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STRING THEORY

Book 1 (Strings and Circles, The Musical Abacus and the Book of Patterns)

Major Scales – Key Signatures – Finger Patterns

Book 2

Arpeggios – Minor Keys – Intervals

Book 3

Chords – Progressions – Composing

Book 4

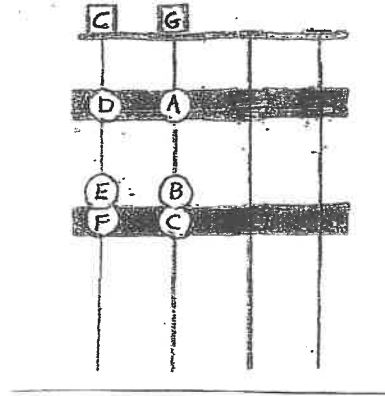
Non Harmonic Tones – Modulation – Analysis

You can already play many scales. Let's start by playing the easiest scales.

Violas and Cellos – start on your open C string and play eight notes (also called an octave, just as an octagon has eight sides and an octopus has eight tentacles).

We could draw the scale some different ways.

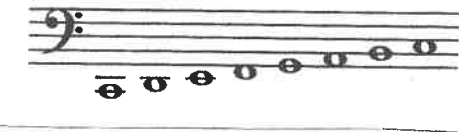
On a fingerboard chart:



As a table:

C	D	E	F	G	A	B	C
---	---	---	---	---	---	---	---

On the staff



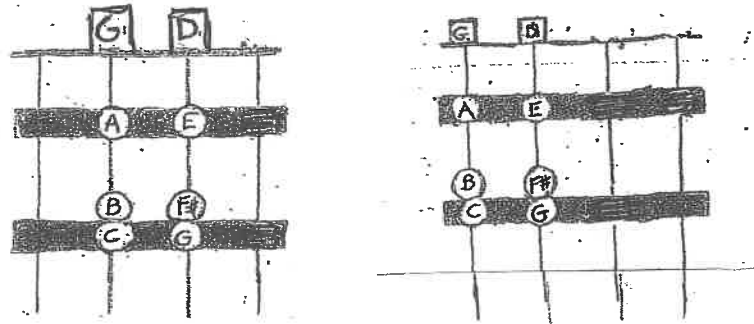
The fingerboard chart shows clearly where fingers are far apart (a whole step) and where they are touching (a half step) – however it can seem confusing that the notes that sound higher appear lower on the page.

The staff shows clearly that the notes ascend but the notes are the same distance apart regardless of whether they are a whole step or a half step.

The table makes the names of the notes easy to read

The second scale we will play will begin on the open G string for the cellos, violas and violins.

The fingerboard chart:

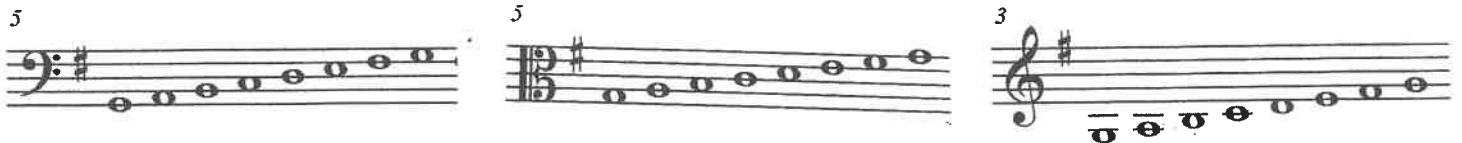


The table:

G	A	B	C	D	E	F#	G
---	---	---	---	---	---	----	---

↑
New
#

On the staff:



Note that we had to raise F to it's sharped position - F# - to make the scale sound right.

That makes this a true statement:

The G scale uses an F#.

This is another way to state the same information:

In the key of G there is an F#.

Yet another way:

In the key of G there is an F#.

Note that the F# appears in the 7th box of the table.

Play the scale beginning on the open D string – this scale is the same for cello, viola and violin.

Fingerboard chart:

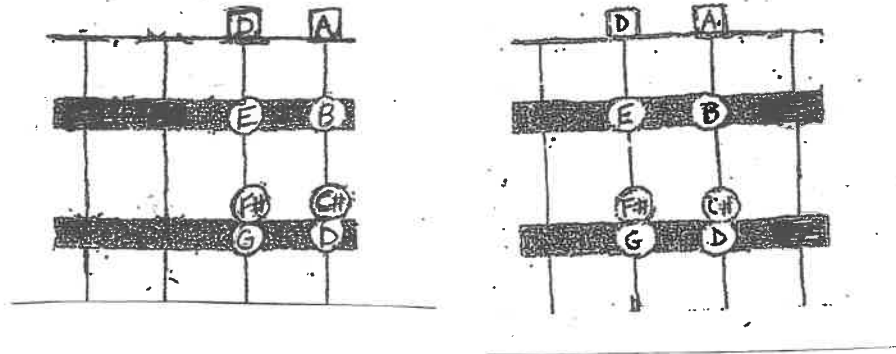
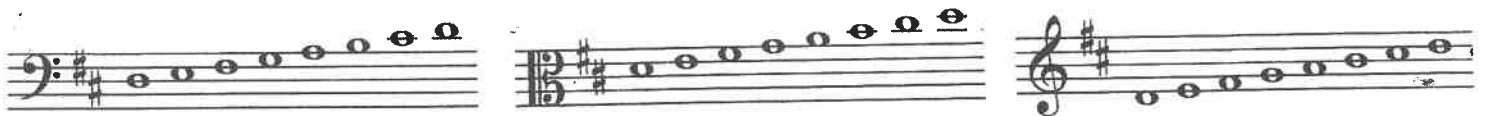


Table:

D	E	F#	G	A	B	C#	D
---	---	----	---	---	---	----	---

New #

Staff:



Note that we now need to raise both F and C to the sharp position - F# and C# - to make the scale sound right.

Note that C# (the new sharp) is in the 7th box of the table.

Violins – Play the scale beginning on open A.

Fingerboard Chart:

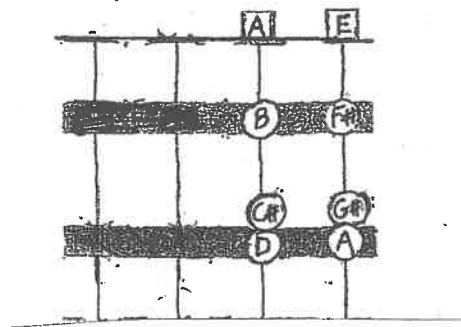
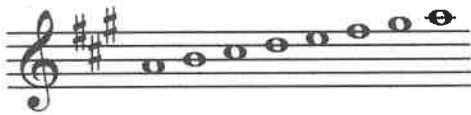


Table:

A	B	C#	D	E	F#	G#	A
---	---	----	---	---	----	----	---

New #

Staff:



Note that now F, C and G need to be sharped - F#, C# and G#.

Note that the newest sharp - G# - is in the 7th box of the table.

All of the scales we have played have used the fingers in the same pattern.

Violin / Viola

Cello

0

0

1

1

2
3

3
4

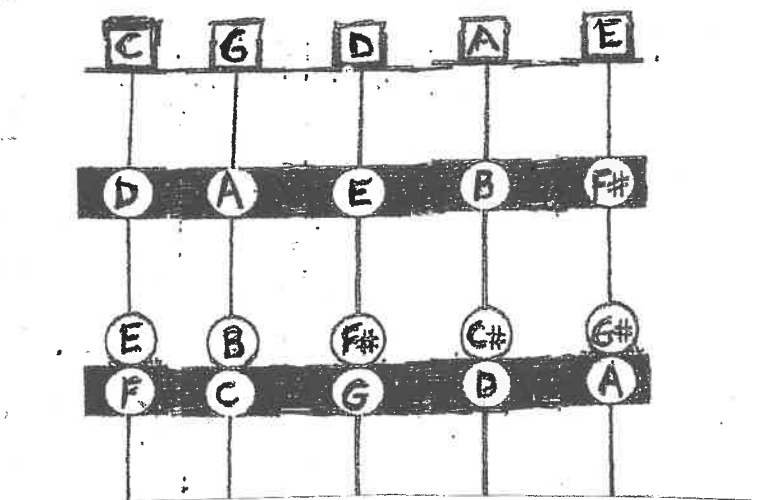


It seems that most string method books begin with this pattern of the fingers.

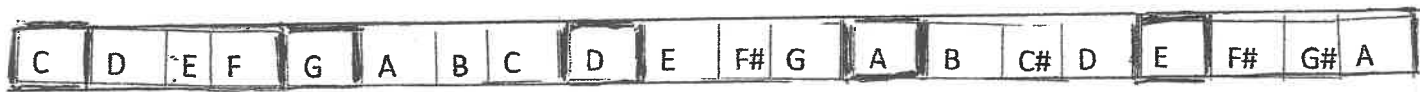
I would like to call this the HOME finger pattern (some like to call it the Twinkle finger pattern).

Many electric bowed string instruments are now being made with five strings.

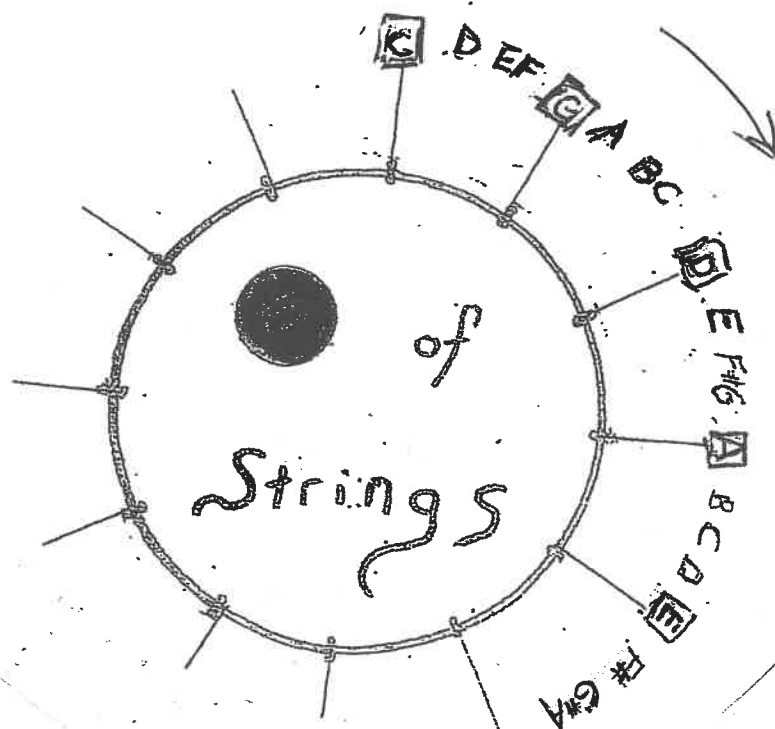
Such an instrument could play all the scales we have covered using only the HOME finger pattern.



If we put all of the notes from the fingerboard chart above on a single ~~line~~ it would read as follows:



And if we curled that line



It makes part of a circle.

Let's call it the Circle of Strings.

We can also take the 5 stringed instrument fingerboard chart of scales and put the information on a table.

Since some strings are used in two scales they will appear twice on the table.

Scale							
C	D	E	F	G	A	B	C
G	A	B	C	D	E	F#	G
D	E	F#	G	A	B	C#	D
A	B	C#	D	E	F#	G#	A
Tetrachord				Tetrachord			

Note that the second four notes of each scale are reused as the first four notes of the scale on the next line.

Eight notes in a row are called a scale.

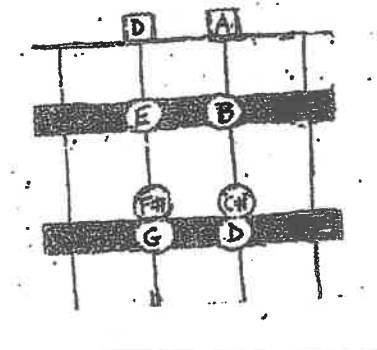
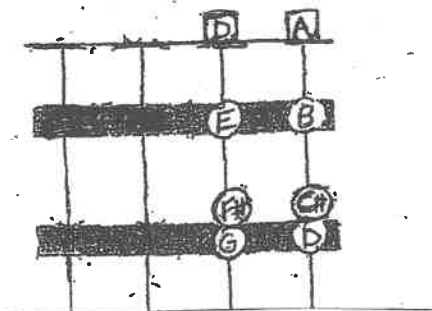
Four notes in a row are called a tetrachord.

A scale is made of two tetrachords.

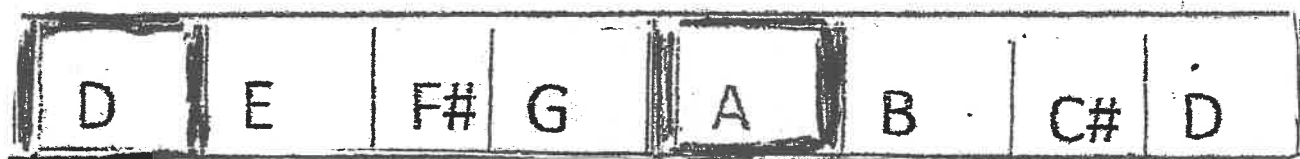
When playing scales that begin on an open string each string is playing one tetrachord of the scale.

Let's use this information to determine the formula for these scales.

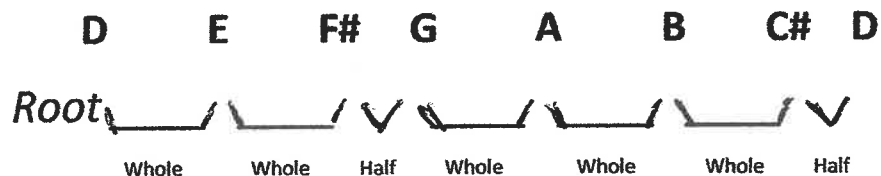
Take the fingerboard chart for the D scale.



And now place the strings next to each horizontally:



The formula can be written as:



This is the formula for the Major scale.

In a major scale there are two identical tetrachords.

Each tetrachord in a Major scale uses a bottom note followed by two whole steps and a half step.

Every scale we have made so far has the same formula.

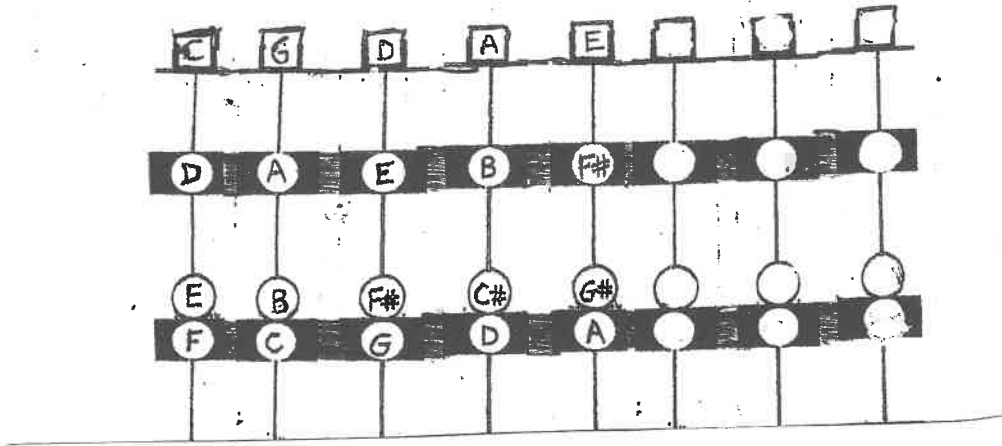
C	D	E	F	G	A	B	C
G	A	B	C	D	E	F#	G
D	E	F#	G	A	B	C#	D
A	B	C#	D	E	F#	G#	A

Root: 

Whole Whole Half Whole Whole Whole Half

The study of music theory is useful because once you know a formula you don't need to listen to a scale to figure out the correct notes. Instead you can apply the Major Scale Formula and "theorize" what notes will make a scale sound right.

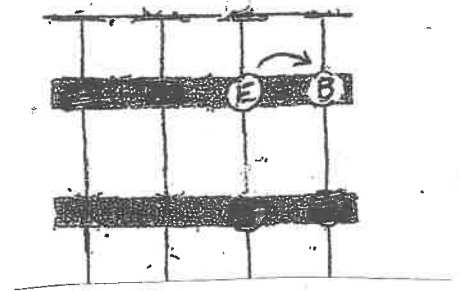
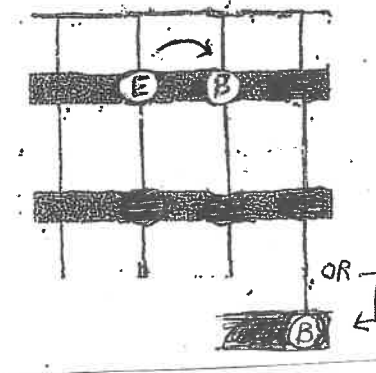
Let's figure out the scales that could be played on the theoretical 8 string instrument below:



To fill in the name of the 6th string either figure out the name of the 4th finger on the violin E string or

Place 1st finger on the D string and jump it up a string to 1st finger on the A string.

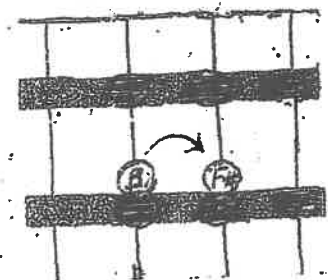
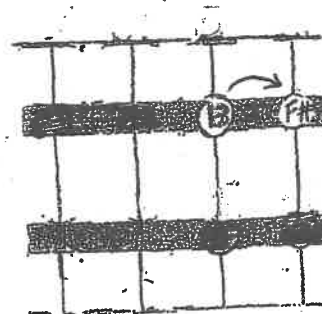
The answer to both methods is – B.



To figure out the name of the 7th string place a B on your instrument in a place where you can jump up a string. For violins place 1st finger on the A string and jump up a string to 1st finger on the E string. For violas and cellos place a B on the G string (violas use High 2nd finger/cellos use 3rd finger) and hop that finger up a string to the D string. Figure out the name of the finger on the new string.

