Puzzle of the Week

Letter Substitutions – 13

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.

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

THE CHALLENGE: Find the value of P, O, T, A, M, L, E, U, and C to make this puzzle work.

$$\begin{array}{r} P\ O\ T\ A\ T\ O \\ +\ T\ O\ M\ A\ T\ O \\ \hline L\ E\ T\ T\ U\ C\ E \end{array}$$

EXPLORATION: Make some letter substitution puzzles for others to solve.

Puzzle of the Week

Letter Substitutions – 13 – Notes

THE CHALLENGE: Because carrying in adding problems with two numbers can be at most 1, we know that L must be 1.

Note that in the ones column O + O = E and that in the ten thousands column O + O + (possible carry) = T. So the "possible carry" is a definite carry. Next notice one column to the right that we have T + M + (possible carry) = 1T. If M is 0, the sum will be less than 10. Therefore, M = 9 and the possible carry is a definite carry. Note also that O + O = E and O + O + 1 = T forces T = E + 1.

With those values, the puzzle becomes:

```
  P O T A T O
+ T O 9 A T O
1 E T T U C E
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P + T + (possible carry) = E and T = E + 1 forces P to be 8 or 9. However, 9 is taken. So P = 8 and, once again, the possible carry is a definite carry. Given the carry information we have established, we also know that O + O is at least 10 and A + A is at least 10. Put another way, O and A are at least 5.

To summarize, here is our updated puzzle, and we also know T = E + 1, C = T + T + 1, and O and A are at least 5.

```
  8 O T A T O
+ T O 9 A T O
1 E T T U C E
```

At this point, we have 0, 2, 3, 4, 5, 6, and 7 to work with, and we need to find the value of E, T, C, O, A and U. Note that O + O = E forces E to be even.

- E = 2, T = 3, C = 7, O = 6.
- E = 4, T = 5, C = 1, O = 7. This is impossible as it forces C = L = 1.
- E = 6, T = 7, C = 5, O = 8. This is impossible as it forces O = P = 8.

Therefore E = 2, T = 3, C = 7, O = 6, P = 8, M = 9, and L = 1. That only leaves 0, 4, and 5 for A and U. Fortunately, A = 5 and U = 0 works, and we are done! Here is the finished puzzle:

```
  8 6 3 5 3 6
+ 3 6 9 5 3 6
1 2 3 3 0 7 2
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