

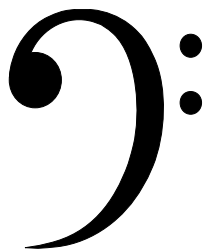
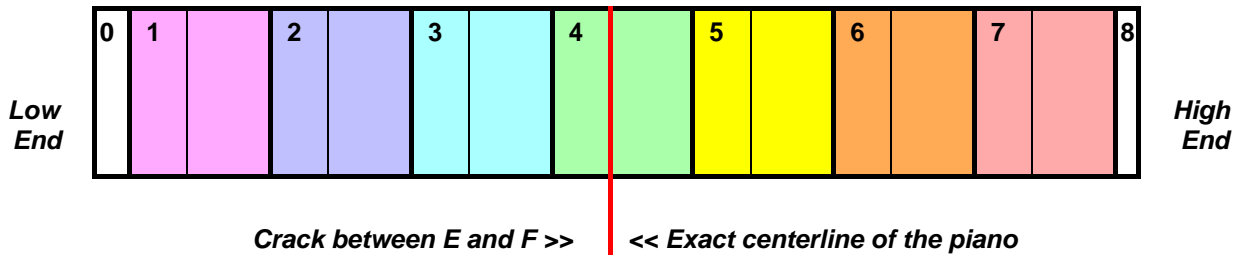
Identifying and Finding the Piano Keys

PK-15

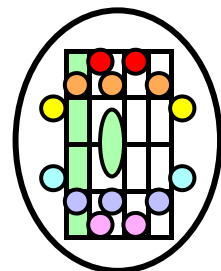


Learning About the Awesome Keyboard

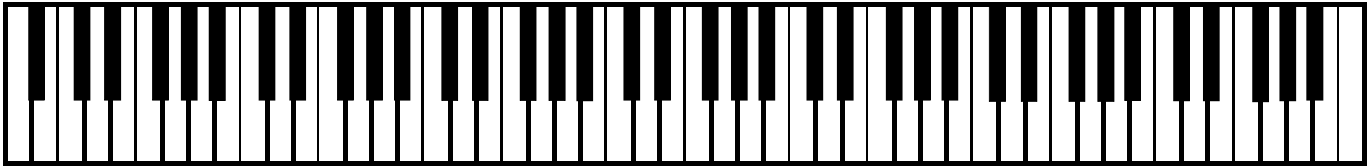
Diagram of a Piano Keyboard Labeled With The Rainbow Colors of the 7 Identical Octave Groups



From the Music Innovator's Workshop



Standard 88 Key Piano Keyboard



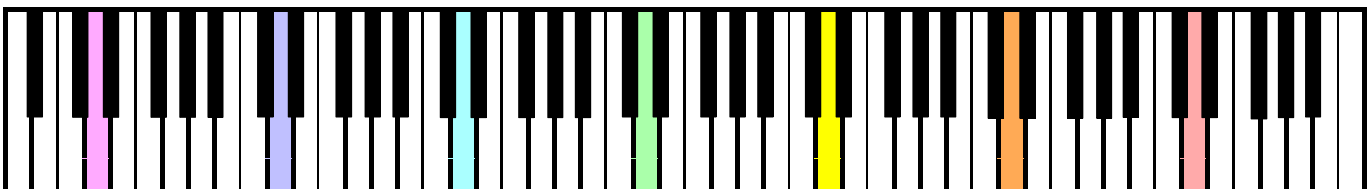
About This Unit

This unit is about the piano keyboard. As you can see from the diagram of a piano keyboard at the top of this page, it appears to be a confusing mixture of black and white keys. You might wonder how anyone could find the right keys fast enough to play a song, let alone fast enough to play many keys at a time at the lightning fast pace required by some pieces.

This unit will show you how this can be done. It will show you how the correct keys can be found, not only at a fast pace, but also without looking at them. You will understand how it can be done, but you will also see that it takes some time to develop habits that will help you do it at a fast pace.

As it turns out, the keyboard is NOT a confusing mixture of black and white keys. It is a very thoughtfully structured mixture of keys. They can be identified almost instantly either by sight, by location, by feel, or by distance from the previous key just played.