The answer for all instruments is – F#.

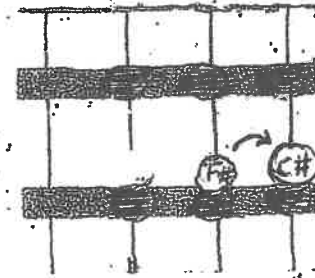
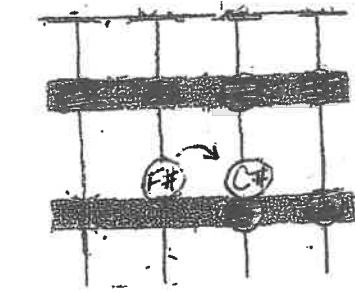
The 7th string is the F# string.



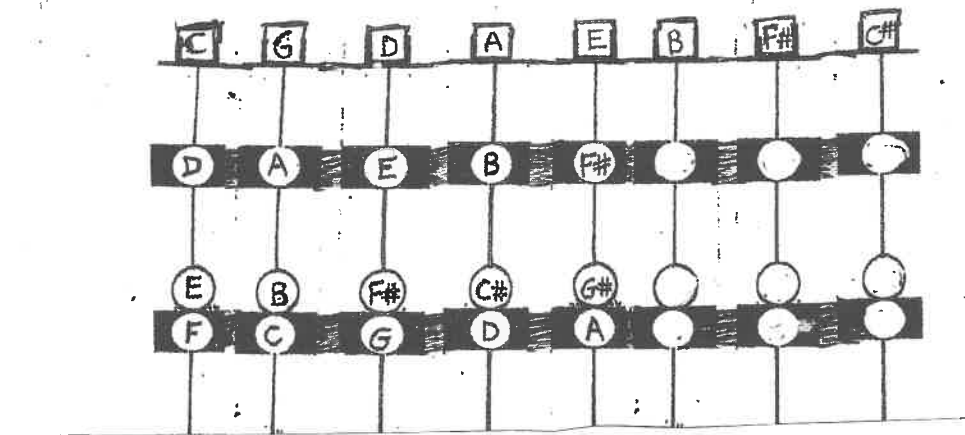
To figure out the name of the 8th string place an F# on the D string (violin and viola = High 2/cello = 3) and jump up a string to the A string. What is the name of that note?

The answer is – C#

The 8th string is the C# string.

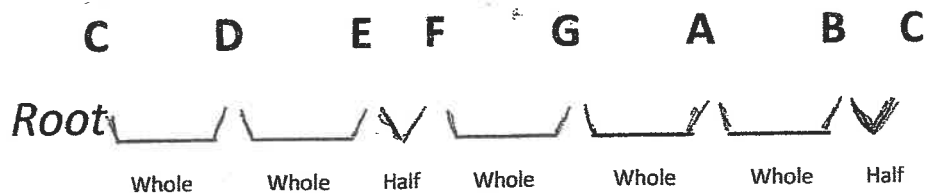


The entire set of strings is shown below:



Before we fill in the letter names for the fingered notes on the 9 string fingerboard chart we need to review some theory you have probably already learned in your studies.

Look at the C Major Scale below:



Note three things –

1. None of the notes uses a sharp
2. Most notes are a whole step apart, but in two spots the notes are a half step apart.
3. The half notes in the C Major Scale are spelled EF and BC

Any note in the scale can be made higher by a half step by adding a sharp.

I consider the first group to be simple sharps and the second group to be advanced sharps.

Simple sharps:

C	C#	D	D#	E	F	F#	G	G#	A	A#	B	C
---	----	---	----	---	---	----	---	----	---	----	---	---

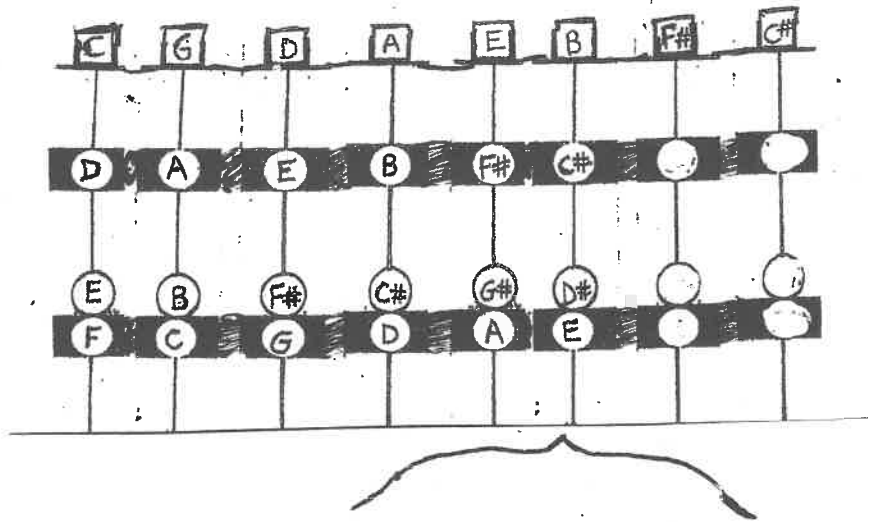
Advanced sharps:

B#		D		E	E#		G		A		B	B#
C		D		E	F		G		A		B	C

Here is a musical ruler to help us with our calculations:

B#	C#	D	D#	E	E#	F#	G	G#	A	A#	B	B#
C	C#	D	D#	E	F	F#	G	G#	A	A#	B	C

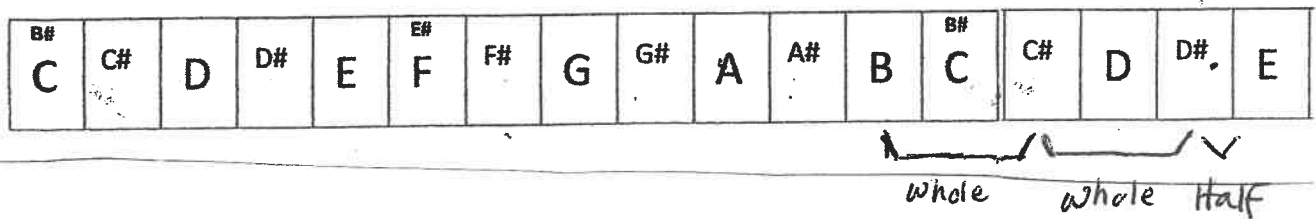
Now we are ready to place the note names on the B string.



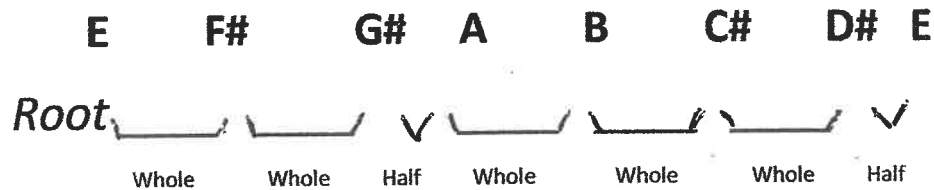
A whole step higher than B is C#.

A whole step higher than C# is D#.

A half step higher than D# is E.



The notes of the E Major Scale are:



We can add this scale to the table:

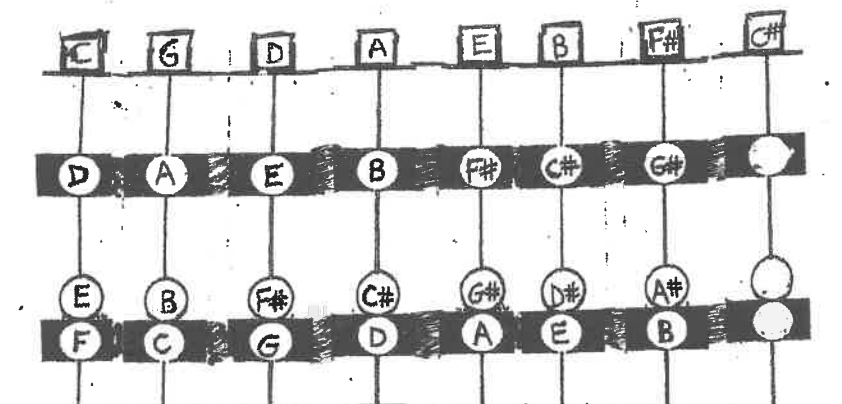
C	D	E	F	G	A	B	C
G	A	B	C	D	E	F#	G
D	E	F#	G	A	B	C#	D
A	B	C#	D	E	F#	G#	A
E	F#	G#	A	B	C#	D#	E

Here it is on the staff:



Now let's theorize the scale beginning on the **B** string.

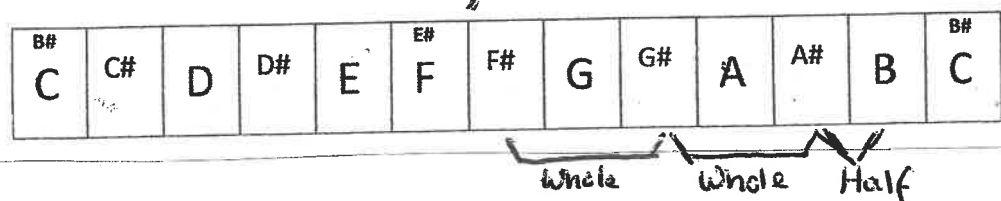
We are ready to place the notes on the **F#** string.



A whole step from F# is G#.

A whole step from G# is A#.

A half step from A# is B.



The notes of the B Major Scale are:

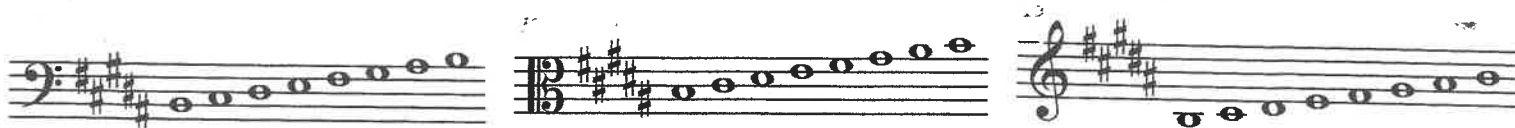
B C# D# E F# G# A# B

Root _____
 Whole Whole Half Whole Whole Whole Half

Let's place this scale on the table of scales:

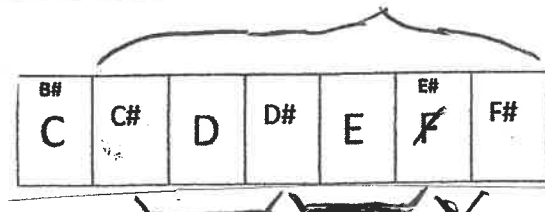
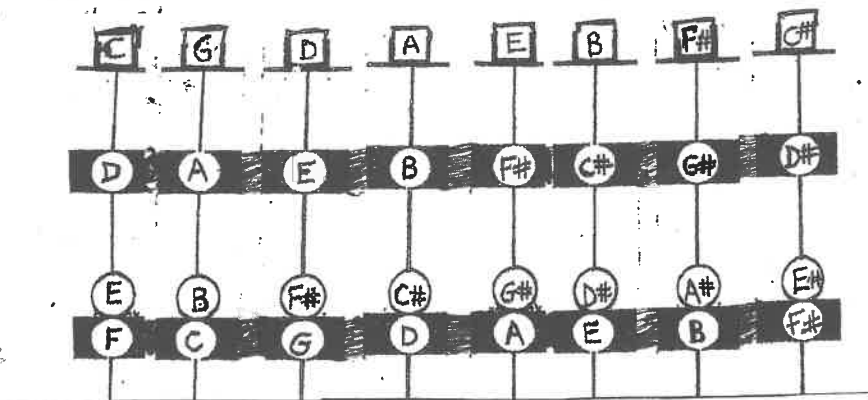
C	D	E	F	G	A	B	C
G	A	B	C	D	E	F#	G
D	E	F#	G	A	B	C#	D
A	B	C#	D	E	F#	G#	A
E	F#	G#	A	B	C#	D#	E
B	C#	D#	E	F#	G#	A#	B

Here it is on the staff:



The top string on our eight string instrument makes the tetrachord that completes the F# Major Scale.

Place the notes on
the C# string.



A whole step higher than C# is D#.

A whole step higher than D# is E# (this sounds like F but we cannot call it F as we are writing a scale and need to use one note of each name – the letter that must appear after D is E) Whole. Whole Half

A half step higher than E# is F#.

The notes of the F# Major Scale are:

F# G# A# B C# D# E# F#

Root _____

Whole

Whole

Half

Whole

Whole

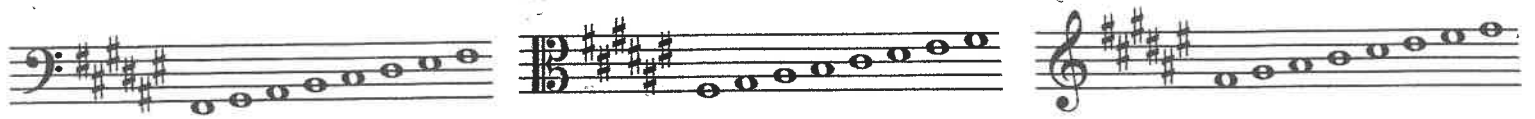
Whole

Half

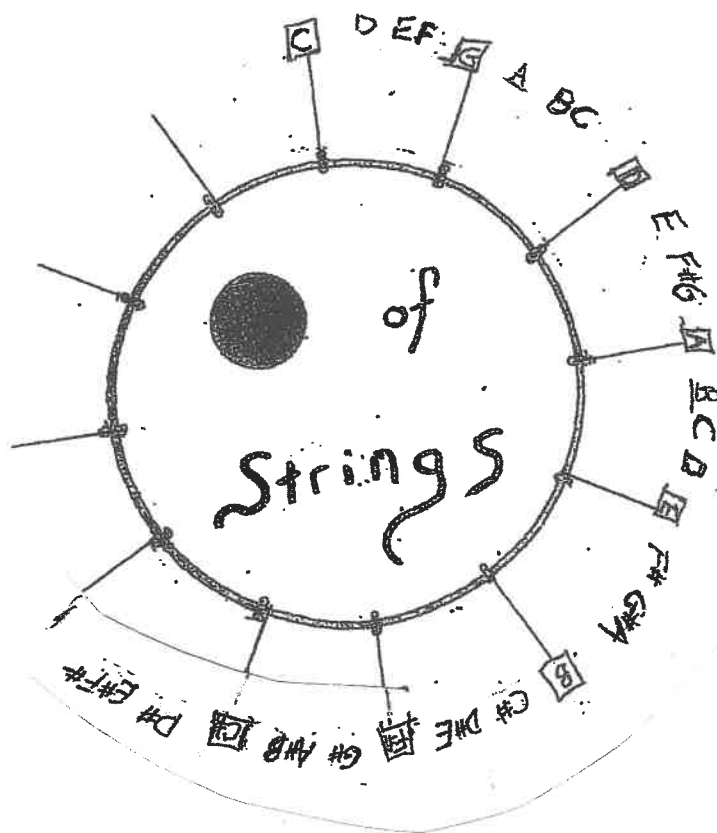
Added to the table:

C	D	E	F	G	A	B	C
G	A	B	C	D	E	F#	G
D	E	F#	G	A	B	C#	D
A	B	C#	D	E	F#	G#	A
E	F#	G#	A	B	C#	D#	E
B	C#	D#	E	F#	G#	A#	B
F#	G#	A#	B	C#	D#	E#	F#

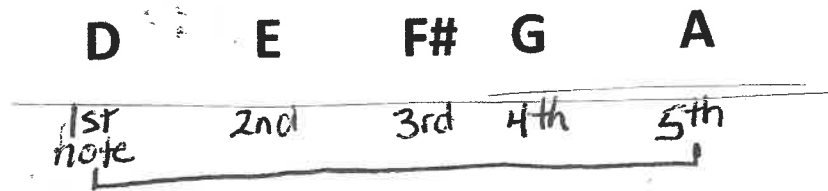
Shown on the staff:



And now let's show this table as a Circle of Strings:



Open strings are considered 5 notes apart. In music we count out notes of a series of notes as the first and last notes as shown below:



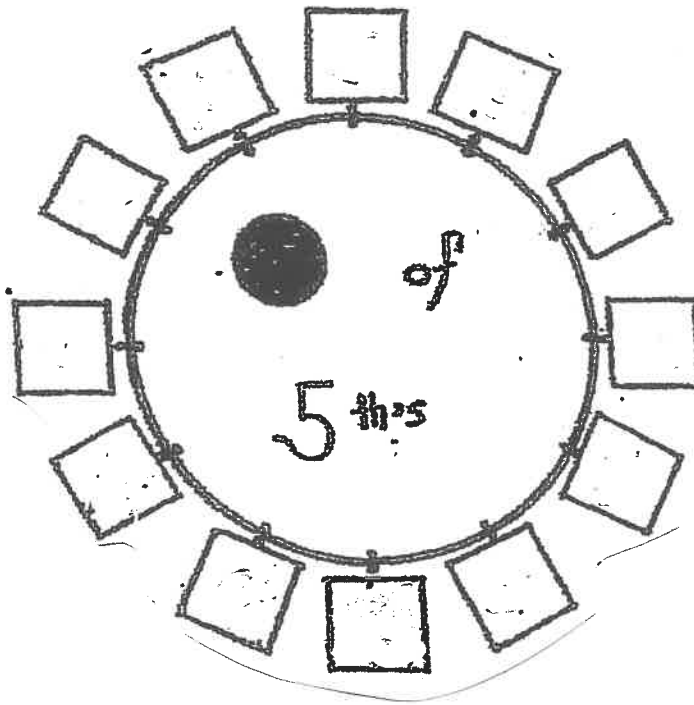
Since open strings are 5 notes apart they are called a fifth apart.

D to A is called a fifth.

Higher level theory books introduce the Circle of Fifths which looks a lot like our Circle of Strings.

The difference is that it only show the open strings. The notes in between are not shown so you have to imagine them.

The Circle of 5ths:



In order to complete the Circle of 5ths you need to include the major scales which use flats.

Altogether there are 12 places on the Circle of 5^{ths}.

