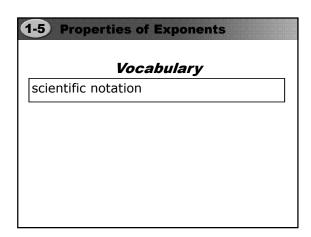
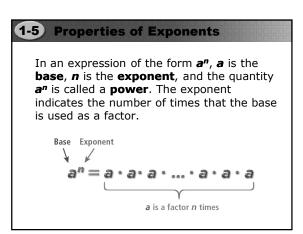
Starter 1.5 HW Simplify.	1.3???, Short Quiz 1.3 & 1.4
1. 4 • 4 • 4 64	2. $\frac{1}{2 \cdot 2 \cdot 2 \cdot 2}$ $\frac{1}{16}$
3. $\frac{10 \cdot 10 \cdot 2}{10}$ 20	4. $\left(\frac{2}{3}\right)^2 \frac{4}{9}$
5. $\frac{1}{4^2}$ $\frac{1}{16}$	6. 10 ⁵ 100,000
7. 3 × 10 ⁴ 30,000	

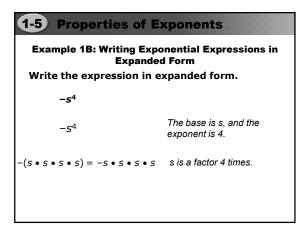
1-5 Properties of Exponents
Objectives
Simplify expressions involving
exponents.
Use scientific notation.



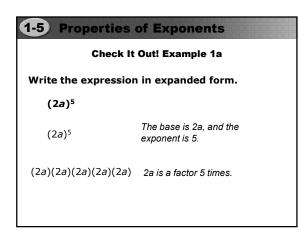


	n parenthes		e than one symb	01,
Expon	ential Form	Base	Expanded Form	
	$-2x^{3}$	x	$-2(x \cdot x \cdot x)$	
	$-(2x)^{3}$	2 <i>x</i>	-(2x)(2x)(2x)	
	$(-2x)^{3}$	-2 <i>x</i>	(-2x)(-2x)(-2x)	

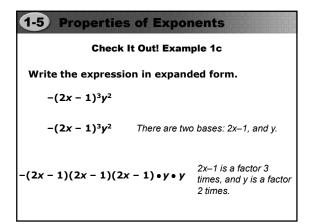
Example 1A: V	Vriting Exponential Expressions in Expanded Form
Write the expr	ession in expanded form.
(5 <i>z</i>) ²	
(5 <i>z</i>) ²	The base is 5z, and the exponent is 2.
(5z)(5z)	5z is a factor 2 times.



1-5 Properties	of Exponents
Example 1C: Writing Exponential Expressions in Expanded Form Write the expression in expanded form.	
$3h^{3}(k+3)^{2}$	
$3h^3(k+3)^2$	There are two bases: h and k + 3.
3(h)(h)(h)(k + 3)(k +	- 3) h is a factor 3 times, and k + 3 is a factor 2 times.

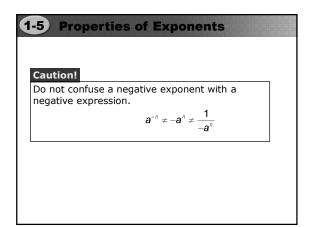


1-5 Propertie	es of Exponents
Chec	k It Out! Example 1b
Write the express	sion in expanded form.
3 <i>b</i> ⁴	
3 <i>b</i> ⁴	The base is b, and the exponent is 4.
3•b•b•b•b	b is a factor 4 times.

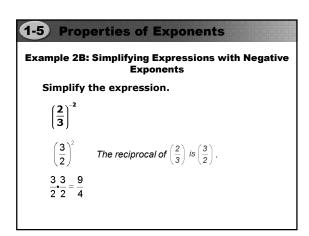


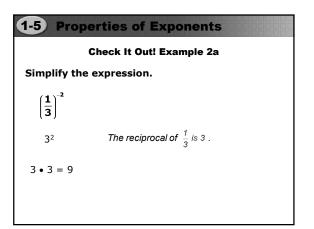
	f Exponents	
ero and Negative Exponent For all nonzero real numbers a and in		
WORDS	NUMBERS	ALGEBRA
Zero Exponent Property		
A nonzero quantity raised to the zero power is equal to 1.	$100^{0} = 1$	a ⁰ = 1
Negative Exponent Property		
A nonzero base raised to a negative exponent is equal to the	$7^{-2} = \left(\frac{1}{7}\right)^2 = \frac{1}{7^2}$	$a^{-n} = \left(\frac{1}{a}\right)^n = \frac{1}{a^n}$
reciprocal of the base raised to the opposite, positive exponent.	$\left(\frac{3}{2}\right)^{-4} = \left(\frac{2}{3}\right)^4$	$\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^{n}$

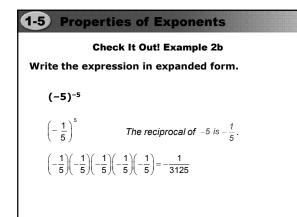
Algebra 2 / Trigonometry 1.5: Properties of Exponents



1-5 Prope	rties of Exponents
Example 2A: S	implifying Expressions with Negative Exponents
Simplify th	e expression.
3-2	
$\frac{1}{3^2}$	The reciprocal of 3 is $\frac{1}{3}$.
$\frac{1}{3\cdot 3} = \frac{1}{9}$	



