Addition: Push together and count.

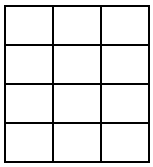
Subtraction: 1) "Take away" model. The question is "How much is left?"
2) Opposite (as in a number line)
3) Comparison model. The questions are usually "How many more/less does _____ have?

Multiplication: Shortcut for repeated addition.

3 + 3 + 3 + 3 = _____ ← 4 groups of 3

4 + 4 + 4 = _____ ← 3 groups of 4

Rectangular array:



This can be viewed as either
4 rows of 3 or 3 columns of 4.

Division: 1) Shortcut for repeated subtraction. "_____ groups of 2 is 12." The question is "How many groups are there?"

2) "Divvy-up" method. "6 groups of _____ is 12." The question is "How much/many is in each group?"

In both of these cases, the amount you start with is the first number in the division problem.

Exponents: Shortcut for repeated multiplication.

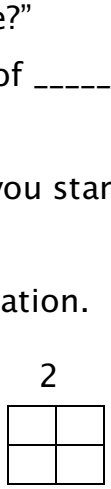
3 x 3 x 3 x 3 = _____

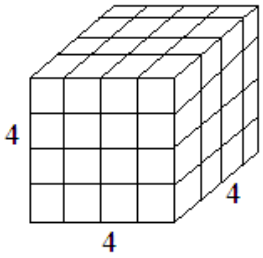
"two squared" = _____

"four cubed" = _____

2

2





We know the dimensions of the figure and want to know the area, volume, etc.

The inverse of an exponent is a root. In a square root, we know the area and want to know the dimensions. In a cube root, we know the volume and want to know the dimensions.

For a square root, the question we ask is "What number times itself gives us the number under the root?" (Two of the same factors) For a cube root, the question we ask is "What number times itself twice gives us the number under the root? (Three of the same factors)

$\sqrt{81}$ = _____ $\sqrt{100}$ = _____ $\sqrt{25}$ = _____ $\sqrt[3]{8}$ = _____ $\sqrt[3]{27}$ = _____