A Young Student's Guide to Pitch Tendencies and Tuning

FLUTE

Practical Application
Project 2

Cory Walavich
Master's Candidate
Second Year

A Young Student's Guide to Pitch Tendencies and Tuning Flute Workbook

This workbook is intended for the beginning student who has the ability to create a representative tone on the flute. The student must be able to read pitches given in notation on a music staff. It is assumed that this book will be utilized with the guidance of a professional musician (band director, private lesson teacher, etc.)

Materials

1. Flute
2. Pencil
3. Electronic Tuner
4. Access to photocopier/ scanner to reproduce pages from this workbook

Photocopies of Materials

The following pages may (and should) be photocopied at will

Flute Pitch Tendency Chart
Scale Tuning Exercises
Ear Training Exercises
Flute Pitches

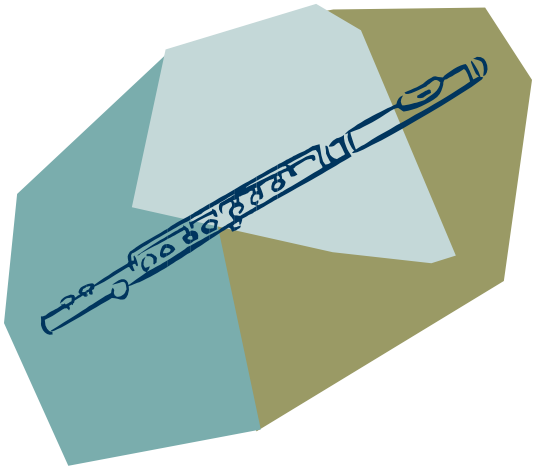
Introduction

Pitch Tendencies and Tuning

One important aspect of being a musician is learning to play in tune, or tuning. Every note on your instrument can be played three ways: In tune, flat (out of tune and too low) or sharp (out of tune and too high). Your instrument has tendencies for notes to be in tune, flat or sharp. If you can learn the tendencies for your instrument, you can anticipate tuning problems, and fix them before they occur. It is the musician's responsibility to learn how to play in tune at all times. This can be a challenge. This workbook is designed to help you learn the pitch tendencies for your instrument and how to play in tune.

The first step to learning to play in tune is to learn to hear the difference between notes that are out of tune, and notes that are in tune. Your band director will be able to help you with this. When notes are out of tune, there is a pulsing in the sound. It is sort of a "Wah, Wah, Wah" sound that occurs at a regular speed. The faster the pulsing, the further the notes are from being in tune. The slower the pulsing, the closer the notes are to being in tune. When two notes are in tune, there is no pulsing. They sound very smooth, as if only one musician was playing.

The next step to learning to play in tune is learning to adjust the pitch you are playing so that it is in tune. There are two different ways to adjust the pitch you are playing, mechanical and physical. *Mechanical* adjustments are the ways you can adjust your instrument by changing its length. This includes the adjustment of tuning slides, mouthpieces, reeds, and more. *Physical* adjustments are the ways you can adjust the way you are playing the instrument in order to adjust the pitch. This includes, embouchure, adding extra fingers, using alternate fingerings, varying air pressure, and more.



When is an “A” not an “A”?

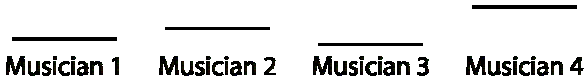
Which one of the following words is printed in red ink?

RED RED RED RED RED RED RED RED

You could argue for any of the above words as being printed in red. Without a standard being established for the color red, there is room for inconsistency. Luckily in music, we have a standard for pitch. You will learn about this standard below.

When musicians play together, it is important that they agree on pitch. As I said in the introduction, all notes can be played in tune, flat or sharp. Musicians think of pitch as a vertical concept. If a musician is playing flat, they are too low. If a musician is playing sharp, they are too high. If all musicians are playing the same note in tune, then they are in tune.

In the following diagram, all musicians are playing the same note. The height of the lines represents the flatness (low) or sharpness (high) of their note. If all of the lines are at the same height, then they will be in tune on that note.



As you can see, the musicians are not in agreement on their pitch. They are out of tune with each other. How can they adjust so that they are in tune?

There are many ways to adjust your pitch, and it is your goal to learn how to utilize these techniques. These techniques can be broken down into two categories, mechanical (adjusting the instrument) and physical (adjusting the way you, the player, plays the instrument). You will be learning about these techniques in this workbook. It is your job to practice them until you have them mastered so that you can always play in tune.

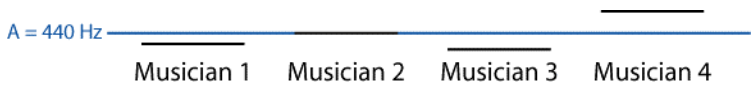
The Standard Pitch

Frequency is the way that we are able to measure and assign a value to a given pitch. Sound is caused by vibrations. Musical tones are produced by vibrations that travel in waves, and can be measured. The waves are measured by the number of times the wave completes a cycle in one second. One cycle per second is called a Hertz (Hz).

Throughout history, like the “red” ink above, there has been disagreement on pitch. The note that we call “A” today has been higher and lower at different times and in different places around the world. Luckily for us, musicians around the world have adopted a standard for pitch.

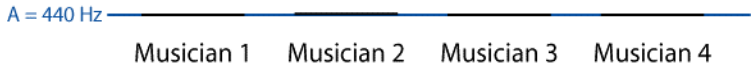
The current standard is A = 440. This means that the "A" above middle C is assigned the frequency 440 Hz. Instruments today are manufactured to play to this standard.

