

Making 56

Write a mathematical expression that equals exactly 56 using only the five numbers 1, 1, 1, 2, and 3. Each of the numbers must be used exactly once. The numbers are not digits, so it is not permitted to combine 1 and 1 to make 11, for example.

Solution to Making 56

There are several different solutions to this brain teaser. The most straight-forward solution is as follows:

$$\frac{2^3!}{((1+1+1)!)!} = \frac{8!}{6!} = 56$$

A somewhat more elegant way to write the same expression is to use the notation for combinations (aka binomial coefficient) - the number of unique combinations of N objects taken from a collection of M objects:

$$\binom{2^3}{1+1+1} = \frac{8!}{5! \times 3!} = 56$$

Another solution utilizes an obscure mathematical function called the double factorial (see <https://www.geeksforgeeks.org/double-factorial/>), denoted “!!”. The double factorial of a number is the product of all integers of the same parity (odd or even) less than or equal to that number. So, for example, $8!! = 8 \times 6 \times 4 \times 2$. The solution is as follows:

$$(3! + 1) \times (2+1+1)!! = 7 \times 8 = 56$$