Musical Math

In Greece during the 6th century B.C. Pythagoras of Samos was the first to make the connection between math and music. He discovered that an octave had a ratio of 2:1. This meant that the note produced in this ratio had the same tone but one octave higher. With simple fractions he devised the musical scale of today.

"The ancestors of modern symbolic music notation originated in the Roman Catholic Church, as monks developed methods to put plainchant (sacred songs) to parchment. The earliest of these ancestral systems, from the 8th century, did not originally utilize a staff, and used neum (or *neuma* or *pneuma*), a system of dots and strokes that were placed above the text. Although capable of expressing considerable musical complexity, they could not exactly express pitch or time and served mainly as a reminder to one who already knew the tune, rather than a means by which one who had never heard the tune could sing it exactly at sight. To address the issue of exact pitch, a staff was introduced consisting originally of a single horizontal line, but this was progressively extended until a system of four parallel, horizontal lines was standardized."

The musical symbols that are used today are:

Name	Note	Rest	Length
Whole Note			4 beats
Half Note			2 beats
Quarter Note			1 beat
Eighth Note			1/2 beat
Sixteenth Note			1/4 beat

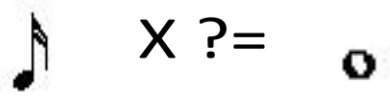
The problem

John needs to write a song. A) He needs to know how many sixteenth notes make a whole note. B) He needs to know how many eighth notes and eighth rests combined make a whole note.

A)

1. Rewrite the problem in notes and rests.

How many sixteenth notes make a whole note is written?



2. Notice that a sixteenth note has a value of ¼ of a beat and a whole note is 4 beats. So, we have $\frac{1}{16} \cdot \frac{?}{1} = 4$

3. Suppose y= the number of sixteenth notes that we need to make a whole note. Then we have $\frac{1}{16} \cdot y = 4$

4. Next we multiply both sides by the reciprocal of $\frac{1}{4}$,which is $\frac{4}{1}$.

Now we have: $\frac{16}{1} \cdot \frac{1}{16} \cdot y = \frac{4}{1} \cdot \frac{16}{1}$

$$y = 64$$

5. So, it takes 64 sixteenth notes to make a whole note.

B)

1. Rewrite the problem in notes and rests.

How many eighth notes make a whole note is written?

X ?=

2. Notice that an eighth note has a value of $1/8$ of a beat and a whole note is 4 beats. So, we have $\frac{1}{8} \cdot \frac{?}{1} = 4$

3. Suppose y= the number of eighth notes that we need to make a whole note. Then we have $\frac{1}{8} \cdot y = 4$

4. Next we multiply both sides by the reciprocal of $\frac{1}{8}$,which is $\frac{8}{1}$.

Now we have: $\frac{8}{1} \cdot \frac{1}{8} \cdot y = \frac{4}{1} \cdot \frac{8}{1}$

$y = 32$

5. So, it takes 32 eighth notes to make a whole note.

Some more applications of math problems related to music is counting beats, counting rests, and seeing how many other combinations of rests and notes can be put together to make a whole note.

Thank you Oleksiy Kodash for doing the initial research on this problem.

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