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Exponents



In exponential notation, the **exponent** tells how many times the **base** is used as a factor. For example, $6^4 = 6 * 6 * 6 * 6 = 1,296$. The base is 6, and the exponent is 4. The product is written as 1,296 in standard notation.

1. Complete the table.

Exponential Notation	Base	Exponent	Repeated Factors	Standard Notation
9^3	9	3	$9 * 9 * 9$	729
	4	5		
			$7 * 7 * 7 * 7$	
			$10 * 10 * 10 * 10 * 10 * 10$	
				262,144

Describe the mistake. Then find the correct solution.

2. $6^3 = 6 + 3 = 9$

Mistake: _____

Correct solution: _____

3. $2^9 = 9 + 9 = 18$

Mistake: _____

Correct solution: _____

4. $4^7 = 4 * 7 = 28$

Mistake: _____

Correct solution: _____

Practice

5. $351.82 + n = 366.52$

$n =$ _____

6. $100 - r = 99.52$

$r =$ _____

7. $\frac{4}{7} + u = \frac{19}{7}$

$u =$ _____



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Guides for Powers of 10



There are prefixes that name powers of 10. You know some of them from the metric system. For example, *kilo-* in kilometer (1,000 meters). It's helpful to memorize the prefixes for every third power of 10 through one trillion.

Memorize the table below. Have a friend quiz you. Then cover the table, and try to complete the statements below.

Standard Notation	Number-and-Word Notation	Exponential Notation	Prefix
1,000	1 thousand	10^3	kilo-
1,000,000	1 million	10^6	mega-
1,000,000,000	1 billion	10^9	giga-
1,000,000,000,000	1 trillion	10^{12}	tera-

- More than 10^9 , or one _____, people live in China.
- One thousand, or 10^{\square} , feet is a little less than $\frac{1}{5}$ of a mile.
- Astronomers estimate that there are more than 10^{12} , or one _____, stars in the universe.
- More than one million, or 10^{\square} , copies of *The New York Times* are sold every day.
- A kiloton equals one _____, or 10^{\square} , metric tons.
- A megaton equals one _____, or 10^{\square} , metric tons.

Practice

Find the prime factorization of each number, and write it using exponents.

7. $48 =$ _____

8. $60 =$ _____

Write each number in expanded notation.

9. $3,264 =$ _____

10. $675,511 =$ _____

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Interpreting Scientific Notation



Scientific notation is a short way to represent large and small numbers. In scientific notation, a number is written as the product of two factors. One factor is a whole number or a decimal. The other factor is a power of 10.

Scientific notation: $4 * 10^4$

Meaning: Multiply 10^4 (10,000) by 4.

$$4 * 10^4 = 4 * 10,000 = 40,000$$

Number-and-word notation: 40 thousand

Scientific notation: $6 * 10^6$

Meaning: Multiply 10^6 (1,000,000) by 6.

$$6 * 10^6 = 6 * 1,000,000 = 6,000,000$$

Number-and-word notation: 6 million

Guides for Powers of 10

10^3	one thousand
10^6	one million
10^9	one billion
10^{12}	one trillion

Complete the following statements.

- The area of Alaska is about $6 * 10^5$, or _____ thousand, square miles.
The area of the lower 48 states is about $3 * 10^6$, or _____ million, square miles.
- There are about $6 * 10^9$, or _____ billion, people in the world.
- It is estimated that about $5 * 10^8$, or _____, people speak English as their first or second language.
- In Bengal, India, and Bangladesh there are about $2.6 * 10^8$, or _____, people who speak Bengali.
- At least 1 person in each of $1 * 10^7$ households, or _____, watches the most popular TV shows.

Source: *The World Almanac and Book of Facts, 2000*

Practice

6. $5 * (3^2 + 4^2) =$ _____

7. $3 * (9 + 16) =$ _____

8. $2 * (9 + h) = 20$ _____

9. $g = (7^2 - 2^2)$ _____



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Using Parentheses



Make each sentence true by inserting parentheses.

1. $2 = 3 * 2 - 4 / 1$

2. $3 = 4 + 3 - 1 / 2$

3. $4 = 3 - 1 + 4 / 2$

4. Write seven names for 8. Use only numbers less than 10, and use at least three different operations in each name. Use parentheses. Follow the directions in Problem 7 to fill in the last two rows.

