

EXPLORATION 3.20 Understanding the Standard Algorithm

1. Mathematical power comes from knowing what each step of an algorithm means. The middle column in the table below describes the verbalization of each step in the pencil-and-paper algorithm. The right column asks you to explain the why for each step. A story for this problem is: A janitor has moved all 72 desks out of 3 classrooms. How many desks go into each classroom? *better story?*

$\begin{array}{r} 24 \\ 3 \overline{)72} \\ \underline{6} \\ 12 \\ \underline{12} \\ 0 \end{array}$	What we do	Why we do it
	a. 3 "gazinta" 7 two times	a. What is going on mathematically when we say "gazinta"?
	b. Place the 2 above the 7.	b. Why do we place the 2 above the 7?
	c. $3 \times 2 = 6$. Place the 6 below the 7.	c. Why do we multiply 3×2 ?
	d. Subtract 6 from 7.	d. Why do we subtract?
	e. Bring down the 2.	e. What is going on mathematically when we "bring down" the 2?
	f. 3 "gazinta" 12 four times. Place the 4 above the 2. Next, $3 \times 4 = 12$. Place the 12 below the other 12.	f. Why do we repeat these three steps again: gazinta, multiply, subtract?

2. Many students have trouble when there are zeros in the quotient. Explain these steps in the long-division problem below.

$\begin{array}{r} 304 \\ 27 \overline{)8208} \\ \underline{81} \\ 108 \\ \underline{108} \\ 0 \end{array}$	Algorithm	Justification
	a. 27 doesn't go into 8.	a. What is going on mathematically here?
	b. 27 goes into 823 times.	b. What is going on mathematically here?
	c. $27 \times 3 = 81$; put the 3 above the 2.	c. How do you know where to put the 3?
	d. Subtract $82 - 81$ and bring down the 0.	d. Why do we bring down the 0, since we are bringing down nothing?
	e. Since 27 doesn't go into 10, put a 0 above the 0.	e. Why?
f. Bring down the 8.	f. Why?	