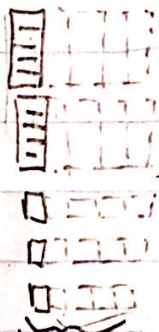


Teaching Questions Ch 3 pg 142 #2

- 2) One student said there is an advantage in using our base-ten system over other systems b/c to multiply by ten, just put a zero at the end of the number. The other student said the same was true when multiplying by 5 in base five or 8 in base eight.

The second student generalized correctly! The advantage of multiplying in base ten by 10 is repeated in other bases.

I'd start with an example. Consider $23_{\text{five}} \times 5$ or $23_{\text{five}} \times 10_{\text{five}}$ (if we have all #'s in base 5). We could draw 2 longs and 3 units, five times or stretch 2 longs and 3 units by five.



stretch by five

Notice that the stretching stretches our longs into flats and our units into longs. We have 230_{five}

$$\text{or } 23_{\text{five}} \times 10_{\text{five}} = 230_{\text{five}}$$

This stretching approach generalizes well to other bases. Ultimately

we are taking our digits in a position & stretching (multiplying by the base) to get a digit in the next position higher.

Algebraically, if x, y, z are digits to a number in base b

$$xyz_{\text{base } b} \times 10_{\text{base } b} = (x \cdot b^2 + y \cdot b + z) \times b = x \cdot b^3 + y \cdot b^2 + z \cdot b = xyz0_{\text{base } b}$$