

Unit 7 Lesson 4: Dividing Powers of 10

1 A Surprising One (Warm up)

Student Task Statement

What is the value of the expression?

$$\frac{2^5 \cdot 3^4 \cdot 3^2}{2 \cdot 3^6 \cdot 2^4}$$

2 Dividing Powers of Ten

Student Task Statement

1. a. Complete the table to explore patterns in the exponents when dividing powers of 10. Use the “expanded” column to show why the given expression is equal to the single power of 10. You may skip a single box in the table, but if you do, be prepared to explain why you skipped it.

| expression | expanded | single power |
|------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| $10^4 \div 10^2$ | $\frac{10 \cdot 10 \cdot 10 \cdot 10}{10 \cdot 10} = \frac{10 \cdot 10}{10 \cdot 10} \cdot 10 \cdot 10 = 1 \cdot 10 \cdot 10$ | 10^2 |
| | $\frac{10 \cdot 10 \cdot 10 \cdot 10 \cdot 10}{10 \cdot 10} = \frac{10 \cdot 10}{10 \cdot 10} \cdot 10 \cdot 10 \cdot 10 = 1 \cdot 10 \cdot 10 \cdot 10$ | |
| $10^6 \div 10^3$ | | |
| $10^{43} \div 10^{17}$ | | |

b. If you chose to skip one entry in the table, which entry did you skip? Why?

2. Use the patterns you found in the table to rewrite $\frac{10^n}{10^m}$ as an equivalent expression of the form 10^{\square} .

3. It is predicted that by 2050, there will be 10^{10} people living on Earth. At that time, it is predicted there will be approximately 10^{12} trees. How many trees will there be for each person?

3 Zero Exponent

Student Task Statement

So far we have looked at powers of 10 with exponents greater than 0. What would happen to our patterns if we included 0 as a possible exponent?

1.
 - a. Write $10^{12} \cdot 10^0$ with a power of 10 with a single exponent using the appropriate exponent rule. Explain or show your reasoning.
 - b. What number could you multiply 10^{12} by to get this same answer?

2.
 - a. Write $\frac{10^8}{10^0}$ with a single power of 10 using the appropriate exponent rule. Explain or show your reasoning.
 - b. What number could you divide 10^8 by to get this same answer?

3. If we want the exponent rules we found to work even when the exponent is 0, then what does the value of 10^0 have to be?

4. Noah says, "If I try to write 10^0 expanded, it should have zero factors that are 10, so it must be equal to 0." Do you agree? Discuss with your partner.

4 Making Millions (Optional)

Student Task Statement

Write as many expressions as you can that have the same value as 10^6 . Focus on using exponents, multiplication, and division. What patterns do you notice with the exponents?