If musicians are all playing an "A" above middle C, and we show where the "A" should be played (440 Hz), then we will know who is too high, and who is too low. Then the musicians can adjust so they are playing in tune.



Which musicians are too low? Too high? In tune? Obviously, musicians 1 and 3 are too low and will need to adjust their pitch higher. Musician 4 is too high, and will need to adjust her pitch lower. Musician 2 is in tune with the standard.

The challenge is that we do not see pitch, we hear it. We must train our ears to be able to hear the differences between in tune and out of tune, as well as flat and sharp. When notes are out of tune, as indicated by the diagram above, there are audible pulses that can be heard because the sound waves are not aligned. When notes are in tune, as in diagram below, the sound is very smooth and steady.



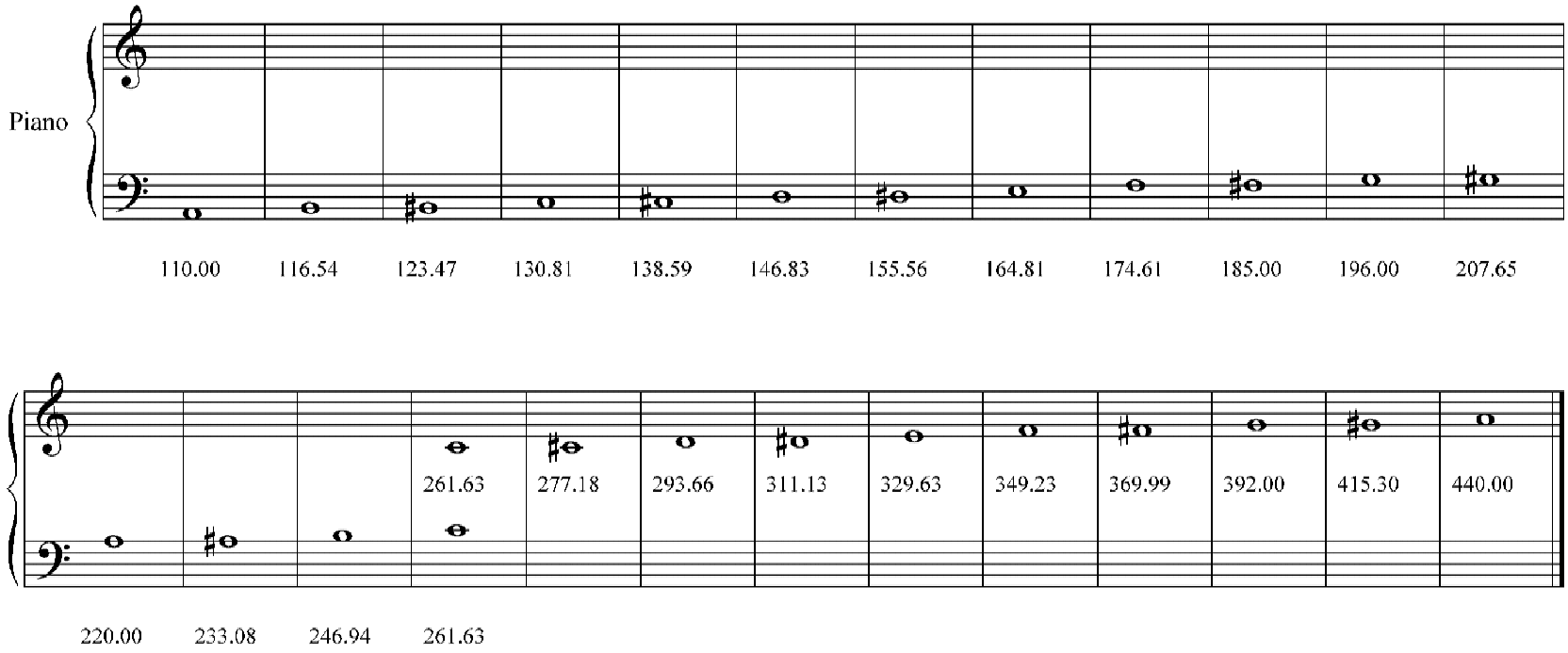
Your band director or private instructor should provide you with examples of in tune, and out of tune sounds. The first step is to be able to hear the difference between notes that are in tune, and notes that are not. Once you can do this, the next step is to learn whether or not the out of tune notes are either too flat (low) or too sharp (high). After you can do that, you must learn how to adjust your pitch so that you can play in tune.

Equal Temperament Tuning and Pure Tuning

There are two tuning systems that are commonly used by musicians, Equal temperament tuning, and pure tuning. Pure tuning is based on intervals found in nature, in the harmonic series. Equal temperament tuning is a man-made system that separates the octave into 12 equal semitones (half steps) that are precisely, but evenly, mistuned. The Equal temperament system is used because fixed pitched instruments (piano, organ, etc.) are unable to adjust pitch while playing. The equal temperament system allowed these instruments to play in all keys with equal and tolerable intonation. You do not need to fully understand this at this point, but you should be aware that there are slight differences.

The chart on the next page shows the frequencies for each pitch in an equally tempered scales based on A = 440. Note the frequencies of all of the "A's". A = 110, A = 220, A = 440. Each octave higher is exactly twice the frequency of the previous octave.

