Four 4s: Explore making the numbers 1 to 20 with only four 4s and different operations.

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Level: Grades 3 and Up

Concepts: Number Sense, Computational Fluency

The Problem

It has been proposed that all whole numbers to infinity can be represented by four 4s and different operations.

Explore how this can be done for the numbers 1 to 20.

Materials

Scrap paper and pencils, pens, etc. **Useful Math Concepts**

Order of operations

- Anything inside brackets first (following the order of operations inside the brackets as well)
- Exponents next
- Then multiplication and division from left to right
- Finally, addition and subtraction from left to right

Factorial !

! means to multiply the number by each number below it in succession

$4! = 4 \times 3 \times 2 \times 1$

Square Root

The square root of a given number is a number that when squared, equals the given number.

$\sqrt{4} = 2$ (because $2x2 = 4$ or $2^2 = 4$)

Playing with the Four 4s problem develops:

- understanding that numbers can be composed in many ways; flexibility with numbers
- understanding of mathematical rules and concepts
- skills in representing mathematical thinking symbolically

Extensions

Find ways to make the numbers 1-50 or 1-100. (Hint: you will need some other operations for some numbers.)

Can you do the same with five 5s? How about six 6s?

The Four 4s problem has been around since at least the late 1800s.

One source for this problem is: https://www.youcubed.org/tasks/the four-4s/

Interesting Video Here is a video from Numberphile that shows how four 4s can be used to make numbers all the way to infinity!
https://www.youtube.com/watch?v=N oo4lN-vSvw