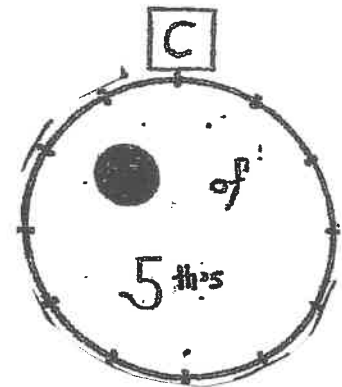
It is convenient that because of this the Circle looks a lot like a clock face.

We know that the C Major Scale uses these notes:

C	D	E	F	G	A	B	C
---	---	---	---	---	---	---	---

It uses no sharps.

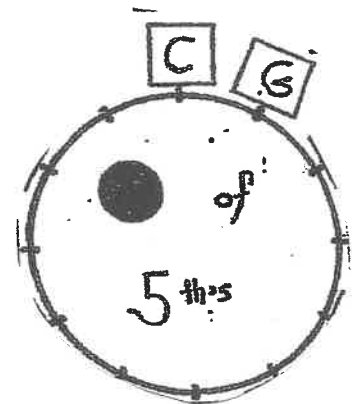
It is placed at high noon on the clock face.



The G Major Scale is spelled:

G	A	B	C	D	E	F#	G
---	---	---	---	---	---	----	---

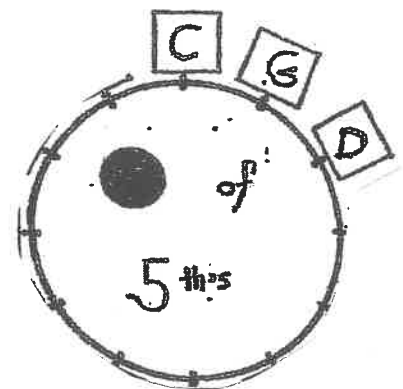
It uses one sharp (F#) and is placed at the 1:00 position of the clock face.



The D Major Scale is spelled:

D	E	F#	G	A	B	C#	D
---	---	----	---	---	---	----	---

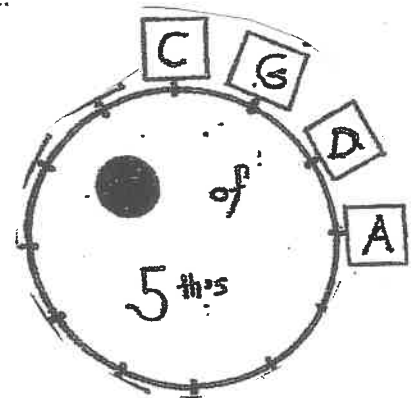
It uses 2 sharps (F# and C#) and is placed at the 2:00 position of the clock face.



The A Major Scale is spelled:

A	B	C#	D	E	F#	G#	A
---	---	----	---	---	----	----	---

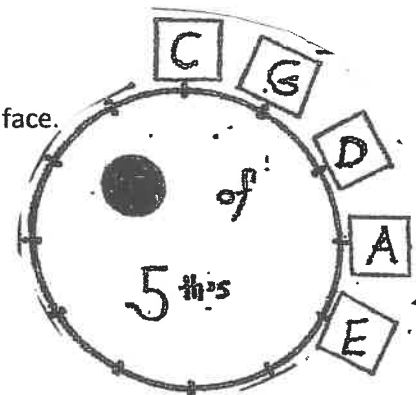
It uses 3 sharps (F#, C# and G#) and is placed at the 3:00 position of the clock face.



The E Major Scale is spelled:

E	F#	G#	A	B	C#	D#	E
---	----	----	---	---	----	----	---

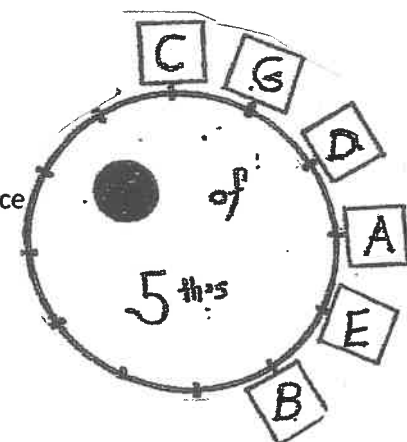
It uses 4 sharps (F#, C#, G# and D#) and is placed at the 4:00 position of the clock face.



The B scale is spelled:

B	C#	D#	E	F#	G#	A#	B
---	----	----	---	----	----	----	---

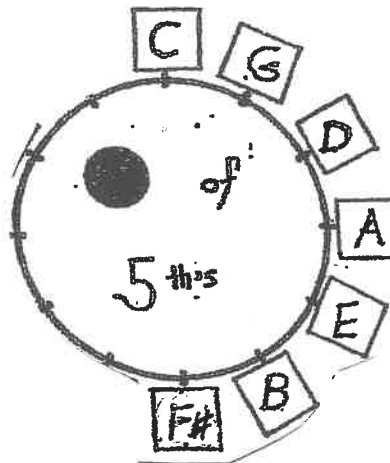
It uses 5 sharps (F#, C#, G#, D# and A#) and is placed at the 5:00 position of the clock face.



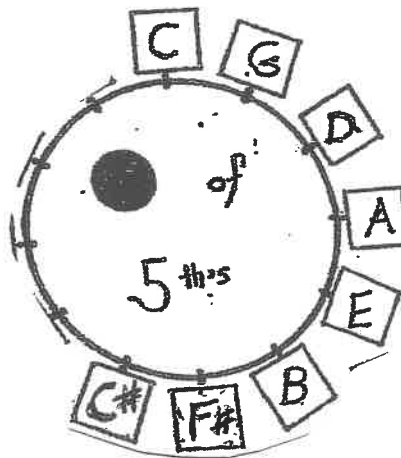
The F# scale is spelled:

F#	G#	A#	B	C#	D#	E#	F#
----	----	----	---	----	----	----	----

It uses 6 sharps (F#, C#, G#, D#, A# and E#) and is placed at the 6:00 position on the clock face.



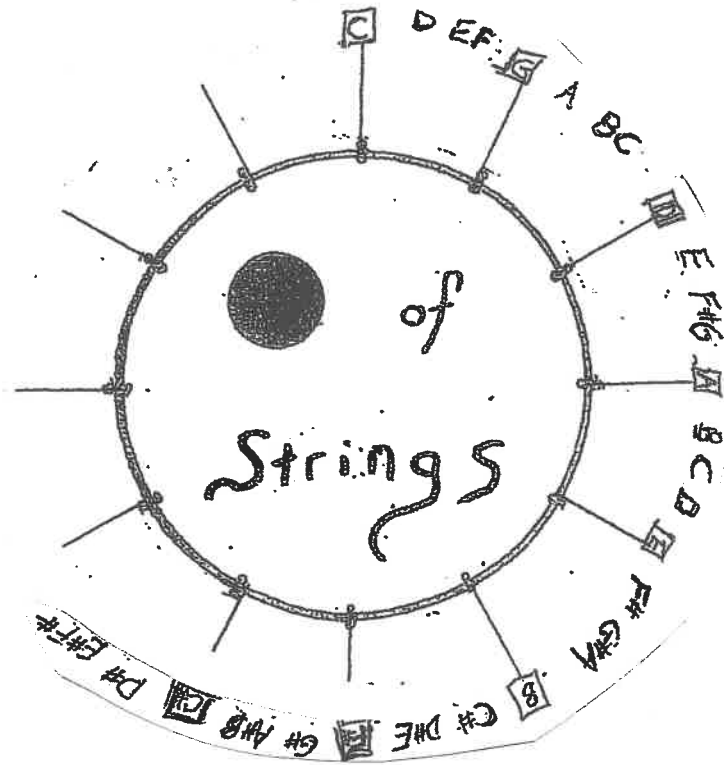
C# is placed at the 7:00 position on the clock face.



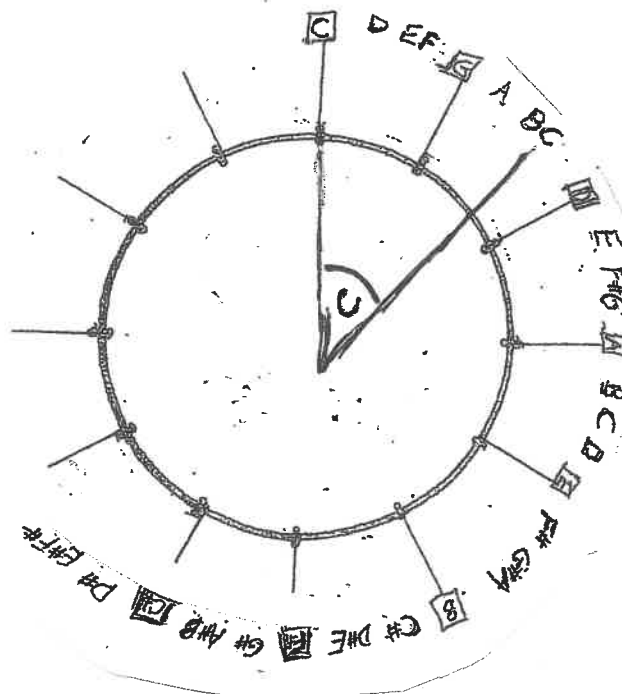
Note that the Circle of 5ths has two halves. They are usually considered the sharp side and the flat side. On string instruments it is convenient to use open strings to discuss beginning theory. The open strings appear on the sharp side of the Circle of 5ths. Because of that we will do a thorough study of the sharp side of the Circle which can then be applied to the flat side of the Circle. On the flat side the same strings appear but with a flat on the note name.

Order of Sharps on the Circles.

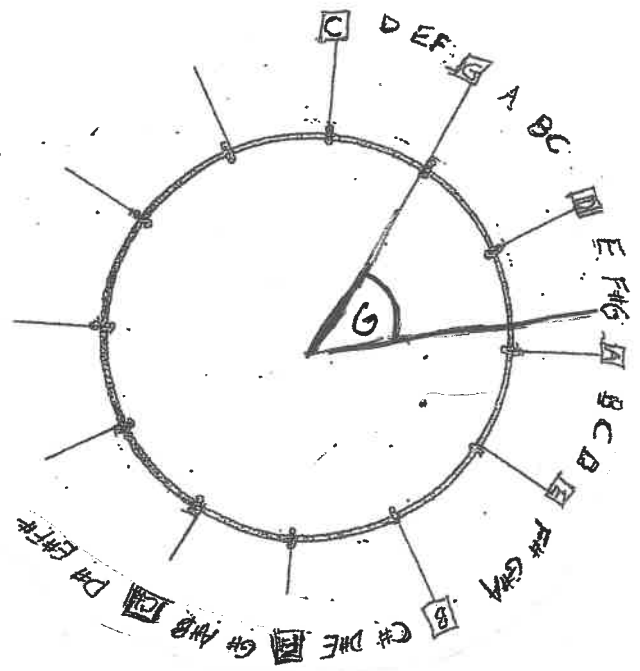
Let's see a diagram of the Circle of Strings as we have studied it so far:



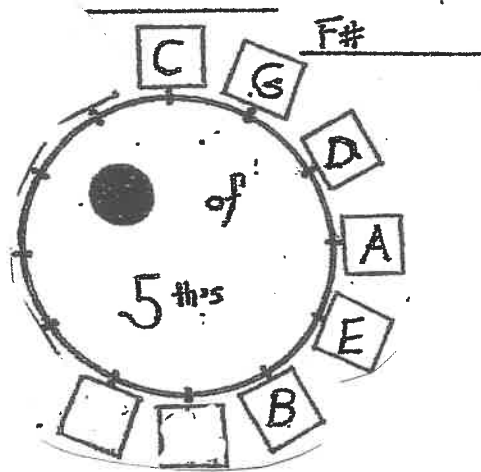
The pie-shaped piece includes the notes found in the C Major Scale.



This pie piece is the G Major Scale – note that the 7th note is F#.

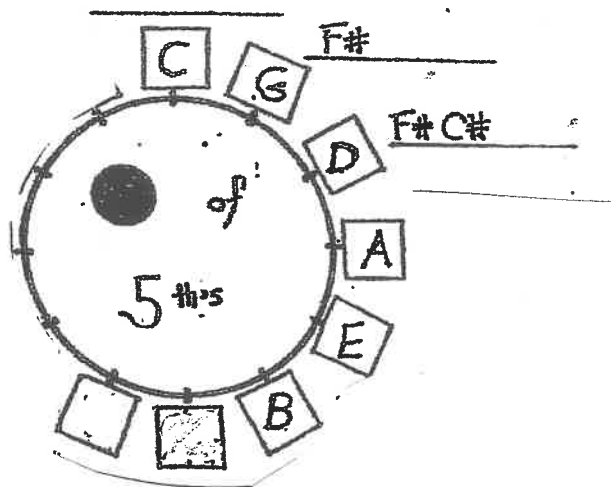
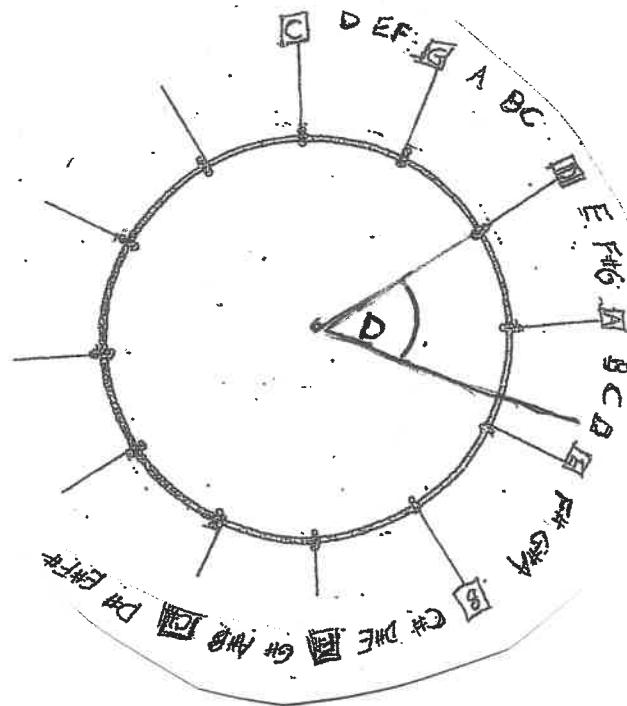


Since the name of the fingered notes are not listed on the Circle of 5ths they list the notes which are sharpened as follows:

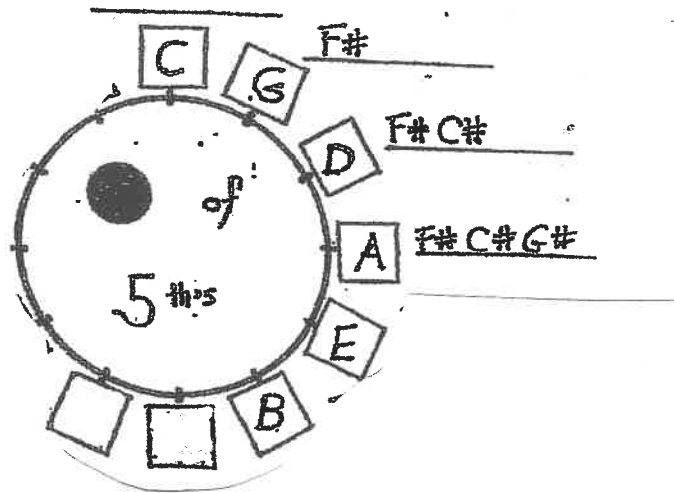
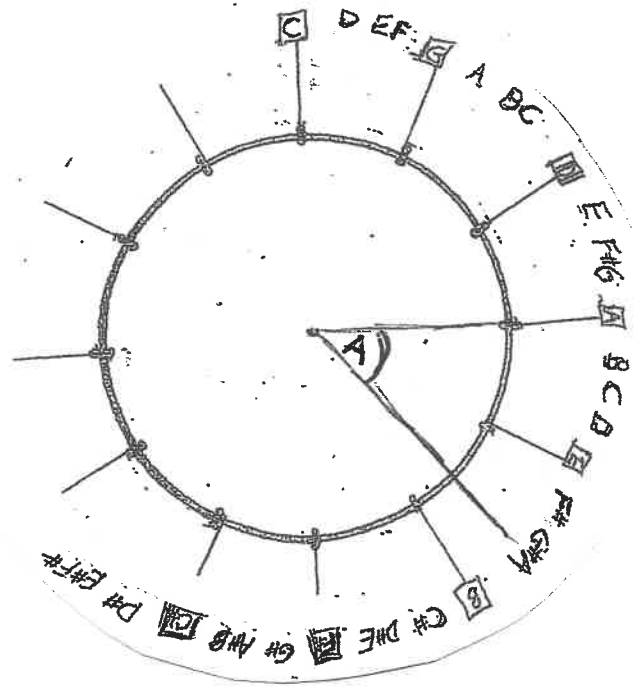


On the staff the F# is shown in at the beginning of the line:

Here are the same presentations of the D Major Scale:

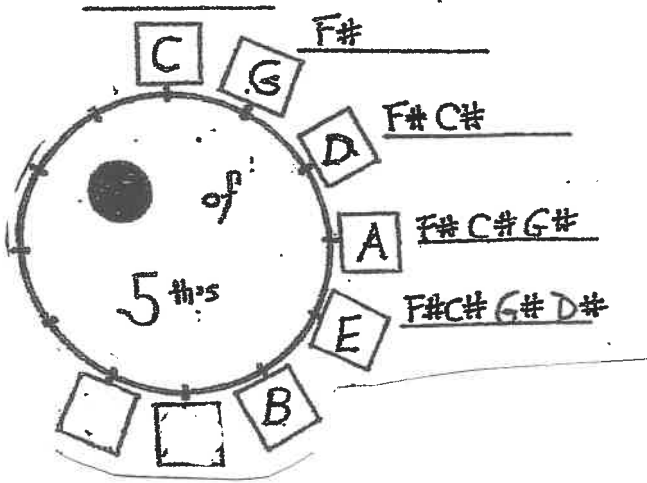
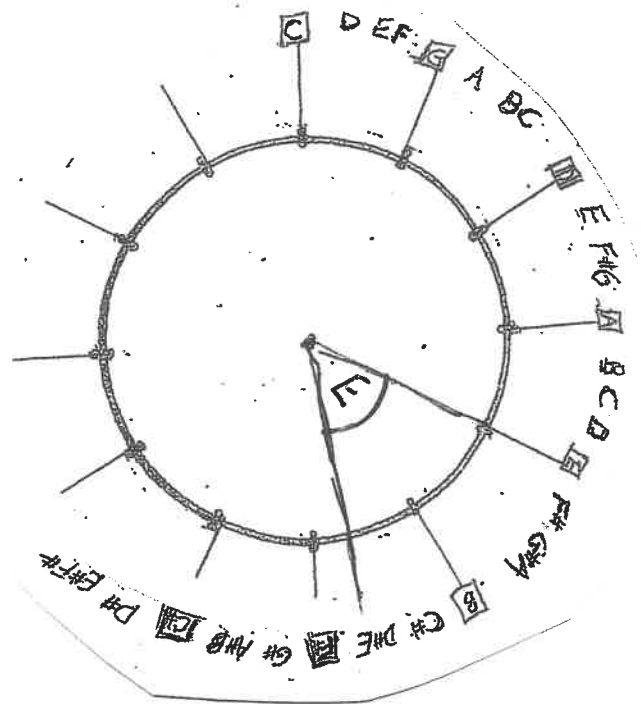


Here is the A Major Scale:

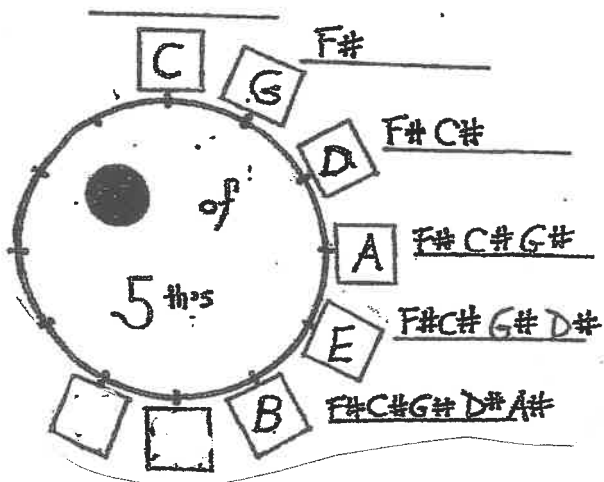
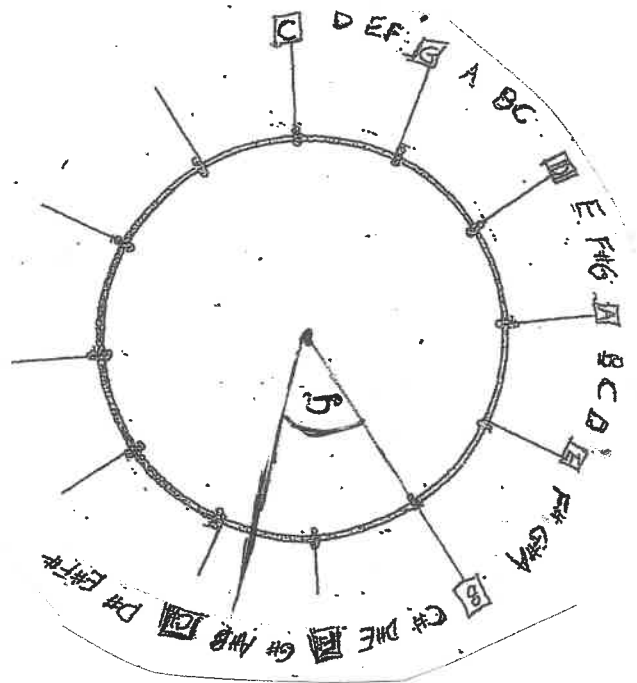


Note that the sharps are always listed in the order that they first appear on the Circle of Strings –
F#, C#, G#.....

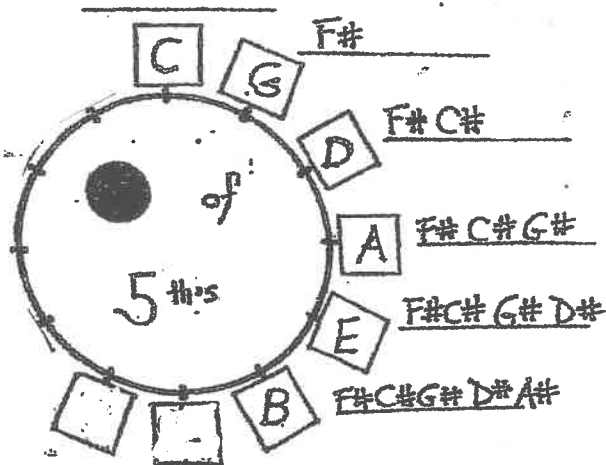
Here is the E Major Scale:



Here is the B Major Scale



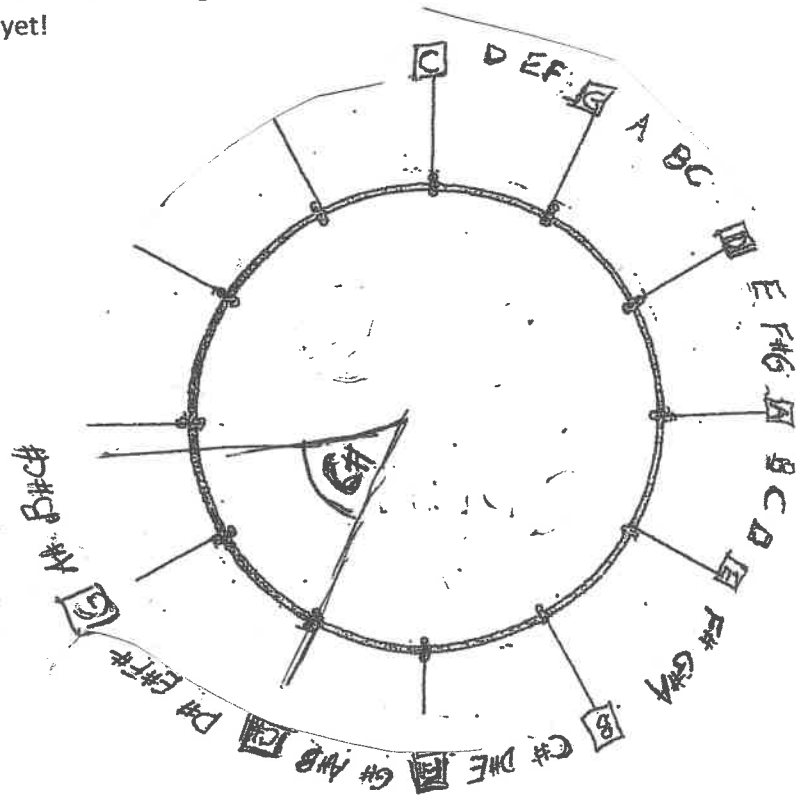
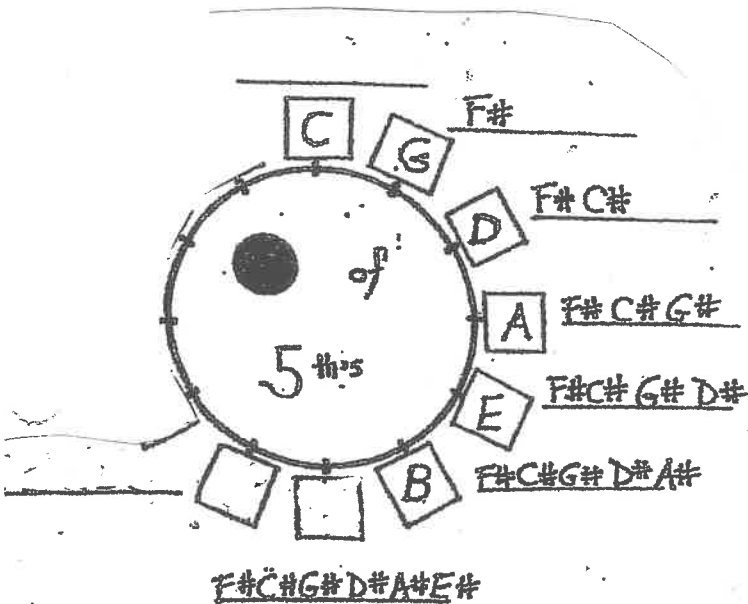
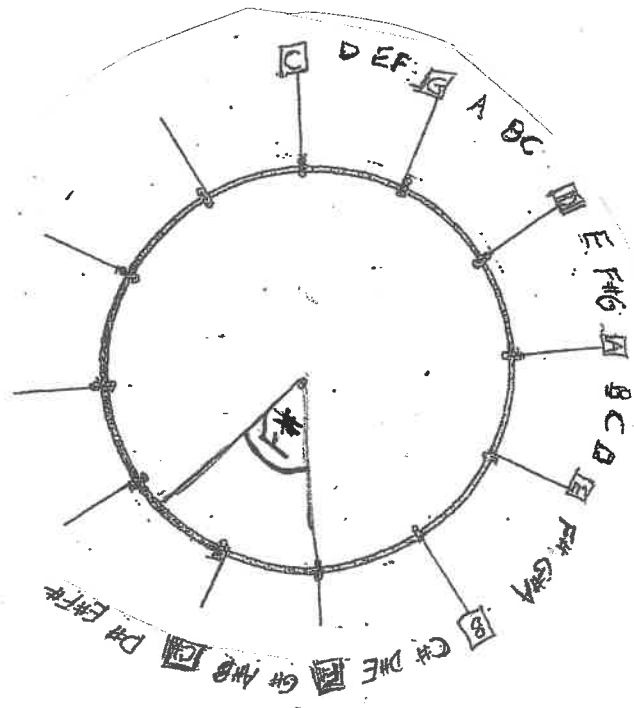
Here is the F# Major Scale:

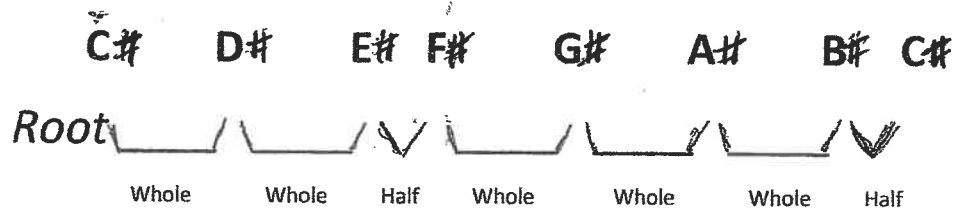


F#C#G#D#A#E#

Optional Advanced Scale

C# Major Scale – Some books choose to finish the sharp side of the Circle of 5ths at 6:00 – other books go on to include 7:00. The reason for this will become clear as we study enharmonics (notes that sound the same but are spelled differently). Regardless we will include a diagram of this “Advanced Level” scale – I have never encountered this scale in a piece yet!





Every note in the C# Major Scale has a sharp.

Let's compare the C# Major Scale to the C Major Scale:

C	D	E	F	G	A	B	C
C#	D#	E#	F#	G#	A#	B#	C#

Every note has the same name other than the fact that in the C# Major Scale every note is sharped.

A song is usually made of notes from one scale. To show which scale the composer has chosen the composer shows the sharps they want to use at the beginning of each line of music.

For instance, if the composer chooses to use the G Major Scale there will be an F# on the staff at the beginning of each line as shown here:



This is called the key signature. It is the key to knowing what notes to play. It is also the key to figuring out what scale is being used (what key the piece is in).

What notes are being used: G A B C D E F# G

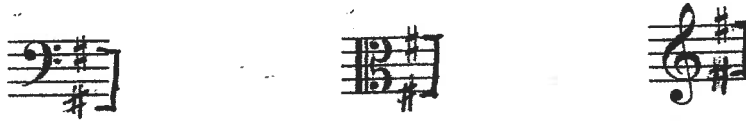
What Scale to use: the G Major Scale

We say that this song is in the Key of G.

The sharp at the beginning of the song is called the Key Signature.

Two interesting facts to note:

1. Even though the Key Signature includes only one F# - because it is written at the beginning of the line it means that any F# in the piece is to be played as an F#. I have often thought it would be easier to understand if it was written like this:



But for whatever reason Key Signatures are not written this way – but it is understood that that it affects the lower F as well – and also any F#'s above the staff.

2. A shortcut to finding the answer to the question, "What key is this piece in?"

Do you remember that the newest sharp was always the 7th note of the scale? J

Look at the Key Signature we used above:



In this key F# was the newest sharp – if F# is the 7th note in the scale then G must be the 8th note.

In a Major Scale the 8th note and the 1st note are spelled the same.

So the 1st note must be G and the answer to the question "What key is this piece in?" is G Major.



What key is this piece in?

The newest sharp is C#.

The 7th note is C#.

The 8th note is D so the 1st note is also D.

The piece is in the key of D Major.

CONGRATULATIONS! You now have a strong understanding of the sharp side of the Circle of 5ths.

It is always good to let a new idea sit for awhile before adding a new element. As a result we will diverge to a couple of other topics before adding the flat side of the Circle of 5ths.

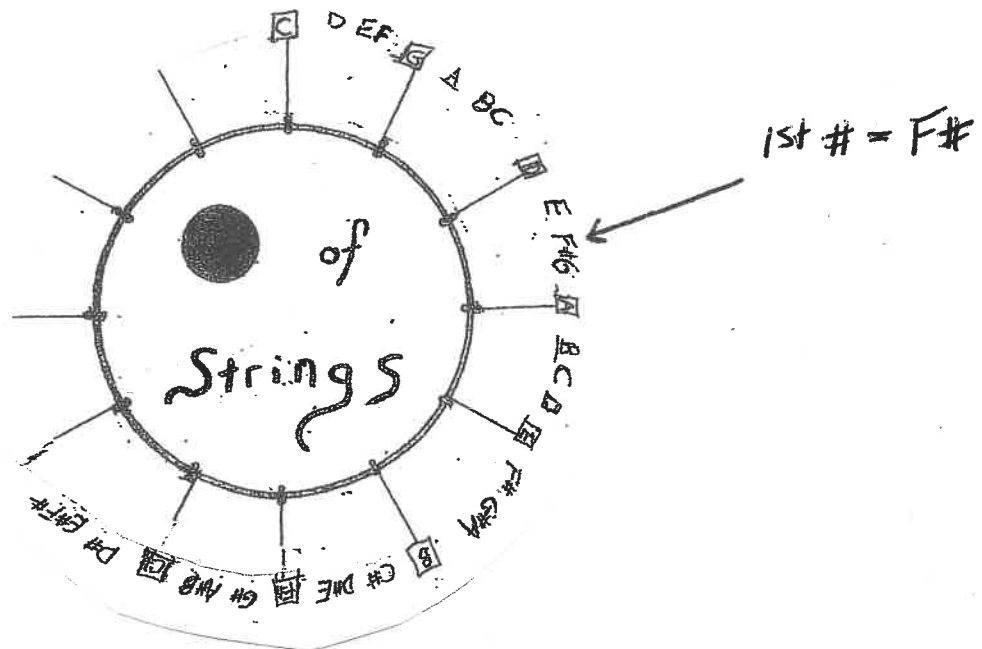
Since the Circle has two halves which are very similar – the more the sharp half is understood the easier it is to understand the other side.

The Order of Sharps on the Circle of 5ths

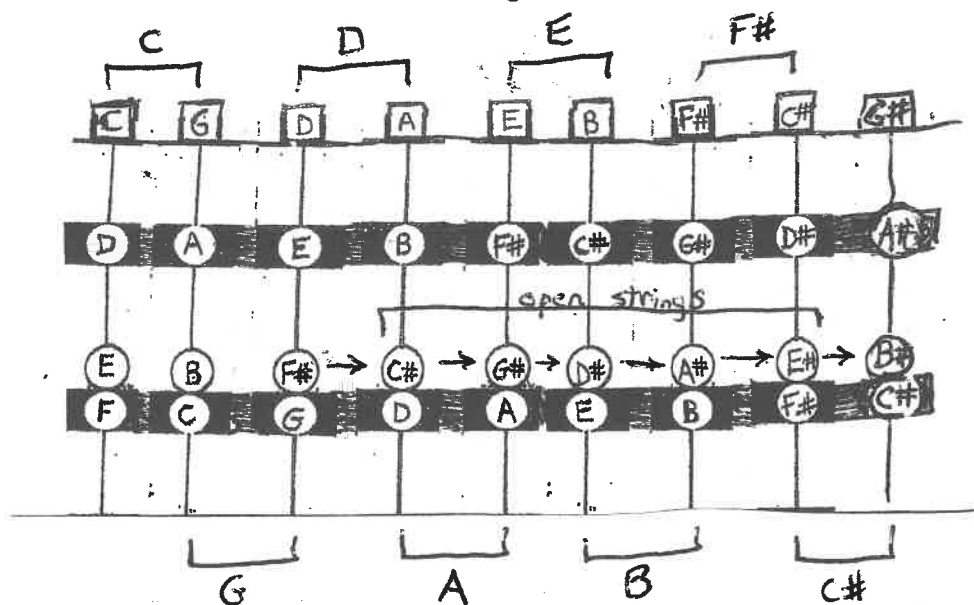
I wondered how I would answer a student who asked the question "Why is F# this first sharp?"

Now you can see what the answer to that question is.

On the Circle of Strings beginning with the open C string – the first scale the needs a sharp to sound right is the G scale. It needs the 7th note (F) to be sharped – F#.



Let's put this information on a theoretical 9 string instrument



Do you see how every two adjacent strings make a Major scale?

Now look at the D string – place your finger on the F# – then slide it over to the next string – the note straight across from F# is the C# on the A string.

If you continue across all of the strings you get the following set of sharps –

F# C# G# D# A# E# B#

This is the order of sharps that we use to write Key Signatures and to fill out the sharps for each Key on the Circle of 5ths.

Did you notice that beginning at the C# you see the names of the open strings in a row?