Equal Tempered Frequencies



Equal Tempered Frequencies (Hz) are from Georgia State University website http://hyperphysics.phy-astr.gsu.edu/hbase/music/et.html#c2

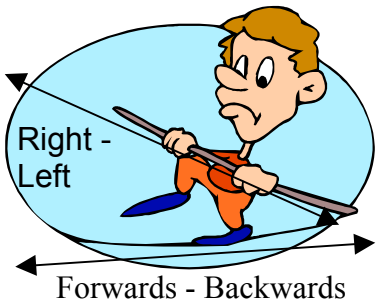
Intonation – A Tightrope Act

Have you ever seen a tightrope walker on television or at the circus? These highly skilled individuals have to monitor their balance at every instance. If they feel their body moving too far left, they have to shift to the right. If they feel their body leaning too far to the right, they have to shift to the left. In the meantime, they have to travel across the tightrope to get to their destination.

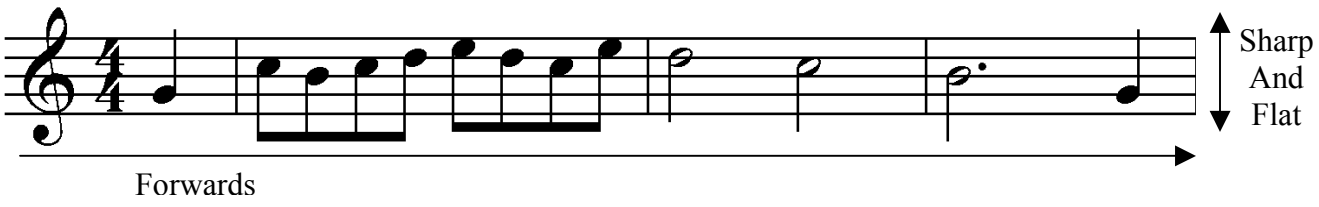
Musicians have a similar task while playing their instruments when it comes to playing in tune. Good musicians constantly monitor their pitch and make adjustments when needed. A musician's pitch is like the balance for a tightrope walker; the musician must monitor and adjust his pitch at all times. Unlike the tightrope walker, a good musician can often predict intonation problems that might occur by getting to know his instrument better. When your instrument was built, it was manufactured to play every note as close to in tune as possible; however, some notes will tend to be sharp and some notes will tend to be flat. This book will help you learn those tendencies so that you can predict this before you play your note, and you can learn to make adjustments so that each note is in tune immediately.

When thinking about the tightrope walker, we think of the performer moving forwards and backwards on the rope, while keeping their balance from side to side.

The Tightrope Walker



When we think about music we must think about moving forward in the music with the proper notes, rhythms, articulations, dynamics, tone quality, expression, etc. We must also think about the correct intonation of each note, which in music we think of as sharp or flat. If a pitch is too high (sharp) we have to adjust it down; if a pitch is too low (flat) we have to bring it up.



This workbook will help you learn to adjust your pitch so that you can play in tune.

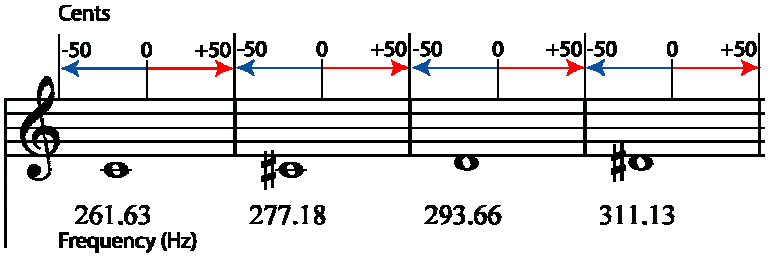
The Electronic Tuner

Living in the time period we do, we have the advantage of using technology to help us learn to play in tune. Every musician who plays a wind instrument should have an electronic tuner. Your band director will be able to tell you where to purchase a tuner if you do not already have one, as well as which tuner would be appropriate for you. There are a wide variety of tuners available that range from very simple and cheap to very complicated and expensive. If you are familiar with the computer program Smartmusic, it comes with a great tuner built in.

Once you have your tuner, you need to be familiar with how to use it. Be sure that your tuner is calibrated to A=440. Most tuners have a needle that moves when you play a note into the tuner to give you a visual reference to your pitch, and a display that shows you what pitch is being "heard" by the tuner. Often the tuner will display notes in concert pitch. If an Alto Saxophone player plays his "G" into the tuner, it will read "Bb or A#". If you play a transposing instrument (Clarinet, Saxophone, Horn, Trumpet, Treble Clef Euphonium, etc.) then you will need to adjust accordingly. See your band director if you do not know how to transpose to concert pitch.

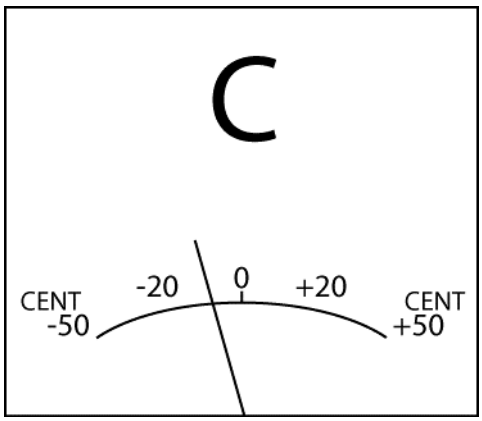
Cents

The scientific unit used to calculate deviation in pitch is called "cent". There are 100 cents between each semitone. A semi-tone, or half step, equals 100 cents. C to C♯ = 100 cents. Do not mistake this with frequency. You will be using cents to determine how sharp or flat you are if you are out of tune.

