What you will learn about:
Introduction to Whole Numbers

Counting Numbers

Whole Numbers

Comparing Numbers

Number Line

Place Values

Place Value														
Trillions			Billions			Millions			Thousands			Ones		
Hundred trillions	Ten trillions	Trillions	Hundred billions	Ten billions	Billions	Hundred millions	Ten millions	Millions	Hundred thousands	Ten thousands	Thousands	Hundreds	Tens	Ones
								5	2	7	8	1	9	4

Whole numbers in words	In the numbers below find the place value of each digit 27,493,615 a) 2 b) 1 c) 4 d)7 e)5 519,711,641,328 a) 9 b) 4 c) 2 d) 6 e) 7 Write 74,218,369 in words. Name the number 9,258,137,904,061 using words. Name the number 17,864,325,619,004 using words.

Write a whole number using digits	Write the number two billion, four hunderd sixty-six million, seven hundred fourteen thousand, fifty-one as a whole number using digits. Write the nmber eleven billion, nune hundred twenty-two million, eight hundred thirty thousand, one hundred six as a whole number using digits.
Rounding Whole Numbers	In 2013 the U.S. Census Bureau estimated the popluation of the state of New York as 19,651,127. We could say that the population of New York was appoximately 20 million. In many cases, you don'd need the exact value; and appoximate number is good enough. Round to the nearest hundred: 17,852 Round 103,978 to the nearest a) hundred b) thousand c) ten thousand Round 784,951 to the nearest a) ten b) hundred c) hundred thousand

Multiples and Apply Divisibility Tests

Multiples of 2

Multiples of 3

Counting #	1	2	3	4	5	6	7	8	9	10	11	12
Multipes of 2												
Multipes of 3												
Multipes of 4												
Multipes of 5												
Multipes of 6												
Multipes of 7												
Multipes of 8												
Multipes of 9												
Multipes of 10												

Divisibility by a number

A number is divisible by:

- 2
- 3
- 5
- 6
- 10

Determine whether 4,962 is divisible by 2, 3, 5, 6, and by 10.

Determine whether 3,765 is divisible by 2, 3, 5, 6, and by 10.

Prime Factorization and Least Common Multiple

Factors

Prime Number

Composite Number

Number	Factors	Prime or Composite?
2	1,2	Prime
3	1,3	Prime
4	1,2,4	Composite
5	1,5	Prime
6	1,2,3,6	Composite
7	1,7	Prime
8	1,2,4,8	Composite
9	1,3,9	Composite
10	1,2,5,10	Composite

Number	Factors	Prime or Composite?
11	1,11	Prime
12	1,2,3,4,6,12	Composite
13	1,13	Prime
14	1,2,7,14	Composite
15	1,3,5,15	Composite
16	1,2,4,8,16	Composite
17	1,17	Prime
18	1,2,3,6,9,18	Composite
19	1,19	Prime

Prime Factorization

Factor Tree

Find the prime factorization of 80

Find the prime factorization of 63

Find the prime factorization of 252

Find the prime factorization of 126

	Find the prime factorization of 294.
Common Multiple	Find the common multiples of 18 and 24. Find the LCM.
Least Common Multiple (LCM)	Find the common multiples of 15 and 20. Find the LCM
Using prime factorization to find the LCM	Find the LCM of 12 and 18 using the prime factors method.
	Find the LCM of 24 and 36 using the prime factors method.

Summary	Carl purchased a new house. The cost of the house was $253,926. The bank wrote a check for the house. Write the purchase in words. Julia is building a workshop on her garage. The addition will cost her $15,532. Round the amount to the nearest thousand. Hamburger buns are sold in packeges of 10. Hambergures are sold in packages of 12. What is the smallest number of that makes the buns come out even?

What you will learn about:
How to Use the Language of Algebra

Use of variables and algebraic symbols

Suppose this year Greg is 20 years old and Alex is 23. You know that Alex is 3 years older than Greg. When Greg was 12, Alex was 15. When Greg is 35, Alex will be 38. No matter what Greg's age is, Alex's age will always be 3 years more, right? In the language of algebra, we say that Greg's age and Alex's age are **variables** and the 3 is a **constant**. The ages change ("vary") but the 3 years between them always stays the same ("constant"). Since Greg's age and Alex's age will always differ by 3 years, 3 is the *constant*.

