Exponents and Order of Operations

Exponents and order of operations: Models and calculations

Name _____ **Date** _____ **Score** _____ / 8

QUICK REVIEW

An exponent counts equal factors: $3^4 = 3 \times 3 \times 3 \times 3 = 81$, not 3×4. Evaluate grouping symbols, then exponents, then multiplication/division left to right, then addition/subtraction left to right. Thus $2 + 3^2 \times 4 = 2 + 9 \times 4 = 38$.

Worked example

Evaluate $5 + 2^3 \times 3$.

1. $2^3 = 2 \times 2 \times 2 = 8$.

2. $5 + 8 \times 3 = 5 + 24 = 29$.

Answer: 29.

Practice Problems

Show your thinking.

1. Expand and evaluate 4^3.

2. Evaluate $18 - 2^3$.

3. Evaluate $(6 + 2)^2 \div 4$.

4. Explain the result of $20 \div 5 \times 2$.

5. A cube has edge 3 cm. Its volume is 3^3. Evaluate cubic centimeters.

6. Find the value represented by $2^4 + 6$.

7. Evaluate $7^2 - 3^2$.

8. Use parentheses to model twice the sum of the square of 5 and 1, then evaluate.

Answer Key

1. 64.
2. 10.
3. 16.
4. 8.
5. 27.
6. 22.
7. 40.
8. 52.

Step-by-Step Solutions

Follow each calculation, then check your own work.

Problem 1

1. $4^3 = 4 \times 4 \times 4$.
2. $4 \times 4 = 16$, then $16 \times 4 = 64$.

Problem 2

1. $2^3 = 8$.
2. $18 - 8 = 10$.

Problem 3

1. $6 + 2 = 8$; $8^2 = 64$.
2. $64/4 = 16$.

Problem 4

1. Work left to right: $20/5 = 4$.
2. Then $4 \times 2 = 8$, not $20/(5 \times 2)$.

Problem 5

1. $3^3 = 3 \times 3 \times 3$.
2. $9 \times 3 = 27$ cm^3.

Problem 6

1. $2^4 = 16$.
2. $16 + 6 = 22$.

Problem 7

1. $7^2 = 49$ and $3^2 = 9$.
2. $49 - 9 = 40$.

Problem 8

1. The model is $2(5^2 + 1)$; $5^2 + 1 = 25 + 1 = 26$.
2. $2 \times 26 = 52$.

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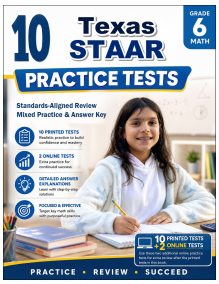

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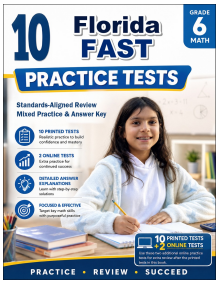

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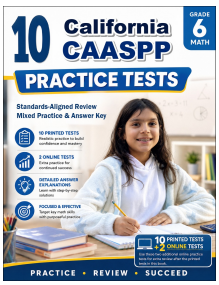

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