1.2

Powers and Exponents

Essential Question

How can you use repeated factors in real-life situations?

Do Now

Find the sum or product

1) $3 \times 3 \times 3$

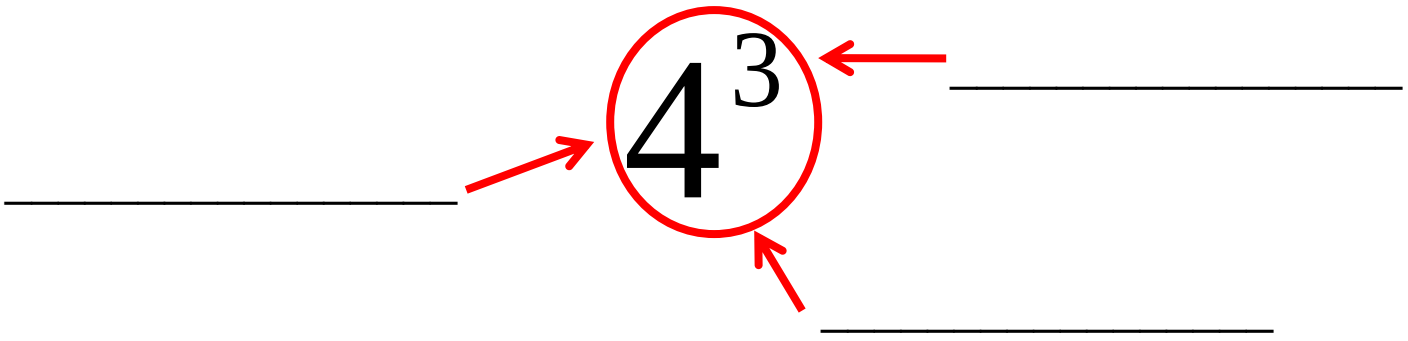
2) $5 \times 5 \times 5 \times 5$

3) $11 \bullet 11$

Do Now

4) Why is $4 \times 4 \times 4$ called a "product of repeated factors?"

Parts of Powers



Special ways to call certain powers

5^2 _____

_____

7^3 _____

_____

Example 1

Write each product as a power.

a) $4 \bullet 4 \bullet 4 \bullet 4 \bullet 4$

b) $12 \times 12 \times 12$

On Your Own

Write each product as a power.

1) $6 \bullet 6 \bullet 6 \bullet 6 \bullet 6 \bullet 6 \bullet 6$

2) $15 \times 15 \times 15 \times 15$

Example 2

Find the value of each power.

a) 7^2

b) 5^3

On Your Own

Find the value of each power.

3) 8^3

4) 5^4

Perfect Squares

The value of a square of two whole numbers is known as a perfect square.

In other words, _____

_____

Find the value of each perfect square.

1^2	5^2	9^2
2^2	6^2	10^2
3^2	7^2	11^2
4^2	8^2	12^2

Circle or highlight each of the perfect squares in WHITE.

X	0	1	2	3	4	5	6	7	8	9	10
0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10
2	0	2	4	6	8	10	12	14	16	18	20
3	0	3	6	9	12	15	18	21	24	27	30
4	0	4	8	12	16	20	24	28	32	36	40
5	0	5	10	15	20	25	30	35	40	45	50
6	0	6	12	18	24	30	36	42	48	54	60
7	0	7	14	21	28	35	42	49	56	63	70
8	0	8	16	24	32	40	48	56	64	72	80
9	0	9	18	27	36	45	54	63	72	81	90
10	0	10	20	30	40	50	60	70	80	90	100

What do you notice? Is there a pattern?

On Your Own

Determine whether each number is a perfect square.

5) 64

6) 20

7) 50

8) 9

Practice

Find the value of the power

9) 6^3

10) 9^2

11) 3^4

12) 18^2

Practice

Determine whether each number is a perfect square.

