

Precalculus

Basic exponent equation of type $c^{px+q} = A$

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Example

Solve the equation.

$$2^{1-5x} = 12$$

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$$\begin{array}{rcl} 2^{1-5x} & = & 12 \\ \log_2(2^{1-5x}) & = & \log_2 12 \end{array} \quad \left| \text{ apply } \log_2 \right.$$

Example

Solve the equation.

$$\begin{array}{rcl} 2^{1-5x} & = & 12 \\ \log_2(2^{1-5x}) & = & \log_2 12 \\ 1 - 5x & = & \log_2 12 \end{array} \quad \left| \begin{array}{l} \text{apply } \log_2 \end{array} \right.$$

Example

Solve the equation.

$$\begin{array}{rcl} 2^{1-5x} & = & 12 \\ \log_2(2^{1-5x}) & = & \log_2 12 \\ 1 - 5x & = & \log_2 12 = ? \end{array} \quad \left| \text{ apply } \log_2 \right.$$

Example

Solve the equation.

$$\begin{array}{rcl} 2^{1-5x} & = & 12 \\ \log_2(2^{1-5x}) & = & \log_2 12 \\ 1 - 5x & = & \log_2 12 = \log_2(4 \cdot 3) \end{array} \quad \left| \begin{array}{l} \text{apply } \log_2 \end{array} \right.$$

Example

Solve the equation.

$$\begin{aligned} 2^{1-5x} &= 12 && | \text{ apply } \log_2 \\ \log_2(2^{1-5x}) &= \log_2 12 \\ 1 - 5x &= \log_2 12 = \log_2(4 \cdot 3) \\ 1 - 5x &= \log_2 4 + \log_2 3 \end{aligned}$$

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Example

Solve the equation.

$$\begin{aligned}
 2^{1-5x} &= 12 && | \text{ apply } \log_2 \\
 \log_2(2^{1-5x}) &= \log_2 12 \\
 1 - 5x &= \log_2 12 = \log_2(4 \cdot 3) \\
 1 - 5x &= \log_2 4 + \log_2 3 \\
 \textcolor{red}{1} - 5x &= 2 + \log_2 3 \\
 5x &= \textcolor{red}{1} - (2 + \log_2 3)
 \end{aligned}$$

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Solve the equation.

$$\begin{array}{rcll}
 2^{1-5x} & = & 12 & | \text{ apply } \log_2 \\
 \log_2(2^{1-5x}) & = & \log_2 12 & \\
 1 - 5x & = & \log_2 12 = \log_2(4 \cdot 3) & \\
 1 - 5x & = & \log_2 4 + \log_2 3 & \\
 1 - 5x & = & 2 + \log_2 3 & \\
 5x & = & 1 - (2 + \log_2 3) & \\
 & & -1 & \\
 x & = & \underline{\hspace{2cm}} &
 \end{array}$$

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Solve the equation.

$$\begin{array}{rcll}
 2^{1-5x} & = & 12 & | \text{ apply } \log_2 \\
 \log_2(2^{1-5x}) & = & \log_2 12 & \\
 1 - 5x & = & \log_2 12 = \log_2(4 \cdot 3) & \\
 1 - 5x & = & \log_2 4 + \log_2 3 & \\
 1 - 5x & = & 2 + \log_2 3 & \\
 5x & = & 1 - (2 + \log_2 3) & \\
 x & = & \underline{-1 - \log_2 3} &
 \end{array}$$

Example

Solve the equation.

$$\begin{array}{rclcl}
 2^{1-5x} & = & 12 & & | \text{ apply } \log_2 \\
 \log_2(2^{1-5x}) & = & \log_2 12 & & \\
 1 - 5x & = & \log_2 12 = \log_2(4 \cdot 3) & & \\
 1 - 5x & = & \log_2 4 + \log_2 3 & & \\
 1 - 5x & = & 2 + \log_2 3 & & \\
 \textcolor{red}{5}x & = & 1 - (2 + \log_2 3) & & \\
 & & - 1 - \log_2 3 & & \\
 x & = & \frac{\quad}{\textcolor{red}{5}} & &
 \end{array}$$

Example

Solve the equation.

$$\begin{aligned}
 2^{1-5x} &= 12 && | \text{ apply } \log_2 \\
 \log_2(2^{1-5x}) &= \log_2 12 \\
 1 - 5x &= \log_2 12 = \log_2(4 \cdot 3) \\
 1 - 5x &= \log_2 4 + \log_2 3 \\
 1 - 5x &= 2 + \log_2 3 \\
 5x &= 1 - (2 + \log_2 3) \\
 &= -1 - \log_2 3 \\
 x &= \frac{-1 - \log_2 3}{5} \\
 \text{Calculator: } x &\approx -0.516993.
 \end{aligned}$$