

Understanding Division: math lesson, Grade 3 – download the PDF

Have you ever shared a pizza with friends, or packed toys into equal boxes? Then you have already used division! In this chapter you will learn to share and group equally, to write division equations, to connect division with multiplication, and to solve division word problems.

1. What does division mean?

Division is about making things **equal**. When you divide, you start with a total and you split it up so that every share or every group has exactly the same amount. Division answers one of two questions:

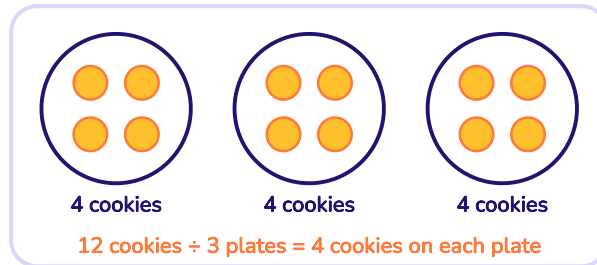
- How many are in **each share**?
- How many **equal groups** can I make?

D Definition: division

Division is the operation that splits a total into equal shares or equal groups. We write it with the symbol $\div$, which we read “divided by”.

2. Sharing equally

In a sharing problem you know the total and the **number of shares**. You want to find how many go in **each** share. Imagine dealing cards one at a time: one for you, one for your friend, one for you, one for your friend, until the cards run out.



E

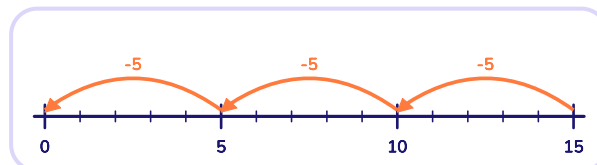
Example 1

Nora has 15 stickers. She shares them equally among 3 friends. How many stickers does each friend get?

Deal the stickers one at a time to the 3 friends. After 5 rounds, all 15 stickers are gone and each friend has 5. So $15 \div 3 = 5$. Each friend gets 5 stickers.

3. Grouping equally

In a grouping problem you know the total and the **size of each group**. You want to find how many groups you can make. You can take away one group at a time, or count back on a number line using equal jumps.



On the number line, each jump is the same size. Counting the jumps gives the answer: $15 \div 5 = 3$

M**Method: grouping with jumps**

1. Start at the total.
2. Jump back by the size of one group.
3. Keep jumping until you reach 0.
4. Count the jumps. That is the number of groups.

E**Example 2**

A farm stand has 18 apples. Each bag holds 6 apples. How many bags can be filled?

Count back by 6: 18, 12, 6, 0. That is 3 jumps, so $18 \div 6 = 3$. The farm stand fills 3 bags.

4. Division equations

A division equation uses three numbers. In $20 \div 4 = 5$ each number has a name.

Name		What it is	In $20 \div 4 = 5$
Dividend	The total you start with		20
Divisor	The number of shares, or the size of each group		4
Quotient	The answer to the division		5

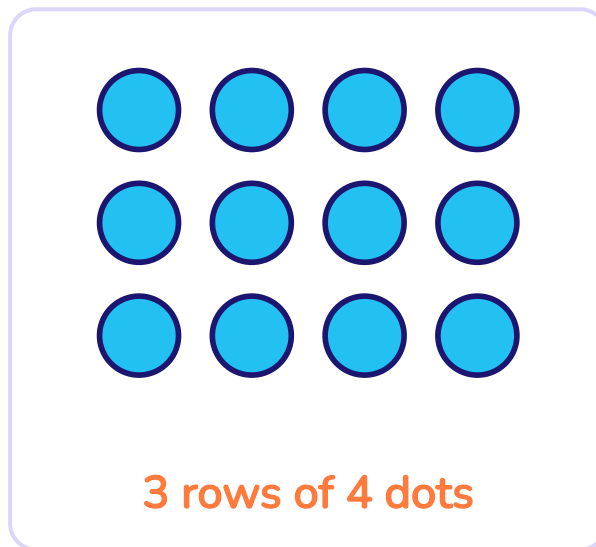


Watch the order!

The total always comes first. $20 \div 4 = 5$, but $4 \div 20$ is not 5. Read the problem carefully to decide which number is the total.

5. Relating division to multiplication

Division and multiplication are partners. They undo each other. An array shows this well: 3 rows with 4 dots in each row make 12 dots.



From this one picture we get $3 \times 4 = 12$. If we split the 12 dots back into the 3 rows we get $12 \div 3 = 4$. If we split them into columns of 3 we get $12 \div 4 = 3$.



Property: division undoes multiplication

If $a \times b = c$, then $c \div a = b$ and $c \div b = a$.

M**Method: think multiplication**

To find $40 \div 8$, ask yourself: “8 times what number makes 40?” Since $8 \times 5 = 40$, the answer is 5.

