Answers to Test 2 Review Problems

EXERCISE 1. $440 \cdot 2^{1 \cdot (3/2)^3} = 2970$ Hz. $440 \cdot 2^{-1 \cdot (3/2)^{-3}} = 65.19$ Hz.

EXERCISE 2. Pitch of $600$ Hz = $69 + 12 \log_2(600/440) = 74.37$. Frequency of pitch $75 = 440 \cdot 2^{(75-69)/12} = 622.25$ Hz.

EXERCISE 3. $12 \log_2 6 = 31.02$ semitones.

EXERCISE 4. $78 \pmod{12} = 6$. Other members of this pitch class: 6, 18, 30, 42, 54, 66, . . .

EXERCISE 5. If desired, the pitch classes are numbered clockwise, starting with 0 at the top.

EXERCISE 6. E♭, F, G, A♭, B♭, C, D

EXERCISE 7. $(100 - 50) \pmod{12} = 2$, so the interval is a major second.

EXERCISE 8. The intervals whose class numbers are relatively prime to 8 generate the chromatic scale. They are 1, 3, 5, and 7.

EXERCISE 9. Locating the two sets on the pitch class circle, we can see that they are related by rotation, so they are transpositions of each other. Another set that is equivalent is { F, A, C }.

EXERCISE 10. $7 - (-4) \pmod{11} = 0$, so the first equivalence is TRUE. $60 - 30 \pmod{4} = 2 \neq 0$, so the second equivalence is FALSE.

EXERCISE 11. The relation is not reflexive, because any pitch $x$ is NOT higher than itself. It is also not symmetric: if $y$ is higher than $x$, then $x$ is NOT higher than $y$. (The relation is transitive: if $x$ is higher than $y$, and $y$ is higher than $z$, then $x$ is higher than $z$.)

EXERCISE 12. The interval class number of a major third is 4. Using this equivalence relation, a major third is equivalent to interval classes 4 and −4. Since −4 + 12 = 8, this interval class is a minor sixth. So the equivalence class of a major third is { major third, minor sixth }. The interval class number of a minor second is 1. Using this equivalence relation, a minor second is equivalent to interval classes 1 and −1. Since −1 + 12 = 11, this interval class is a major seventh. So the equivalence class of a minor second is { minor second, major seventh }. 