

Challenge: “Alpha Math”

Level: Beginner

Description:

Given a valid math statement composed of letters instead of numbers, find a number to replace each character to create a numerically correct statement. Each like letter must be replaced by the same number, and each letter will be restricted to representing the values 0, 1, 2, 3, 4, 5, 6, 7, 8, or 9.

Example input set:

A string representing an abstract math statement such that:

- A sequence of letters will be followed by a single mathematical symbol (+, -, *, /) which will be followed by a second sequence of letters, which will be followed by a single equals sign (=), which will be followed by a final sequence of characters
- No spaces exist in the string
- Characters can be repeated throughout each of the three sequences of characters
- Each character will be restricted to representing the values 0, 1, 2, 3, 4, 5, 6, 7, 8, 9
- There will be no “leading zeroes” on any number
- Each number is not necessarily replaced by the same letter
- At least one valid, numerically correct math statement can be created by substituting a number for each letter

HI+HO=YES

Sample solution:

Reorganizing the problem visually can be helpful to understand the concept:

```
  HI
+ HO
----
YES
```

If we replace the following letters with the following numbers:

```
H => 5
I => 2
O => 4
Y => 1
E => 0
S => 6
```

(Noting that both instances of H are replaced by a number 5)

The problem is now:

$$\begin{array}{r} 52 \\ + 54 \\ ---- \\ 106 \end{array}$$

This is a valid mathematical statement which also fulfills the “pattern” of the input set.

PASS/FAIL:

The solution will be considered PASSED if it returns an output which:

- **Is properly formatted**

The output will follow the same format as the input, but with the letters replaced by numbers. The format should be a sequence of numbers of the same length as the first sequence of letters from the input, followed by the same mathematical symbol from the input set, followed by a second sequence of numbers the same length as the second sequence of letters from the input, followed by a single equals sign (=), followed by a final sequence of numbers the same length as the third sequence of letters from the input.

$$11+22=33$$

If multiple solutions are found, they should be submitted with a space between them. For example:

$$11+22=33 \quad 22+33=55 \quad 33+44=77$$

(The submission of multiple valid problem statements will be used in tiebreaker scenarios. See the Tiebreakers section below for more information. If multiple problem statements are submitted, all problem statements must be valid.)

- **Follows the substitution rules**

Each unique number should replace a unique letter from the input set. That is, if the input set has two letter B, they must both be replaced by the same number.

- **Contains only valid characters**

One mathematical symbol, specified by the input set, one equals sign, and valid numbers 0-9.

- **Is a valid mathematical statement**

- **Is unique**

Multiple identical solutions for a single input set will not be considered valid.

All other solutions will be considered FAILED.

Tiebreakers:

The code you submit will be called several times, with a different input set each time. If more than one team outputs a correct solution to at least one input set, the following tiebreaker scenarios will be used to determine the ordering of teams for this challenge, in the order given below:

- Most input sets solved successfully, highest number winning the tiebreaker. Each input set will be weighted equally for this tiebreaker (e.g. no extra points for solving a “more difficult” input set).
- Total number of valid solutions found, summed across all input sets, highest number winning the tiebreaker. If Team A finds one valid solution for input set 1, two valid solutions for input set 2, and two valid solutions for input set 3, their total number of valid solutions is 5. Team B must find 6 or more valid solutions to win the tiebreaker.
- Submission time, earliest submission winning the tiebreaker.