C# G# D# A# E#

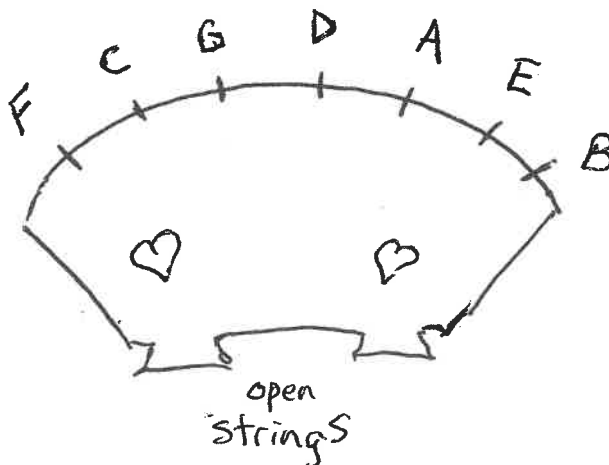
The order of sharps also follows the pattern of jumping up by string.

I find it helpful to think that if a cello or viola had a string lower than the C string it would be an F string.

Similarly, if a violin had a string higher than the E string it would be a B string.

Including these two strings with the 5 strings on our instruments would create a complete list of the entire order of sharps:

F# C# G# D# A# E# B#



Here are the sharps on the staff in order. This will be the Key Signature of 7 sharps – the Key of C#.



Sharps and Flats

~~Here is the chart of sharps~~ we created earlier.

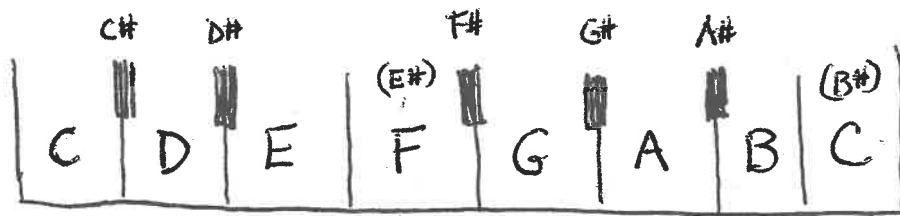
Consider ¹table¹ scales

C	D	E	F	G	A	B	C
G	A	B	C	D	E	F#	G
D	E	F#	G	A	B	C#	D
A	B	C#	D	E	F#	G#	A
E	F#	G#	A	B	C#	D#	E
B	C#	D#	E	F#	G#	A#	B
F#	G#	A#	B	C#	D#	E#	F#
C#	D#	E#	F#	G#	A#	B#	C#

I have had students who want to know why the chart starts on the 3rd letter of the alphabet. It does seem puzzling to younger students who learn the alphabet beginning on A.

In music the Major scale (alphabet) starting on C allows us to list the note names with no added sharps or flats. This makes the key of C Major the HOME key for books on music theory.

If you have played a keyboard, this will look familiar to you:



On a keyboard it is easiest to use the white key notes. These spell the C Major Scale.

The sharps are mostly found on the black keys. (The exceptions are the advanced sharps – E# which sounds like F and B# which sounds like C which are played on white keys.)

Every note of the C Major Scale can also be made a half step lower by adding a flat. I like to distinguish between two types of flats – the simple flats and the advanced flats.

Simple Flats

C	Db	D	Eb	E	F	Gb	G	Ab	A	Bb	B	C
---	----	---	----	---	---	----	---	----	---	----	---	---

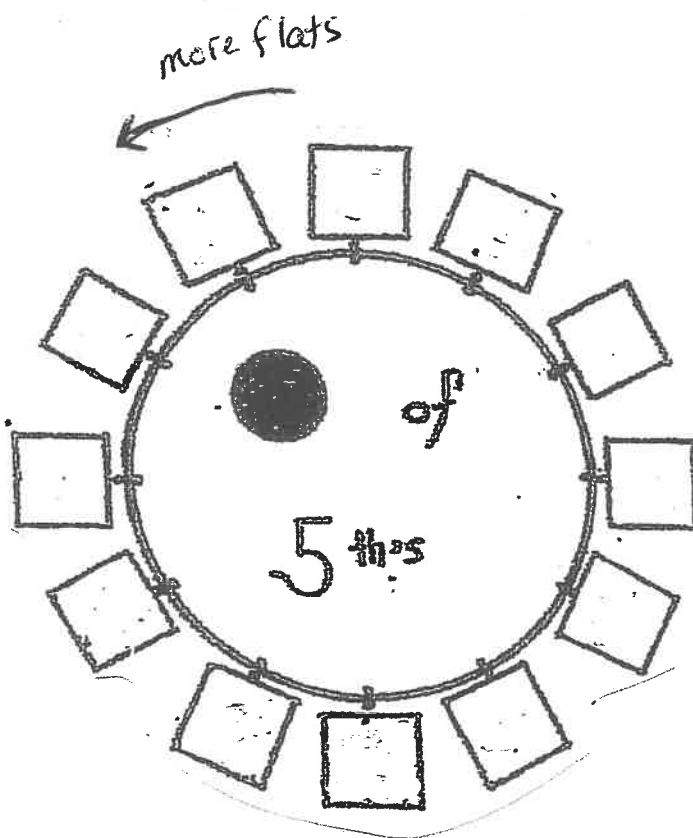
Advanced Flats

C		D		E	F		G		A		B	C
				Fb							cb	

Combined Flat Ruler

C	Db	D	Eb	E	F	Gb	G	Ab	A	Bb	B	C
				Fb							cb	

Using this ruler we can now use the Major Scale Formula to fill in the flat side of the Circle of Strings



When we traveled clockwise around the Circles we added sharps. In order to add flats we will begin at high noon (C Major) and travel counterclockwise.

The first box on the flat side of the circle we will consider is at the 11:00 position on the clock face.

Since we are traveling counterclockwise we need to find the name of the string which is just below the open C string.

One way to do this is to place your 2nd finger on the note C found on the A string (violin and viola – Low 2/ cello – 2) and jump it down one string to the D string. Now determine the name of the 2nd finger on the D string.

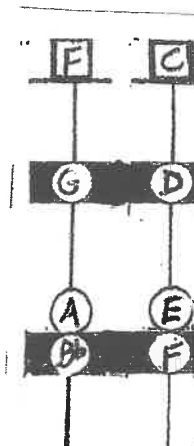
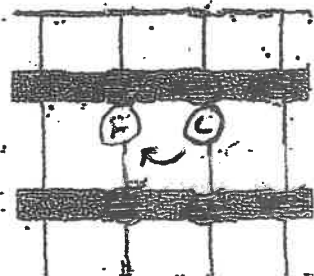
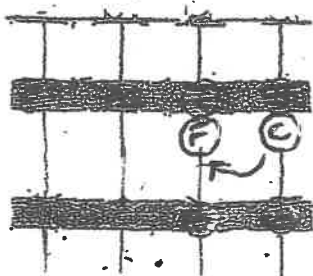
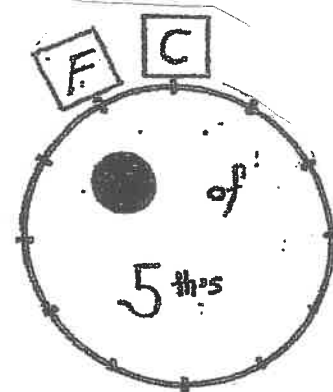
The answer is F.

Put F in the box at 11:00 on the clock face.

If there was string lower the open C on either cello or viola it would be the F string.

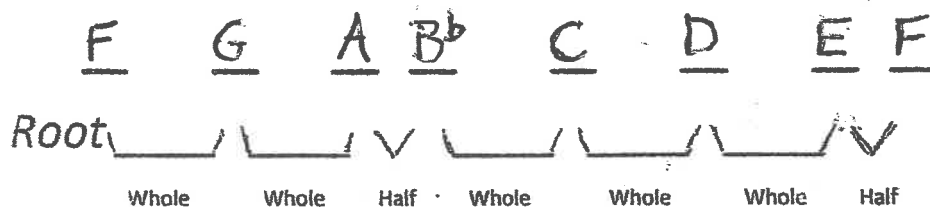
F is a 5th lower than C. Open strings are 5 notes apart.

Here is a fingerboard chart of the F and C strings:

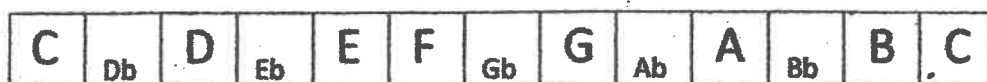


What notes are used to fill in the circles?

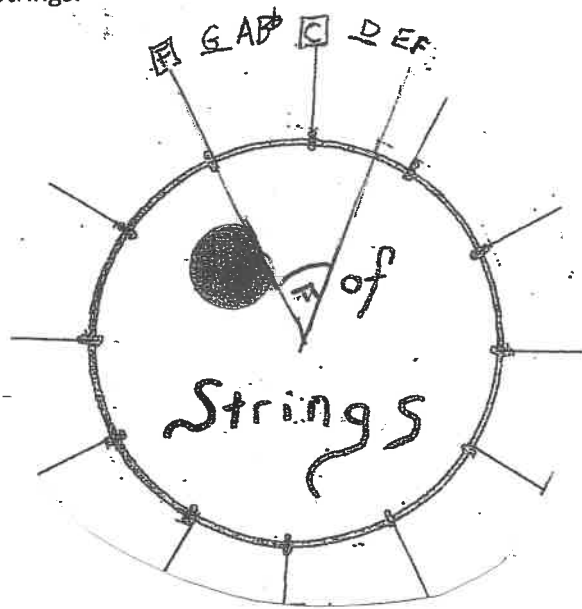
Here is another way to write the question:



1. Note that the B had to be lowered to a B^b to make the F Major Scale sound right.
2. The F Major Scale uses one flat – B^b
3. Note that the B^b is the 4th note of the scale. (New sharps were always the 7th note of the scale. New flats will always be the 4th note of the scale.)



Here is the information on the Circle of Strings:



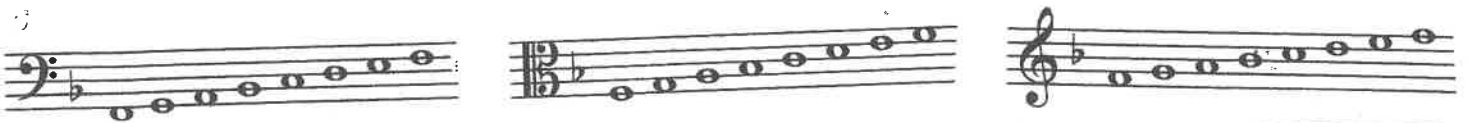
On the Table of Scales:

2nd tetrachord same as ⇒ .

F	G	A	Bb	C	D	E	F
C	D	E	F	G	A	B	C

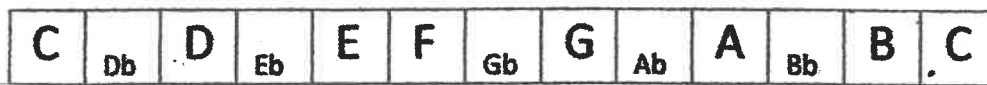
On the Staff:

→ 1st tetrachord



Rule:

38

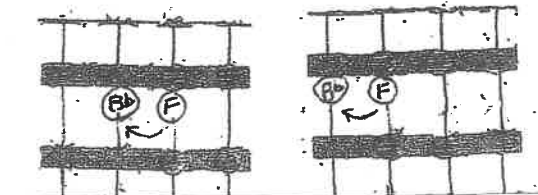


Travel counterclockwise to the box at the 10:00 position on the clock face. We need to determine the name of the open string one below the F string.

To find the answer place 2nd finger on the D string (violins and violas – Low 2/ cellos – 2) and jump it down one string to the G string. What is the name of this 2nd finger on the G string?

The answer is – Bb.

Put Bb in the box at 10:00 on the clock face.



Use the Major Scale Formula to figure out the notes used in the Bb Major Scale.

B^b C D E^b F G A B^b

Root:

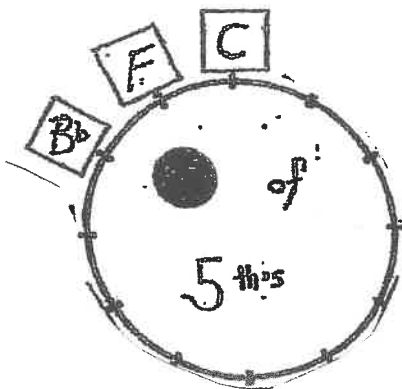
Whole Whole Half Whole Whole Whole Half

This key uses 2 flats – Bb and Eb.

The Bb is only counted as one flat even though it appears twice.

The root of the scale has the same name – Bb – as the next to the last flat.

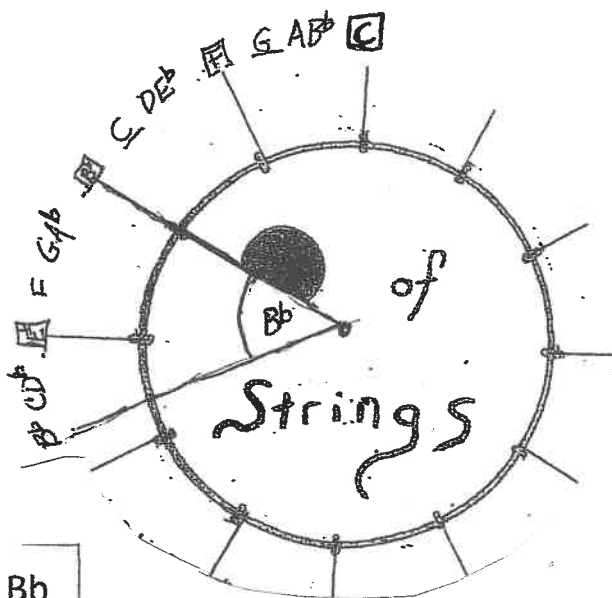
Here it is on the Circles:



On the table:

New flat =
4th note

Bb	C	D	E ^b	F	G	A	Bb
F	G	A	Bb	C	D	E	F
C	D	E	F	G	A	B	C



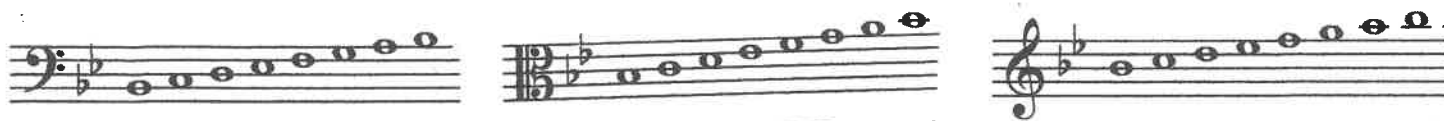
Rules:

39

C	Db	D	Eb	E	F	Gb	G	Ab	A	Bb	B	C	Db	D	Eb	E
---	----	---	----	---	---	----	---	----	---	----	---	---	----	---	----	---

Note that the new flat - Eb - is the 4th note.

On the staff:



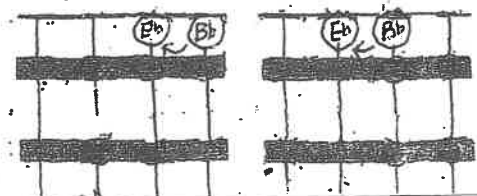
To fill out the box at the 9:00 position on the clock face we need to find the name of the string that is one 5th lower than Bb.

To do this place Low 1st finger on the A string - Bb - and jump down one string to Low 1st finger on the D string. What is the name of this note?

The answer is Eb.

Put Eb in the box at 9:00.

Use the Major Scale Formula to figure out the notes of the Eb Major Scale.



E^b F G A^b B^b C D E^b

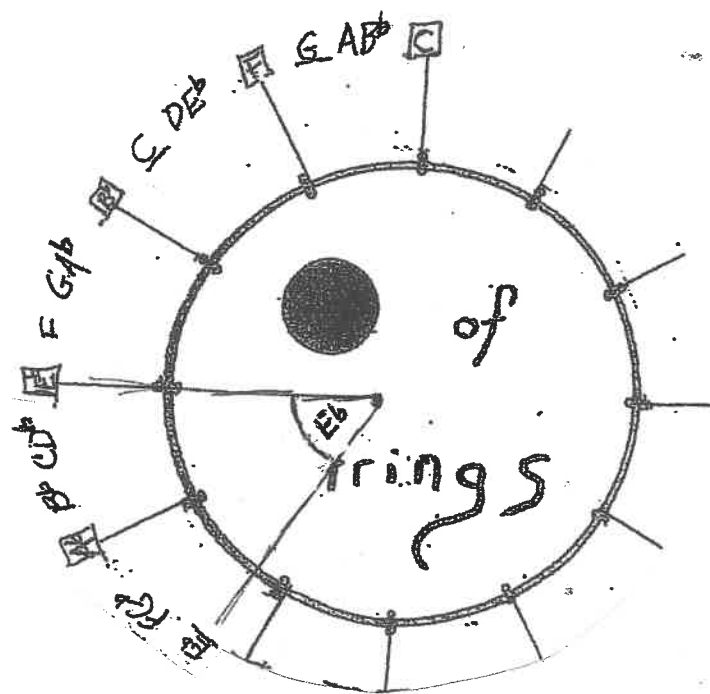
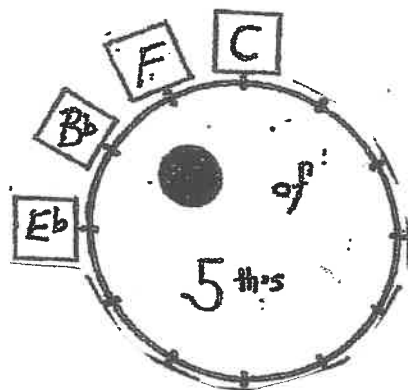
Root

Whole Whole Half Whole Whole Whole Half

The Eb Major Scale uses 3 flats - Bb, Eb, and Ab.

The root of the scale has the same name - Eb - as the next to the last flat.

