

Using Multiplicative Inverses to Solve Equations

Stalactites are icicle-shaped stone formations found on cave ceilings they form from minerals deposited by dripping water. Suppose a stalactite is 10 inches long and is growing at a rate of about $\frac{1}{8}$ per decade. How long will it take for the stalactite to reach a length of 1 foot? In Example 3, you'll see how to answer this question by writing and solving an equation.



To solve an equation that has a fractional coefficient, you can multiply each side of the equation by the fraction's multiplicative inverse. The **multiplicative inverse** of a nonzero number is the number's reciprocal.

Multiplicative Inverse Property

Words: The product of a number and its multiplicative inverse is 1.

Numbers: $\frac{3}{5} \cdot \frac{5}{3} = 1$

Algebra: $\frac{a}{b} \cdot \frac{b}{a} = 1$, where $a \neq 0, b \neq 0$

Example 1: Solve the equation

$$\frac{4}{7}x = -12$$

$$\frac{7}{4}\left(\frac{4}{7}\right)x = \frac{7}{4}(-12)$$

$$1x = \frac{7}{4}(-12)$$

$$x = -21$$

The solution is -21 .

Original equation.

Multiply each side by multiplicative inverse of $\frac{4}{7}$.

Multiplicative inverse property.

Multiply.