In algebra, we use letters of the alphabet to represent variables. So if we call Greg's age g, then we could use $g + 3$ to represent Alex's age. See Table 1.2.

Greg's age	Alex's age
12	15
20	23
35	38
g	g + 3

Variable

Constant

The four basic operations arithmetic operations: addition, subtraction, multiplicatioin, and division.

Operation	Notation	Say:	The result is...
Addition	$a + b$	*a* plus *b*	the sum of *a* and *b*
Subtraction	$a - b$	*a* minus *b*	the difference of *a* and *b*
Multiplication	$a \cdot b, ab, (a)(b), (a)b, a(b)$	*a* times *b*	the product of *a* and *b*
Division	$a \div b, a/b, \frac{a}{b}, b\overline{)a}$	*a* divided by *b*	the quotient of *a* and *b*, *a* is called the dividend, and *b* is called the divisor

Equality

EQUALITY SYMBOL

$a = b$ is read "a is equal to b"

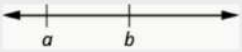
The symbol "=" is called the **equal sign**.

Inequality

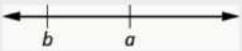
On the number line, the number gets larger as they go from left to right. The number line can be used to explain the symbols "<" and ">."

INEQUALITY

$a < b$ is read "a is less than b"
a is to the left of b on the number line



$a > b$ is read "a is greater than b"
a is to the right of b on the number line



Inequality Symbols	Words
$a \neq b$	a is *not equal to* b
$a < b$	a is *less than* b
$a \leq b$	a is *less than or equal to* b
$a > b$	a is *greater than* b
$a \geq b$	a is *greater than or equal to* b

Tanslate from algebra to English

$17 \leq 26$ $8 \neq 17 - 3$

$12 > 27 \div 3$ $y + 7 < 19$

Grouping Symbols

Typles of Grouping Symbols

-
-
-
-
-

Expression

Expression	Words	English Phrase
$3 + 5$	3 plus 5	the sum of three and five
$n - 1$	n minus one	the difference of n and one
$6 \cdot 7$	6 times 7	the product of six and seven
$\frac{x}{y}$	x divided by y	the quotient of x and y

Equation

Equation	English Sentence
$3 + 5 = 8$	The sum of three and five is equal to eight.
$n - 1 = 14$	n minus one equals fourteen.
$6 \cdot 7 = 42$	The product of six and seven is equal to forty-two.
$x = 53$	x is equal to fifty-three.
$y + 9 = 2y - 3$	y plus nine is equal to two y minus three.

	Determine if each is an expression or and equation. $2(x+3)=10$ $4(y-1)+1$ $x \div 25$ $y+8=40$
Exponential Expression	a^n
Order of Operations	PEMDAS GEMDAS Simplify: $12-5\cdot 2$ $(12-5)\cdot 2$

	Simplify: $18 \div 6 + 4(5 - 2)$ $\quad\quad$ $5 + 2^3 + 3[6 - 3(4 - 2)]$ $9 + 5^3 - [4(9 + 3)]$ $\quad\quad$ $7^2 - 2[4(5 + 1)]$
Evaluate an Expression	Evaluate $7x - 4$ When *x = 5* $\quad\quad$ When *x = 1* Evaluate $x^2 \; and \; 3^x, when \; x = 4.$ Evaluate $2x^2 + 3x + 8$ when x = 4

Term Coefficient	Identify the coeffiecent of each term a) 14y b) $15x^2$ c) a
Like Terms	Identify the like terms $y^3, 7x^2, 14, 23, 4y^3, 9x, 5x^2$ $9, 2x^3, y^2, 8x^3, 15, 9y, 11y^2$
	Idenify the terms in each expression $4x^2 + 5x + 17$ $5x + 2y$

