

Puzzle of the Week

Letter Substitutions – 10

Rules:

1. A letter represents a digit from 0 to 9, and has the same value throughout a single puzzle.
2. No number can start with the digit 0.
3. Within a puzzle, different letters must have different values.

$$\begin{array}{r} 8 \\ + \underline{A} \\ B \ 2 \end{array} \Rightarrow \begin{array}{r} 8 \\ + \underline{4} \\ 1 \ 2 \end{array}$$

THE CHALLENGE: Find the value of S, E, N, D, M, O, R, and Y to make this puzzle work.

$$\begin{array}{r} S \ E \ N \ D \\ + \underline{M \ O \ R \ E} \\ M \ O \ N \ E \ Y \end{array}$$

EXPLORATION: Make some letter substitution puzzles for your friends to solve.

Puzzle of the Week

Letter Substitutions – 10 – Notes

THE CHALLENGE: Because carries when adding two digits, plus a possible carry, are at most 1, the first thing to notice is that M must be 1.

Now that M is 1, look at $S + 1 + (\text{possible carry}) = 10$ on the left side of the puzzle. $S + 1 + (\text{possible carry})$ cannot be more than 11, and since letters cannot repeat another letter's value, O must be 0.

Our puzzle now looks like this:

$$\begin{array}{r} S E N D \\ + 1 0 R E \\ \hline 1 0 N E Y \end{array}$$

Because $E + 0 = N$, there must be a carry into that column and N must be one more than E. Also, that column does not produce a carry into the next column. This means $S + 1 = 10$, so $S = 9$.

With N being one more than E, and $N + R + (\text{possible carry}) = 1E$, this forces $R = 8$ and there is indeed a carry into that column.

Our puzzle now looks like this:

$$\begin{array}{r} 9 E N D \\ + 1 0 8 E \\ \hline 1 0 N E Y \end{array}$$

At this point there is nothing clever to do other than look at possibilities while remembering that E and N are consecutive numbers. The only way $D + E = 1Y$ without duplicating values is for $D = 7$, $E = 5$, $Y = 2$, and $N = 6$.

At last we have the solution:

$$\begin{array}{r} 9 5 6 7 \\ + 1 0 8 5 \\ \hline 1 0 6 5 2 \end{array}$$

Notice how helpful it is to update the puzzle each time we determine the value of some new letters.