Patterns with Powers of Ten

Patterns with Powers of Ten: Find, Fix, and Work Backward

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QUICK REVIEW

$10^2 = 100$ and $10^3 = 1000$. Multiplication by 10^k makes each digit worth 10^k times as much; division makes it worth that fraction. For example, $0.47 \times 100 = 47$ and $47 \div 1000 = 0.047$.

Worked example

Find 3.26×10^2 and check by division.

1. $10^2 = 10 \times 10 = 100$.
2. $3.26 \times 100 = 326$.
3. $326 \div 100 = 3.26$.
Answer: 326.

Practice Problems

Show your thinking.

1. A student leaves the value unchanged in $0.082 \times 1000 = 0.082$. Correct the equation.

2. Find the input: $\square \div 100 = 0.645$.

3. Find the input: $\square \times 10 = 70.9$.

4. A student leaves the value unchanged in $912 \div 1000 = 912$. Correct the equation.

5. Find the power of ten: $0.053 \times \square = 5.3$.

6. Correct: $10^3 = 30$ because $10 \times 3 = 30$.

7. A machine divides by 10 twice. It ends at 0.48. What was the input?

8. Find the missing term and rule: $630, 63, \square, 0.63$.

Answer Key

1. 82.
2. 64.5.
3. 7.09.
4. 0.912.
5. $100 = 10^2$.
6. $10^3 = 1000$.
7. 48.
8. 6.3; divide by 10.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. The scale is $1000 = 10^3$, so the value changes by that factor.
2. $0.082 \times 1000 = 82$.
3. Check: $82 \div 1000 = 0.082$.

Problem 2

1. The scale is $100 = 10^2$, so the value changes by that factor.
2. $64.5 \div 100 = 0.645$.
3. Check: $0.645 \times 100 = 64.5$.

Problem 3

1. The scale is $10 = 10^1$, so the value changes by that factor.
2. $7.09 \times 10 = 70.9$.
3. Check: $70.9 \div 10 = 7.09$.

Problem 4

1. The scale is $1000 = 10^3$, so the value changes by that factor.
2. $912 \div 1000 = 0.912$.
3. Check: $0.912 \times 1000 = 912$.

Problem 5

1. $5.3 \div 0.053 = 100$.
2. $0.053 \times 100 = 5.3$, which is two tenfold changes.

Problem 6

1. The exponent counts factors: $10^3 = 10 \times 10 \times 10$.
2. $10 \times 10 = 100$ and $100 \times 10 = 1000$.

Problem 7

1. Two divisions combine to division by 100.
2. $0.48 \times 100 = 48$; check $48 \div 10 \div 10 = 0.48$.

Problem 8

1. $630 \div 63 = 10$, so each term is divided by 10.
2. $63 \div 10 = 6.3$ and $6.3 \div 10 = 0.63$.

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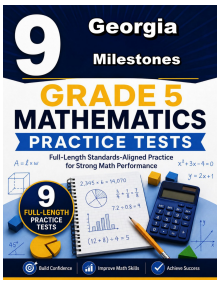

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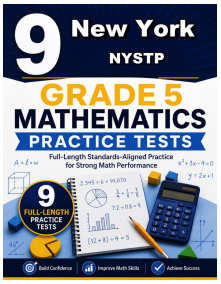

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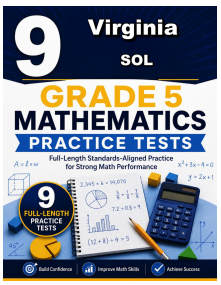

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