Here it is on the Circles:



Here it is on the table:

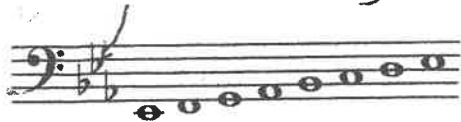
New Flat
↓

E ^b	F	G	A ^b	B ^b	C	D	E ^b
B ^b	C	D	E ^b	F	G	A	B ^b
F	G	A	B ^b	C	D	E	F
C	D	E	F	G	A	B	C

The new flat is the 4th note.

Here it is on the staff:

next to last flat = E^b = Key



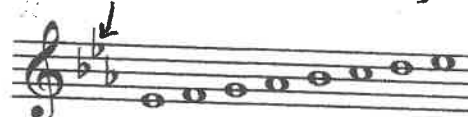
Key of E^b

Next to last flat = E^b = Key



Key of E^b

Next to last flat = E^b = Key



Key of E^b

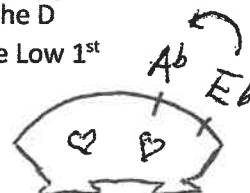
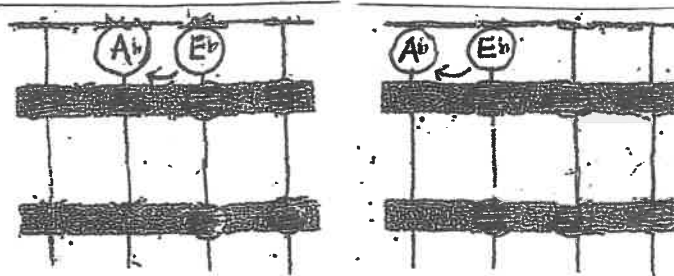
To fill out the box at the 8:00 position on the clock face we need to determine the name of the open string just below the E^b string.

A quick way to do this is to imagine a violin that was tuned down a half step on all strings. The top string would now be E^b – what string would be just below it? This string would also be flat so it would be the A^b string.

Using the other method (which I think of as using the musical abacus) place a Low 1st finger on the D string to make E^b. Jump the finger down one string to the G string. What is the name of the the Low 1st finger on the G string?

The answer either way is – A^b.

Put A^b in the box at 8:00.



Using the Formula find the notes of the A^b Major Scale:

A^b B^b C D^b E F G A^b

Root

Whole Whole Half Whole Whole Whole Half

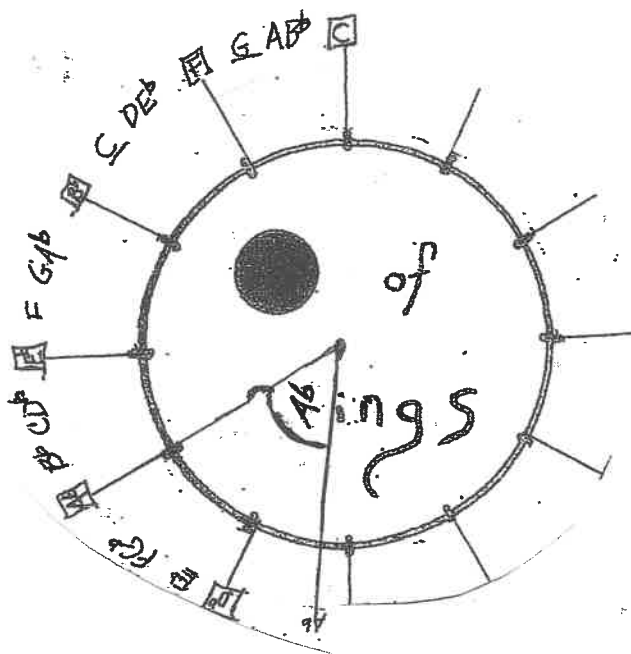
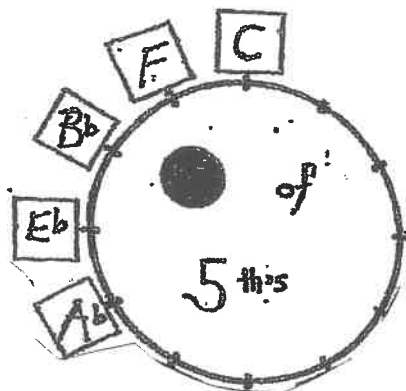
The A^b Major Scale uses 4 flats – B^b, E^b, A^b and D^b.

Ruler:

C	D ^b	D	E ^b	E	F	G ^b	G	A ^b	A	B ^b	B	C
---	----------------	---	----------------	---	---	----------------	---	----------------	---	----------------	---	---

40A

on the circles:

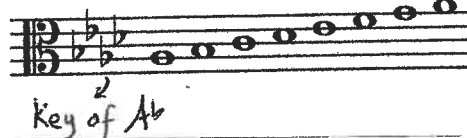
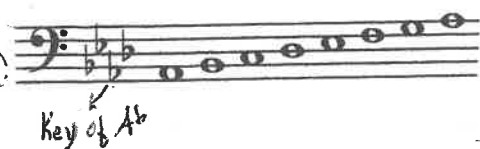


on the table:

New b
↓

Ab	Bb	C	Db	Eb	F	G	Ab
Eb	F	G	Ab	Bb	C	D	Eb
Bb	C	D	Eb	F	G	A	Bb
F	G	A	Bb	C	D	E	F
C	D	E	F	G	A	B	C

On the staff:



C	Db	D	Eb	E	F	Gb	G	Ab	A	Bb	B	C	Db	D
---	----	---	----	---	---	----	---	----	---	----	---	---	----	---

The root has the same name – Ab – as the next to the last flat.

Next is the box at 7:00 on the clock face. We need to determine the name of the string just below the open Ab string.

The quick way is to imagine an instrument tuned down a half step – the A string is now tuned to Ab. Jump down one string – this string is also flat so the name is Db.

For the string abacus method place a finger on the note Ab (cello and viola – place Low 1st finger on the G string/ violins place Low 4 on the D string or Low 3 on the E string – all of these notes are Ab). Jump the finger down one string. What is the name of this note?

The answer is – Db.

This is truly Music Theory as you might be using flats you have never had to play in a piece of music! This will help you be prepared for music you will encounter in the future.



Use the formula to find the notes of the Db Major Scale:

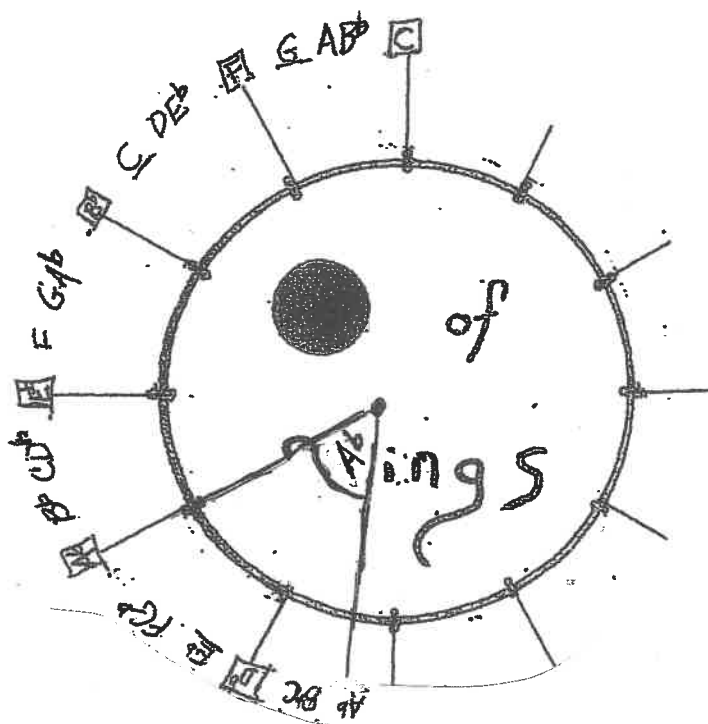
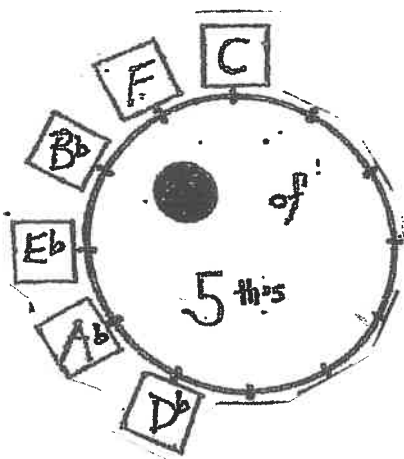
D^b E^b F G^b A^b B^b C D^b

Root _____
 Whole Whole Half Whole Whole Whole Half

The Db Major Scale uses 5 flats – Bb, Eb, Ab, Db and Gb.

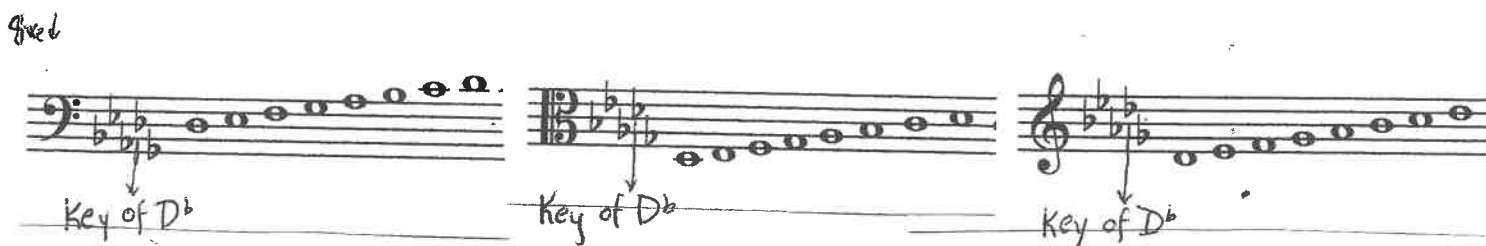
The name of the root is the same as the name of the next to the last flat.

On the Circles:



On the table:

Db	Eb	F	Gb	Ab	Bb	C	Db
Ab	Bb	C	Db	Eb	F	G	Ab
Eb	F	G	Ab	Bb	C	D	Eb
Bb	C	D	Eb	F	G	A	Bb
F	G	A	Bb	C	D	E	F
C	D	E	F	G	A	B	C

The new flat – Gb – is the 4th note.

Although we previously named 6:00 on the clock face as F# we can also assign it a flat name. To fill in this box we need the name of the open string just below the Db string.

The quick method has us picture an instrument tuned down a half step and determine what string is below the Db flat string – since all the strings are flat it is the Gb string.



Using the musical abacus place your finger on a note named Db (violins and violas can use Low 4th finger on the A string/ violas could also use Low 3rd finger on the D string/ cellos can use 3 in Low 1 position on the D string). Jump this finger down a string. What is the name of this note?

The answer is – Gb

Place Gb in the box at 6:00. Put it next to the F# which is already in that box. We separate them with a backslash.

Rule:

C	Db	D	Eb	E	F	Gb	G	Ab	A	Bb	B	C
---	----	---	----	---	---	----	---	----	---	----	---	---

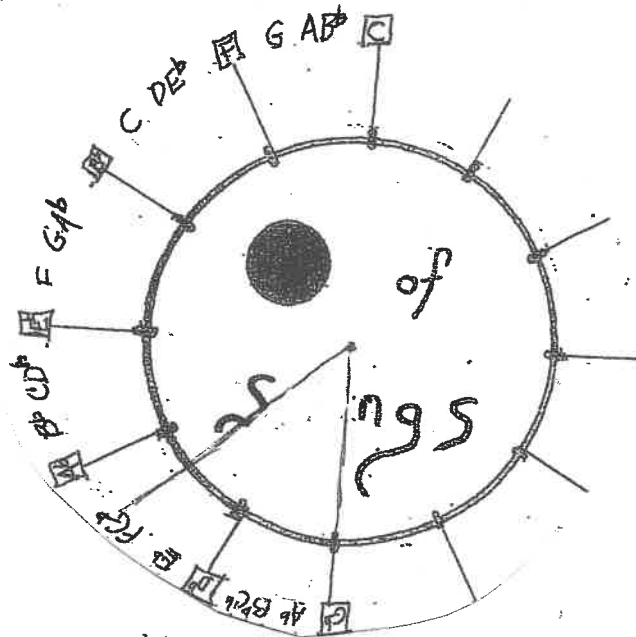
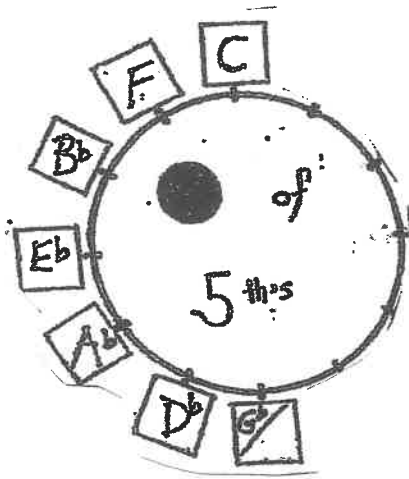
Use the formula to find the names of the notes in the Gb Major Scale.

G^b A^b B^b C^b D^b E^b F G^b

Root _____

Whole Whole Half Whole Whole Whole Half

Here it is on the Circles:



Here it is on the table:

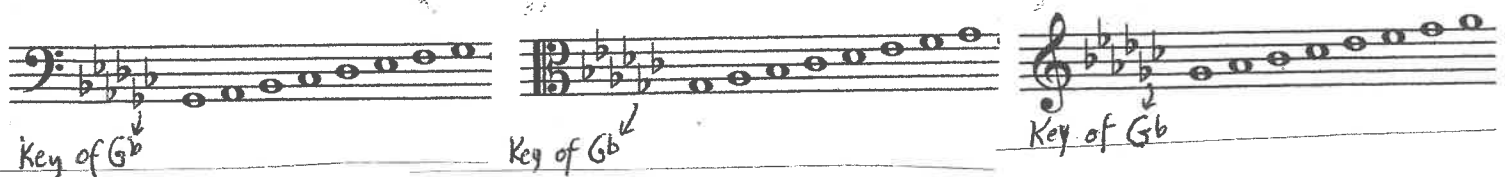
New b ↓

Gb	Ab	Bb	Cb	Db	Eb	F	Gb
Db	Eb	F	Gb	Ab	Bb	C	Db
Ab	Bb	C	Db	Eb	F	G	Ab
Eb	F	G	Ab	Bb	C	D	Eb
Bb	C	D	Eb	F	G	A	Bb
F	G	A	Bb	C	D	E	F
C	D	E	F	G	A	B	C

The Gb Major Scale uses 6 flats – Bb, Eb, Ab, Db, Gb and Cb.

The name of the root is the same as the next to the last flat.

Here it is on the staff:



✓✓✓

Advanced Flat Scale.

We assigned two letters to the box at 6:00 – one from the sharp side of the circle and one from the flat side of the circle. We can also do this for the box at 5:00.

To use the musical abacus Gb could be placed as Low 3rd finger on the D string and jumped down to Low 3rd finger on the G string.

Use the formula to find the notes of the Cb Major Scale:

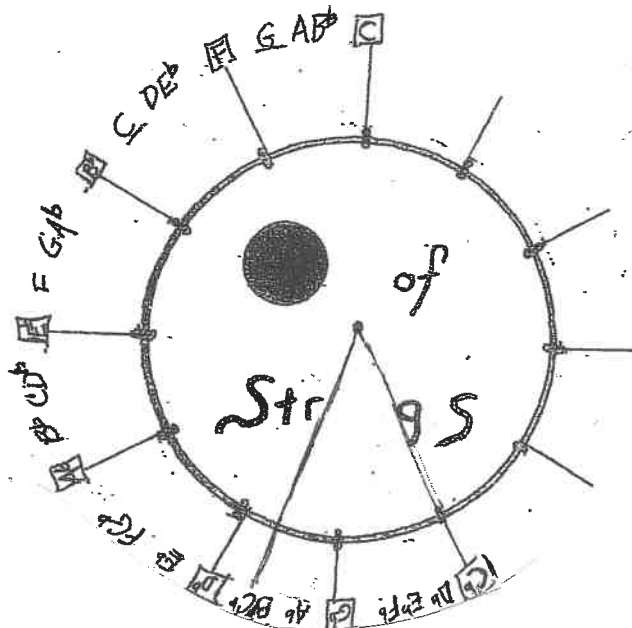
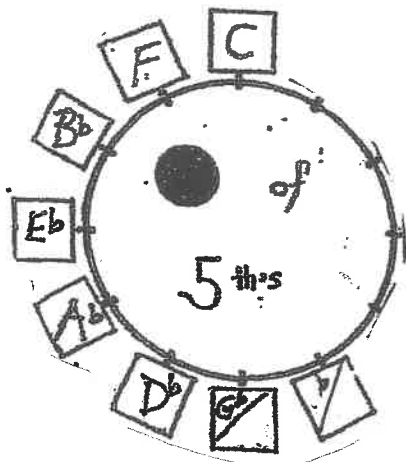
Root

Whole Whole Half Whole Whole Whole Half

The letters are in the same order as in the C Major Scale but every note is flatted.

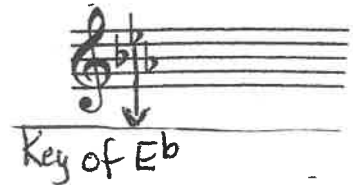
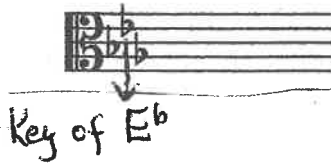
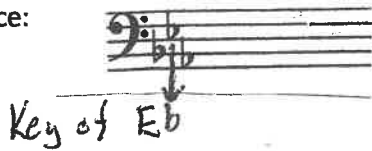
C	D	E	F	G	A	B	C
Cb	Db	Eb	Fb	Gb	Ab	Bb	Cb

On the Circles:



There is a shortcut for answering the question "What key is this piece in?" or "What scale does this piece use?" when a piece uses flats. Look at the Key Signature – determine the name of the next to last flat (the one second from the end) – this is the name of the Key. It is also the root of the scale used in the piece.

