

Four Number Expressions

The idea of this problem was to use a digit exactly 4 times, along with arithmetic operations, to create expressions with different numerical values. Such expressions are called **Four Number Expressions**. For instance, $4 + (4 + 4) \cdot 4$ is a **Four Number Expressions** for the number 36.

The Task

Create as many **Four Number Expressions** as you can for each of the numbers from 1 to 15, using the rules outlined here.

The Rules

The rules for **Four Number Expressions**:

- Your teacher will assign your group a digit for the **Four Number Expressions**.
- You must use your digit exactly four times.

The digits can be combined using any of these methods.

- You may use any of the four basic arithmetic operations—addition, subtraction, multiplication, and division (according to the order-of-operations rules).
- You may use exponents.
- You may use radicals or factorials.
- You may put two or more digits together to form a number such as 11.
- You may use parentheses and brackets to change the meaning of the expression.

Each member is responsible for making a list of their own **Four Number Expressions (CHOOSE Either 2, 3, or 4 to work with, unless you were assigned a number to work with in class)**.

Hints

If you were using the digit 5 to get the numbers 1-5

$1 = 5 \cdot 5 / (5 \cdot 5)$ This is not the only way to get 1.

For example anything to the zero power is 1:

$$1 = (5+5)^{(5-5)}$$

$2 = 5/5 + 5/5$ There are many ways to get 2.

Here is one way using the square root:

$$2 = (\sqrt{5 \cdot 5} + 5) / 5$$

$$3 = (5+5+5)/5$$

$$4 = 5 - 5^{(5-5)}$$

$$5 = (5-5)/5 + 5$$

Here is an example of how to use factorials:

$$5! \text{ is equal to } 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 120$$

So to get 7:

$$7 = 5! / (5+5) - 5 \text{ Here is how } 120/10 = 12 - 5 = 7$$