</u></p>
<p><b>How will I use the information?</b></p> <p>I can act out the problem by making equal <u>groups</u> with counters.</p>	<div data-bbox="893 840 1299 1260" data-label="Diagram"> </div> <p>So, 7 people will travel in each van.</p>

## Division as Sharing

You can use counters to show division problems:

There are 6 shirts and 3 boxes. How many shirts fit in each box?

First, use 6 counters for the 6 shirts.



Since the problem is 6 divided by 3, divide the counters into 3 groups.



There are 2 counters in each group. Since  $6 \div 3 = 2$ , two shirts can fit in each box.

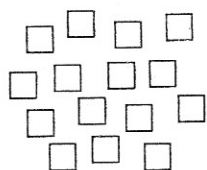


## Modeling Division Using Arrays

Find how many equal groups of 5 are in 15. Find  $15 \div 5$ .

### Step 1

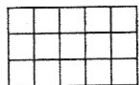
Use 15 tiles.



### Step 2

Place 5 tiles in each row.

Use all the tiles.



### Step 3

Count the rows of 5.

There are 3 rows of 5.

$$15 \div 5 = 3$$

The array shows  $\rightarrow$  two division facts:

There are 3 equal groups of 5 in 15.  $\rightarrow 15 \div 5 = 3$

There are 5 equal groups of 3 in 15.  $\rightarrow 15 \div 3 = 5$

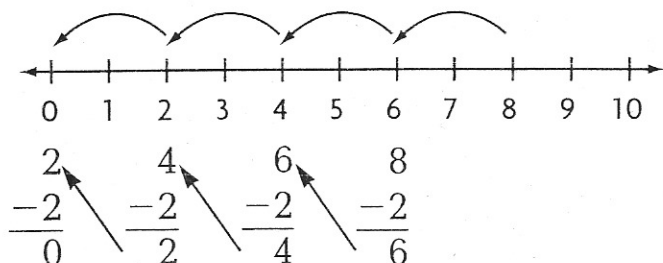
## Connecting Subtraction and Division

Division is like repeated subtraction.

How many groups of 2 are there in 8?

Start at 8 on the number line.

Count back 2 spaces at a time until you reach 0.

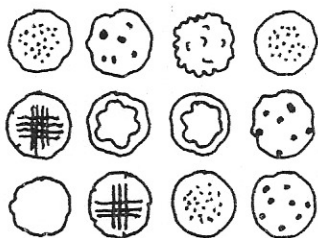


You can subtract 2 from 8 four times because there are 4 equal groups of 2 in 8.

$$8 \div 2 = 4$$

## Fact Families

Use multiplication and division to tell about the cookies in opposite ways.



Use multiplication to put same-size groups together.

Use division to separate the total into same-size groups.

$$3 \times 4 = 12$$

or

$$4 \times 3 = 12$$

$$12 \div 3 = 4$$

or

$$12 \div 4 = 3$$

The four number sentences are called a **fact family**. Each of the four sentences uses the same numbers.

## Algebra • Write Related Facts

**Related facts** are a set of related multiplication and division equations.

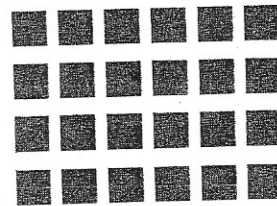
**Write the related facts for the array.**

There are 4 equal rows of tiles.

There are 6 tiles in each row.

There are 24 tiles.

Write 2 multiplication equations and 2 division equations for the array.



factor  $\times$  factor = product

$$\boxed{4} \times \boxed{6} = 24$$

$$\boxed{6} \times \boxed{4} = 24$$

dividend  $\div$  divisor = quotient

$$24 \div \boxed{4} = \boxed{6}$$

$$24 \div \boxed{6} = \boxed{4}$$

The equations show how the numbers 4, 6, and 24 are related.

So, the related facts are  $4 \times 6 = 24$ ,  $6 \times 4 = 24$ ,  $24 \div 4 = 6$ , and  $24 \div 6 = 4$ .



## Writing Division Stories

How to write a division story:

First, look at the number sentence given. Think of a situation in which the larger number is divided by the smaller number. For example, with the number sentence  $20 \div 2 = n$ , you might think of 20 dollars divided between 2 friends. Here is a division story for  $20 \div 2 = n$ :

Dan's father gave him \$20 for cutting the grass and doing other chores around the house. Since Dan's friend Steve helped him, Dan decided to divide the money by 2. How much did each boy receive?

## Dividing Using 0 and 1

$6 \div 6 = ?$ Divide 6 counters into groups of 6.  There is 1 group. $6 \div 6 = 1$	$6 \div 1 = ?$ Divide 6 counters into groups of 1.  There are 6 groups. $6 \div 1 = 6$	$0 \div 6 = ?$ Divide 0 counters into groups of 6.  There are 0 groups $0 \div 6 = 0$
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Any number divided by itself is 1.

Any number divided by 1 is that number.

Zero divided by any number is 0.

## Dividing with 2 and 5

Thinking about multiplication can help you divide with 2 and 5.

For example:

Darren and Molly have 16 pieces of construction paper for their project. Each person will get the same number of pieces of construction paper. How many pieces will each person get?

