

The diagram illustrates two multiplication problems using colored digit counters. On the left, a red counter with '1', a cyan counter with '5', and a green counter with '8' are arranged in a top row. Below them, an orange counter with '2' and a yellow counter with '3' are arranged in a bottom row. A horizontal line is drawn below the bottom row, and the product '3 634' is written below the line. An asterisk is to the left of the top row. On the right, a purple counter with '7' and a brown counter with '9' are arranged in a top row. Below them, a light green counter with '4' and a blue counter with '6' are arranged in a bottom row. A horizontal line is drawn below the bottom row, and the product '3 634' is written below the line. An asterisk is to the left of the top row. An equals sign is placed between the two multiplication diagrams.

Nine counters, each bearing one of the nine digits from 1 through 9, are arranged in two groups as is shown. Each group represents a multiplication and, more interestingly, results in the same product. As it can be seen 158 multiplied by 23 is the same as 79 multiplied by 46 which gives 3,634 in both cases.

The challenge is to rearrange the counters so that to get as large product as possible. Remember both groups must multiply to the same amount, and there must be three counters multiplied by two in one group, and two multiplied by two counters in the other, just as it is now. What is the biggest amount which can be produced?

$$\begin{array}{r}
 * \quad \boxed{5} \quad \boxed{3} \quad \boxed{2} \\
 \quad \quad \boxed{1} \quad \boxed{4} \\
 \hline
 7448
 \end{array}
 =
 \begin{array}{r}
 * \quad \boxed{7} \quad \boxed{6} \\
 \quad \quad \boxed{9} \quad \boxed{8} \\
 \hline
 7448
 \end{array}$$

There are 11 different solutions\*:

$158 * 23 = 46 * 79 = 3634$   
 $138 * 27 = 54 * 69 = 3726$   
 $134 * 29 = 58 * 67 = 3886$   
 $174 * 23 = 58 * 69 = 4002$   
 $146 * 29 = 58 * 73 = 4234$   
 $259 * 18 = 63 * 74 = 4662$   
 $186 * 27 = 54 * 93 = 5022$   
 $158 * 32 = 64 * 79 = 5056$   
 $174 * 32 = 58 * 96 = 5568$   
 $584 * 12 = 73 * 96 = 7008$   
 $532 * 14 = 76 * 98 = 7448$

Solution with the largest product is shown.

\*Thanks to our visitor Jeff H. for providing us with complete list of solutions.

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