Combining like terms

Like Terms

Simplify: $2x^2 + 3x + 7 + 4x + 5 + x^2$

Simplify: $4y^2 + 2 + 5y + 4y + 8y^2 + 5$

Translating an English Phrase to an Algebraic Expression

Operation	Phrase	Expression
Addition	a plus b the sum of a and b a increased by b b more than a the total of a and b b added to a	$a + b$
Subtraction	a minus b the difference of a and b a decreased by b b less than a b subtracted from a	$a - b$
Multiplication	a times b the product of a and b twice a	$a \cdot b, ab, a(b), (a)(b)$ $2a$
Division	a divided by b the quotient of a and b the ratio of a and b b divided into a	$a \div b, a/b, \frac{a}{b}, b\overline{)a}$

Translate each English phrase into an alegbraic expression

a) the difference of 17x and 5

b) the quatient of $10x^2$ and 7

c) the sum of $17y^2$ and 19

d) the product of 7 and z

e) Seventeen more than y

f) Nine less than the product of nine and x squared

g) five time the the sum of m and n

h) the sum of five times m and n

g) the difference of two times x and eight

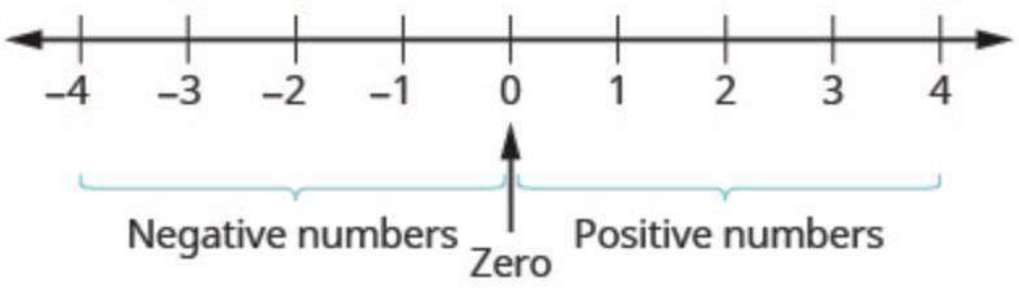
h) The length of a rectangle is six less than the width. Let w represent the with of the retangle. Write an expression for the length of the retangle.

i) Lauren has dimes and nickels in her purse. The number of dimes is three more than seven times the number of nickels. Let n represent the number of nickels. Write the expression for the number of dimes.

Summary	Justin's car insurance has $750 deductible per incident. This means that he pays $750 and his insurnace company will pay all costs beyond $750. If Justin files a claim for $2,100. a) How much will he pay? b) How much will the insurance company pay? Simplify: $3(1 + 9 \cdot 6) - 4^2$ $\qquad$ $33 \div 3 + 8 \cdot 2$ $4 \cdot \frac{12}{8}$ $\qquad$ $4 + 6(3 + 6)$ $3^2 - 18 \div (11 - 5)$

What you will learn about:
Add and Subtract Integers

Use Negatives and Opposites



Numbers to the left of zero are neagative and numbers to the right of zero are positive. Zero is neutral and is the only number that is not positive or negative.

Moving to the right numbers get bigger and moving to the left numbers get smaller.

Order each of the following pairs of numbers using < or >

14___6 -1____9 -1 ____-4 2 _____-20

Opposite of a Number

Sometimes in algebra the same symbol has different meanings. Just like some words in English, the specific meaning becomes clear by looking at how it is used. You have seen the symbol "–" used in three different ways.

$10 - 4$	Between two numbers, it indicates the operation of *subtraction*. We read $10 - 4$ as "10 minus 4."
-8	In front of a number, it indicates a *negative* number. We read -8 as "negative eight."
$-x$	In front of a variable, it indicates the *opposite*. We read $-x$ as "the opposite of x."
$-(-2)$	Here there are two "–" signs. The one in the parentheses tells us the number is negative 2. The one outside the parentheses tells us to take the *opposite* of -2. We read $-(-2)$ as "the opposite of negative two."

Figure 1.9 The opposite of 3 is –3.

