**Main Problem #4**

Topic: *Multiplying Fractions by Whole Numbers*

Problem: Your friend Rashad is an amazing pianist who develops instrumental music for the top R&B singers in the world. This year, he is developing a music for an studio album and he would like to hear your opinion. He gave you one of his music sheets and you notice that there are 4 *crescendos,* 5 *decrescendos,* and 8 *diminuendos.*

Q1. What fraction of the music sheet consists of crescendos? Decrescendos? Diminuendos?

Q2. Rashad tells you that 7 music sheets equals a song. Assuming all sheets have the same number of crescendos, decrescendos, and diminuendos, what fraction of a song consists of crescendos? Decrescendos? Diminuendos?

Q3. Rashad is able to make 4 songs every 9 months. How many songs can he make in 2 years?

*Note: A fraction of a song is not considered a song.*

A1. The number of “endos” or gradual changes in one music sheet is 17 since 4+5+8=17. Therefore, crescendos make up $\frac{4}{17} $of one sheet, decrescendos make up $\frac{5}{17},$ and diminuendos make up $\frac{8}{17}.$

“Confusion helps students grow and learn, even if they stumble.

A2. This question is actually a trick question since it tests a student’s math literacy and reasoning. The answer to this question is actually the same as the first question. If you think about it, all sheets have the same number of a particular “endo”, therefore, for a certain “endo”, that “endo” makes up the same fraction for all sheets like the first one.

To get a better understand: Crescendos make up $\frac{4}{17} $of the first sheet. Since we assumed that all sheets have the same number of “endos”, the second, third, fourth, fifth, sixth, and seventh sheets are also$\frac{4}{17} $crescendos.

If you were to multiply $\frac{4}{17} $by 7, you would get $\frac{28}{17}$(or $1\frac{11}{17}$) which doesn’t make sense since the value of this product is greater than 1 (or 100%). This would mean that crescendos make up more than 100% of a song.

The right way to think about this is to look at the units of each fraction. $\frac{4}{17}$translates to 4 crescendos in one sheet out of 17 “endos” in that one sheet; $\frac{ 4 crescendo/sheet}{17 endos/sheet}$. You would actually have to multiply this amount by $\frac{7 sheets}{7 sheets}$ (or 1) to understand why the answer is this way.

A3. This question is solvable even if students have yet to review rates. They should think about how many songs Rashad makes in a month, which is $\frac{4}{9}$. Since 2 years equals 24 months, we can model this expression and obtain $\frac{4}{9}\*24=\frac{96}{9}=10\frac{6}{9}$. Since a song must be represented as “whole”, Rashad can make 10 songs every 2 years; we ignore the fraction.