

Notes 1.2 → Be familiar with these powers:

	<u>2</u>	<u>3</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>	<u>9</u>
$2^0 =$	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

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

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

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

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

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

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

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

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

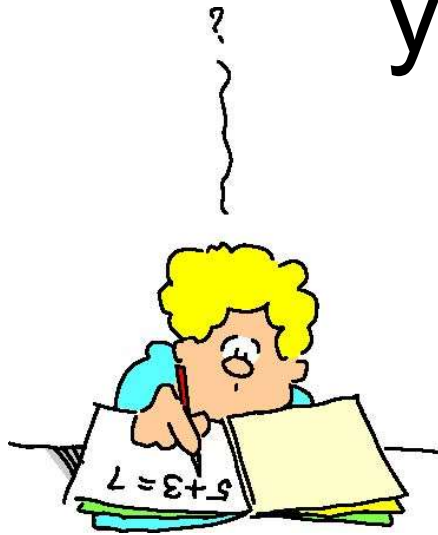
$$\left(\frac{x}{y}\right)^n = \frac{x^n}{y^n}$$

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

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

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. $a^3 \cdot a^4 =$

2. $2^3 \cdot 2^4 =$

3. $(a^3)^4 =$

4. $(5^3)^4 =$

5. $\frac{a^8}{a^2} =$

6. $\frac{4^8}{4^2} =$

7. $\left(\frac{a}{b}\right)^5 =$

8. $(ab)^5 =$

9. $(a^2b^3)^5 =$

10. $(2a^2b^3)^5 \cdot 3a^4b^{10} =$

11. $(9x^8)^{\frac{1}{2}} =$

(#12-20 should not contain exponents.)

12. $25^{\frac{1}{2}} =$

13. $(-27)^{\frac{1}{3}} =$

14. $16^{\frac{1}{4}} =$

15. $4^{\frac{3}{2}} =$

16. $-3^4 =$

17. $(-3)^4 =$

18. $3^{-2} =$

19. $5^0 =$

20. $0^5 =$

Rewrite without negative exponents and simplify:

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

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. $\frac{a^5}{b^5}$

8. $a^5 b^5$

9. $a^{10} b^{15}$

10. $32a^{10} b^{15} \cdot 3a^4 b^{10} = \boxed{96a^{14} b^{25}}$

11. $3x^4$

Warm-up (practice quiz)

Check answers:

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

Now for the last problem:

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

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

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

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

$$S \cap V = \emptyset \quad S \text{ and } V \text{ have no element in common}$$

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) $[-1, 2) = \{x \mid -1 \leq x < 2\}$ 

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

(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

$$x = 3.5474747 \dots$$

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

$$\begin{array}{r} 1000x = 3547.47474747 \dots \\ 10x = 35.47474747 \dots \\ \hline 990x = 3512.0 \end{array}$$

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:

Integer Exponents

A product of identical numbers is usually written in exponential notation. For example, $5 \cdot 5 \cdot 5$ is written as 5^3 . In general, we have the following definition.

Exponential Notation

If a is any real number and n is a positive integer, then the n th power of a is

$$a^n = \underbrace{a \cdot a \cdot \cdots \cdot a}_{n \text{ factors}}$$

The number a is called the **base**, and n is called the **exponent**.

TAKE NOTE

Select text while reading to see options for adding notes and highlights.

Example 1

(a) $\left(\frac{1}{2}\right)^5 = \left(\frac{1}{2}\right)\left(\frac{1}{2}\right)\left(\frac{1}{2}\right)\left(\frac{1}{2}\right)\left(\frac{1}{2}\right) = \frac{1}{32}$

(b) $(-3)^4 = (-3) \cdot (-3) \cdot (-3) \cdot (-3) = 81$

(c) $-3^4 = -(3 \cdot 3 \cdot 3 \cdot 3) = -81$

Now Try Exercise 17

Note

Note the distinction between $(-3)^4$ and -3^4 . In $(-3)^4$ the exponent applies to -3 , but in -3^4 the exponent

JUMP AROUND

Jump to any page in the chapter and track your location.

TOO SMALL?

Adjust the text size, or set your bookmark for the page where you left off.

PRINT IT

Print just this section in a printer friendly format. The ability to print full chapters is not supported.

WHAT'S NEXT?

Flip to the next and previous pages.

WHAT IS THAT?

Keep an eye out for: Footnotes, Glossary terms, and Enlargeable images and tables.

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



Highlight Text
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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



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Helpful tips for navigating the ebook:

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:

$$2x^2 - 3x + 4x + 10y - 2zy + 4$$

A **monomial** is an expression of the form ax^k , 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

$$a_n x^n + a_{n-1} x^{n-1} + \dots + a_1 x + a_0$$

where a_0, a_1, \dots, a_n are real numbers, and n is a nonnegative integer. If $a_n \neq 0$, then the polynomial has **degree** n . The monomials ax^k 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
$2x^2 - 3x + 4$	trinomial	$2x^2, -3x, 4$	2
$x^8 + 5x$	binomial	$x^8, 5x$	8
$6x^3 + 4x^2 - 2$	trinomial	$6x^3, 4x^2, -2$	3

Move to any section of current chapter