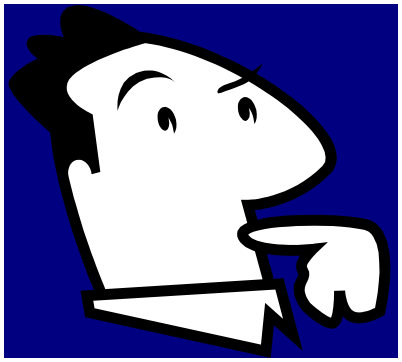


This diagram indicates the frequencies for four pitches. The frequencies would measure at the indicated Hz if the pitches are played perfectly in tune. If the first note (C) is played at 265.29 Hz, instead of the 261.63 Hz that it should be, it would be slightly sharp. Rather than trying to memorize all of the frequencies for all of the notes on your instrument, we use cents to help us understand how flat or sharp we are in comparison to where we should be. If you look at this diagram, you will see that the Cents are indicated above each measure. There are 100 cents per note. If a note is perfectly in tune, we would say it is 0 cents sharp or flat. The blue arrows represent flat (negative cents), and the red arrows represent sharp (positive cents). Your tuner should have the cents indicated on it. This is valuable information that you need in order to learn the pitch tendencies of your instrument. Each note can be up to 50 cents flat or 50 cents sharp. If it is more than 50 cents, it is a different note.

At the right is a basic picture of what you might see on a tuner if you played a “C” concert while the tuner was on. Notice that the needle is not centered on the “0” which indicates that the note is not in tune. This “C” is approximately 10 cents flat, or lower than it should be to be. Note that flat is indicated by the “-” sign. If the note had been sharp, the needle would be on the side marked with the “+” sign.



Now the musician has to decide how to adjust this pitch 10 cents higher in order to be in tune. There are a variety of mechanical and physical ways to adjust the pitch. The musician has to decide which is best when, and why.



Steps to Improving Intonation

Before you begin any tuning procedure, it is very important that you take the time to warm up your instrument by playing on it a little to help it get to normal playing temperature. Temperature can be a big factor when it comes to intonation. Instruments that are too warm will be sharp, while instruments that are too cold will play flat. If you try to tune your instrument without warming up, you will have to re-tune it again once it warms up so that it is accurate. It is much better to tune your instrument after you have played on it for a little while (5-15 minutes depending on how much time you have).

Tuning your instrument – After you have properly warmed up, the first thing you must do is set up your instrument properly so that it has the best chance to play the most notes in tune. This will be a MECHANICAL adjustment. There will always be notes to adjust physically, but by tuning the instrument first, you will have the best chance to be in tune. We will go into detail about this on the next few pages.

Creating a Pitch Tendencies Chart – It is important that you learn what the natural tendencies are for every note that you will have to play. This way you can predict the adjustment you will have to make on a given note before you even play it. If you know that 2nd. line G is a sharp note on your instrument, you will know that you have to adjust that pitch down every time you play it.

Knowing how, and practicing methods of adjusting the pitch on your instrument while you are playing – It is important that you know what to do when you are out of tune so that you are able to fix the problem, and play in tune. It is very important that you always do this with the best tone possible. There are many important factors to consider. These can be MECHANICAL or PHYSICAL adjustments.

Learning to hear when you are in or out of tune and how to adjust quickly – It is important for a musician to figure out when they are out of tune, and how to fix the problem quickly. With regular practice and careful attention, this can become second nature.

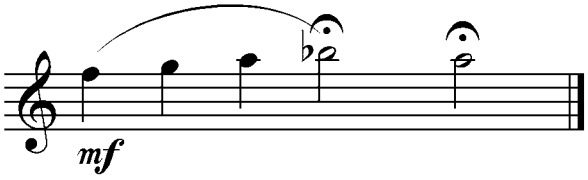
Training the Ear – While going through the process of tuning your instrument, creating a pitch tendencies chart, and learning to adjust, it is important that you are training your ear at the same time so that you are not always relying on a tuner for your intonation. Training your ear so that you can hear what is in tune or not is a very important skill for a musician.

Flute

Tuning the Flute

1.) Warm up thoroughly before tuning the flute
2.) Tune at a comfortable volume level (*mf*), with a smooth tone. No vibrato.
3.) Tune to a reliable pitch (electronic tuner, keyboard, etc.) using the recommended tuning note(s) below.
4.) Do not "humor" the tuning note by making physical adjustments. Play it straight. Adjust the head joint if the pitch is sharp or flat.
5.) Recheck the tuning note with the reliable pitch until it is in tune.

Basic Tuning Notes
Use the black notes to slur into the pitch you will use for tuning.



Tuning Mechanism: Head Joint. Pull out the head joint if the pitch is sharp; push it in if the pitch is flat.

The head joint has a moveable cork on the plugged end. This needs to be in the proper position in order for the flute to play correctly in tune. To check the position of the cork, insert the bottom end of the cleaning rod into the head joint. The etched line on the cleaning rod should be in the center of the embouchure hole. If it is not, seek the help of a professional to adjust the plug.

Factors that can cause poor flute intonation:

- Poor quality or worn out flute
- Flute out of adjustment
- Leaking pads or joints
- Tuning cork improperly placed
- Dented or chipped mouthpiece plate
- Poor posture or flute position
- Poor embouchure
- Insufficient air support
- Restricted range, flexibility, and endurance due to poor playing procedures and/ or lack of practice
- Insufficient Warm up
- Playing off the Standard Tuning Frequency (A = 440)
- Pitch Tendencies of flute and performer
- Poorly trained ears

Flute Pitch Tendencies Chart

Once the flute has been properly tuned to the tuning note, it is time to begin working on your pitch tendencies chart.

