# Puzzle of the Week

## *Letter Substitutions – 12*

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 S, A, T, U, R, N, P, L, and E to make this puzzle work.

$$\begin{array}{r} S\ A\ T\ U\ R\ N \\ +\ U\ R\ A\ N\ U\ S \\ \hline P\ L\ A\ N\ E\ T\ S \end{array}$$

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

# Puzzle of the Week

## *Letter Substitutions – 12 – Notes*

THE CHALLENGE: Because carrying in adding problems with two numbers can be at most 1, we know that P must be 1. Also, N + S = S forces N = 0.

With those values, the puzzle becomes:

```
  S A T U R 0
+ U R A 0 U S
1 L A 0 E T S
```

Looking at U + 0 + (possible carry) = E tells us that E is one more than U, there is a carry from the previous column, and there is no carry to the next column. That then means that T + A = 10, and there is a carry to the next column. A + R + (carry of 1) = 1A means that R is 9 and there is a carry to the next column.

We now know E = U + 1, T + A = 10, and the puzzle looks like this:

```
  S A T U 9 0
+ U 9 A 0 U S
1 L A 0 E T S
```

Looking at the tens column, 9 + U + (no carry) = 1T means that T is one less than U. Consequently, we have three digits in a row: T, U, and E.

Look through the possibilities using T + A = 10. The remaining question is how to make S + U + (carry) = 1L?

- T = 2, U = 3, E = 4, A = 8. Unused so far: 5, 6, 7. It's not possible to solve S + 3 + 1 = 1L.
- T = 3, U = 4, E = 5, A = 7. Unused so far: 2, 6, 8. It's not possible to solve S + 3 + 1 = 1L.
- T = 4, U = 5, E = 6, A = 6. Impossible with A = E.
- T = 5, U = 6, E = 7, A = 5. Impossible with A = T.
- T = 6, U = 7, E = 8, A = 4. Unused so far: 2, 3, 5. S = 5 and L = 3 works!

We end up with S = 5, A = 4, T = 6, U = 7, R = 9, N = 0, P = 1, L = 3, and E = 8. The solution looks like this:

```
  5 4 6 7 9 0
+ 7 9 4 0 7 5
1 3 4 0 8 6 5
```