Opposite Notation

Integers	Evaluate x when x = -8 Evalutate –x when x = -8 Evaluate –x when x =8
Absolute Value	Evaluate: $\|3\|$ $\|-44\|$ $\|0\|$ $-\|25\|$ Fill in <. > or = for each pf the following pairs of numbers. $7\_\_\_\_ - \|-7\|$ $-(-10)\_\_\_\_ - \|-10\|$ $\|-4\|\_\_\_\_\_ - \|-4\|$ $-1\_\_\_\_\_\|-1\|$

Adding Integers

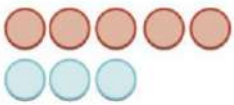
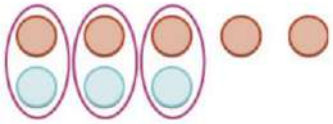
Simplify

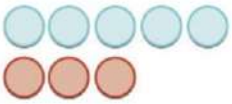
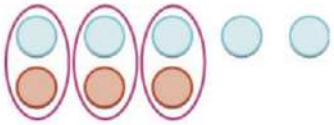
$24 - |19 - 3(6 - 2)|$ $19 - |11 - 4(3 - 1)|$

Add:

$1 + 4$ $-1 + (-4)$

$8 + 2$ $-8 + (-2)$

	–5 + 3 means the sum of –5 and 3.
We start with 5 negatives.	
And then we add 3 positives.	
We remove any neutral pairs.	
We have 2 negatives left.	 2 negatives
The sum of –5 and 3 is –2.	–5 + 3 = –2

	5 + (−3) means the sum of 5 and −3.
We start with 5 positives.	
And then we add 3 negatives.	
We remove any neutral pairs.	
We have 2 positives left.	 2 positives
The sum of 5 and −3 is 2.	5 + (−3) = 2

Add:

$-1 + 5$ $1 + (-5)$

$-2 + 4$ $2 + (-4)$

$37 + (-53)$ $-74 + (-27)$

$-31 + (-19)$ $15 + (-32)$

$-5 + 3(-2 + 7)$ $-42(-3 + 5)$

Subtracting Integers

We start with 5 positives.	
We 'take away' 3 positives.	
We have 2 positives left.	
The difference of 5 and 3 is 2.	2

Now we will subtract $-5-(-3)$. Watch for similarities to the last example $5-3=2$.

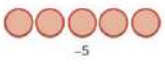
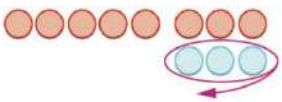
To subtract $-5-(-3)$, we restate this as "–5 take away –3"

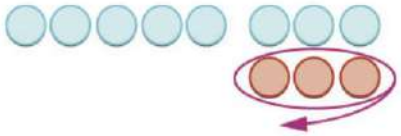
We start with 5 negatives.	
We 'take away' 3 negatives.	
We have 2 negatives left.	
The difference of –5 and –3 is –2.	–2

Subtract:

$7-5$ $-7-(-5)$

$12-8$ $-12-(-4)$

	–5 – 3 means –5 take away 3.
We start with 5 negatives.	 –5
We now add the neutrals needed to get 3 positives.	
We remove the 3 positives.	
We are left with 8 negatives.	 8 negatives
The difference of –5 and 3 is –8.	–5 – 3 = –8

	5 – (–3) means 5 take away –3.
We start with 5 positives.	
We now add the needed neutrals pairs.	
We remove the 3 negatives.	
We are left with 8 positives.	 8 positives
The difference of 5 and –3 is 8.	5 – (–3) = 8

Subtract:

$-3-1$ $3-(-1)$

$-6-4$ $6-(-4)$

Simplify:

$13-8$ $13+(-8)$

$-17-9$ $-17+(-9)$

Simplify:

$9 - (-15)$ $-7 - (-4)$

$7 - (-4 - 3) - 9$ $18 - |2 - 7|$

$-12 + 2|3 - 4|$ $-14 + (-18) + 10$

$6 - 38 + 27 + (-8) + 126$ $32 - [5 - (15 - 20)]$

$3^2 - 4^2$

In June 2011, the state of Pennsylvania estimated it would have a budget surplus of $540 million. The same month, Texas estimated it would have a budget deficit of $27 billion. Use the integers to the budget of Pennsylvania and Texas.