8

Make each sentence true by inserting parentheses.

Reminder: When you have a pair of parentheses inside another pair, the parentheses are called **nested parentheses**.

Example: $8 = ((5 * 6) + 2) / 4$

5. $1 = 4 + 1 - 3 / 2$

6. $7 = 4 * 3 / 2 + 1$

7. Add two names to your name-collection box in Problem 4. Use nested parentheses.

Practice

Find the number that each variable represents.

8. $2\frac{5}{12} = (1\frac{1}{12} + a)$ _____

9. $(1\frac{1}{2} + p) * 2^2 = 12$ _____

10. $6\frac{5}{8} + d = 7\frac{15}{8}$ _____

11. $6.4 - y = 6\frac{2}{5}$ _____

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7.5**Order of Operations****Rules for Order of Operations**

- ① Do operations inside **parentheses**.
- ② Calculate all expressions with **exponents**.
- ③ **Multiply** and **divide** in order, from left to right.
- ④ **Add** and **Subtract** in order, from left to right.

Solve.

1. $4 + 5 * 6 =$ _____

2. $(2 + 3)^2 =$ _____

3. $12 * 2 + 8 \div 2 =$ _____

4. $115 - 10^2 + 3 * 5 =$ _____

5. $6 * (3 + 2^2) \div 2 =$ _____

6. $7 + 9 * 7 \div 3 =$ _____

Write true or false for each number sentence. Follow the rules for order of operations.

7. $3 + 4 * 5 = 35$ _____

8. $(3 + 4) * 5 = 35$ _____

9. $0 = 3 * 4 - 12$ _____

10. $0 = (3 * 4) - 12$ _____

11. $36 = 12 - 3 * 4$ _____

12. $36 = (12 - 3) * 4$ _____

13. $8 \div 2 + 6 = 1$ _____

14. $8 \div (2 + 6) = 1$ _____

Practice

Find the number that each variable represents.

15. $354 * 26 = z$ _____

16. $907 * 86 = r$ _____

17. $3.000 - 1.75 = s$ _____

18. $0.006 + 3.2 + 0.75 + 4 = h$ _____

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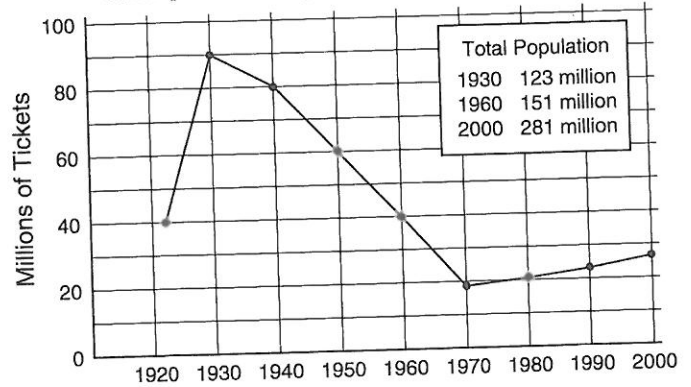
Making Line Graphs



Bar graphs, circle graphs, and line graphs display information in a way that makes it easy to show comparisons, but line graphs can also show trends.

- Use the information in the line graph to write two true statements about movie ticket sales.

Average Number of Movie Tickets Sold per Week (in Millions), 1922–2000

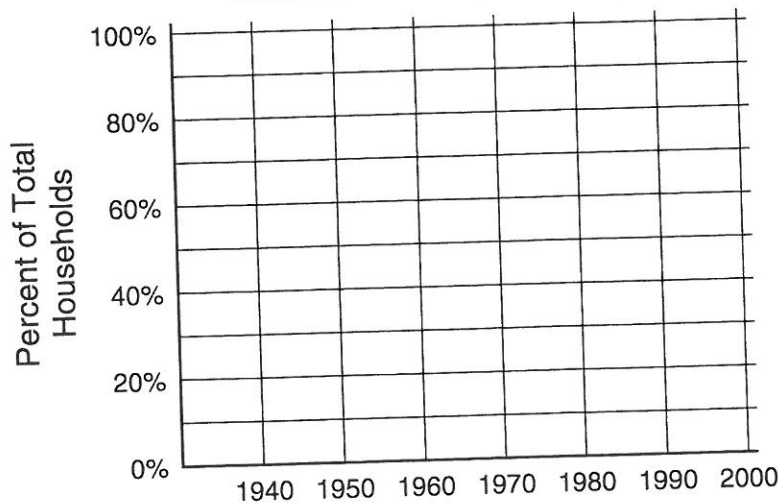


- The table data lists the estimated percent of households with television sets from 1940 to 2000. Plot the data on the line graph below.

