



This brainteaser was written by Patrick Vennebush.

Fill in each square with a digit 1-9, and fill in each circle with an operator $+$, $-$, \times , \div . Use each digit and each operator exactly once. The resulting equation should be true. Use the standard order of operations (PEMDAS).

$$\frac{\square \circ \square \circ \square}{\square \circ \square \circ \square} = \square \square \square$$

What is the largest possible three-digit result that can be obtained on the right side of the equation?



Solution: 532.

Because we want the largest result possible, you should try to do two things: make the denominator of the fraction as small as possible, and make the numerator as large as possible.

To make the denominator as small as possible, you can use subtraction and division. The smallest possible denominator can be obtained with $1 - 8 \div 9$, which has a value of $1/9$, and dividing by $1/9$ is the same as multiplying by 9. That's a good start. Then, to make the numerator as large as possible, take the three greatest remaining digits 5, 6, and 7, and combine them with the remaining operations, + and \times . The largest expression that can be formed in the numerator using these digits and operations is $6 \times 7 + 5$. Luckily, the result with this numerator and denominator contains the remaining three digits, 2, 3, and 4:

$$\frac{6 \times 7 + 5}{1 - 8 \div 9} = 47 \times 9 = 423$$

This is a very good answer, and if this is the answer you obtained, you should be very proud!

However, there is a better answer. If you compromise just a little on the size of the denominator, you can increase the size of the numerator, which will yield a greater result. In the denominator, use $1 - 6 \div 7$, which has a value of $1/7$. Dividing by $1/7$ is the same as multiplying by 7, which isn't as good as multiplying by 9, but it's still pretty good. The benefit of doing this is that it leaves the largest digits, 8 and 9, to be used in the numerator. You can then make the expression $8 \times 9 + 4$ for the numerator, which will yield a final result on the right containing the digits 2, 3, and 5 that is greater than 423:

$$\frac{8 \times 9 + 4}{1 - 6 \div 7} = 76 \times 7 = 532$$