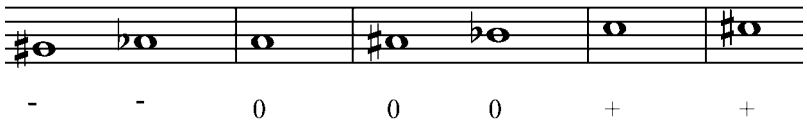
The pitch tendencies chart is a record that you create for yourself that helps you know the tendencies of each note on your instrument when you play it without adjusting. This way, you will know which way to adjust, and how much.

The best way to work on your tuning chart is to do it with a friend who can work the tuner and act as the recorder for each pitch. This way, you are not attempting to compensate for the tuner because you are watching it.

Procedures:

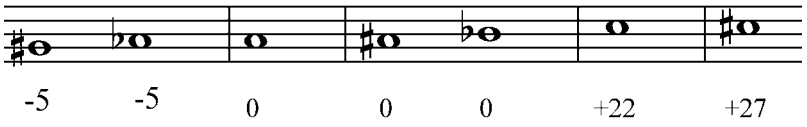
1.) Fill out the top of the Pitch Tendencies Chart. It is important to record the brand and model because each instrument will be slightly different.
2.) If you have an assistant helping you (friend, parent, aunt or uncle, etc.) give them the chart and a pencil.
3.) Once you are properly warmed up, use the tuner to tune and then give the tuner to your assistant.
4.) Play each note on the pitch tendencies chart at a *mf* level with a good, steady tone so that your assistant can record them as Sharp (+), Flat (-), or in tune (0).

Example



5.) Now you have a good idea of which notes are sharp, flat, or in tune. You must now go back for every note and record the cents that each note is flat or sharp.

Example

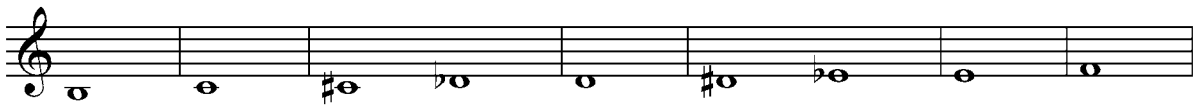


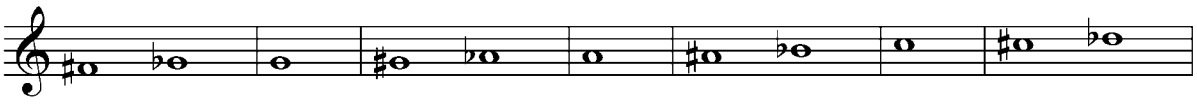
Now you have a completed pitch tendencies chart. The first one can take some time, but they should get better after that. In order to improve your intonation, it is important that you chart the intonation on your instrument periodically (quarterly or at least bi-annually) for the entire range of your instrument, as well as all of your major and minor scales. Keep completed charts so that you can monitor your progress.

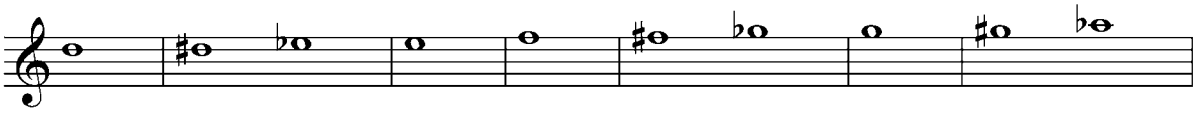
Flute Pitch Tendencies Chart

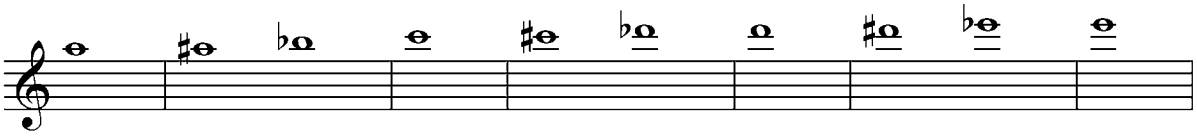
Name:_____ Date:_____

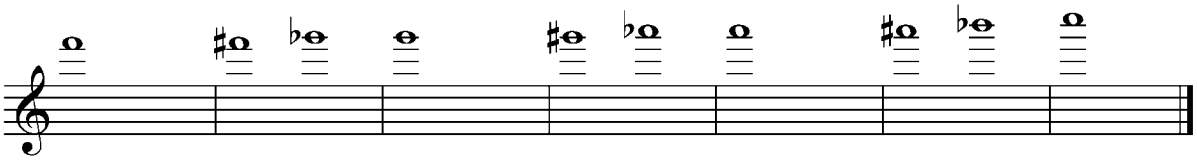
Instrument Brand and Model:_____











Flute

Adjusting pitches

Now that you have warmed up and tuned your instrument, and charted the pitch tendencies of the flute, you should notice that not all notes are in tune without further adjustment. This is why you need to learn to adjust the pitch while playing.

There are multiple ways to adjust the pitch while playing the flute, both physical and mechanical.

To raise the pitch (if the pitch is flat)

1.) Direct the air upward
2.) Roll Flute Out
3.) Use more air
4.) Alternate fingerings – check with your director
5.) Combinations of the above

To lower the pitch (if the pitch is sharp)

1.) Direct the air downward
2.) Roll flute in
3.) Use less air
4.) Alternate fingerings – check with your director
5.) Combinations of the above

It is very important that you learn to do this without compromising the tone. You must work to have a good embouchure, proper breath support and be an active listener to play with good intonation with a proper tone.