Estimated Percent of Households with Television Sets, 1940–2000

Year	1940	1950	1960	1970	1980	1990	2000
Percentage	0%	12%	88%	96%	98%	98%	98%

Estimated Percent of Households with Television Sets, 1940–2000



- Compare the information in the line graphs from Problems 1 and 2. What relationships do you see?

Name _____

Date # _____

Time _____

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Greater Than or Less Than?



Name a number between each pair of numbers.

1. 2 and 3 _____ 2. 1.5 and 2 _____
3. -5 and -6 _____ 4. -9.5 and -10 _____

Order each set of numbers from *least* to *greatest*.

5. $5\frac{1}{4}$, 3.8, -1.2, -1, $5\frac{3}{8}$ _____
6. -6, $-4\frac{1}{2}$, -0.5, -7, 0 _____

True or false? Write T for true and F for false.

7. $-6 > 5$ _____
8. $5\frac{1}{2} < 5\frac{3}{6}$ _____
9. $-2.5 > -3.5$ _____
10. -4 is less than 0 _____

Write one true and one false number sentence. In each sentence, use at least one negative number and one of the $>$, $<$, or $=$ symbols. Label each sentence T or F.

11. _____
12. _____

Practice

Find the number that each variable represents.

13. $92.47 + f = 105$ _____
14. $32 + 15 + 25 + 8 + s = 10^2$ _____
15. $4\frac{3}{12} + n = 5$ _____
16. $4\frac{3}{12} - r = 3\frac{6}{12}$ _____

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Positive and Negative Numbers



Write < or >.

1. -7 _____ 6

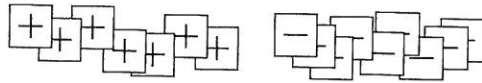
2. 0.01 _____ -32

3. 8.5 _____ -10^3

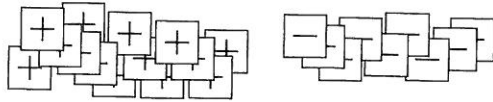
4. $-\frac{3}{4}$ _____ -1.6

Find the account balance. \oplus = \$1 cash. \ominus = \$1 debt.

5. Balance = \$ _____



6. Balance = \$ _____



Solve these addition problems.

7. $-15 + 6 =$ _____

8. $17 + (-5) =$ _____

9. $-56 + (-32) =$ _____

10. $90 + (-20) =$ _____

11. $18 + (-15) =$ _____

12. $-987 + 987 =$ _____

13. Use the rule to complete the table.

-200
in ↓

Rule

out = $-25 + \text{in}$

↓ out
 -225

in	out
25	
50	
-25	
-100	
100	
0	

Practice

Find the number that each variable represents.

14. $3\frac{2}{3} = \frac{j}{3}$ _____

15. $7\frac{9}{3} = \frac{a}{3}$ _____

16. $\frac{19}{25} * \frac{y}{y} = \frac{57}{75}$ _____

17. $\frac{75}{100} \div \frac{p}{p} = \frac{15}{20}$ _____

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Addition and Subtraction Problems



Solve each problem. Be careful. Some problems involve addition, and some involve subtraction.

Reminder:

To subtract a number, you can add the opposite of that number.



1. $-25 + (-16) = \underline{\hspace{2cm}}$

2. $0 - (-43) = \underline{\hspace{2cm}}$

3. $-4 - (-4) = \underline{\hspace{2cm}}$

4. $-4 - 4 = \underline{\hspace{2cm}}$

5. $29 - (-11) = \underline{\hspace{2cm}}$

6. $9 - (-11) = \underline{\hspace{2cm}}$

7. $-100 + 15 = \underline{\hspace{2cm}}$

8. $10 - 10.5 = \underline{\hspace{2cm}}$

9. $4\frac{1}{2} + (-2\frac{1}{2}) = \underline{\hspace{2cm}}$

10. $10 - \underline{\hspace{2cm}} = 20$

11. For each temperature change in the table, two number models are shown in the Temperature after Change column. Only one of the number models is correct. Cross out the incorrect number model. Then complete the correct number model.

