Notes 1.2→Be familiar with these powers:

	2	3	4	5	6	7	8	9
$2^0 =$	1	1	1	1	1	1	1	1
$2^1 =$	2	3	4	5	6	7	8	9
$2^2 =$	4	9	16	25	36	49	64	81
$2^3 =$	8	27	64	125	216	343	512	729
$2^4 =$	16	81	256	625				
$2^5 =$	32	243						
$2^6 =$	64							
$2^7 =$	128							
$2^8 =$	256							

These values are reasonable to find without a calculator!

See notes in ebook regarding exponent rules!

Exponents and Radicals

$$x^m x^n = x^{m+n}$$

$$(x^m)^n = x^{mn}$$

$$(xy)^n = x^n y^n$$

$$x^{1/n} = \sqrt[n]{x}$$

$$\sqrt[n]{xy} = \sqrt[n]{x}\sqrt[n]{y}$$

$$\sqrt[m]{\sqrt[n]{x}} = \sqrt[n]{\sqrt[m]{x}} = \sqrt[mn]{x}$$

$$\frac{x^m}{x^n} = x^{m-n}$$

$$x^{-n} = \frac{1}{x^n}$$

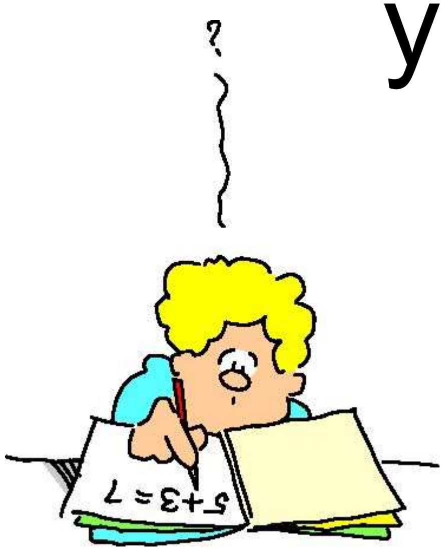
$$\left(\frac{x}{y}\right)^n = \frac{x^n}{y^n}$$

$$x^{m/n} = \sqrt[n]{x^m} = \left(\sqrt[n]{x}\right)^m$$

$$\sqrt[n]{\frac{x}{y}} = \frac{\sqrt[n]{x}}{\sqrt[n]{y}}$$

Warm-up: Exponents

Quiz yourself and see what you remember!!



Actual quiz will be on Tuesday.

NO CALCULATOR!!

NO CALCULATOR!!

Simplify. (Keep in exponential form.)

1. $a^3 \bullet a^4 =$
2. $2^3 \bullet 2^4 =$
3. $(a^3)^4 =$
4. $(5^3)^4 =$
5. $\dfrac{a^8}{a^2} =$
6. $\dfrac{4^8}{4^2} =$
7. $\left(\dfrac{a}{b}\right)^5 =$
8. $(ab)^5 =$
9. $(a^2b^3)^5 =$
10. $(2a^2b^3)^5 \bullet 3a^4b^{10} =$
11. $(9x^8)^{1/2} =$

(#12-20 should not contain exponents.)

12. $25^{1/2} =$
13. $(-27)^{1/3} =$
14. $16^{1/4} =$
15. $4^{3/2} =$
16. $-3^4 =$
17. $(-3)^4 =$
18. $3^{-2} =$
19. $5^0 =$
20. $0^5 =$

Rewrite without negative exponents and simplify:

21. $\dfrac{x^{-2}y^3}{4^{-1/2}}$

Warm-up (practice quiz)

Check answers:

1. a^7
2. 2^7
3. a^{12}
4. 5^{12}
5. a^6
6. 4^6
7. $\dfrac{a^5}{b^5}$
8. a^5b^5
9. $a^{10}b^{15}$
10. $32a^{10}b^{15} \bullet 3a^4b^{10} = \boxed{96a^{14}b^{25}}$
11. $3x^4$

Warm-up (practice quiz)

Check answers:

12. **5**
13. **-3**
14. **2**
15. **8**
16. **-81**
17. **81**
18. **1/9**
19. **1**
20. **0**

Now for the last problem:

21. $$\frac{x^{-2}y^{3}}{4^{-1/2}} = \frac{4^{\frac{1}{2}} \cdot y^{3}}{x^{2}} = \boxed{\frac{2y^{3}}{x^{2}}}$$

1.1 from yesterday
Refer to book for extra examples:

Example 4 Union and Intersection of Sets

If $S = \{1,2,3,4,5\}$, $T = \{4,5,6,7\}$, and $V = \{6,7,8\}$, find the sets $S \cup T$, $S \cap T$, and $S \cap V$.

Solution

$S \cup T = \{1,2,3,4,5,6,7\}$ All elements in S or T

$S \cap T = \{4,5\}$ Elements common to both S and T

$S \cap V = \emptyset$ S and V have no element in common

Now Try Exercise 41

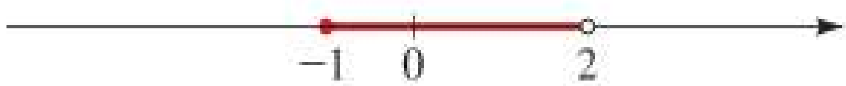
Compare to #41-43

1.1 Similar to #47-59odd:

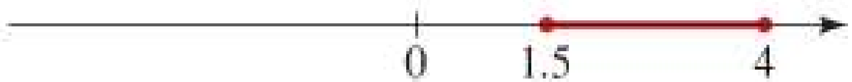
Example 5 **Graphing Intervals**

Express each interval in terms of inequalities, and then graph the interval.