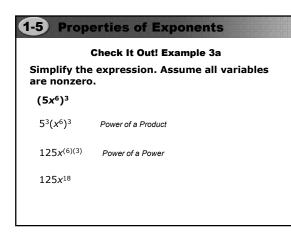


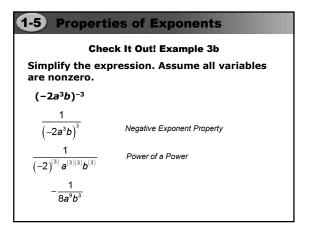


For all nonzero real numbers a and b and inte	and n	
WORDS	NUMBERS	ALGEBRA
Product of Powers Property		
To multiply powers with the same base, add the exponents.	$4^3 \cdot 4^2 = 4^{3+2} = 4^5$	$a^m \cdot a^n = a^{m+n}$
Quotient of Powers Property		
To divide powers with the same base, subtract the exponents.	$\frac{3^7}{3^2} = 3^{7-2} = 3^5$	$\frac{a^m}{a^n} = a^{m-n}$
Power of a Power Property		
To raise one power to another, multiply the exponents.	$(4^3)^2 = 4^{3 \cdot 2} = 4^6$	$(a^m)^n = a^m \cdot n$
Power of a Product Property		
To find the power of a product, apply the exponent to each factor.	$(3\cdot 4)^2 = 3^2\cdot 4^2$	$(ab)^m = a^m b^m$
Power of a Quotient Property		
To find the power of a quotient, apply the exponent to the numerator and denominator.	$\left(\frac{3}{5}\right)^2 = \frac{3^2}{5^2}$	$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$

1-5 Properties	of Exponents
	g Properties of Exponents to lify Expressions
Simplify the expres are nonzero.	ssion. Assume all variables
$3z^{7}(-4z^{2})$	
$3 \cdot (-4) \cdot z^7 \cdot z^2$	
-12 <i>z</i> ^{7 + 2}	Product of Powers
-12 <i>z</i> ⁹	Simplify.

Example 3B: Usin	of Exponents g Properties of Exponents to lify Expressions
Simplify the express are nonzero. $\left(\frac{yz^3}{z^5}\right)^3$	sion. Assume all variables
$(yz^{3-5})^3 = (yz^{-2})^3$	Quotient of Powers
y ³ (z ⁻²) ³	Power of a Product
$y^{3}z^{(-2)(3)}$	Power of a Product
$\boldsymbol{y}^{3}\boldsymbol{z}^{-6}=\frac{\boldsymbol{y}^{3}}{\boldsymbol{z}^{6}}$	Negative of Exponent Property



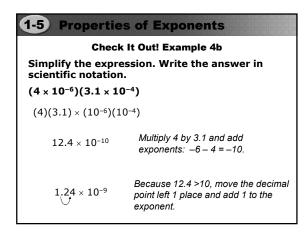


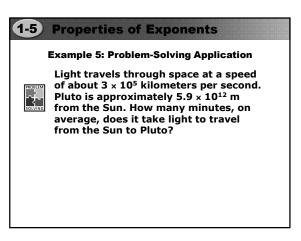
notation, a nur	ing powers of 10. In s nber takes a form <i>m</i> d <i>n</i> is an integer.	
Scientific Notation	Move the decimal	Standard Notation
1.275×10^{7}	Right 7 places	12,750,000
1.275 × 10	5	
3.5×10^{-7}	Left 7 places	0.00000035

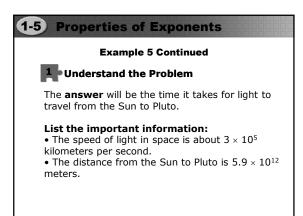
1-5 Properties of Exponents		
Example 4A: Simplifying Expressions Involving Scientific Notation Simplify the expression. Write the answer in		
scientific notation.		
$\frac{4.5 \times 10^{-5}}{1.5 \times 10^{6}}$		
$\left(\frac{4.5}{1.5}\right) \times \left(\frac{10^{-5}}{10^6}\right)$	$\frac{\mathbf{a} \cdot \mathbf{b}}{\mathbf{c} \cdot \mathbf{b}} = \frac{\mathbf{a}}{\mathbf{c}} \cdot \frac{\mathbf{b}}{\mathbf{d}}$	
3.0×10^{-11}	Divide 4.5 by 1.5 and subtract exponents: -5 - 6 = -11.	

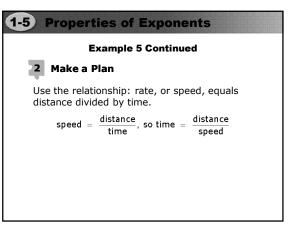
1-5 Propertie	s of Exponents	
Example 4B: Simplifying Expressions Involving Scientific Notation Simplify the expression. Write the answer in scientific notation.		
(2.6 × 10 ⁴)(8.5 × 10 ⁷)		
$(2.6)(8.5) \times (10^4)(10^7)$		
$\textbf{22.1}\times\textbf{10}^{11}$	Multiply 2.6 and 8.5 and add exponents: 4 + 7 = 11.	
2.21×10^{12}	Because 22.1 > 10, move the decimal point left 1 place and add 1 to the exponent.	

1-5 Propertie	es of Exponents	
Check It Out! Example 4a Simplify the expression. Write the answer in scientific notation.		
9.3×10 ⁹		
$\left(\frac{2.325}{9.3}\right) \times \left(\frac{10^6}{10^9}\right)$	$\frac{a \cdot b}{c \cdot b} = \frac{a}{c} \cdot \frac{b}{d}$	
$0.25 imes 10^{-3}$	Divide 2.325 by 9.3 and subtract exponents: 6 – 9 = –3.	
,2.5 × 10 ⁻⁴	Because 0.25 < 10, move the decimal point right 1 place and subtract 1 from the exponent.	









Algebra 2 / Trigonometry 1.5: Properties of Exponents

