Lesson 1: Exponent Review

Let's review exponents.

1.1: Which One Doesn't Belong: Twos

Which expression does not belong? Be prepared to share your reasoning.

$$2^3 \qquad\qquad\qquad 3^2$$

$$8 \qquad\qquad\qquad 2^2 \cdot 2^1$$

1.2: Return of the Genie

Mai and Andre found an old, brass bottle that contained a magical genie. They freed the genie, and it offered them each a magical $1 coin as thanks.

- The magic coin turned into 2 coins on the first day.

- The 2 coins turned into 4 coins on the second day.

- The 4 coins turned into 8 coins on the third day.

This doubling pattern continued for 28 days.

Mai was trying to calculate how many coins she would have and remembered that instead of writing $1 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$ for the number of coins on the 6th day, she could just write 2^6.

1. The number of coins Mai had on the 28th day is very, very large. Write an expression to represent this number without computing its value.

2. Andre's coins lost their magic on the 25th day, so Mai has a lot more coins than he does. How many times more coins does Mai have than Andre?

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1.3: Broken Coin

After a while, Jada picks up a coin that seems different than the others. She notices that the next day, only half of the coin is left!

- On the second day, only $\frac{1}{4}$ of the coin is left.

- On the third day, $\frac{1}{8}$ of the coin remains.

  1. What fraction of the coin remains after 6 days?

  2. What fraction of the coin remains after 28 days? Write an expression to describe this without computing its value.

  3. Does the coin disappear completely? If so, after how many days?

Are you ready for more?

Every animal has two parents. Each of its parents also has two parents.

1. Draw a family tree showing an animal, its parents, its grandparents, and its great-grandparents.

2. We say that the animal's eight great-grandparents are "three generations back" from the animal. At which generation back would an animal have 262,144 ancestors?

Lesson 1 Summary

Exponents make it easy to show repeated multiplication. For example,
$$2^6 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2.$$
One advantage to writing 2^6 is that we can see right away that this is 2 to the *sixth* power. When this is written out using multiplication, $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$, we need to count the number of factors. Imagine writing out 2^{100} using multiplication!

Let's say you start out with one grain of rice and that each day the number of grains of rice you have doubles. So on day one, you have 2 grains, on day two, you have 4 grains, and so on. When we write 2^{25}, we can see from the expression that the rice has doubled 25 times. So this notation is not only convenient, but it also helps us see structure: in this case, we can see right away that it is on the 25th day that the number of grains of rice has doubled! That's a lot of rice (more than a cubic meter)!

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