Practicing Adjusting with a Tuner

Practicing adjusting your pitch is very important. You need to learn the best methods to adjust the pitch, as well increasing your ability to adjust notes quickly. A good way to practice is to get out your most recent Pitch Tendencies Chart, your instrument and your tuner. Warm up properly and tune your instrument.

Start in a comfortable register, and then work your way up and down the range of the instrument.

Play each pitch as a long tone and work to adjust it in tune using the methods listed above. Concentrate on keeping good air support and focus on maintaining a great sound at all times. Good tone is vital.

Once you have adjusted a note so that it is in tune, try to start it in tune. After a while, try to play a few notes in a row, getting each note in tune.

You can (and should) also do this with all of your Major and minor scales as well.

Practicing Adjusting by Ear

Practicing adjusting your pitch is very important. You need to learn the best methods to adjust the pitch, as well increasing your ability to adjust notes quickly. A good way to practice is to get out your tuner, and get a friend to help you. You can also use a reliable pitch source (tone generator, tuning CD). Warm up properly and tune your instrument.

Whether you are using your friend or a pitch source is not important. What is important is that you are using your ears. If you are using your friend as a pitch source, have them look at the tuner while they play to make sure they are in tune and keeping the pitch steady. Position yourself with your back facing your friend so that you are not looking at the tuners. Learn to trust your ears.

After you have tuned your instrument, play your tuning pitch with your pitch source and work to eliminate the beats. If you adjust one way and the beats increase, you have gone the wrong way. Adjust the other way and eliminate the beats. Once the beats are gone, you are in tune. Now that you have that note in tune, adjust your pitch so it goes flat and listen to how that sounds. Bring the pitch back in tune. Now adjust the pitch so that it is sharp of the pitch source, and bring it back in tune.

Start in a comfortable register, and then work your way up and down the range of the instrument.

Once you have a good idea of how notes sound in tune, flat and sharp, see if you can tell which way you are if the note is not in tune.

Have your pitch source sound a note, play your note. If it is out of tune, decide if it is flat or sharp. Say this out loud, and then turn around and check it with your tuner.

If you have a friend helping you, stand back to back. Tune your instruments to the tuner. Turn the tuner off. Now call out a note and have your friend play it intentionally flat, sharp, or in tune and hold it steady. You play the note and try to match the pitch as quickly as you can.

Scale Tuning Exercises

The Scale Tuning Exercises sheet can be used in many ways. You will notice that this is a simple scale sheet with concert pitch B♭ Major, E♭ Major, F Major and their relative natural minor scales.

Some ideas for development of pitch adjustment skills
(After you have warmed up and tuned your instrument)

Use the following to make your own exercise variations:

1.) Markings
    a. Mark in the pitch tendencies from your most recent pitch tendency chart
        i. (+12, -7,0) mark in the exact tuner reading
        ii. (+,-,) mark in only sharp or flat notes
        iii. (S+, M+, V+, S-, M-, V-) indicate notes as slightly, moderately or very sharp or flat.)
        iv. No markings
2.) Tuner
    a. Look at tuner
    b. Have another person look at tuner and indicate whether in tune or not
    c. No tuner, use another source of pitch – Friend playing along while they look at tuner. Adjust until the beats are gone.
3.) Tempo
    a. Play long tones and adjust each note
    b. Play slowly in rhythm and adjust each note
    c. Play quickly in rhythm, working to land on goal notes in tune (notes with fermatas)
4.) Singing
    a. Sing the exercises using a tuner to help you hear and internalize where the notes are supposed to be before you actually play them.

Try to vary the way you work on intonation a little each day to keep it interesting and fresh as well as to train your ears in various ways.

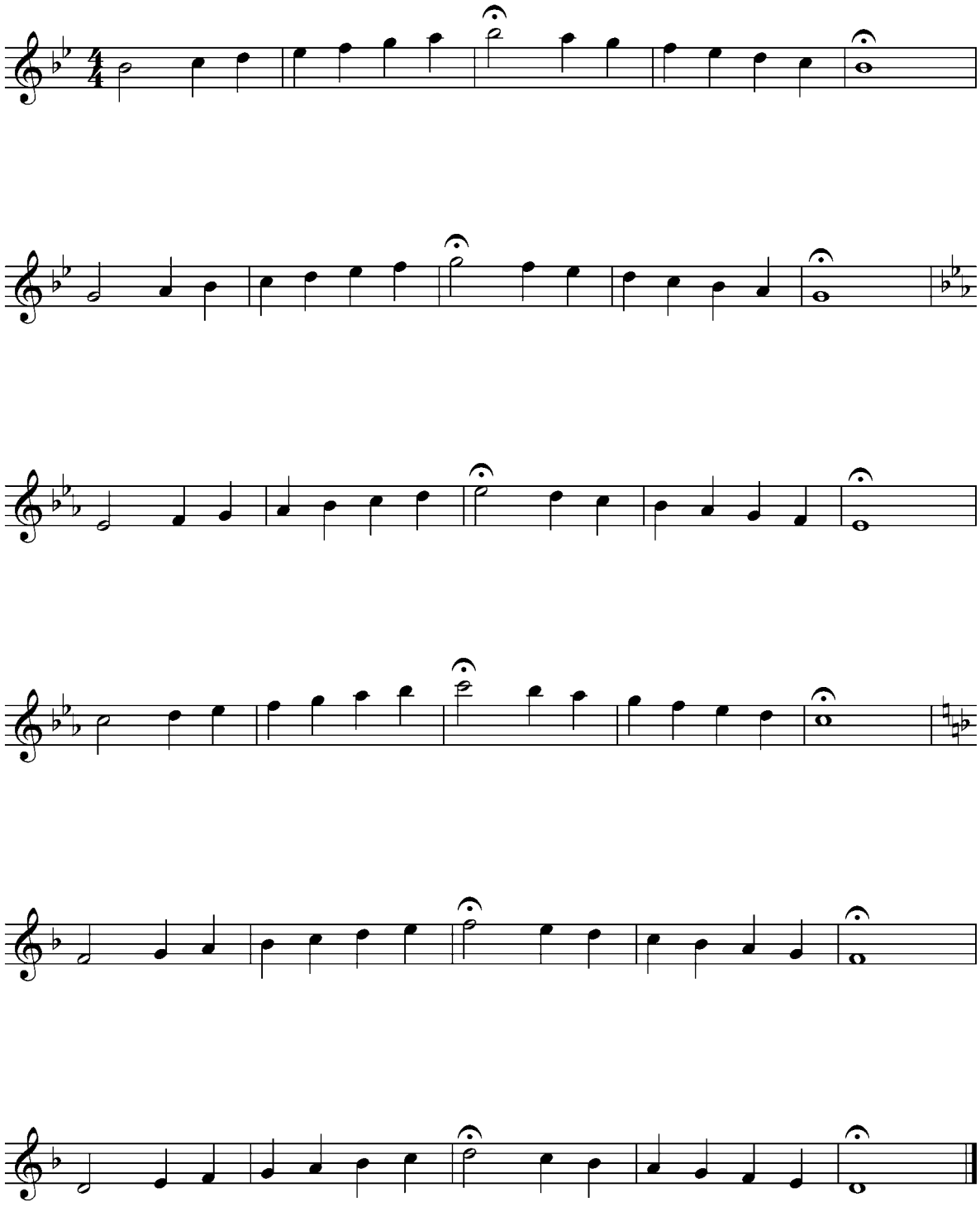
Example 1 – Write in all of the pitch tendencies exactly, look at tuner, play long tones on each note, making adjustments as you play until each note registers in tune. Repeat and try to adjust more quickly this time until you can play each note in tune immediately.

