Module 5: Applying Powers

TOPIC 1: EXPONENTS AND SCIENTIFIC NOTATION

In this topic, students learn and apply properties of integer exponents. Students then explore a specific application of exponents and the exponent rules: scientific notation. They learn to express numbers in standard form in scientific notation and those in scientific notation in standard form. Throughout the conversion activities, students attend to the reasonableness of their answers. Once students understand scientific notation, they multiply, divide, add, and subtract numbers expressed in scientific notation, making connections to the exponent rules learned earlier in the topic.

Where have we been?

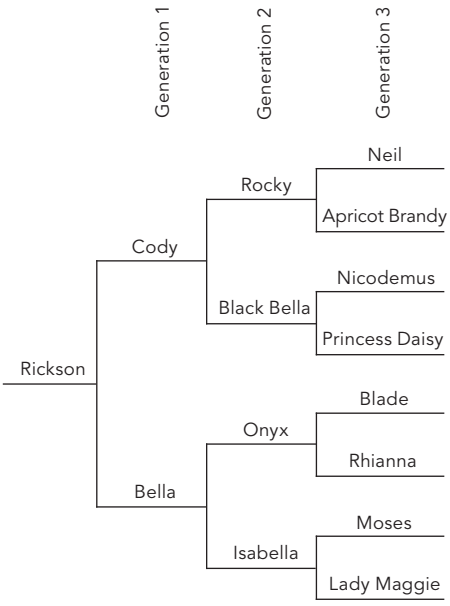
Students have been working with exponents since grade 5. They have learned to write and evaluate numerical and algebraic expressions with whole number exponents. In this topic, students expand on that knowledge.

Where are we going?

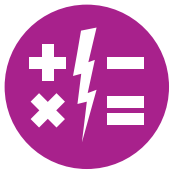
In high school, students will evaluate rational number exponents. Therefore, this topic provides a bridge between students' first formal use of exponents and a more rigorous and abstract exposure in high school. Scientific notation, an application of exponents, will arise in students' science courses in middle school and high school, particularly in the study of chemistry.

Using Tree Diagrams to Study Exponential Growth

A tree diagram can show exponential growth. This tree diagram is actually a family tree—for a dog. Rickson represents 2^0, or 1, dog. His parents in Generation 1 are 2^1, or 2, dogs. Generation 2 has 2^2, or 4, dogs, and Generation 3 shows 2^3, or 8, dogs.



Myth: Faster = smarter.



In most cases, speed has nothing to do with how smart you are. Why is that? Because it largely depends on how familiar you are with a topic. For example, a bike mechanic can look at a bike for about 8 seconds and tell you details about the bike that you probably didn't even notice (e.g., the front tire is on backwards). Is that person smart? Sure! Suppose, instead, you show the same bike mechanic a car. Will they be able to recall the same amount of detail as for the bike? No!

It's easy to confuse speed with understanding. Speed is associated with the memorization of facts. Understanding, on the other hand, is a methodical, time-consuming process. Understanding is the result of asking lots of questions and seeing connections between different ideas. Many mathematicians who won the Fields Medal (i.e., the Nobel prize for mathematics) describe themselves as extremely slow thinkers. That's because mathematical thinking requires understanding over memorization.

#mathmythbusted

Talking Points

You can support your student's learning by approaching problems slowly. Students may observe a classmate learning things very quickly, and they can easily come to believe that mathematics is about getting the right answer as quickly as possible. When this doesn't happen for them, future encounters with math can raise anxiety, making problem solving more difficult, and reinforcing a student's view of himself or herself as "not good at math." Slowing down is not the ultimate cure for math difficulties. But it's a good first step for children who are struggling. You can reinforce the view that learning with understanding takes time, and that slow, deliberate work is the rule, not the exception.

Key Terms

base

The base of a power is the factor that is multiplied repeatedly in the power.

exponent

The exponent of a power is the number of times the base is used as a factor.

scientific notation

In general terms, $a \times 10^n$ is a number written in scientific notation, where a is greater than or equal to 1 and less than 10, and n is any integer. The number a is called the mantissa, and n is the called the characteristic.