Illustrative Mathematics

6.NS Changing Currency

Alignments to Content Standards: 6.NS.B.3

Task

a. How many one-hundred dollar bills do you need to make $2,000? $20,000?

b. How many ten dollar bills do you need to make $2,000? $20,000?

c. How many dimes do you need to make $0.20? $2? $20?

d. How many pennies do you need to make $0.02? $0.20? $2?

e. Use the answers to the questions above to fill in the table:

A	B	$A \div B$
2	0.01	
20	0.1	
200	1	
2,000	10	
20,000	100	

f. What changes (and how does it change) and what stays the same as you move from row to row down the table?

IM Commentary

The purpose of this task is for students to notice that if the dividend and divisor both increase by a factor of 10, the quotient remains the same. This sets them up to understand the rules for moving decimal points when performing long division. After students have described the pattern in the table, the teacher can challenge them to explain why this pattern must always hold, or can explain the pattern to the students.

- One way to do this is to write the first division question $2 \div 0.01 =?$ as $0.01 \times ? = 2$ and note that if we multiply both sides by 10, we get the second division problem. Multiplying both sides by 10 again gives the third, and so on.
- For students who are familiar with complex fractions, we can also explain this by thinking of $2 \div 0.01$ as $\frac{2}{0.01}$ and can note that if we multiply this fraction by $\frac{10}{10}$, which is 1, we get $\frac{20}{0.1}$. Multiplying this fraction by $\frac{10}{10}$ again gives us $\frac{200}{1}$.
- We can also explain it by thinking about it in terms of the context. If we are finding out how many coins are needed to make a certain total, then we need the same number of coins if we are making an amount that is ten times as great with a coin worth ten times as much.

A task and discussion like this help prepare students to understand why $1.2\overline{)2.4} = 12\overline{)24}$.

One approach to parts (a) through (d) would be to use language. One might think of $2,000 as 2,000 ones, 200 tens, and 20 hundreds. This is a fine approach, as the connection to division is made in part (e). One idea might be to give students only parts (a) through (d) first, discuss, and then give them parts (e) and (f) (the table and the generalizing question.)

Edit this solution

Solution

a. $2,000 \div 100 = 20$, so you need 20 one-hundred dollar bills to make $2,000. You need ten times as many as that, or 200, to make $20,000.

b. $2,000 \div 10 = 200$, so you need 200 ten dollar bills to make $2,000. You need ten times as many as that, or 2,000, to make $20,000.

c. $0.20 \div 0.10 = 2$ (or more intuitively, 2 dimes are worth $0.20). You need ten times as many, or 20 dimes, to make $2.00. You need ten times as many as that, or 200, to make $20.

d. $0.02 \div 0.01 = 2$ (or more intuitively, 2 pennies are worth $0.02). You need ten times as many, or 20 pennies, to make $0.20. You need ten times as many as that, or 200, to make $2.

e. Use the answers to the questions above to fill in the table:

A	B	$A \div B$
2	0.01	200
20	0.1	200
200	1	200
2,000	10	200
20,000	100	200

f. As we go down the first column, the value is ten times bigger than the value in the row above. The same is true with the second column. But the quotient always stays the same. So the number being divided and the number dividing into it increase by a factor of ten from row to row, but the quotient never changes.