Example 2- Mark in sharp or flat and degree (slightly, moderately or very), play slowly in rhythm along with friend who is looking at a tuner and adjust quickly by ear.

Have fun, be creative, and know that every time you work on intonation, you will get better.

Flute

Scale Tuning Exercises



Memorizing your Pitch Tendencies

Memorizing the pitch tendencies on your instrument so that you are always aware of them can be a challenge. Here are some ideas that may help you.

Photocopy the Flute Pitches page and you can use it in a variety of ways to help you learn your pitch tendencies.

Flash Cards

Cut out each of the measures so that you have them on little squares of paper. On the back of each square, write the pitch tendency of each note. Flat, Sharp or In Tune. You can practice quizzing yourself, or you can have another person help you.

Written Assessment

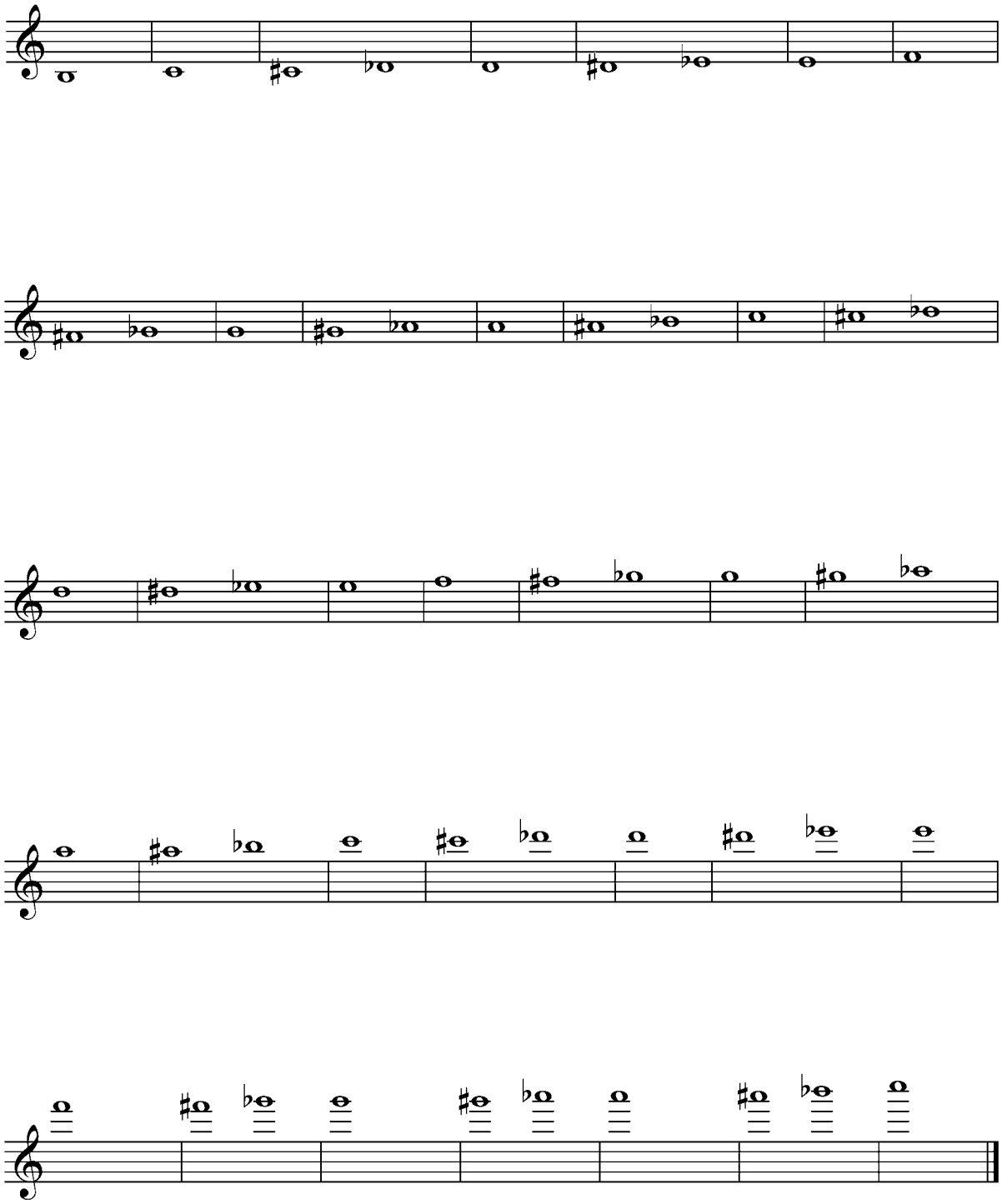
Without looking at your latest pitch tendencies chart, try to write in all of the pitch tendencies for each note that is either flat or sharp on your instrument. Once you think you have them all written in correctly, get out your latest chart and see how you did. This is a great way to help learn your pitch tendencies.

