Puzzle of the Week
Feb 5-11, 2010

In the sum below each letter represents a different digit, and no leading digit is 0.

\[
\begin{array}{ccc}
S & U & P \\
E & R & B \\
+ & O & W & L \\
\hline
Z & Z & Z \\
\end{array}
\]

Which digit is represented by \(Z\)?

_Solutions should be submitted to Morgan Sherman:
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before next Friday. Those with correct and complete solutions will have their names listed in next week’s email announcement. Anybody is welcome to make a submission._

**Solution:**

The digit \(Z\) must be 9. To see this look at the equation \(SUP + ERB + OWL = ZZZZ\) modulo 9: since all the digits are distinct, and the sum of the digits 0 through 9 is 45 we get \(45 - Z = 3Z\) or \(4Z = 0\) modulo 9. Thus 9 must divide \(Z\) and we see that \(Z = 9\) is the only possibility.

We should verify that there is at least one solution:

\[
\begin{array}{ccc}
1 & 0 & 8 \\
2 & 5 & 4 \\
+ & 6 & 3 & 7 \\
\hline
9 & 9 & 9 \\
\end{array}
\]

There are many others.