To do this for yourself, you will need to learn exactly how the keyboard is organized, and you will need to know the names and addresses of every key. This is doable because of the way the keyboard is structured into 7 identical little 12-key keyboards - each with the same 12 key names and addresses - with different, but similar sounds.



The Awesome Keyboard

The piano keyboard (and other keyboards as well - especially the organ) provides a unique visual and tactual display of the full useful range of sound pitches used to create (almost) all of our music.

Chromatic Scale

The keyboard arranges these sounds in half steps from low to high at the back side of the keyboard, where the black and white keys are mixed together.

C Major Scale

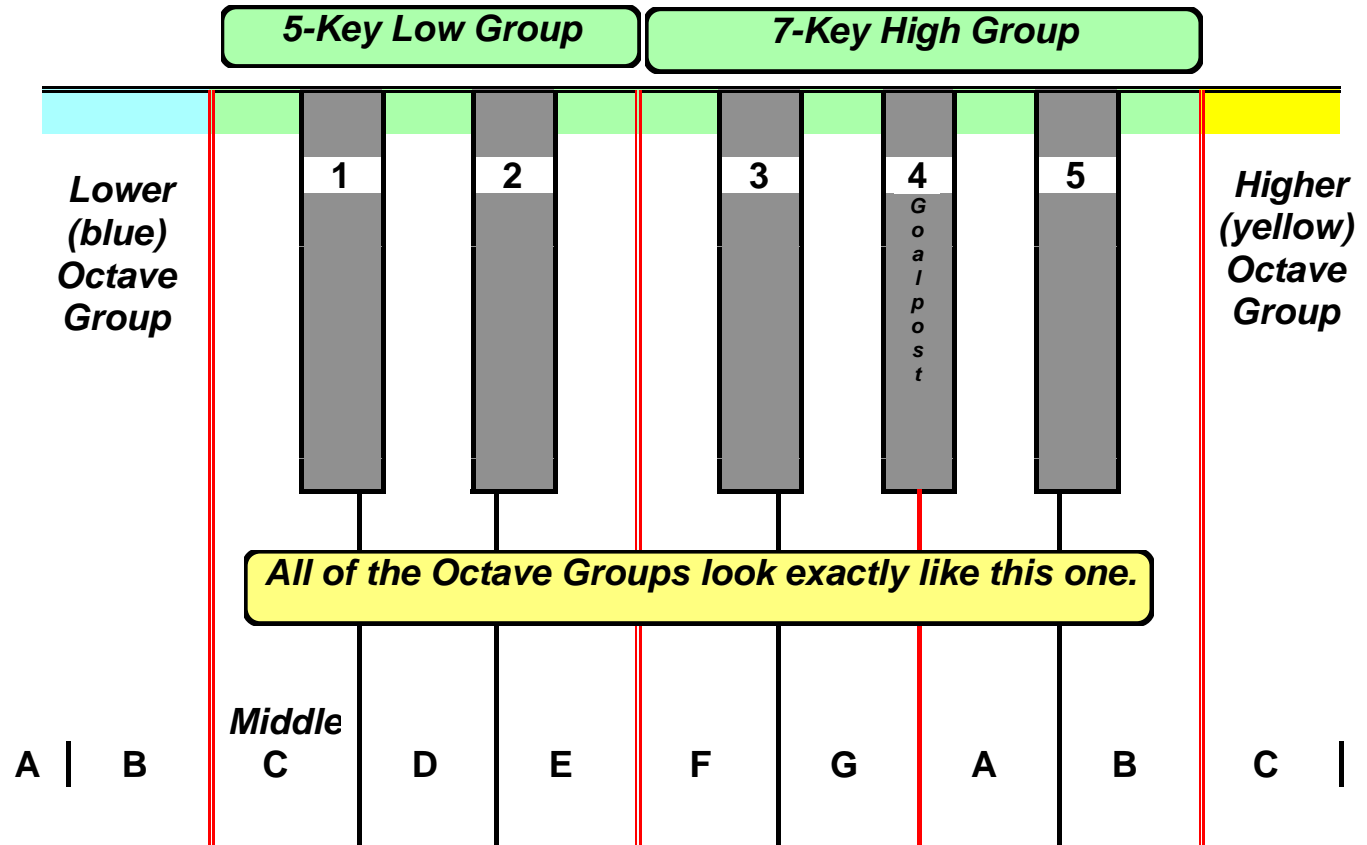
Across the front of the keyboard, the white keys are arranged to provide a C major scale across the entire piano.

