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Zero and Negative Exponents For use with Activity 10.4

Essential Question How can you evaluate a nonzero number with an exponent of zero? How can you evaluate a nonzero number with a negative integer exponent?

1 ACTIVITY: Using the Quotient of Powers Property

Work with a partner.

a. Complete the table.

| Quotient | Quotient of Powers Property | Power |
|-------------------------|-----------------------------|-------|
| $\frac{5^3}{5^3}$ | | |
| $\frac{6^2}{6^2}$ | | |
| $\frac{(-3)^4}{(-3)^4}$ | | |
| $\frac{(-4)^5}{(-4)^5}$ | | |

b. REPEATED REASONING Evaluate each expression in the first column of the table. What do you notice?

c. How can you use these results to define a^0 where $a \ne 0$?

20.4 Zero and Negative Exponents (continued)

2 ACTIVITY: Using the Product of Powers Property

Work with a partner.

a. Complete the table.

| Product | Product of Powers Property | Power |
|--|----------------------------|-------|
| 3° • 34 | | |
| 8 ² • 8 ⁰ | | |
| $\left(-2\right)^{3} \bullet \left(-2\right)^{0}$ | | |
| $\left[\left(-\frac{1}{3}\right)^0 \bullet \left(-\frac{1}{3}\right)^5\right]$ | | |

- **b.** Do these results support your definition in Activity 1(c)?
- **ACTIVITY:** Using the Product of Powers Property

Work with a partner.

a. Complete the table.

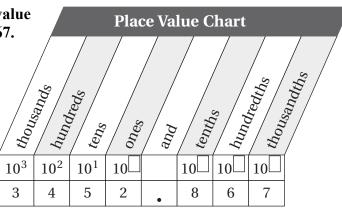
| Product | Product of Powers Property | Power |
|--|----------------------------|-------|
| $5^{-3} \bullet 5^3$ | | |
| $6^2 \bullet 6^{-2}$ | | |
| $(-3)^4 \bullet (-3)^{-4}$ | | |
| $\left(-4\right)^{-5} \bullet \left(-4\right)^{5}$ | | |

b. According to your results from Activities 1 and 2, the products in the first column are equal to what value?

10.4 Zero and Negative Exponents (continued)

- **c. REASONING** How does the Multiplicative Inverse Property help you to rewrite the numbers with negative exponents?
- **d. STRUCTURE** Use these results to define a^{-n} where $a \neq 0$ and n is an integer.
- 4 ACTIVITY: Using a Place Value Chart

Work with a partner. Use the place value chart that shows the number 3452.867.



- **a. REPEATED REASONING** What pattern do you see in the exponents? Continue the pattern to find the other exponents.
- **b. STRUCTURE** Show how to write the expanded form of 3452.867.

What Is Your Answer?

5. IN YOUR OWN WORDS How can you evaluate a nonzero number with an exponent of zero? How can you evaluate a nonzero number with a negative integer exponent?