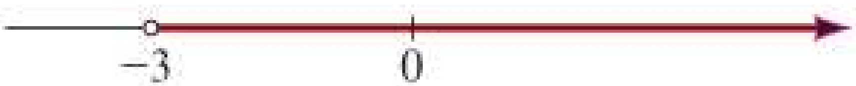
(a) $[-1, 2) = \{x \mid -1 \le x < 2\}$



(b) $[1.5, 4] = \{x \mid 1.5 \le x \le 4\}$



(c) $(-3, \infty) = \{x \mid -3 < x\}$



Now Try Exercise 47

1.1 Example for #77 can be found under intro notes for "real numbers"

Note

A repeating decimal such as

$$x = 3.5474747\ldots$$

is a rational number. To convert it to a ratio of two integers, we write

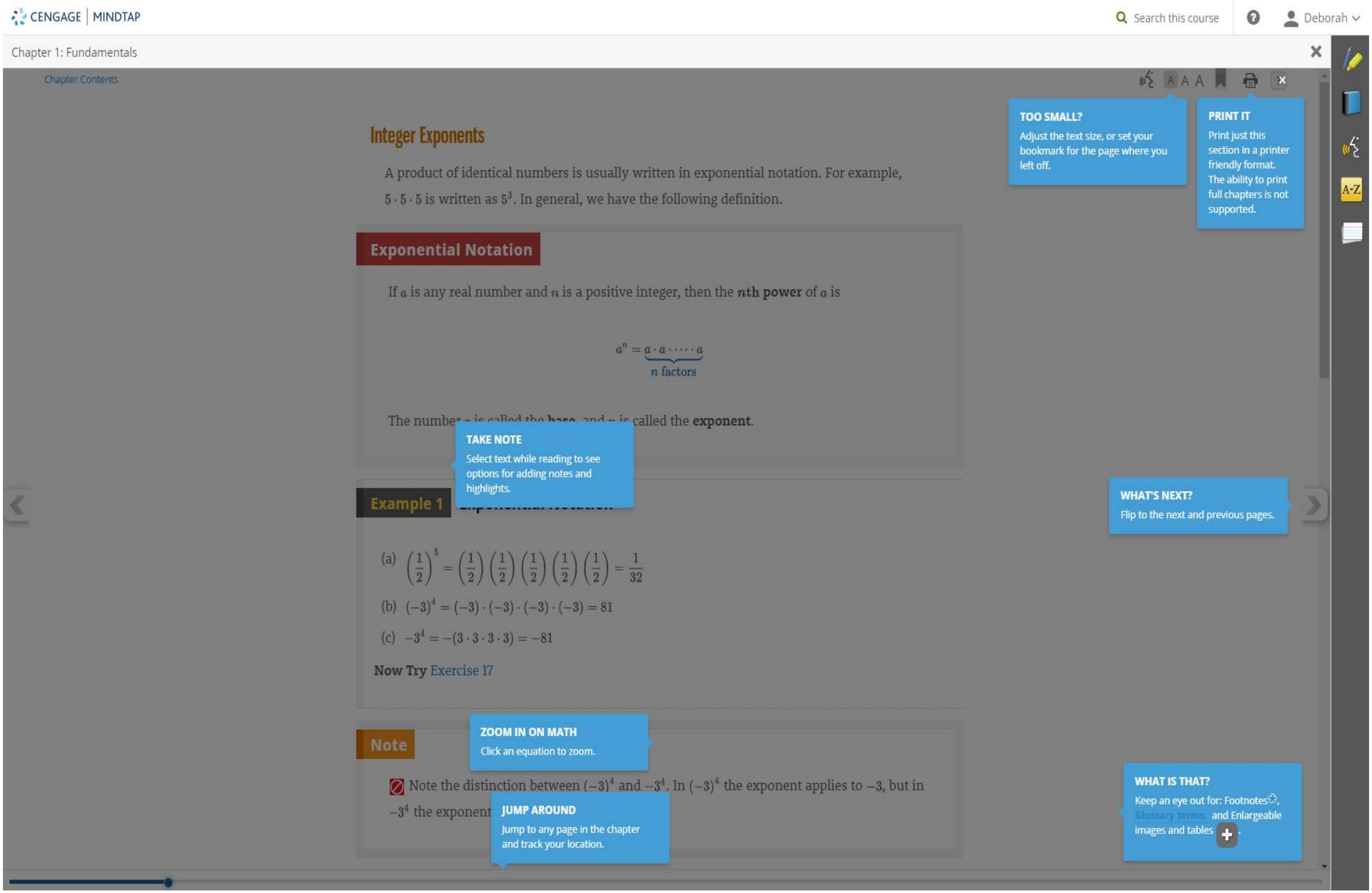
$$\begin{aligned} 1000x &= 3547.47474747\ldots \\ 10x &= 35.47474747\ldots \\ \hline 990x &= 3512.0 \end{aligned}$$

Thus $x = \frac{3512}{990}$. (The idea is to multiply x by appropriate powers of 10 and then subtract to eliminate the repeating part.)

1.1 from yesterday:
If you have questions, see ebook for examples that are similar to the assigned problems.

Assigned problem	See ebook for example
#23-28	#1 and #2
#30	#3
#41-43	#4
#47-59 odd	#5
#69-72	#7
#75	#8
#77	See intro notes/example for real numbers

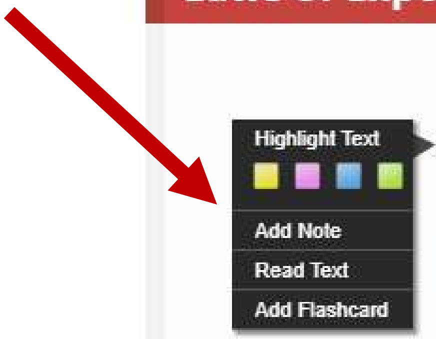
Helpful tips for navigating the ebook:



Helpful tips for navigating the ebook:

Familiarity with the following rules is essential for our work with exponents and bases. In the table the bases a and b are real numbers, and the exponents m and n are integers.

