

Multiplying and Dividing Signed Numbers

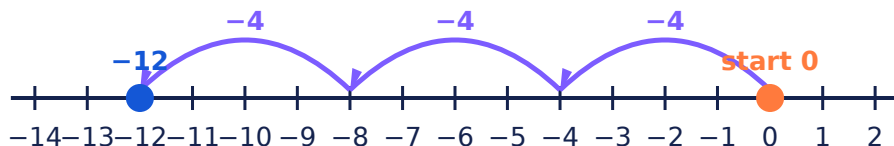
Grade 7 math · Lesson · Standards: 7.NS.A.2a, 7.NS.A.2b, 7.NS.A.2c

Quick answer: To multiply or divide signed numbers, multiply or divide the absolute values and then choose the sign: same signs give a positive result, different signs a negative result. So $(-3)(-4) = 12$ and $-36 \div 9 = -4$. Division by zero is undefined, and the rules hold for fractions and decimals.

Standards: 7.NS.A.2a, 7.NS.A.2b, 7.NS.A.2c · **Level:** Grade 7

How do you multiply numbers with different signs?

Multiplication is repeated addition. Three jumps of -4 land on -12 , so $3 \times (-4) = -12$. A positive number times a negative number is negative, and the order of the factors does not change that.



$3 \times (-4) = -12$: three jumps of -4 .

Why is a negative times a negative positive?

Look at the pattern in the table. Each row lowers the first factor by 1, so the product rises by 1. The pattern continues through 0 and reaches $(-1) \times (-1) = 1$, which is exactly what the distributive property demands as well.

Product	Result
$3 \times (-1)$	-3
$2 \times (-1)$	-2
$1 \times (-1)$	-1
$0 \times (-1)$	0
$(-1) \times (-1)$	1

The results climb by 1 each row, so the last row has to be $+1$.

Sign rules for products and quotients

If the two numbers have the **same sign**, the answer is positive. If the signs are **different**, the answer is negative. The size of the answer is the product (or quotient) of the absolute values.

First factor	Second factor	Product or quotient
+	+	+
+	−	−
−	+	−
−	−	+

Same signs give a positive result; different signs give a negative result.

Worked example

A cold front makes the temperature fall 3°F each hour. Five hours from now: $5 \times (-3) = -15^{\circ}\text{F}$, a drop of 15°F . Five hours ago, the temperature was higher: $(-3) \times (-5) = +15$, so it was 15°F warmer.

How do you divide signed numbers, and what about zero?

Division undoes multiplication, so it follows the same sign rules: $-36 \div 9 = -4$ because $9 \times (-4) = -36$. Zero divided by any nonzero number is 0, but division by 0 is undefined: no number times 0 can ever produce a nonzero amount.

Signs in fractions

For integers p and q with $q \neq 0$: $-(p/q) = (-p)/q = p/(-q)$. For example, $-3/4 = (-3)/4 = 3/(-4)$.

Method: multiply or divide rational numbers

1. Count the negative factors: an even count gives a positive result, an odd count a negative result.
2. Multiply or divide the absolute values, as you would with positive numbers.
3. For fractions, multiply by the reciprocal when dividing.
4. Attach the sign you found and check that the answer makes sense.

Common mistake

Mixing up the addition and multiplication rules. In addition, $-3 + (-4) = -7$, but in multiplication, $(-3)(-4) = +12$. Decide the operation first, then the sign rule.

Mathbot's tip

Count the minus signs. Even number of them: positive. Odd number: negative.

Key points to remember

- Same signs give a positive product or quotient; different signs give a negative one.
- $(-1)(-1) = 1$ follows from the pattern of products and from the distributive property.
- Division by 0 is undefined, but 0 divided by a nonzero number is 0.
- $-(p/q) = (-p)/q = p/(-q)$ for $q \neq 0$.
- Properties of operations, such as the distributive property, still work with negative numbers.

Multiplying and Dividing Signed Numbers: frequently asked questions

Why does a negative times a negative equal a positive?

Follow the pattern of $3 \times (-1)$, $2 \times (-1)$, $1 \times (-1)$, $0 \times (-1)$: the products rise by 1 each time, so the next one, $(-1) \times (-1)$, must be 1. The distributive property gives the same result.

What are the sign rules for division?

They match multiplication. Two numbers with the same sign give a positive quotient, and two numbers with different signs give a negative quotient.

Why is division by zero undefined?

If $-7 \div 0$ had an answer q , then $q \times 0$ would have to equal -7 . But anything times 0 is 0, so no such number exists.

How can I tell the sign of a long product?

Count the negative factors. An even number of negatives gives a positive product, and an odd number gives a negative product.

Are $-3/4$, $(-3)/4$ and $3/(-4)$ the same number?

Yes. Moving the negative sign between the numerator, the denominator and the front of the fraction does not change its value.