

Zero and Negative Exponents

MATERIALS • paper and pencil



Look for and make use of structure.

QUESTION How can you simplify expressions with zero or negative exponents?

EXPLORE Evaluate powers with zero and negative exponents

STEP 1 Find a pattern

Copy and complete the tables for the powers of 2 and 3.

Exponent, n	Value of 2^n
4	16
3	?
2	?
1	?

Exponent, n	Value of 3^n
4	81
3	?
2	?
1	?

As you read the tables from the *bottom up*, you see that each time the exponent is increased by 1, the value of the power is multiplied by the base. What can you say about the exponents and the values of the powers as you read the table from the *top down*?

STEP 2 Extend the pattern

Copy and complete the tables using the pattern you observed in Step 1.

Exponent, n	Power, 2^n
3	8
2	?
1	?
0	?
-1	?
-2	?

Exponent, n	Power, 3^n
3	27
2	?
1	?
0	?
-1	?
-2	?

DRAW CONCLUSIONS Use your observations to complete these exercises

- Find 2^n and 3^n for $n = -3, -4$, and -5 .
- What appears to be the value of a^0 for any nonzero number a ?
- Write each power in the tables above as a power with a positive exponent. For example, you can write 3^{-1} as $\frac{1}{3^1}$.