13) 25

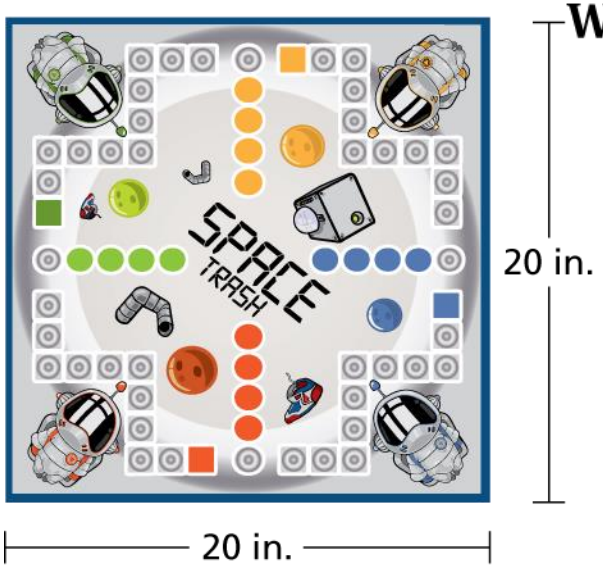
14) 2

15) 99

16) 100

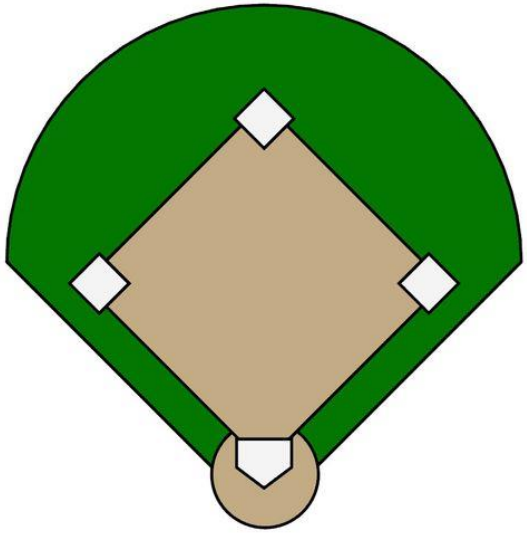
Real-Life Application

A game board is a square with a side length of 20 inches. What is the area of the game board?



Real-Life Application

A baseball diamond is a square with a side length of 90 feet. What is the area of a baseball diamond?



Group Work

Work with a partner. Complete the table.

Repeated Factors	Using an Exponent	Value
a. 4×4		
b. 6×6		
c. $10 \times 10 \times 10$		
d. $100 \times 100 \times 100$		
e. $3 \times 3 \times 3 \times 3$		
f. $4 \times 4 \times 4 \times 4 \times 4$		
g. $2 \times 2 \times 2 \times 2 \times 2 \times 2$		

Key Words

- Product
- Factor
- Exponent
- Base
- Value
- Perfect Square

Name: _____ Period: ____

Score ____ / 20

Math 6 – Chapter 1: Numerical Expressions and Factors

HOMEWORK

Day/Date Assigned	Assignment	Day/Date Due	Missing (0 point)	Not Complete (1 point)	Not Corrected (1 point)	Full Credit (2 points)
Thu 8/24	**Chapter 1 Textbook Scavenger Hunt** HW: Finish Pre-Course Review Problem Set, #1- 41	Mon 8/28				
Fri 8/25	**Chapter 1 Textbook Scavenger Hunt (Cont.)** Finish Pre-Course Review Problem Set, #1- 41					
Mon 8/28	**1.1 Whole Number Operations** HW: pg. 7-9 #1-7, 18, 21, 29-34	Tue 8/29				
Tue 8/29	**1.2 Powers and Exponents** HW: pg. 14-15 #5-9 odd, 14, 15, 19, ***36**	BLOCK DAY				
BLOCK DAY	**1.3 Order of Operations** HW: pg. 20-21 #7, 8, 9, 11, 18, 22, 31, ***21**	Fri 9/1				
Fri 9/1	**Class Activity** HW: No homework					
Mon 9/4	**Labor Day (No School)**					
Tue 9/5	**Review 1.1 – 1.3 Quiz**	BLOCK DAY				
BLOCK DAY	**Quiz 1.1-1.3 & Class Activity** HW: No homework	Fri 9/8				
Fri 9/8	**1.4 Prime Factorization** HW: pg. 28-29 #9, 19, 21, 23, 27, 35, 37, 42, 44	Mon 9/11				
Mon 9/11	**Staff Development (No School)**	Tue 9/12				
Tue 9/12	**1.5 Greatest Common Factor** HW: pg. 34-35 #7, 11, 13, 15, 19, 21, 23, 39	BLOCK DAY				
BLOCK DAY	**1.6 Least Common Multiple** HW: pg. 40-41 #7, 9, 12, 15, 21, 23, 25, 32	Fri 9/15				
Fri	**Chapter Review (Day 1)**	Mon				

pg. 14-15 #5-9 odd, 14, 15, 19, *36

1.2 Exercises

Check It Out
Help with Homework
BigIdeasMath.com

Vocabulary and Concept Check

1. **VOCABULARY** How are exponents and powers different?
2. **VOCABULARY** Is 10 a perfect square? Is 100 a perfect square? Explain.
3. **WHICH ONE DOESN'T BELONG?** Which one does *not* belong with the other three? Explain your reasoning.