Mark Your Music

Mark in all of the pitch tendencies for your instrument into your band music. This will help you anticipate probable pitch problems, as well as to memorize the pitch tendencies of your instrument.

Flute Pitches

Copy this sheet and use for flashcards and written assessment to help you memorize the pitch tendencies for your instrument.



Ear Training

Ear training is one of the most important skills to develop as a musician. One way that you need to develop your ear is by listening to a reference pitch, and adjusting your pitch to match. Another way that you need to train your ear is to hear the music before you play it so that you know how the notes are supposed to sound.

Interval Ear training is a great way to get started. An interval is the distance between two notes. There are 12 basic intervals that you need to learn. This ear training exercise will help you learn 8 of these intervals.

First, take a look at the Ear Training exercise. Notice that the first line of music is the B♭ Concert scale. The numbers below it are called scale degrees.

There are 8 listed intervals:

P8 – Perfect Octave
P5 – Perfect 5th
P4 – Perfect 4th
M2 – Major 2nd
M3 – Major 3rd
M6 – Major 6th
M7 – Major 7th

The first thing you need to be able to do is play the scale in tune; then you need to learn to sing the scale. Once you can sing and play the scale in tune, it is time to learn your intervals.

When learning intervals, it is a good idea to start with a few, and then add more as you are ready. I recommend this order:

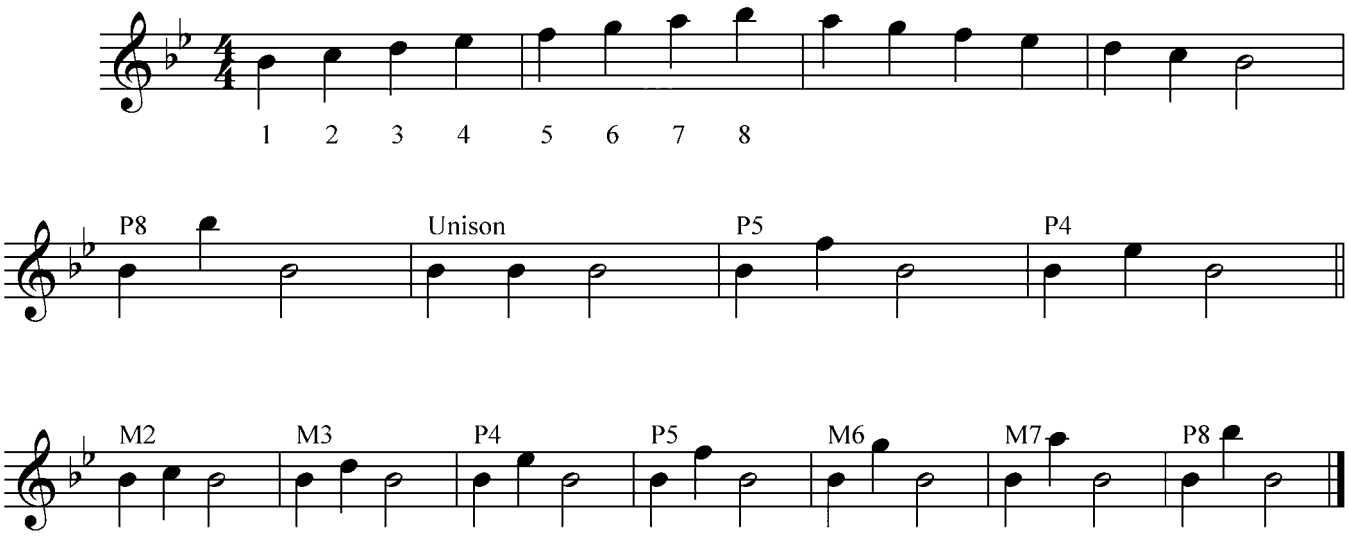
P8 and Unison
P4 & P5
P8, P5, P4 & Unison
M2 & M3
P8, P5, P4, M3, M2 & Unison
M6 & M7
P8, M7, M6, P5, P4, M3, M2 & Unison

Steps for learning intervals:

1. Play in tune using tuner
2. Sing in tune using tuner
3. Play with friend while friend looks at tuner and match by ear
4. Have friend play interval and you decide which interval was played
5. Identify intervals in your band music and lesson material

Flute

Ear Training



Works Cited

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