The Magic of the Black Keys

*This is awesome: The keyboard has been designed so that any of its 88 keys can be found quickly (in a fraction of a second by skilled musicians) **BY TOUCH OR BY SIGHT!** This is made possible by the protruding black keys, arranged in 2's and 3's, across the entire keyboard. Any key can be identified and found without looking at the keyboard, first by the key's general location in front of you, and then by touch.*

*Although this arrangement makes it relatively easy to identify the 88 keys of the keyboard, the traditional grand staff notation totally ignores this design, and does not take advantage of it - using over 100 different notes for locating these keys. (To be fair, it was not designed for the keyboard, but to show pitch and rhythm for any instrument and voice.) On the other hand, the Key Map notation for the keyboard that we have developed is **BASED ON** this arrangement of keys built into the keyboard - and uses just 12 different notes for these 88 keys.*

Layout of the Keyboard - "Green" Octave Group With Labels



Q - What are the names of the WHITE keys?

A - The white keys of each octave group have the names ABCDEFG, as shown on the diagram of the green octave group above.

Q - How do I know the location of each WHITE key?

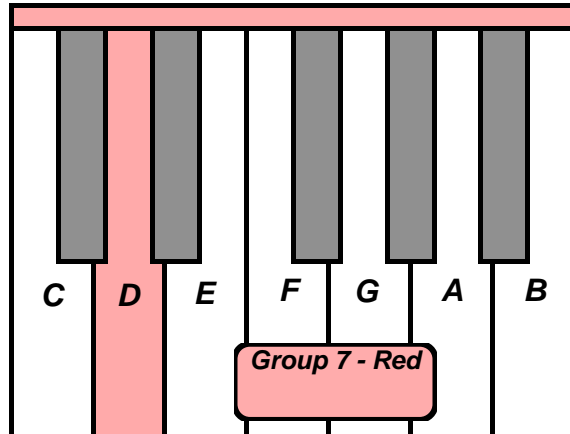
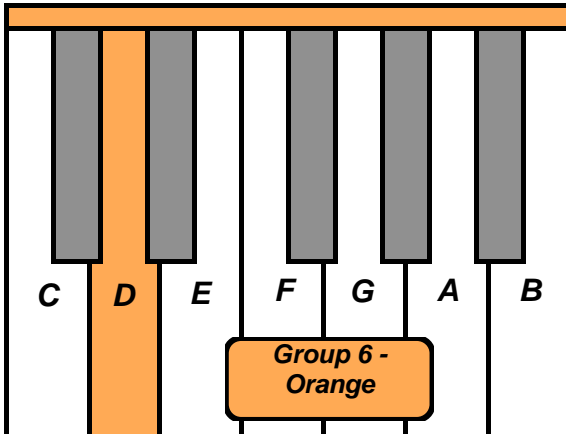
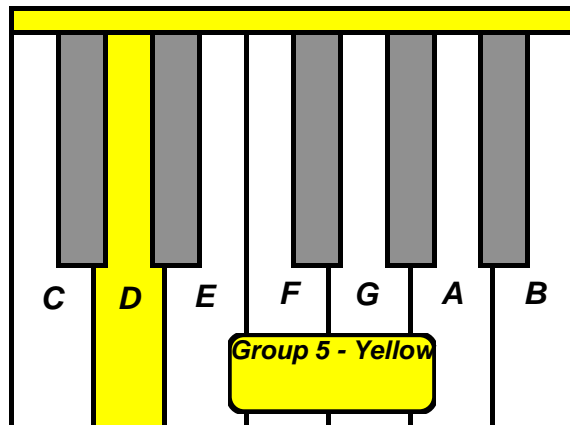
