Unit 7, Lesson 1

Exponent Review

Let's review exponents.

1.1 Which Three Go Together: Fours

Which three go together? Why do they go together?

A

2^4

B

4^2

C

$4^4 - 240$

D

4^4

1.2 Building Blocks

Mai and Andre found some connecting cubes and took turns building towers made of single cubes stacked on top of each other.

- Mai went first and built a tower 2 cubes tall.
- Andre went second and built a tower 4 cubes tall.
- Mai went third and built a tower 8 cubes tall.
- They each tried to build a tower that was double the height of the previous tower.

1. How many cubes would be needed to build the 7th tower? Explain your reasoning.

2. The number of cubes needed to build the 25th tower is very, very large. Write an expression to represent this number without computing its value.

3. The 28th tower would require even more cubes than the 25th tower. How many times as many cubes are needed to build the 28th tower as are needed for the 25th tower?

1.3 Shrinking Tower

Imagine a tall tower that is different from any other tower. One day this tower is only half as tall as it was the day before!

- On the second day, the tower is $\frac{1}{4}$ of its original height.
- On the third day, the tower is $\frac{1}{8}$ of its original height.

1. What fraction of the original height is the tower after 6 days?

2. What fraction of the original height is the tower after 28 days? Write an expression to describe this without computing its value.

3. Will the tower ever disappear completely? If so, after how many days?

Are you ready for more?

A rancher is tracking the ancestry of his prize cattle. Each cow has 2 parents and each parent also has two parents.

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

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

Lesson 1 Summary

Consider the expression $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$. Written this way using multiplication, we would need to count the number of factors. Written as 2^6, the **base** of 2 and the **exponent** of 6 make it easy to see that there are 6 factors of 2 being multiplied together. Exponents make it easy to show repeated multiplication—imagine writing out 2^{100} using multiplication!

Here is another example. Let's say that 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 we have been doubling the amount of rice each day for 25 days! That's a lot of rice (more than a cubic meter)!