$2^4 = 2 \times 2 \times 2 \times 2$ | $3 + 3 + 3 + 3 = 3(4)$ | $3^2 = 3 \times 3$ | $5 \cdot 5 \cdot 5 = 5^3$

Practice and Problem Solving

Write the product as a power.

4. 9×9
5. 13×13
6. $15 \times 15 \times 15$
7. $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$
8. $14 \times 14 \times 14$
9. $8 \cdot 8 \cdot 8 \cdot 8$
10. $11 \times 11 \times 11 \times 11 \times 11$
11. $7 \cdot 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7$
12. $16 \cdot 16 \cdot 16 \cdot 16$

13. **ERROR ANALYSIS** Describe and correct the error in writing the product as a power.

✗ $4 \cdot 4 \cdot 4 = 3^4$

Find the value of the power.

14. 5^2
15. 4^3
16. 2^5
17. 14^2

Use a calculator to find the value of the power.

18. 7^6
19. 4^8
20. 12^4
21. 17^5

22. **ERROR ANALYSIS** Describe and correct the error in finding the value of the power.

✗ $8^3 = 8 \cdot 3 = 24$

23. **POPULATION** The population of Virginia is about 8×10^6. About how many people live in Virginia?

24. **FIGURINES** The smallest figurine in a gift shop is 2 inches tall. The height of each figurine is twice the height of the previous figurine. Write a power to represent the height of the tallest figurine. Then find the height.

pg. 14-15 #5-9 odd, 14, 15, 19, *36

5)

7)

9)

14)

15)

pg. 14-15 #5-9 odd, 14, 15, 19, *36

Determine whether the number is a perfect square.

3 **25.** 8 **26.** 4 **27.** 81 **28.** 44

29. 49 **30.** 125 **31.** 150 **32.** 144

33. PAINTING A square painting measures 2 meters on each side. What is the area of the painting in square centimeters?

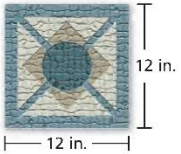
34. NUMBER SENSE Write three powers that have values greater than 120 and less than 130.

35. CHECKERS A checkers board has 64 squares. How many squares are in each row?

36. PATIO A landscaper has 125 tiles to build a square patio. The patio must have an area of at least 80 square feet.

a. What are the possible arrangements for the patio?

b. How many tiles are not used in each arrangement?

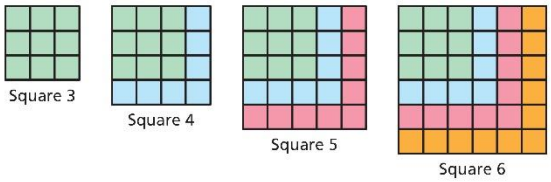


37. PATTERNS Copy and complete the table. Describe what happens to the value of the power as the exponent decreases. Use this pattern to find the value of 4^0.

Power	4^6	4^5	4^4	4^3	4^2	4^1
Value	4096	1024				

38. REASONING Consider the equation $56 = \square^2$. The missing number is between what two whole numbers?

39. Repeated Reasoning How many blocks do you need to add to Square 6 to get Square 7? to Square 9 to get Square 10? to Square 19 to get Square 20? Explain.



Fair Game Review What you learned in previous grades & lessons

Find the value of the expression. *(Skills Review Handbook)*

40. 6×14 **41.** 11×15 **42.** $56 \div 7$ **43.** $112 \div 16$

44. MULTIPLE CHOICE You buy a box of sugar-free gum that has 12 packs. Each pack has 5 pieces. Which expression represents the total number of pieces of gum? *(Skills Review Handbook)*

Ⓐ $12 + 5$ Ⓑ $12 - 5$ Ⓒ 12×5 Ⓓ $12 \div 5$

Exit Ticket

$$3 \times 3 \times 3 \times 3 \times 3$$

1) Write the product as a power.

2) Find the value of the power