The Thirty-Fourth Annual
Eastern Shore High School Mathematics Competition

November 9, 2017

Team Contest Exam

Instructions

Answer as many questions as possible in the time provided. To receive full credit for a correct solution, show all work and provide a clearly written explanation. Solutions will be judged based on correctness, completeness and clarity. (Little credit, if any, will be given for a solution consisting of just a number or

1. "ABC", "DEF" and "GHI" are distinct 3-digit numbers. Furthermore, the nine digits are non-zero and distinct.

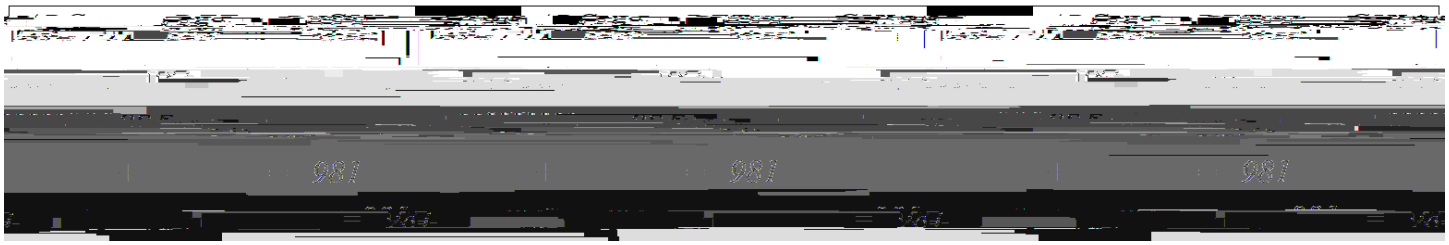
   i.e., $\{A, B, C, D, E, F, G, H, I\} = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$.

   Part 1: Consider the sum: $ABC + DEF = GHI$.

   If $GHI = 981$, determine all possible distinct solutions to the problem $ABC + DEF = 981$.

   i.e., $\{A, B, C, D, E, F\} = \{2, 3, 4, 5, 6, 7\}$ and $\{G, H, I\} = \{1, 8, 9\}$.
   Note: $ABC + DEF = 981$ and $DEF + ABC = 981$ are not considered to be different solutions.

   Enter your solutions in the table shown below. List the smaller addend first in each of your distinct solutions. You may not need all of the cells shown to list all of the distinct solutions.



   Part 2: Consider the sum: $ABC + DEF = GHI$.

   If the digits G, H and I are distinct and are elements of the set 1, 8, 9 and "GHI" = 981, determine all possible distinct solutions to the problem $ABC + DEF = GHI$.

   i.e., $\{G, H, I\} = \{1, 8, 9\}$ and $\{A, B, C, D, E, F\} = \{2, 3, 4, 5, 6, 7\}$.
   Note: ABC + DEF = GHI and DEF + ABC = GHI are not considered to be distinct solutions.

   Enter your solutions in the table shown below. List the smaller addend first in each of your distinct solutions. You may not need all of the cells shown.

2. "ABC", "DEF" and "GHI" are distinct 3-digit numbers. Furthermore, the nine digits are non-zero and distinct.

   i.e., $\{A, B, C, D, E, F, G, H, I\} = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$.

   Consider the sum $ABC + DEF = GHI$.

   (a) Explain why GHI cannot equal 345.

   (b) Explain why GHI cannot equal 548.

3. The digits 1,2,3, and 4 can be arranged in a multiplication equation where each digit is used exactly once: $3 \times 4 = 12$.

   (a) Find a whole-number multiplication equation using the digits 1, 2, 3, 4, and 5, where each digit is used exactly once.

   (b) Find a whole-number multiplication equation using the digits 1, 2, 3, 4, 5, and 6, where each digit is used exactly once.