Temperature before Change	Temperature Change	Temperature after Change	
40°	up 7°	$40 + 7 = \underline{\hspace{2cm}}$	$40 + (-7) = \underline{\hspace{2cm}}$
10°	down 8°	$10 - (-8) = \underline{\hspace{2cm}}$	$10 - 8 = \underline{\hspace{2cm}}$
-15° (15° below zero)	up 10°	$-15 + 10 = \underline{\hspace{2cm}}$	$15 + 10 = \underline{\hspace{2cm}}$
-20° (20° below zero)	down 10°	$-20 - 10 = \underline{\hspace{2cm}}$	$20 - (-10) = \underline{\hspace{2cm}}$

Practice

Find the number that each variable represents.

12. $684 * 96 = u$ _____

13. $69 \div e = 23$ _____

14. $32.486 - 1.645 = w$ _____

15. $9.45 - m = 3.99$ _____

Name _____

Date 4/17

Time _____

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Positive and Negative Number Review



Write $>$, $<$ or $=$.



1. -8 _____ 5 2. -3 _____ -10 3. 10 _____ -20
 4. 12 _____ -15 5. $-\frac{3}{4}$ _____ -1 6. 3^2 _____ 6

Add or subtract.

7. $-20 + 15 =$ _____ 8. $-14 + (-7) =$ _____
 9. $-8 + 12 =$ _____ 10. $3 + (-9) =$ _____
 11. $-4 - 7 =$ _____ 12. $-10 - 16 =$ _____
 13. $5 - (-11) =$ _____ 14. $8 - 12 =$ _____

Some of the following number sentences are true because they follow the rules for the order of operations. Some of the sentences are false. Make a check mark next to the true number sentences. Insert parentheses in the false number sentences to make them true.

15. $3 + 7 * 5 = 38$ 16. $-5 + 20 \div 5 = -1$
 17. $-2 + 3 * 4 = 4$ 18. $-2 + 3 * 4 = 10$
 19. $-3 + 5 * 2 - (-6) = 37$ 20. $4^2 + (-3) - (-5) * 2 = 20$

21. a. Julie arrived 20 minutes before the race began. She started right on time. It took her 24 minutes to finish the 6-kilometer race. She stayed 10 minutes after the race to cool off; then she left. If she arrived at the race at 9:10 A.M., what time was it when she left?

b. Explain how you found your answer.

Name _____

Date # _____

Time _____

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Unit 7 Review



1. Circle the number sentences that are true.

$25 + (-6) < -32$

$4^2 < 2^4$

$15 * 15 * 15 < 15^3$

$21 * 21 = 21^3$

$-5 - (-58) = 53$

$25 > 5^2 - (-2)$

Write each number as a power of 10.

2. 1,000,000 _____

3. 10,000 _____

4. 1 hundred-thousand _____

5. 1 billion _____

Match the number written in number-and-word notation with its standard notation.
Fill in the oval next to the correct answer.

6. 3 million

300,000

30,000,000

3,000,000

30,000

7. 20 thousand

200,000

20,000

2,000,000

20,000,000

8. 640 thousand

6,400,000

64,000,000

640,000,000

640,000

9. 2.6 million

26,000,000

2,060,000

20,600,000

2,600,000

Write the following numbers in expanded notation.

10. 8,759 _____

11. 87.59 _____

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Write each number in scientific notation.

12. 8 million _____

13. 7 billion _____

14. 3 thousand _____

15. 17 billion _____

16. Louise bought three 6-pack containers of yogurt. She ate 5 individual containers of yogurt in one week. How many containers did she have left?

Number model: _____ Answer: _____

17. The water in Leroy's and Jerod's fish tank had evaporated so it was about $\frac{5}{8}$ inch below the level it should be. They added water and the water level went up about $\frac{3}{4}$ inch. Did the water level end up above or below where it should be?

How much above or below?

Number model: _____ Answer: _____

Find the number that each variable represents.

18. $2.4 + 62.8 + 3.752 = f$ _____

19. $86.54 + b = 87$ _____

20. $33\frac{1}{3}\% + p = 100\%$ _____

21. $6,284 \div 4 = a$ _____

22. $8,463 \div 8 = v$ _____

23. $963 \div 7 = k$ _____