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Unit 7, 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 3^2

8 $2^2 \cdot 2^1$

1.2: Return of the Genie

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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

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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?

Tyler has two parents. Each of his parents also has two parents.

1. Draw a family tree showing Tyler, his parents, his grandparents, and his great-grandparents.

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

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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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Unit 7, Lesson 1: Exponent Review

1. Write each expression using an exponent:

   a. $1 \cdot 7 \cdot 7 \cdot 7 \cdot 7 \cdot 7$

   b. $1 \cdot \left(\frac{4}{5}\right) \cdot \left(\frac{4}{5}\right) \cdot \left(\frac{4}{5}\right) \cdot \left(\frac{4}{5}\right) \cdot \left(\frac{4}{5}\right)$

   c. $1 \cdot (9.3) \cdot (9.3) \cdot (9.3) \cdot (9.3) \cdot (9.3) \cdot (9.3) \cdot (9.3) \cdot (9.3)$

   d. The number of coins Jada will have on the eighth day, if Jada starts with one coin and the number of coins doubles every day. (She has two coins on the first day of the doubling.)

2. Evaluate each expression:

   a. 2^5

   b. 3^3

   c. 4^3

   d. 6^2

   e. $\left(\frac{1}{2}\right)^4$

   f. $\left(\frac{1}{3}\right)^2$

3. Clare made $160 babysitting last summer. She put the money in a savings account that pays 3% interest per year. If Clare doesn't touch the money in her account, she can find the amount she'll have the next year by multiplying her current amount by 1.03.

   a. How much money will Clare have in her account after 1 year? After 2 years?

   b. How much money will Clare have in her account after 5 years? Explain your reasoning.

   c. Write an expression for the amount of money Clare would have after 30 years if she never withdraws money from the account.

4. The equation $y = 5{,}280x$ gives the number of feet, y, in x miles. What does the number 5,280 represent in this relationship?

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(from Unit 3, Lesson 1)

5. The points $(2, 4)$ and $(6, 7)$ lie on a line. What is the slope of the line?

   A. 2

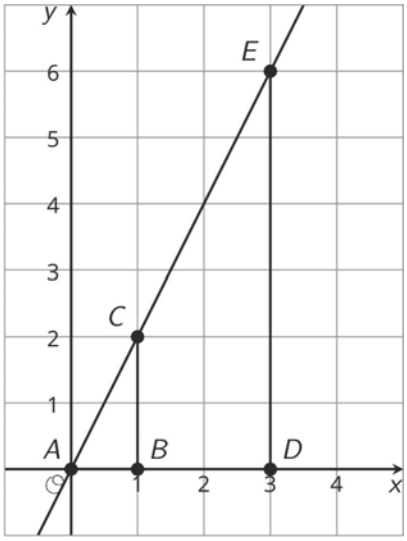
   B. 1

   C. $\frac{4}{3}$

   D. $\frac{3}{4}$

   (from Unit 3, Lesson 5)

6. The diagrams shows a pair of similar figures, one contained in the other. Name a point and a scale factor for a dilation that moves the larger figure to the smaller one.



   (from Unit 2, Lesson 6)