MathFLIX CHALLENGE

Multi-digit Multiplication Practice
Inspired by *The Number Devil: A Mathematical Adventure*
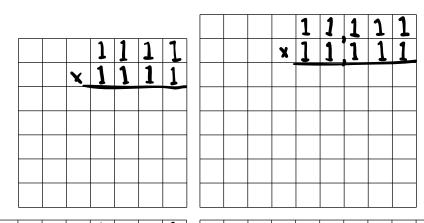by Hans Enzensberger, Susanne Berner and Michael Heim (May, 2000)

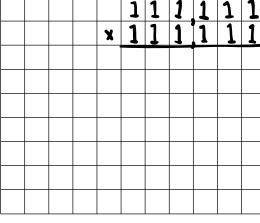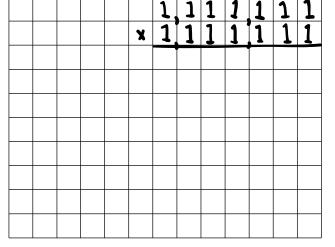During Night 1, the Number Devil offers to show how to make all numbers out of 1.

$$\begin{array}{r} 1 \\ \times\ 1 \\ \hline 1 \end{array} \qquad \begin{array}{r} 11 \\ \times\ 11 \\ \hline 11 \\ 11 \\ \hline 121 \end{array} \qquad \begin{array}{r} 111 \\ \times\ 111 \\ \hline 111 \\ 111 \\ 111 \\ \hline 12321 \end{array}$$

If you continue this pattern, will you make all the numbers from 0-9? Is the Number Devil correct?

$$\begin{array}{r} 1111 \\ \times\ 1111 \\ \hline \end{array} \qquad \begin{array}{r} 11111 \\ \times\ 11111 \\ \hline \end{array}$$

$$\begin{array}{r} 111111 \\ \times\ 111111 \\ \hline \end{array} \qquad \begin{array}{r} 1111111 \\ \times\ 1111111 \\ \hline \end{array}$$

The Number Devil thinks this pattern will continue forever. He is wrong. Do you know why?