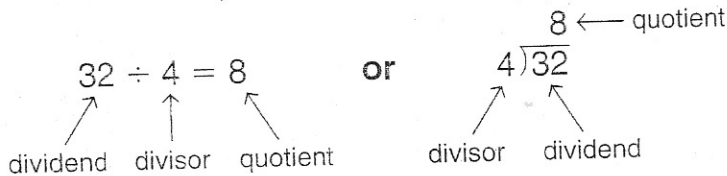
What You Think	What You Write
Find $16 \div 2$ . 2 times what number equals 16? $2 \times 8 = 16$	$16 \div 2 = 8$ So, each person will get 8 pieces of construction paper.

# Dividing with 3 and 4

You can use multiplication facts for 3 and 4 to help you divide by 3 or 4.

<b>Problem</b>	Peter has 32 planks. If he places them in four equal piles, how many planks will be in each pile?	May and her two friends have 21 treats. If each person gets an equal amount, how many treats does each girl get?
<b>What You Think</b>	Four times what number equals 32? $4 \times 8 = 32$	Three times what number equals 21? $3 \times 7 = 21$
<b>What You Write</b>	$32 \div 4 = 8$ There will be 8 planks in each pile.	$21 \div 3 = 7$ Each girl gets 7 treats.

You can write a division problem in two ways:



# Dividing with 6 and 7

When you divide, you separate things into equal groups.

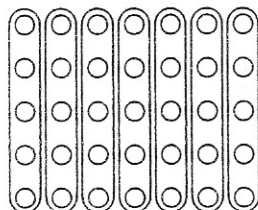
For example:

Find  $35 \div 7$ .

There are 35 circles.



Divide them into 7 equal groups.



There are 5 circles in each group.  
So  $35 \div 7 = 5$

# Dividing with 8 and 9

Remembering multiplication facts can help you divide by 8 and 9.

What multiplication fact can help you find  $24 \div 8$ ?

$$\begin{array}{ll} 8 \times 1 = 8 & 8 \times 6 = 48 \\ 8 \times 2 = 16 & 8 \times 7 = 56 \\ \boxed{8 \times 3 = 24} & 8 \times 8 = 64 \\ 8 \times 4 = 32 & 8 \times 9 = 72 \\ 8 \times 5 = 40 & 8 \times 10 = 80 \end{array}$$

If  $8 \times 3 = 24$ , then  $24 \div 8 = 3$ .

What multiplication fact can help you find  $27 \div 9$ ?

$$\begin{array}{ll} 9 \times 1 = 9 & 9 \times 6 = 54 \\ 9 \times 2 = 18 & 9 \times 7 = 63 \\ \boxed{9 \times 3 = 27} & 9 \times 8 = 72 \\ 9 \times 4 = 36 & 9 \times 9 = 81 \\ 9 \times 5 = 45 & 9 \times 10 = 90 \end{array}$$

If  $9 \times 3 = 27$ , then  $27 \div 9 = 3$ .

## Divide by 10

You can use a multiplication table to divide by 10.

**Find the quotient.**  $30 \div 10$

Think of a related multiplication fact.

$$10 \times \blacksquare = 30$$

**Step 1** Find the row for the factor, 10.  
This number is the divisor.

**Step 2** Look across the row to find the product, 30. This number is the dividend.

**Step 3** Look up to the top row to find the unknown factor, 3.  
This is the quotient.

Since  $10 \times 3 = 30$ , then  $30 \div 10 = 3$ .

So,  $30 \div 10 = 3$ .

$\times$	0	1	2	3	4	5	6	7	8	9	10
0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10
2	0	2	4	6	8	10	12	14	16	18	20
3	0	3	6	9	12	15	18	21	24	27	30
4	0	4	8	12	16	20	24	28	32	36	40
5	0	5	10	15	20	25	30	35	40	45	50
6	0	6	12	18	24	30	36	42	48	54	60
7	0	7	14	21	28	35	42	49	56	63	70
8	0	8	16	24	32	40	48	56	64	72	80
9	0	9	18	27	36	45	54	63	72	81	90
10	0	10	20	30	40	50	60	70	80	90	100



## Division Patterns with 10, 11, and 12

A number is divisible by another number when it can be divided by that number and the remainder is 0. For example,  $80 \div 10 = 8$ . You can also say that 80 is a **multiple** of 10. The chart below shows the multiples of 10, 11, and 12.

x	0	1	2	3	4	5	6	7	8	9	10	11	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10	11	12
2	0	2	4	6	8	10	12	14	16	18	20	22	24
3	0	3	6	9	12	15	18	21	24	27	30	33	36
4	0	4	8	12	16	20	24	28	32	36	40	44	48
5	0	5	10	15	20	25	30	35	40	45	50	55	60
6	0	6	12	18	24	30	36	42	48	54	60	66	72
7	0	7	14	21	28	35	42	49	56	63	70	77	84
8	0	8	16	24	32	40	48	56	64	72	80	88	96
9	0	9	18	27	36	45	54	63	72	81	90	99	108
10	0	10	20	30	40	50	60	70	80	90	100	110	120
11	0	11	22	33	44	55	66	77	88	99	110	121	132
12	0	12	24	36	48	60	72	84	96	108	120	132	144

- The numbers 0, 10, 20, ..., 120 are all multiples of 10. Each of these numbers is divisible by 10. For example,  $30 \div 10 = 3$ .
- The numbers 0, 11, 22, ..., 132 are all multiples of 11. Each of these numbers is divisible by 11. For example,  $99 \div 11 = 9$ .
- The numbers 0, 12, 24, ..., 144 are all multiples of 12. Each of these numbers is divisible by 12. For example,  $108 \div 12 = 9$ .