

Grade 7 - Multiplying and Dividing Rational Numbers - Lesson

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To multiply or divide rational numbers, multiply or divide the absolute values and then decide the sign. Same signs give a positive result, and different signs give a negative result. Division by 0 is undefined. Every rational number can be written as a decimal that either terminates or repeats.

Grade 7 · Common Core State Standards: **7.NS.A.2**

Key facts

- Same signs: positive. Different signs: negative.
- An even number of negative factors gives a positive product; an odd number gives a negative product.
- Divide by a fraction by multiplying by its reciprocal.
- Division by 0 is undefined.
- A fraction is a terminating decimal or a repeating decimal, found by long division.

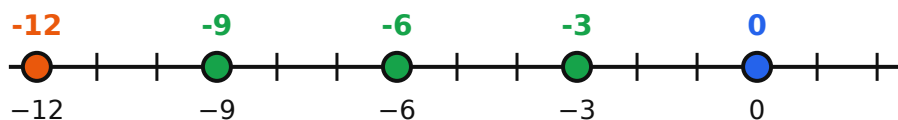
How do you multiply signed numbers?

Multiply the absolute values first, then decide the sign. If the factors have the **same** sign, the product is positive. If the signs are **different**, the product is negative.

Factors	Product sign	Example
+ and +	+	$4 \times 3 = 12$
- and -	+	$(-4) \times (-3) = 12$
+ and -	-	$4 \times (-3) = -12$
- and +	-	$(-4) \times 3 = -12$

Same signs give a positive result. Different signs give a negative result.

One way to see why: multiplication is repeated addition, so
 $4 \times (-3) = (-3) + (-3) + (-3) + (-3) = -12$.



$4 \times (-3)$ is four jumps of 3 units left, which lands on -12.

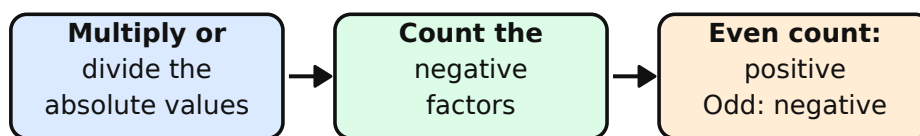
How do you divide signed numbers?

Division follows the same sign rules because every division fact comes from a multiplication fact. Since $(-4) \times 3 = -12$, we know $-12 \div 3 = -4$ and $-12 \div (-4) = 3$.

Division by zero

Dividing by 0 is **undefined**. A quotient $p \div q$ only makes sense when q is not 0. Zero divided by a nonzero number is 0.

Dividing by a fraction means multiplying by its reciprocal: $-\frac{3}{4} \div \frac{1}{2} = -\frac{3}{4} \times 2 = -\frac{3}{2}$.



Follow these three steps.

1. Rewrite division as multiplication by the reciprocal (for fractions).
2. Count the negative factors.
3. Multiply the absolute values and simplify.
4. Attach the sign: an even number of negatives gives a positive answer.

Example. $(-\frac{2}{3}) \times (-\frac{9}{10})$: two negatives, so the result is positive. $\frac{2}{3} \times \frac{9}{10} = \frac{18}{30} = \frac{3}{5}$.

How do you turn a fraction into a decimal?

Divide the numerator by the denominator with long division. The decimal either **terminates** (stops) or **repeats** a block of digits forever. A bar over the repeating block shows it: $\frac{5}{11} = 0.\overline{45}$.

Fraction	Long division	Decimal
$3/8$	0.375 stops	0.375 (terminating)
$5/11$	0.4545... repeats	0.45 repeating
$1/3$	0.333... repeats	0.3 repeating

A fraction becomes either a terminating or a repeating decimal.

Every rational number is one of these two kinds. A fraction in lowest terms terminates only when the denominator has no prime factors other than 2 and 5.

Questions about multiplying and dividing rational numbers

Why is a negative times a negative positive?

Multiplying by a negative reverses direction. Doing it twice sends you back the original way. In patterns, $-3 \times 2 = -6$, $-3 \times 1 = -3$, $-3 \times 0 = 0$, $-3 \times (-1) = 3$.

What is the sign of a product with five negative factors?

It is negative. An odd number of negative factors gives a negative product.

How do you divide by a negative fraction?

Multiply by its reciprocal, which keeps the negative sign. For example,
 $-\frac{2}{5} \div (-\frac{4}{15}) = -\frac{2}{5} \times (-\frac{15}{4}) = \frac{3}{2}$.

How do you know if a decimal terminates?

Write the fraction in lowest terms. If the denominator has only the prime factors 2 and 5, the decimal terminates. Otherwise it repeats.

Why can't you divide by zero?

There is no number that multiplies by 0 to give a nonzero result, so $6 \div 0$ has no answer. We say it is undefined.