For instance:



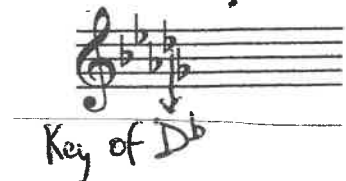
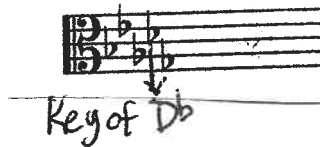
This Key Signature has 3 flats. They are in the order Bb, Eb and Ab. The next to the last flat is Eb.

This piece is in the Key of Eb Major.

This piece uses the Eb Major Scale.

The root of the Eb Major Scale is Eb.

Here is one more example:



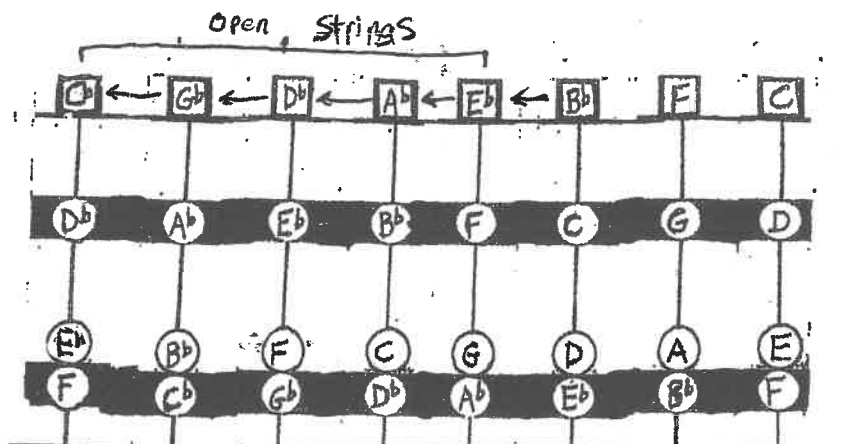
This Key signature has 5 flats. They are in the order Bb, Eb, Ab, Db and Gb.

This piece is in the Key of Db Major.

This piece uses the Db Major Scale.

The root of the Db Major Scale is Db.

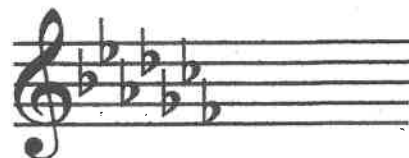
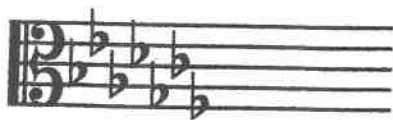
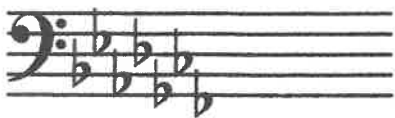
Let's make a 9 string instrument which shows the flat scales in the HOME finger pattern.



If you start at the Bb string and read from right to left (backwards) you see the order of flats as they appear on the Circle of 5ths. This is the order the flats appear in the Key Signatures of pieces of music.

Bb, Eb, Ab, Db, Gb, Cb, Fb.

Here is how flats appear in the Key Signature of Cb Major.



ENHARMONICS

(Musical Homophones)

In a Major Scale there are 8 notes.

C	C#	D	D#	E	F	F#	G	G#	A	A#	B	C
---	----	---	----	---	---	----	---	----	---	----	---	---

When two notes are a whole step apart another note can fit between them.

In the C Major Scale these in between notes are either sharps or flats.

Sound the Same

C	C#	D	D#	E	F	F#	G	G#	A	A#	B	C
---	----	---	----	---	---	----	---	----	---	----	---	---



C	Db	D	Eb	E	F	Gb	G	Ab	A	Bb	B	C
---	----	---	----	---	---	----	---	----	---	----	---	---

Spelled Differently = Enharmonic

This means that C# and Db sound alike (have the same pitch).

C# and Db are different ways to spell the same sound (note).

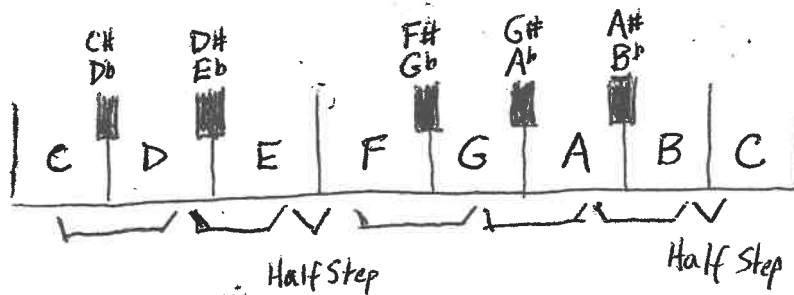
They are described as being Enharmonic. (They are similar to homophones in the study of language – i.e. to and two – sounding the same but being spelled differently.)

Here is a combination of the two charts above.

C	C# Db	D	D# Eb	E	F	F# Gb	G	G# Ab	A	A# Bb	B	C
---	----------	---	----------	---	---	----------	---	----------	---	----------	---	---

ENHARMONIC NOTES

On a keyboard the notes are arranged this way:



Since EF and BC are half steps there is no need to put a black note between them.

If we include the Advanced Accidentals the chart looks like this:

B#	C#	D	D#	E	E#	F#	G	G#	A	A#	B	B#
C	Db		Eb	Fb	F	Gb		Ab		Bb	Cb	C

Here are where the Advanced Accidentals are on the keyboard:



On the keyboard it can be confusing that the half steps of EF and BC look the same distance as the whole steps that use white keys.

On the fingerboard we are used to seeing a larger distance between fingers playing whole steps and having fingers touch when they are playing half steps.

Looking at a fingerboard chart it is clear from the picture which notes are a whole step apart and which notes are a half step apart.

It is interesting to place the two scales found at 6:00 on the Circle of 5ths next to each other.

These scales
Sound the same
but are spelled
differently

F#	G#	A#	B	C#	D#	E#	F#
Gb	Ab	Bb	Cb	Db	Eb	F	Gb

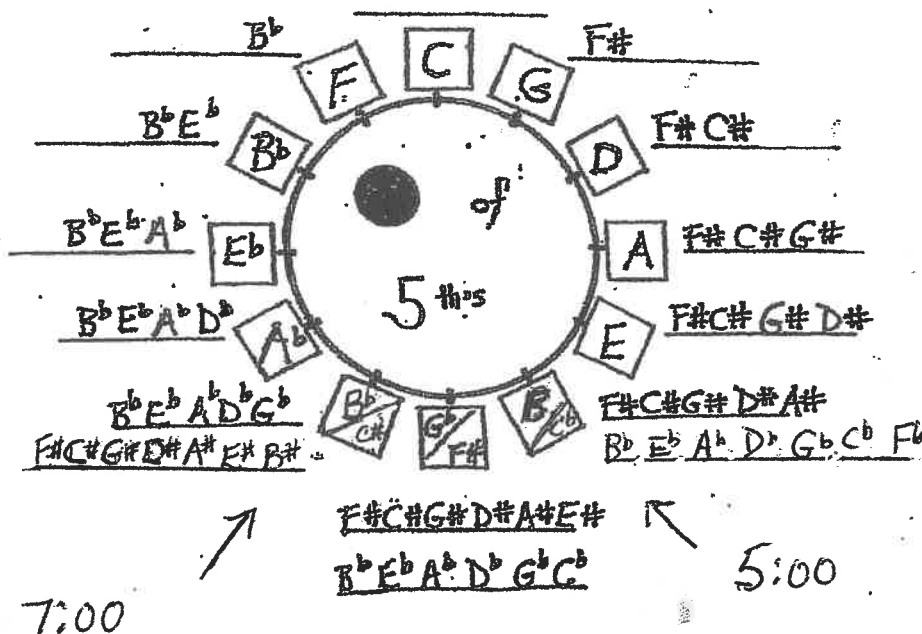
Enharmonic Scales

These scales sound the same but are spelled differently.

These scales are described as being Enharmonic.

Depending on whether you thought you were playing the F# Major Scale or the Gb Major scale you might choose to use a different fingering for the scale – but regardless of the fingering the scales would still sound the same.

The same comparisons are informative to make at both the 5:00 and 7:00 positions on the Circle of 5ths.



B	C#	D#	E	F#	G#	A#	B
Cb	Db	Eb	Fb	Gb	Ab	Bb	Cb

} Enharmonic

The B Major Scale and the Cb Major Scale are Enharmonic.

They sound the same but are spelled differently.

Db	Eb	F	Gb	Ab	Bb	C	Db
C#	D#	E#	F#	G#	A#	B#	C#

} Enharmonic

The Db Major Scale and the C# Major Scale are Enharmonic.

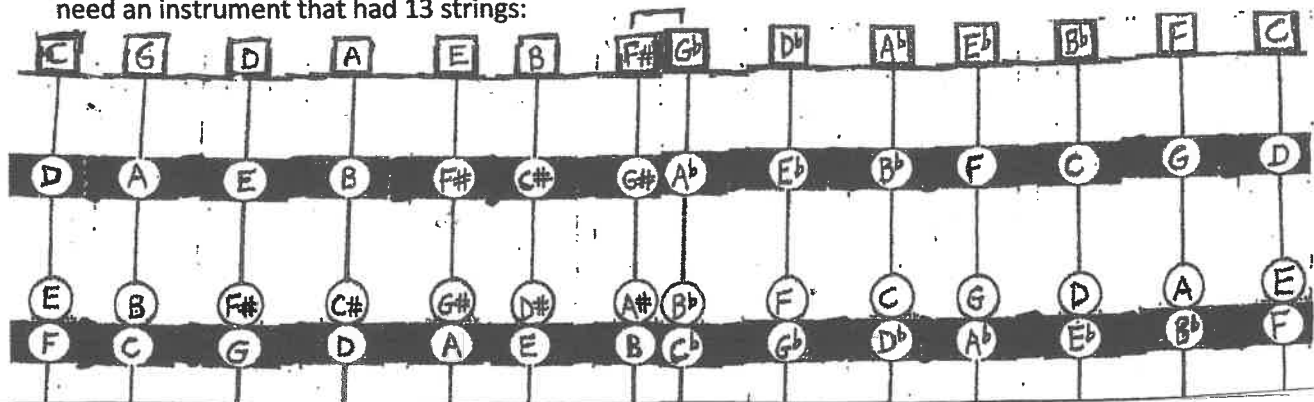
They sound the same but are spelled differently.

Here is this information on a comprehensive table:

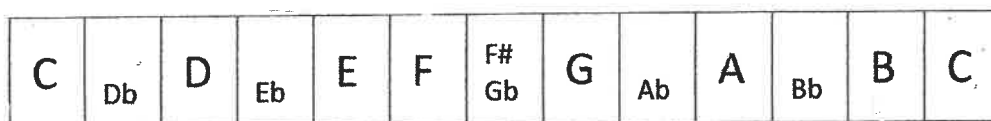
C	D	E	F	G	A	B	C
G	A	B	C	D	E	F#	G
D	E	F#	G	A	B	C#	D
A	B	C#	D	E	F#	G#	A
E	F#	G#	A	B	C#	D#	E
B	C#	D#	E	F#	G#	A#	B
Cb	Db	Eb	Fb	Gb	Ab	Bb	Cb
F#	G#	A#	B	C#	D#	E#	F#
Gb	Ab	Bb	Cb	Db	Eb	F	Gb
C#	D#	E#	F#	G#	A#	B#	C#
Db	Eb	F	Gb	Ab	Bb	C	Db
Ab	Bb	C	Db	Eb	F	G	Ab
Eb	F	G	Ab	Bb	C	D	Eb
Bb	C	D	Eb	F	G	A	Bb
F	G	A	Bb	C	D	E	F
C	D	E	F	G	A	B	C

FINGER PATTERNS

To look at all of the scales found on the Circle of 5ths in the HOME (Twinkle) Finger Pattern we would need an instrument that had 13 strings:

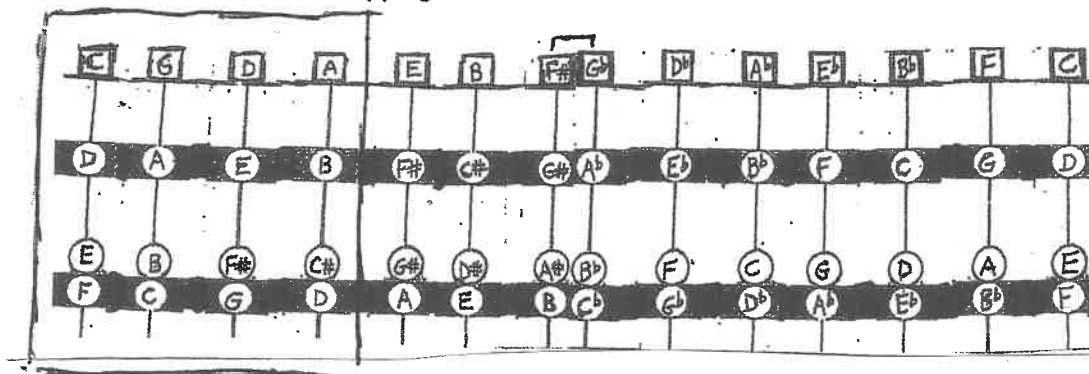


Every string would be named for one of the 12 notes in the scale of half steps on the Musical Ruler below

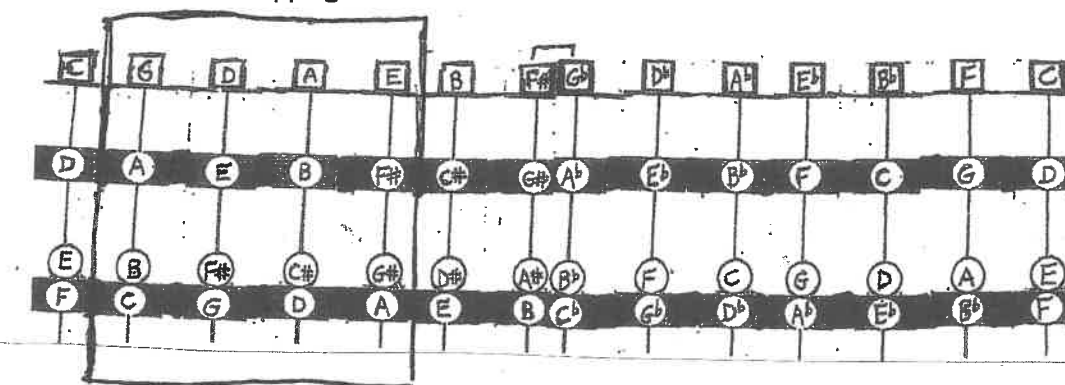


Each of our instruments would only be a cropped picture of the whole 13 string instrument.

The viola and cello use this cropping:



The violin uses this cropping:



B	C#	D#	E	F#	G#	A#	B
Cb	Db	Eb	Fb	Gb	Ab	Bb	Cb

} Enharmonic

The B Major Scale and the Cb Major Scale are Enharmonic.

They sound the same but are spelled differently.

Db	Eb	F	Gb	Ab	Bb	C	Db
C#	D#	E#	F#	G#	A#	B#	C#

} Enharmonic

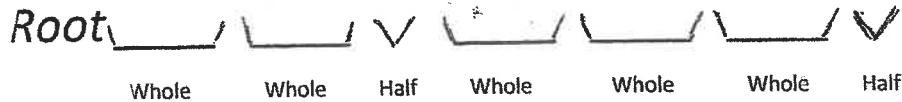
The Db Major Scale and the C# Major Scale are Enharmonic.

They sound the same but are spelled differently.

Here is this information on a comprehensive table.

C	D	E	F	G	A	B	C
G	A	B	C	D	E	F#	G
D	E	F#	G	A	B	C#	D
A	B	C#	D	E	F#	G#	A
E	F#	G#	A	B	C#	D#	E
B	C#	D#	E	F#	G#	A#	B
Cb	Db	Eb	Fb	Gb	Ab	Bb	Cb
F#	G#	A#	B	C#	D#	E#	F#
Gb	Ab	Bb	Cb	Db	Eb	F	Gb
C#	D#	E#	F#	G#	A#	B#	C#
Db	Eb	F	Gb	Ab	Bb	C	Db
Ab	Bb	C	Db	Eb	F	G	Ab
Eb	F	G	Ab	Bb	C	D	Eb
Bb	C	D	Eb	F	G	A	Bb
F	G	A	Bb	C	D	E	F
C	D	E	F	G	A	B	C

All of these scales use the Major Scale Formula:



Picturing all of the Major Scales as starting on an open string and using the HOME finger pattern makes it easy to apply the Major Scale Formula.

In actually playing a four string instrument the challenge is using different finger pattern to play the various Major Scales.

There is a specific order that these finger patterns appear in scales.

Learning the order of the patterns is a study unique to string players – it could be called String Theory.

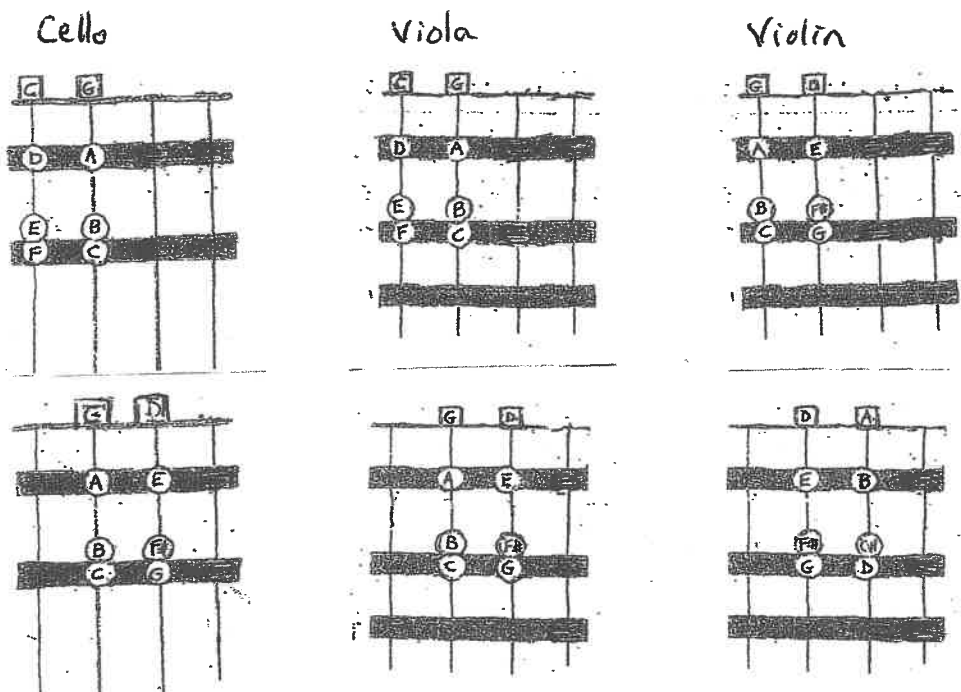
We use many different finger patterns when playing our repertoire and scales – but stepping back to see how the patterns are arranged is something that requires us to use our theoretical imagination.

