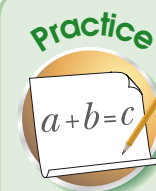


Almost anything goes when you are multiplying and dividing variables. There are ways to work out just about any combination of numbers and variables. For instance, if you want to multiply a number by a variable, $3 \times y$ for example, just write $3y$ and the multiplication symbol is implied. If you are dividing 3 by y , simply write the expression as a fraction $\frac{3}{y}$.

You want to multiply or divide two variables? Piece of cake. Unlike when adding and subtracting, dissimilar variables are no big deal.

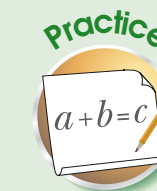
For instance, $3a \times 7b$ multiplies everything together to come out $21ab$ and $a \div b$ can be easily expressed as the fraction $\frac{a}{b}$.

For your last trick, you can even multiply and divide variables with exponents. You have to keep on your toes, but you can do it with relative ease. Just remember that the rules for multiplying and dividing exponents still apply. When you are working with two or more of the same variable, you just add and subtract the exponents. For example, the problem $5c^4 \times 3c^3$ equals $5 \times 3c^{4+3}$, which works out to $15c^7$.



Solve the following problems by multiplying variables. You can check your answers on page 251.

1. $(3x^3)(4x^2)$
2. $(4y^5)(-2y^{-3})$
3. $3x^24y^32x^5y^{-2}$
4. $(-x)(2y^{-1})(3y^3)(-x)$
5. $(-5z^2)(2z^{-5})$
6. $3x^2y^3 \times 2x^{-3}y^4$



Solve the following problems by dividing variables. You can check your answers on page 251.

- a) $\frac{10x^2}{5x}$
- b) $15y^5 \div 3y^2$
- c) $20x^2y^2 \div 5x^2$
- d) $\frac{6x^3y^4}{2xy^2}$
- e) $6x^2 \div 3x$
- f) $4a^6b^5 \div 2a^4b^2$

Multiplying a Variable by a Number

$$8x \times 4 = 32x$$

$$6 \times 3y = 18y$$

$$x \times 2 = 1x \times 2 = 2x$$

$$5 \times a = 5 \times 1a = 5a$$

$$7b \times 2 = 14b$$

Multiplying Two or More Variables

$$3x \times 2y = 6xy$$

$$5xy \times 4xy = 20x^2y^2$$

$$6a \times 2a \times 2b = 24a^2b$$

$$5x \times 2x \times 3x = 30x^3$$

$$2a^3b^5 \times 3a^2b^4 = 6a^{3+2}b^{5+4} = 6a^5b^9$$

Dividing a Variable by a Number

$$\frac{20x}{4} = 5 \times x = 5x$$

$$\frac{40ab^2}{10} = 4 \times ab^2 = 4ab^2$$

$$\frac{56}{7x} = \frac{8}{x}$$

$$\frac{72}{8x^3y} = \frac{9}{x^3y}$$

Dividing Variables

$$\frac{9x^5}{3x^3} = 3x^{5-3} = 3x^2$$

$$\frac{3a^7}{4a^2} = \frac{3a^{7-2}}{4} = \frac{3a^5}{4}$$

$$\frac{8x}{4x} = 2x^{1-1} = 2x^0 = 2 \times (1) = 2$$

$$\frac{50a^8b^4}{10a^3b^3} = 5a^{8-3}b^{4-3} = 5a^5b^1 = 5a^5b$$

1 To multiply a variable by a number, multiply the number in front of the variable, called the coefficient, by the number. A variable is a letter, such as x or y , which represents an unknown number.

Note: When a number does not appear in front of a variable, assume the number is one. For example, x equals $1x$.

2 Place the resulting number in front of the variable.

- For example, $8x \times 4$ equals $32x$.

1 To multiply two or more variables together, multiply the numbers in front of the variables. Then multiply the variables together.

2 Place the resulting number in front of the resulting variables.

- For example, $3x \times 2y$ equals $6xy$.

Note: When multiplying variables with the same letter, such as x , you can add the exponents. If a variable does not have an exponent, assume the exponent is one. For example, $x \times x$ is the same as $x^1 \times x^1$, which equals x^2 .

1 To divide a variable by a number, divide the number in front of the variable by the number.

2 Multiply the resulting number by the variable.

- For example, $20x \div 4$ equals $5x$.
- To divide a number by a variable, divide the number by the number in front of the variable. The variable will remain in the denominator, or bottom part of the fraction.

1 To divide variables, divide the numbers in front of the variables. Then divide the variables.

Note: When dividing variables with the same letter, you can subtract the exponents. For example, $x^5 \div x^3$ equals x^{5-3} , which equals x^2 . If a variable does not have an exponent, assume the exponent is one. For example, x equals x^1 . A variable to the power of 0 equals one. For example, x^0 equals one.

2 Combine the resulting number with the resulting variables.

- For example, $9x^5 \div 3x^3$ equals $3x^{5-3}$, which equals $3x^2$.