Solving Multiplication and Division Equations with Rational Numbers

Solve a Multiplication Equation

Division Property of Equality

A multiplication equation is an equation like 2x = 10 because the variable x is multiplied by 2. Multiplication and division are inverse operations. So, to solve a multiplication equation, use division.

Words

If you divide each side of an equation by the same nonzero number, the two sides remain equal.

Examples

Numbers

$$18 = 18$$

 $\frac{18}{6} = \frac{18}{6}$
 $3 = 3$

Algebra

$$3x = 12$$
 $\frac{3x}{3} = \frac{12}{3}$

$$x = 4$$

Example

4. Solve 3.28x = 19.68. Check your solution.



$$3.28x = 19.68$$

$$\frac{3.28x}{3.28} = \frac{19.68}{3.28}$$

$$x = 6$$

Write the equation.



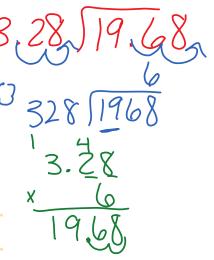
Check
$$3.28\dot{x} = 19.68$$

 $3.28(6) \stackrel{?}{=} 19.68$

Write the original equation.

Replace x with 6.

This sentence is true. 🗸



Got It?

Do these problems to find out.

Solve each equation. Check your solution.

19.68 = 19.68

e.
$$2.25n = 6.75$$
 2.25 1.25 1.25

$$6.15y = 55.35$$

$$6.15$$

$$6.15$$

$$6.15$$

$$6.15$$

$$6.15$$

$$6.15$$

Fraction Coefficients

Recall that two numbers with a product of 1 are called multiplicative inverses, or reciprocals. If the coefficient in a multiplication equation is a fraction, multiply each side by the reciprocal of the coefficient.

Examples



3. Solve
$$\frac{3}{4}x = \frac{12}{20}$$
.

$$\frac{3}{4}x = \frac{12}{20}$$

$$\frac{3}{4}x = \frac{14}{3} \cdot \frac{42}{20}$$

$$\frac{1}{4}x = \frac{1}{3} \cdot \frac{42}{20}$$

Write the equation

Multiply each side by the reciproc

Divide by common factors.

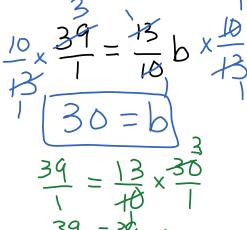
Simplify. Check the solution.

Fractions as Coefficients

The expression 3/2 can be read as $\frac{3}{4}$ of $x_1 = \frac{3}{4}$ multiplied by x, 3x divided by 4, or $\frac{x}{4}$ multiplied by 3.

Solve each equation. Check your solution.

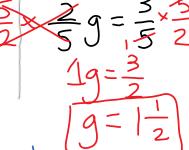
8.
$$39 = 1\frac{3}{10}b$$



9.
$$\frac{1}{2}e = \frac{1}{4}$$

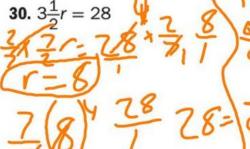


10.
$$\frac{2}{5}g = \frac{3}{5}$$



29.
$$1\frac{2}{5}x = 7$$

30.
$$3\frac{1}{2}r = 28$$



31.
$$2\frac{1}{4}w = 6\frac{3}{4}$$

$$\frac{4}{4} \times \frac{3}{1} = \frac{27}{4} \sqrt{\frac{3}{4}}$$

Independent Practice

Solve each equation. Check your solution.

24.
$$5.9q = 23.6$$

25.
$$2.55d = 17.85$$

32.
$$2\frac{3}{4}a = 19\frac{1}{4}$$

33.
$$1\frac{1}{2}c = 6$$

34.
$$3\frac{3}{4}m = 33\frac{3}{4}$$

17. The Walkers traveled 182 miles in $3\frac{1}{2}$ hours. The equation 3.5m = 182 can be used to find their mean rate of travel. What is the value of m?