

Comedians Bud Abbott and Lou Costello star in the 1941 movie *In the Navy*. Given the task of making thirteen donuts for each of seven officers, Lou cooks 28 donuts, claiming that $7 \times 13 = 28$. Lou demonstrates in three ways that $7 \times 13 = 28$.

<p>Method 1: Lou multiplies 7 x 3 and gets 21. He then multiplies 7 x 1 and gets 7. Adding these two results, he gets 28.</p> $\begin{array}{r} 13 \\ \times 7 \\ \hline 21 \\ +7 \\ \hline 28 \end{array}$	<p>Method 2: Lou divides 28 by 7 and gets 13. He states, 7 won't go into 2, so divide 7 into 8 one time. Subtract and get 21. Now divide 7 into 21.</p> $\begin{array}{r} 13 \\ 7 \overline{) 28} \\ \underline{-7} \\ 21 \\ \underline{-21} \\ 0 \end{array}$	<p>Method 3: Checking by addition. Lou adds all of the 3's together, then adds all of the 1's together and gets 28.</p> $\begin{array}{r} 13 \\ 13 \\ 13 \\ 13 \\ 13 \\ 13 \\ 13 \\ +13 \\ \hline 28 \end{array}$ <p>(3+3+3+3+3+3+3)+ (1+1+1+1+1+1+1)=28</p>
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1. Explain why Lou's techniques are not yielding correct results. An answer such as "he multiplied wrong" is not sufficient. Be mathematically specific, please.

Method 1:

Multiplied treating each digit as a "units" digit.

Method 2:

The division method requires using the entire number, 28, if the 7 does not divide into the first digit of 2. Lou separated the number.

Method 3:

Added units digits and tens digits all as units digits.

2. Find another example that would illustrate Lou's unique interpretation of mathematics.

$$14 \times 5 = 25$$

3. *a.* Using Algebra, represent Lou's multiplication process using a two digit number multiplied by a one digit number, as shown below.

$$\begin{array}{r} ab \\ \times d \\ \hline \end{array} \quad \text{Lou's method: } bd + ad$$

b. Now, represent the actual answer of the multiplication listed in part *a.*

$$\text{Actual method: } bd + 10ad$$

c. Set these two answers equal to each other and see what happens. When will they be equal?

$$\begin{aligned} \cancel{bd} + ad &= \cancel{bd} + 10ad \\ ad &= 10ad \\ 1 &= 10 \quad \text{not true} \end{aligned}$$

4. Under what conditions will Lou's mathematical techniques be true?

When $a = 0$.

As long as only one digit numbers are used, Lou is OK.