NAME _____

Lesson 5.1 Using Exponents

Write each power as the product of factors.

	a	b	c
1.	3^5 _____	9^3 _____	2^7 _____
2.	10^2 _____	3^4 _____	2^8 _____
3.	7^3 _____	4^2 _____	7^2 _____
4.	9^3 _____	8^1 _____	12^2 _____
5.	5^4 _____	11^3 _____	6^5 _____
6.	4^4 _____	10^3 _____	8^6 _____

Use exponents to rewrite each expression.

7.	$3\times3\times3=$_____	$5\times5\times5\times5\times5=$_____	$2\times2\times2\times2\times2\times2=$_____
8.	$9\times9\times9=$_____	$4\times4\times4\times4\times4\times4\times4=$_____	$21\times21=$_____
9.	$10\times10\times10\times10=$_____	$8\times8\times8\times8\times8=$_____	$7\times7\times7\times7=$_____

Evaluate each expression.

10.	8^5 _____	2^8 _____	3^4 _____
11.	6^2 _____	9^1 _____	10^4 _____
12.	4^4 _____	7^4 _____	12^2 _____

NAME _____

Lesson 5.2 Parts of an Expression

A **variable** is a symbol, usually a letter of the alphabet, that stands for an unknown number, or quantity. a = variable

An **algebraic expression** is a combination of numbers, variables, and at least one operation. $x + 13$

A **term** is a number, variable, product, or quotient in an algebraic expression. In $3a + 5$, $3a$ is a term and 5 also is a term.

The term $3a$ means $3 \times a$. The number 3 is the coefficient of a. A **coefficient** is a number that multiplies a variable. In the expression $x + 5$, the coefficient of x is understood to be 1.

An **equation** is a sentence that contains an equal sign. $x + 13 = 25$

Identify each of the following as an *expression* or an *equation*.

	a	b	c
1.	$3 + x$ _____	$7 + 4 = 11$ _____	$55 \times n$ _____
2.	$x - 7 = 15$ _____	$b - 45$ _____	$24 = 6 \times 4$ _____

For each term below, identify the coefficient and the variable.

	a	b
3.	$3x$ coefficient _____ variable _____	$4y$ coefficient _____ variable _____
4.	z coefficient _____ variable _____	$5n$ coefficient _____ variable _____
5.	$7b$ coefficient _____ variable _____	m coefficient _____ variable _____
6.	r coefficient _____ variable _____	$6d$ coefficient _____ variable _____

Translate each phrase into an algebraic expression.

7.	five more than n _____	eight decreased by x _____
8.	x added to seven _____	the product of n and 11 _____

Translate each sentence into an equation.

9.	Six times a number is 18. _____	Seventy less a number is 29. _____
10.	Eight divided by a number is 2. _____	The product of 7 and 12 is 84. _____

Write the following expressions in words.

11. $6 - n = 3$ _____

12. $5 \times 13 = 65$ _____

NAME _____

Lesson 5.2 Parts of an Expression

Identify each of the following as an *expression* or an *equation*.

	a	b	c
1.	$8 + x$ _____	$9 + 7 = 16$ _____	$20 \times m = 60$ _____
2.	$b \div 5$ _____	$32 = 8 \times 4$ _____	43×7 _____
3.	$4h$ _____	$91 - 20 = 71$ _____	$17 + c$ _____
4.	$36 = 9 \times 4$ _____	$65 - x$ _____	$30f$ _____

For each term below, identify the coefficient and the variable.

	a	b
5.	$6g$ coefficient _____ variable _____	p coefficient _____ variable _____
6.	$5r$ coefficient _____ variable _____	$9t$ coefficient _____ variable _____
7.	$2x$ coefficient _____ variable _____	$4n$ coefficient _____ variable _____
8.	$3a$ coefficient _____ variable _____	$7d$ coefficient _____ variable _____
9.	$20s$ coefficient _____ variable _____	y coefficient _____ variable _____

Translate each phrase into an expression or an equation.

10.	the sum of 3 and b _____	8 times the sum of f and 7 _____
11.	product of 8 and d _____	p added to 4 equals 9 _____
12.	subtract 3 from 4 times m _____	r minus 2 is 8 _____
13.	4 times the sum of 5 and x _____	product of 10 and 2 _____
14.	12 times r minus 7 _____	the sum of 9 and k _____

NAME _____

Lesson 5.3 Writing Expressions

An **equation** is a number sentence that contains an equal sign.
An **expression** is a number phrase without an equal sign.
Equations and expressions may contain only numerals, or they also may contain variables. A **variable** is a symbol, usually a letter, that stands for an unknown number.

	Equation	*Expression*
Numerical	$3 \times 5 = 15$	$9 + 2$
Variable	$2n + 2 = 18$	$a - 5$

All equations and expressions express an idea.

3×4 means "three 4s." $6 \div 3 = 2$ means "6 divided by 3 is 2."

$n - 7$ means "n decreased by 7" or "a number decreased by 7."

$4n + 2 = 6$ means "four times a number, plus 2, is 6" or "4ns, plus 2, is 6."

Translate each phrase into an expression or an equation.

	a	b
1.	x increased by 5 _____	12 divided by a number _____
2.	seven ns _____	c less than 7 _____
3.	a number added to 15 is 23 _____	one-fourth of x _____
4.	p added to 6 _____	the product of 15 and m _____

Translate each sentence into an equation. Use n for an unknown number.

5. 11 decreased by a number is 7. _____
6. 8 times a number, plus 4, is 84. _____
7. A number divided by 5 is 6. _____

Write each expression in words.

8. $n - 5$ _____
9. $3n \div 6$ _____

NAME _____

Lesson 5.3 Writing Expressions

Translate each phrase into an algebraic expression or an equation.

	a	b
1.	subtract 8 from 3 times d _____	take away 3 from x _____
2.	g minus 2 is 14 _____	z is added to 8 _____
3.	the sum of 7 and z _____	2 is subtracted from 4 times d _____
4.	two-fifths of the sum of 6 and s _____	9 minus c _____
5.	10 minus x _____	subtract 9 from the product of 4 and f _____
6.	3 is subtracted from 5 times a _____	y minus 3 is 15 _____
7.	s is added to 9 _____	the sum of 8 and t _____
8.	take away 9 from h _____	one-third of the sum of 7 and k _____

Write each expression in words.

9. $9 \div x$ _____

10. $3 \times g = 27$ _____

11. $6 \times m - 4$ _____

12. $\frac{1}{2} \times b + 9 = 11$ _____

13. $14 \div p$ _____

14. $6 \times b = 42$ _____

15. $9 \times d - 10$ _____

16. $\frac{1}{4} \times t + 8 = 16$ _____

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. $12 + 8 \div 4; 5$

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. $6x - 2y$ — 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. $4x + (5 + 3y) - 13$ — 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

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. $4z - 6$