Solving Multiplication and Division Equations with Rational Numbers

Solve a Multiplication Equation

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.

coefficient = 1!

Example

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

$3.28x = 19.68$ Write the equation.

$\frac{3.28x}{3.28} = \frac{19.68}{3.28}$ Divide each side by 3.28.

$x = 6$

Check

$3.28x = 19.68$ Write the original equation.

$3.28(6) \stackrel{?}{=} 19.68$ Replace x with 6.

$19.68 = 19.68$ This sentence is true. ✓

300

3.28 ⟌ 19.68

6

328 ⟌ 1968

1 4

3.28

× 6

19.68

Got It? Do these problems to find out.

Solve each equation. Check your solution.

e. $2.25n = 6.75$

$\frac{2.25n}{2.25} = \frac{6.75}{2.25}$

$n = 3$

2.25 ⟌ 6.75

225 ⟌ 675.

xx3.

-675

0

2.25

× 3

6.75 ✓

f. $1.7b = 8.5$

$\frac{1.7b}{1.7} = \frac{8.5}{1.7}$

$b = 5$

1.7 ⟌ 8.5

17 ⟌ 85

3

× 5

85

b = 5

17 85 = 85

× 5

85

g. $6.15y = 55.35$

$\frac{6.15y}{6.15} = \frac{55.35}{6.15}$

$y = 9$

6.15 ⟌ 55.35

615 ⟌ 5535

1 4

6.15

× 9

55.35 = 55.35 ✓

Division Property of Equality

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

Examples

Numbers	Algebra
$18 = 18$	$3x = 12$
$\frac{18}{6} = \frac{18}{6}$	$\frac{3x}{3} = \frac{12}{3}$
$3 = 3$	$x = 4$

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

Tutor

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

$\frac{3}{4}x = \frac{12}{20}$ — Write the equation.

$\frac{4}{3} \cdot \frac{3}{4}x = \frac{4}{3} \cdot \frac{12}{20}$ — Multiply each side by the reciprocal of $\frac{3}{4}$, $\frac{4}{3}$.

$\frac{4}{3} \cdot \frac{3}{4}x = \frac{4}{3} \cdot \frac{12}{20}$ — Divide by common factors.

$x = \frac{4}{5}$ — Simplify. Check the solution.

$\frac{3}{4} \times \frac{4}{5} = \frac{12}{20}$

$\frac{3}{5} = \frac{12}{20}$ ✓

Fractions as Coefficients

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

Solve each equation. Check your solution.

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

$\frac{39}{1} = \frac{13}{10}b$

$30 = b$

$\frac{39}{1} = \frac{13}{10} \times \frac{30}{1}$

$\frac{39}{1} = \frac{39}{1}$ ✓

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

$1e = \frac{1}{2}$

$\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$ ✓

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

$1g = \frac{3}{2}$

$g = 1\frac{1}{2}$

$\frac{2}{5} \times \frac{3}{2} = \frac{3}{5}$ ✓

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

$\frac{7}{5}x = 7$

$x = 5$

$\frac{7}{5} \times \frac{5}{1} = \frac{7}{1}$ ✓

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

$\frac{7}{2}r = 28$

$r = 8$

$\frac{7}{2}(8) = \frac{28}{1}$

$28 = 28$ ✓

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

$\frac{9}{4}w = \frac{27}{4}$

$w = 3$

$\frac{9}{4} \times \frac{3}{1} = \frac{27}{4}$ ✓

Independent Practice

Solve each equation. Check your solution.

24. $5.9q = 23.6$

25. $2.55d = 17.85$

26. $6.5a = 32.5$

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?