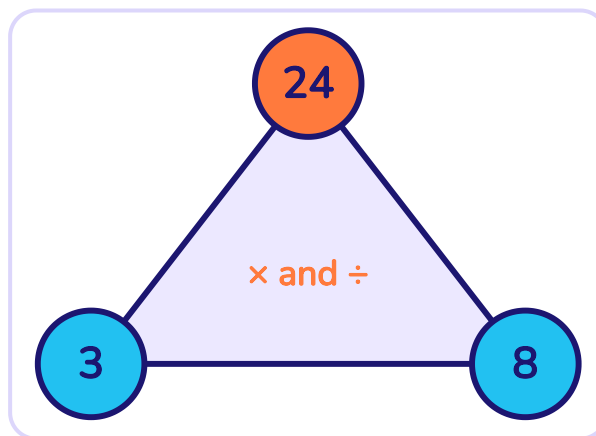
E**Example 3**

Find $56 \div 7$.

Ask: 7 times what is 56? Count by sevens: 7, 14, 21, 28, 35, 42, 49, 56. That is 8 sevens. So $7 \times 8 = 56$ and $56 \div 7 = 8$.

6. Fact families

Three numbers that are linked by multiplication and division form a **fact family**. The triangle below has the family 3, 8 and 24. The biggest number goes on top.



This family gives four facts:

- $3 \times 8 = 24$
- $8 \times 3 = 24$
- $24 \div 3 = 8$

- $24 \div 8 = 3$

E

Example 4

Write the fact family for 5, 9 and 45.

$$5 \times 9 = 45, 9 \times 5 = 45, 45 \div 5 = 9 \text{ and } 45 \div 9 = 5.$$

A

Careful with doubles

If the two small numbers are the same, like 6, 6 and 36, the family has only two facts:

$$6 \times 6 = 36 \text{ and } 36 \div 6 = 6.$$

7. Finding an unknown factor

Sometimes a number is missing. We can write a letter, like ***n***, or a box, for the missing number. A multiplication with a missing factor is solved by dividing the product by the factor you know.

P

Property: unknown factor

$$\text{If } n \times 4 = 36, \text{ then } n = 36 \div 4.$$

E**Example 5**

Solve $n \times 4 = 36$.

Divide the product by the known factor: $n = 36 \div 4 = 9$. Check: $9 \times 4 = 36$. It works, so $n = 9$.

The same idea works when the missing number is in a division. For $n \div 5 = 6$, the total is 6 groups of 5, so $n = 6 \times 5 = 30$. For $48 \div n = 6$, ask “6 times what is 48?” and you get $n = 8$.

!**Tip from Zyro**

Zyro, the alien explorer, says: “When a division puzzles you, flip it into a multiplication. Missing numbers are much easier to spot that way!”

8. Dividing by 1

What happens if you share 7 crackers among just 1 person? That person gets all 7. What if you put 7 crackers into groups of 7? You get just 1 group.

P**Special divisions**

- Any number divided by 1 stays the same: $9 \div 1 = 9$.
- Any number (except 0) divided by itself is 1: $8 \div 8 = 1$.
- Zero divided by any number (except 0) is 0: $0 \div 5 = 0$.

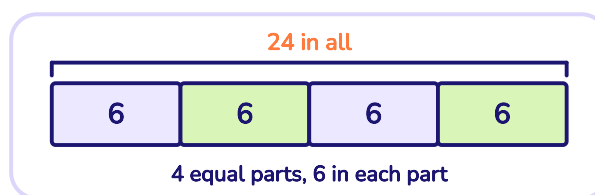


Never divide by 0

You cannot share 6 cookies among 0 friends. Dividing by 0 does not make sense, so we never do it.

9. Division word problems

A bar model helps you see a word problem. The long bar is the total, and it is cut into equal parts.



Method: solving a division word problem

1. Read the problem and find the total.
2. Decide: are you finding the amount in each share, or the number of groups?
3. Write a division equation.
4. Solve it by thinking of a multiplication fact.
5. Write a full sentence answer and check by multiplying.



Example 6

A baker puts 24 muffins equally into 4 boxes. How many muffins are in each box?

Total: 24. Number of shares: 4. Equation: $24 \div 4 = 6$. Check: $6 \times 4 = 24$. There are 6 muffins in each box.

E**Example 7**

A ribbon is 36 inches long. Ana cuts it into pieces that are each 6 inches long. How many pieces does she get?

Total: 36 inches. Size of each group: 6 inches. Equation: $36 \div 6 = 6$. Check: $6 \times 6 = 36$. Ana gets 6 pieces.

Key takeaways

- Division splits a total into **equal** shares or equal groups.
- In $20 \div 4 = 5$: 20 is the dividend, 4 is the divisor and 5 is the quotient.
- Division undoes multiplication: if $3 \times 8 = 24$, then $24 \div 3 = 8$ and $24 \div 8 = 3$.
- A fact family links three numbers with two multiplications and two divisions.
- To find an unknown factor, divide the product by the known factor.
- $n \div 1 = n$, $n \div n = 1$ and $0 \div n = 0$. Never divide by 0.
- For word problems: find the total, write the equation, solve, answer in a sentence, and check.

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