Grade 7/8 Math Circles

February 20/21/22/23, 2023

Math in Musical Scales - Problem Set

1. Complete the following operations. Reduce all fractions to simplest form. (As a challenge, solve without a calculator).
   a) $\frac{24}{25} \div \frac{1}{2}$
   b) $\frac{7}{10} \times \frac{3}{16}$
   c) $\frac{5}{9} \div \frac{37}{40}$
   d) $\frac{1}{3} \times \frac{9}{7}$
   e) $\frac{6}{13} \div 2$
   f) $\frac{25}{17} \times \frac{12}{5}$
2. Determine whether the following notes are a tone or a semitone apart. Looking at the keys on a piano may help for this question.
   a) C and D
   b) B and C
   c) C♯ and E♭
   d) E♯ and G
   e) G♯ and A♯
   f) B and A♯
3. Find the missing values of the just scale in the table below.

do	**re**	**mi**	**fa**	**so**	**la**	**ti**	**do**
1	$\frac{9}{8}$	$\frac{5}{4}$	$\frac{4}{3}$	$\frac{3}{2}$	$\frac{5}{3}$	$\frac{15}{8}$	2
150 Hz							300 Hz

4. Find the missing values of the Pythagorean scale in the table below.

do	**re**	**mi**	**fa**	**so**	**la**	**ti**	**do**
1	$\frac{9}{8}$	$\frac{81}{64}$	$\frac{4}{3}$	$\frac{3}{2}$	$\frac{27}{16}$	$\frac{243}{128}$	2
200 Hz							400 Hz

5. Transpose the following Pythagorean scale with a tonic of B♭ to have a tonic of F. Find all of the notes for the new scale.

B♭	**C**	**D**	**E♭**	**F**	**G**	**A**	**B♭**
1	$\frac{9}{8}$	$\frac{81}{64}$	$\frac{4}{3}$	$\frac{3}{2}$	$\frac{27}{16}$	$\frac{243}{128}$	2
58 Hz							116 Hz

6. Determine whether the following scale is in the Pythagorean tuning system or the just intonation system. (Hint: look at the intervals).

do	**re**	**mi**	**fa**	**so**	**la**	**ti**	**do**
50 Hz	56.25 Hz	62.5 Hz	$66\frac{2}{3}$ Hz	75 Hz	$83\frac{1}{3}$ Hz	93.75 Hz	100 Hz

7. Describe the benefits and drawbacks of Pythagorean tuning and just intonation.

8. If you wanted to transpose a song over and over again, which tuning system would you choose? Why?