Homework 2

Math 109 / Music 109A, Fall 2022

Due Monday, October 3.

1. In $\frac{3}{2}$ time, give the duration in beats for:

   (a) an eighth note

   (b) a dotted half note

   (c) a quarter note with four dots

2. In $\frac{9}{8}$ time, taken as a compound time signature, give the duration in beats for:

   (a) a quarter note

   (b) an eighth note

   (c) an eighth note tied to a thirty-second note

3. Prove the equation:

$$1 + r + r^2 + \cdots + r^m = \frac{1 - r^{m+1}}{1 - r} \, .$$

   for any integer $m \geq 0$ and any real number $r \neq 1$. <u>Hint</u>: Consider the product $(1 - r)(1 + r + r^2 + \cdots + r^m)$. Explain how this relates to the durations of dotted notes.

4. Notate and name the following tuplets:

   (a) that which divides the whole note into 3 equal notes

   (b) that which divides the half note into 7 equal notes

   (c) that which divides the quarter note into 13 equal notes

5. Notate and give the total duration, in $\frac{4}{4}$ time, of:
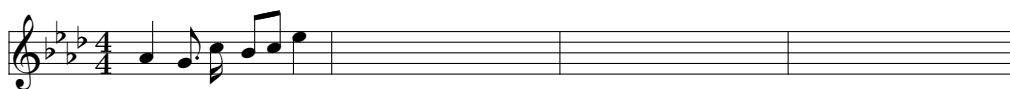
   (a) a sixteenth note quintuplet

   (b) an eighth note triplet

   (c) a sixteenth note 17-tuplet

6. Complete these measures with a single durational note:

   (a) $\frac{3}{4}$ ♩ ♪   (b) $\frac{4}{4}$ ♪ ♩ ♪ ♪   (c) $\frac{9}{8}$ ♩. ♩ ♩

7. Complete the following example three ways with a measure having the
   <u>same rhythm</u>,

   employing, respectively:

   (a) diatonic transposition up three scale tones

   (b) diatonic transposition down one scale tone

   (c) chromatic transposition one step (two semitones)

   Which of of these, if any, represent <u>both</u> diatonic and chromatic trans-
   position?

8. For the <u>refrain</u> of the song *Carolina In the Morning,*, give the form (e.g.,
   ABA′C or ABA) by dividing the *chorus* of the song (which begins on
   page 3) into segments consisting of eight measures.

   For the same chorus, locate transformations such as translation (melodic
   and/or rhythmic) and transposition (diatonic and/or chromatic), other
   than those that are dictated by the global form determined above.

   A pdf copy of song is posted on the course web page under Handouts.
   You may reference your discussion by numbering the measures, letting
   measure 1 be the first measure of the chorus.

9. The *tonic triad* of a mode is the chord consisting of its scale tones $\hat{1}$, $\hat{3}$, and $\hat{5}$. For each of the seven modes name the chord type of the tonic triad.

10. Consider the equivalence relation $\equiv$ on $\mathbb{Z}$ defined by $k \equiv \ell$ if and only if $12 \,|\, (k - \ell)$. Now consider the equivalence $\sim$ relation on $\mathbb{Z}$ defined by $k \sim \ell$ if and only if the musical intervals k semitones and ℓ semitones differ by a multi-octave (i.e., give the same modular interval). Explain why these are the same equivalence relation.