Laws of Exponents

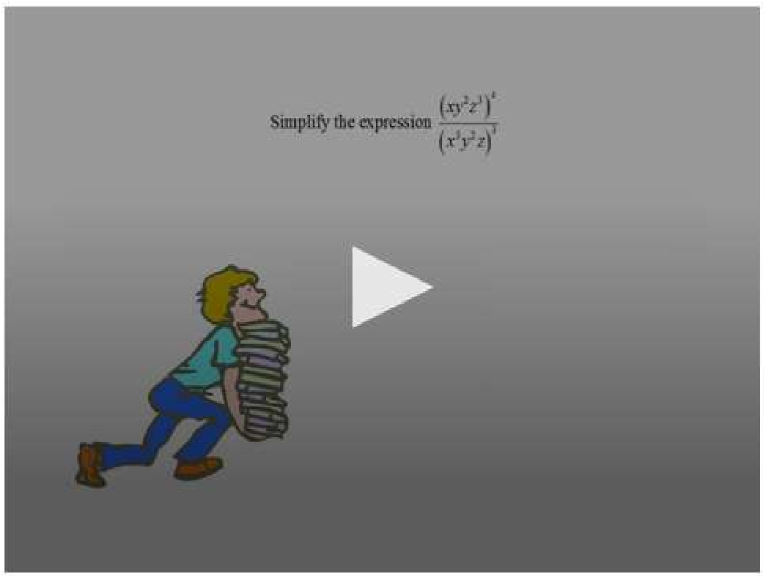


Law	Example	Description
1. $a^m a^n = a^{m+n}$	$3^2 \cdot 3^5 = 3^{2+5} = 3^7$	To multiply two powers of the same number, add the exponents.
2. $\frac{a^m}{a^n} = a^{m-n}$	$\frac{3^5}{3^2} = 3^{5-2} = 3^3$	To divide two powers of the same number, subtract the exponents.
3. $(a^m)^n = a^{mn}$	$(3^2)^5 = 3^{2\cdot 5} = 3^{10}$	To raise a power to a new power, multiply the exponents.
4. $(ab)^n = a^n b^n$	$(3 \cdot 4)^2 = 3^2 \cdot 4^2$	To raise a product to a power, raise each factor to the power.
5. $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$	$\left(\frac{3}{4}\right)^2 = \frac{3^2}{4^2}$	To raise a quotient to a power, raise both numerator and denominator to the power.
6. $\left(\frac{a}{b}\right)^{-n} = \left(\frac{b}{a}\right)^n$	$\left(\frac{3}{4}\right)^{-2} = \left(\frac{4}{3}\right)^2$	To raise a fraction to a negative power, invert the fraction and change the sign of the exponent.
7. $\frac{a^{-n}}{b^{-m}} = \frac{b^m}{a^n}$	$\frac{3^{-2}}{4^{-5}} = \frac{4^5}{3^2}$	To move a number raised to a power from numerator to denominator or from denominator to numerator, change the sign of the exponent.

Look for videos with further information and explanations:

Rules for Working with Exponents

Video: Rules for Working with Exponents



Helpful tips for navigating the ebook:

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Chapter 1: Fundamentals

Chapter Contents

1.3 Algebraic Expressions

A **variable** is a letter that can represent any number from a given set of numbers. If we start with variables, such as x, y, and z, and some real numbers and combine them using addition, subtraction, multiplication, division, powers, and roots, we obtain an **algebraic expression**. Here are some examples:

2x2-3x+4x+10y-2zy2+4

A **monomial** is an expression of the form axk, where a is a real number and k is a nonnegative integer. A **binomial** is a sum of two monomials and a **trinomial** is a sum of three monomials. In general, a sum of monomials is called a *polynomial*. For example, the first expression listed above is a polynomial, but the other two are not.

Polynomials

A **polynomial** in the variable x is an expression of the form

anxn+an-1xn-1+⋯+a1x+a0

where a0,a1,...,an are real numbers, and n is a nonnegative integer. If an≠0, then the polynomial has **degree** n. The monomials akxk that make up the polynomial are called the **terms** of the polynomial.

Note that the degree of a polynomial is the highest power of the variable that appears in the polynomial.

Polynomial	Type	Terms	Degree
2x2-3x+4	trinomial	2x2, -3x, 4	2
x8+5x	binomial	x8, 5x	8

Move to any section of current chapter