Let's approach understanding this order as we approached understanding the Circle of 5ths.

We will start with the order of the finger patterns we have used for the longest time.

We have covered the HOME finger pattern.

Let's play the scales on our instruments that can be made using only the HOME finger pattern.



All of these scales begin on an open string.

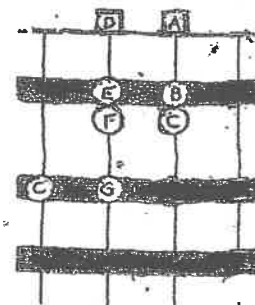
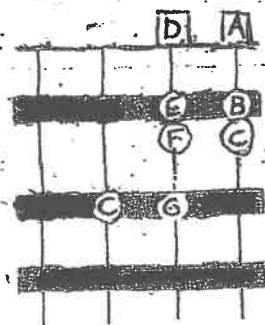
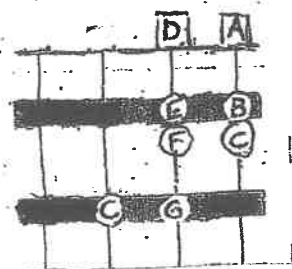
All of these scales use the HOME finger pattern.

Let's see what pattern the fingers make if we begin a scale on a different finger – 3rd finger for violin and viola/ 4th finger for cello.

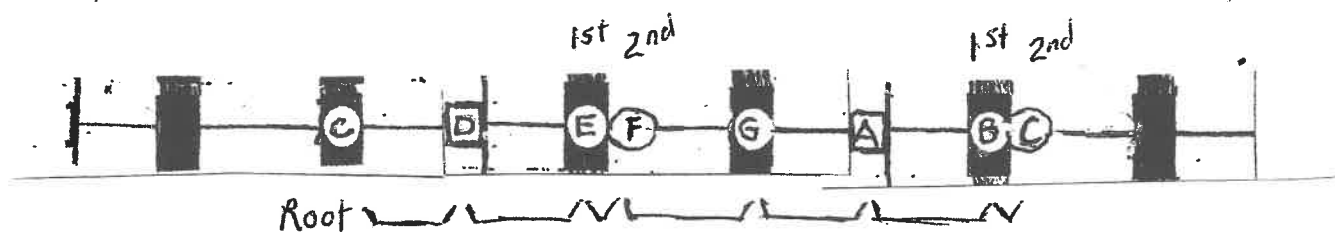
We will play the C Major Scale beginning on the G string.

Viola/Cello C Major Scale

Violin C Major Scale



The pattern still follows the Major Scale Formula

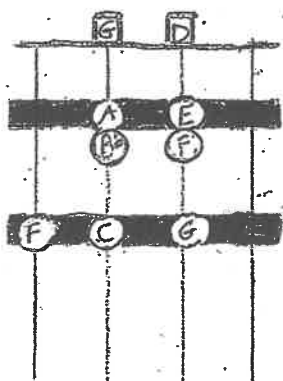


This scale requires a finger pattern where the 1st and 2nd fingers play a half step (touch).

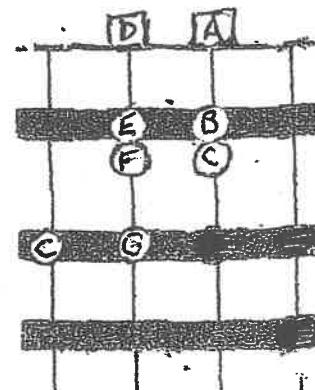
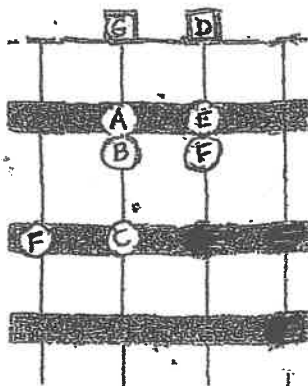


Other scales that start on the 3rd finger for the violin/viola and 4th finger for cello and use the same finger pattern are shown below:

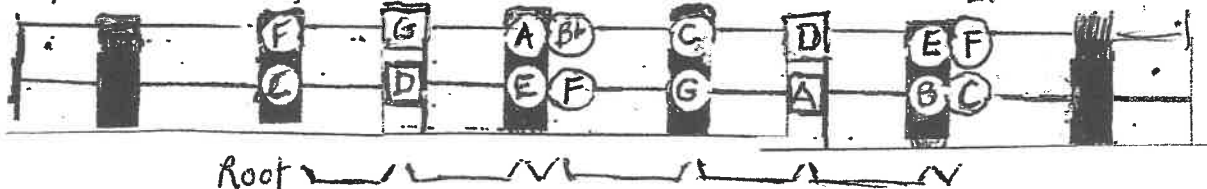
The F Major Scale on the viola and cello



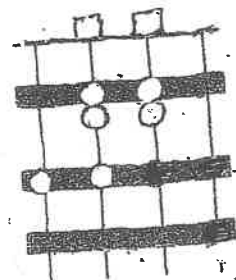
The G Major Scale on the violin



They both follow the Major Scale Formula: 1st 2nd



The patterns look the same if the note names are removed.

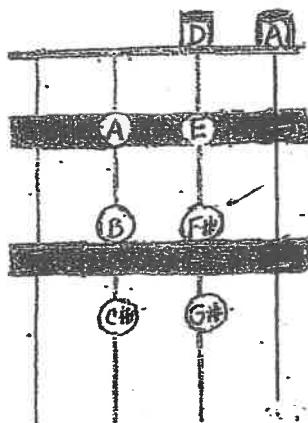


Another finger pattern is used if you play a major scale beginning on 1st finger.

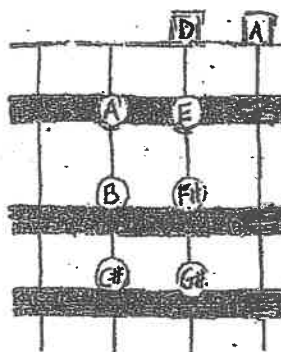
This pattern uses High 3rd finger for the violin and viola and extension 2 for the cello.

Here is the A Major Scale beginning 1st finger on the G string.

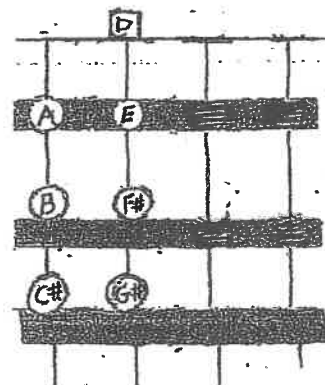
cello



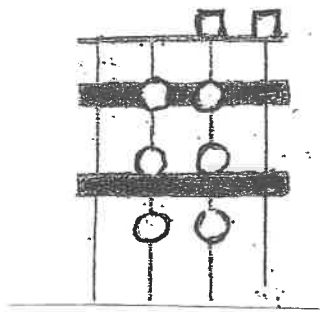
viola



violin



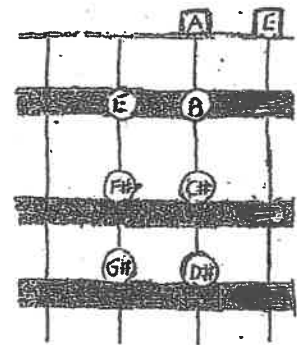
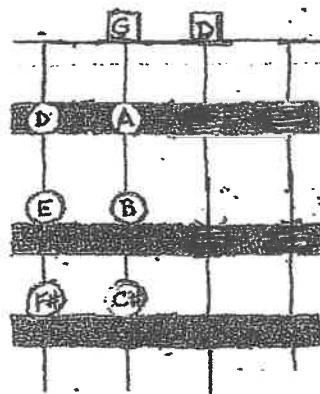
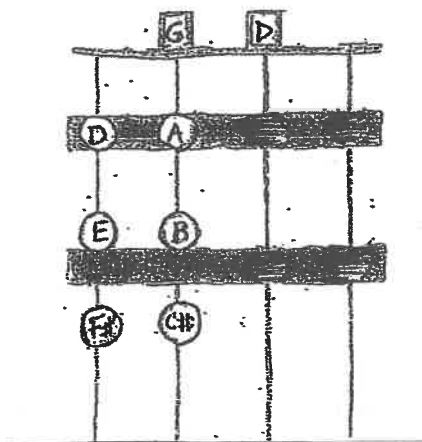
The new finger pattern looks like this:



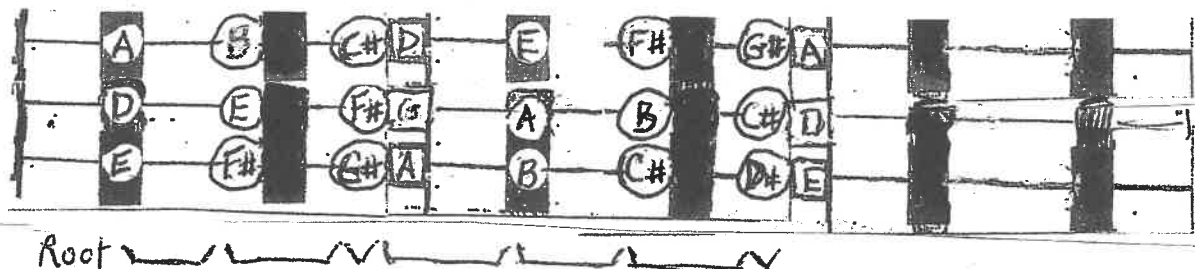
Other major scales that begin on 1st finger and use this finger pattern are :

Viola and cello – D Major Scale (lower octave)

violin – E Major Scale

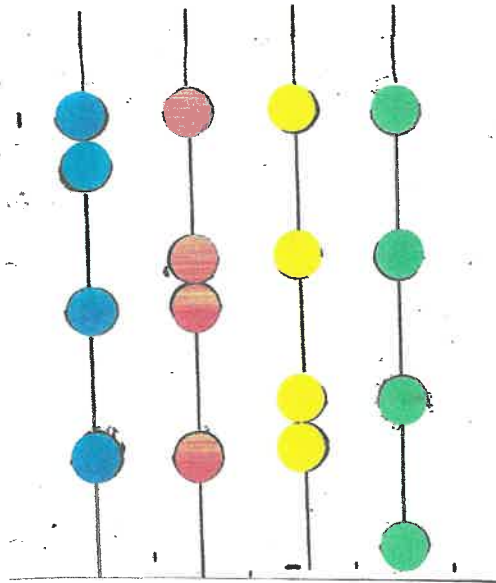


All of these scales use the Major Scale Formula



Because violinists and violists can use a 4th finger there is another finger pattern available to them.

Violinists and violists also usually think in four fingers at a time even when using the blue, red and yellow finger patterns. The upper string finger patterns are listed here:

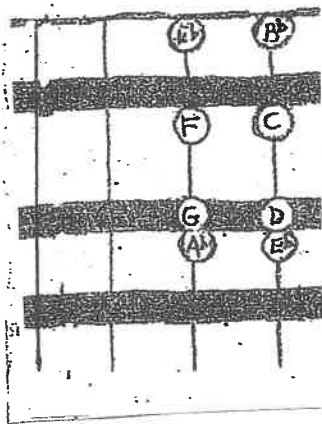


By using the 4th finger there are additional major scales that the upper string instruments can play while remaining in the first position.

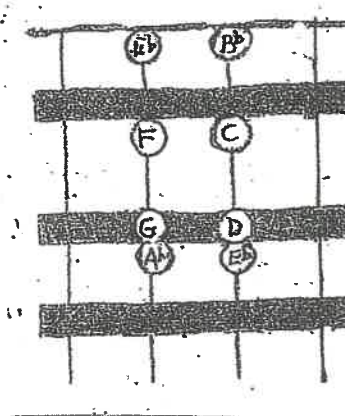
One type is the major scale that begins on a Low 1st finger.

Here is the Eb Major Scale beginning Low 1st finger on the D string.

Viola – Eb Major Scale

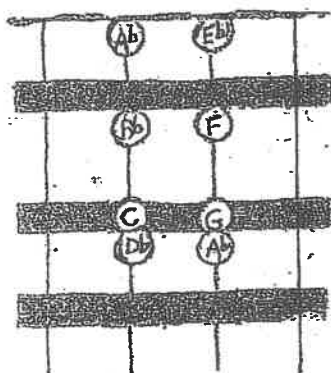


Violin – Eb Major Scale

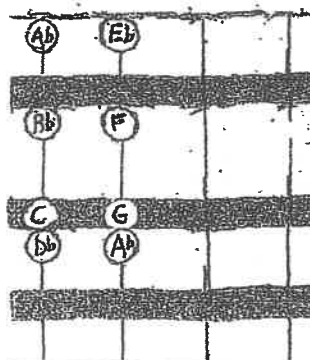


The Ab Major Scale also begins on a Low 1st finger and uses the same finger patterns

Viola – Ab Major Scale



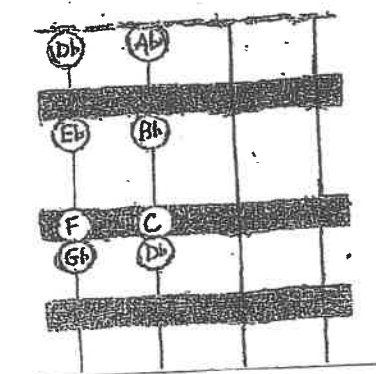
Violin – Ab Major Scale



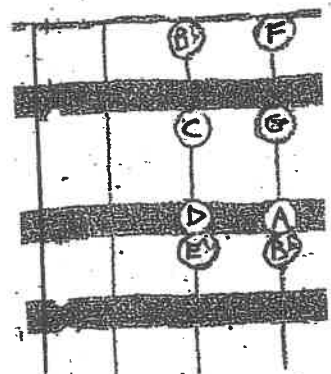
The viola can play the Db Major Scale beginning on Low 1st finger on the C string.

The violin can play the Bb Major Scale beginning on Low 1st finger on the A string.

Viola – Db Major Scale



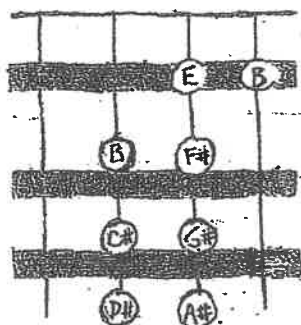
Violin – Bb Major Scale



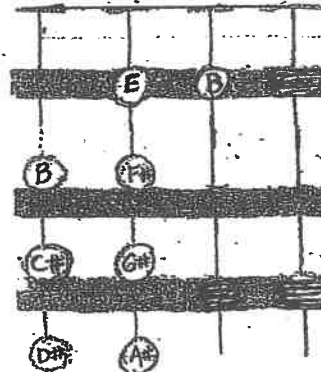
The other set of scales possible with the use of the 4th finger are the scales that begin on the 2nd finger.

The B Major Scale beginning High 2 on the G string can be played by violas and violins.

Viola – B Major Scale



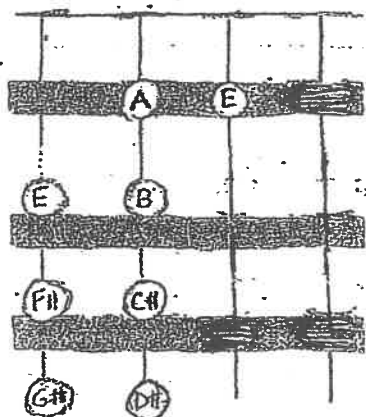
Violin – B Major Scale



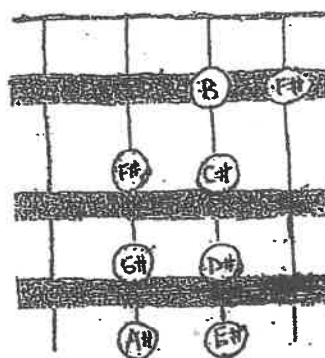
Violas can also play the E Major Scale beginning High 2nd finger on the C string.

Violins can also play the F# Major Scale beginning High 2nd finger on the D string.

Viola – E Major Scale (lower octave)



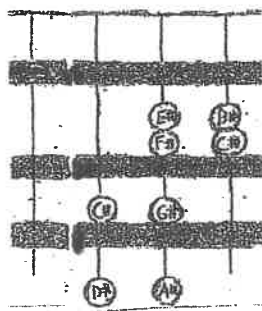
Violin – F# Major Scale



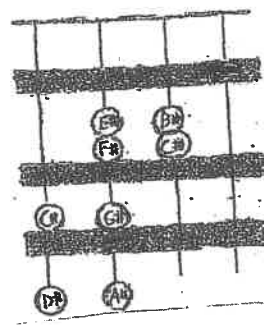
It is also possible to play scales starting on the High (sharped) 3rd finger – (it requires 1st finger to be High – sharpened – as well).

Violas and violins can play the C# Major Scale beginning High (sharped) 3rd finger on the G string.

Viola – C# Major Scale

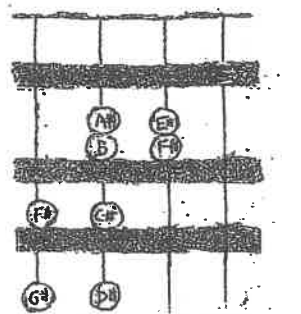


Violin – C# Major Scale



Using the same pattern violas can play the F# Major Scale beginning on the High 3rd finger on the C string.

Viola – F# Major Scale



Cellos can play these scales as well – but it requires them to shift out of first position.