Name Date

Order of operations

Basics of Algebra

A mathematical expression is any combination of numbers using operation symbols such as +, -, x, and ÷. To evaluate an expression, simply find its numerical value. When an expression contains more than one operation, it is important to use the order of operations when finding its value. The rules for the order of operations are as follows:

1. Multiply and divide from left to right.
2. Then add and subtract from left to right.

Find the value of $3 + 2 \times 10$.

$3 + 2 \times 10$	Multiply.
$3 + 20$	Add.
23	Final answer.

When there are grouping symbols (parentheses or brackets), simplify within the symbols first and then use the order of operations. Example,

Find the value of $2(8 + 6) - 7 \times 3$.

$2(8 + 6) - 7 \times 3$	Add.	
$2(14) - 7 \times 3$	Multiply.	$2(14)$ means 2×14.
$28 - 21$	Subtract.	
7	Final answer.	

Name the operation you would do first.

1. $8 + 6 - 3$ **2.** $15 \div (7 - 2) - 3$ **3.** $5 \times 4 \div 10$ **4.** $24 - 21 \div 3$

Find the value of each expression.

5. $18 - 12 \div 4$ **6.** $12 - (4 + 7)$

7. $7 \times (3 + 4)$ **8.** $12 \div 3 \times 2$

9. $(11 + 4) \div 5$ **10.** $(10 \times 4) \div (2 \times 2)$

11. $30 \div 6 - 1$ **12.** $42 \div (5 + 2) \times 3$

Insert parentheses so each expression has the given value.

13. $56 \div 7 \times 2; 4$ **14.** $12 + 8 \div 4; 5$

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13. $56 \div 7 \times 2$; 4 **14.** $12 + 8 \div 4$; 5

Name Date

Variables and expressions

Basics of Algebra

An expression that contains a combination of variables, numbers, and at least one operation is called an algebraic expression. A variable is any symbol, such as x, y, or a, that may be replaced with numbers. An algebraic expression can be evaluated by simply replacing the variables in the expression with their assigned values and then finding the numerical value of the expression.

Evaluate each expression if $x = 2$ and $y = 5$.

1. $6x - 2y$

$6x - 2y$	Notice, $6x$ means 6 times x and $2y$ means 2 times y.
$6(2) - 2(5)$	Replace variables with assigned values. Multiply.
$12 - 10$	Subtract.
2	Final answer.

2. $4x + (5 + 3y) - 13$

$4x + (5 + 3y) - 13$	Remember, evaluate within grouping symbols first.
$4(2) + (5 + 3(5)) - 13$	Replace variables with assigned values.
$8 + (5 + 15) - 13$	Multiply.
$8 + 20 - 13$	Simplify by adding within grouping symbols first. Add.
$28 - 13$	Subtract.
15	Final answer.

Evaluate each expression given the value of its variable.

1. $y + 2$; $y = 4$ **2.** $\frac{6a}{3}$; $a = 3$ **3.** $\frac{10d}{4} - 8$; $d = 6$

4. $x - 7$; $x = 12$ **5.** $2c - 4$; $c = 5$ **6.** $12 - 5z$; $z = 2$

Evaluate each expression if $x = 5$, $y = 2$, and $z = 8$.

7. $2z - 3x$ **8.** $\frac{6x}{y + z}$

9. $2z - xy$ **10.** $10x - (4y + z)$

11. $4x - (y + z)$ **12.** $\frac{7z}{x + y}$

13. $6z + 7y - 3x$ **14.** $2z + 3x + 4y$

Name Date

Symbol translation

Basics of Algebra

Often it is essential to translate words into symbols in order to solve a mathematical problem. Below is a chart with some commonly-used mathematical words and phrases with their possible meanings.

+	−	x	÷
add	subtract	multiply	divide
plus	minus	times	divided by
more than	less than	product of	divided into
sum of	difference	twice	quotient
increased by	decreased by	multiplied by	
added to	subtracted from		

Also, a number can be represented by any variable. It is important to be very careful when arranging the order of terms.

Translate the following phrases into symbols:

1. four more than a number — $x + 4$
2. five subtracted from a number — $x - 5$
3. subtract a number from nine — $9 - x$
4. eight divided by the sum of a number and ten — $8 \div (x + 10)$

Translate each phrase into an algebraic expression.

1. a number divided by nine

2. five less than a number

3. the sum of a number and ten

4. the product of three and a number

5. twice a number

6. three times a number decreased by two

7. the difference of twelve and a number

8. four more than five times a number

Write a verbal phrase for each algebraic expression.

9. $x + 7$

10. $b \div 9$

11. $13 - a$

12. $2(y + 4)$

13. $8n$

14. $4z - 6$

Name Date

Exponents and powers

Properties Used in Algebra

Numbers are often labeled as square numbers. A square number is a number that can be written as the product of two equal factors or as a power.

$16 = 4 \cdot 4$ or 4^2 (4^2 is expressed as 4 to the 2nd power, where 4 is the base, 2 is the exponent, and 4^2 is the power.)

Just as square numbers can be expressed in terms of exponents and powers, many other mathematical situations use them to simplify expressions.

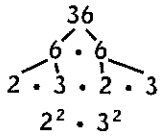
1. Write $a \cdot a \cdot a \cdot a$ using exponents.

   a^4 The exponent is 4 since a is multiplied by itself four times.

2. Express 6^3 as a product of factors and find its value.

   $6 \cdot 6 \cdot 6 = 216$ Multiply 6 by itself 3 times since the exponent is 3.

3. Find the prime factorization of 36. Write the answer using exponents.



   Factor each 6.
   Prime factorization
   $2^2 \cdot 3^2$
   2 has an exponent of 2 since 2 is multiplied by itself twice, and 3 has an exponent of 2 since 3 is multiplied by itself twice.

Write how you read each expression. Name the base and the exponent.

1. 7^2 **2.** a^8 **3.** 9^3

4. 3^6 **5.** 12^4 **6.** x^5

ite each expression using exponents.

• 9 • 9 • 9

8. 5 • 5 • 5 • 5 • 5 • 5

$b \cdot b \cdot b \cdot b \cdot b \cdot b$

10. $a \cdot a \cdot a$

e prime factorization of each number using exponents.

12. 99 **13.** 148 **14.** 54

15. Find the squares of 9 and 10.