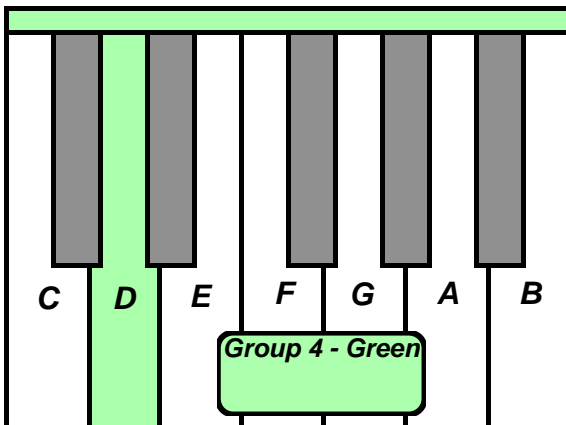
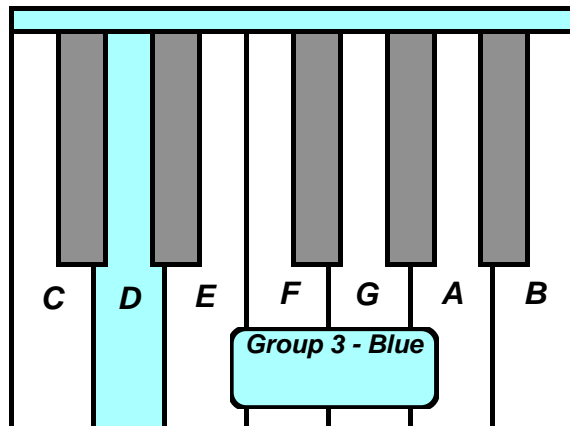
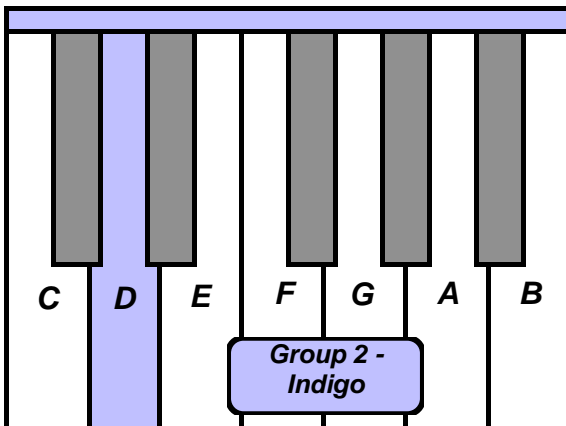
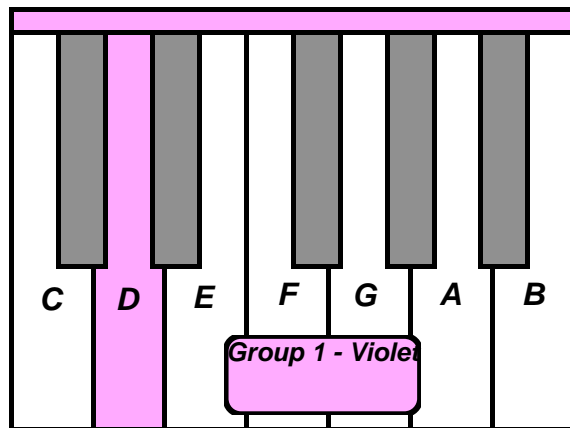
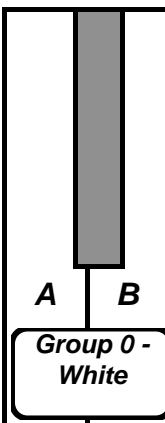
A - The white keys are identified by their locations relative to the black keys that they are next to. The white keys are named in order to the right of each key named A. (The lowest key on the piano happens to be key A. The rest of the white keys - BCDEFGABCD... continue in order across the entire keyboard ... up to the final ABC.) You will learn to recognize the white keys by their locations next to black keys. The letter names of the white keys need to be memorized so that you can recognize them at sight (and by feel).

Q - How do I know location of each BLACK key?

A - They are located by their "addresses" (numbers from 1-5) and by how they look and feel. Reading from left to right at the left end of an octave group, the black keys are numbered from 1 to 5. The addresses of the black keys need to be memorized so that you can recognize them quickly.

The 7 Identical Octave Groups of the Keyboard

A piano has 7 complete octave groups. Other keyboards with fewer keys are grouped the same way, but they have fewer groups. Each octave group is color coded with one of the colors of the rainbow (in order), providing a distinctive sequential identity for each group.



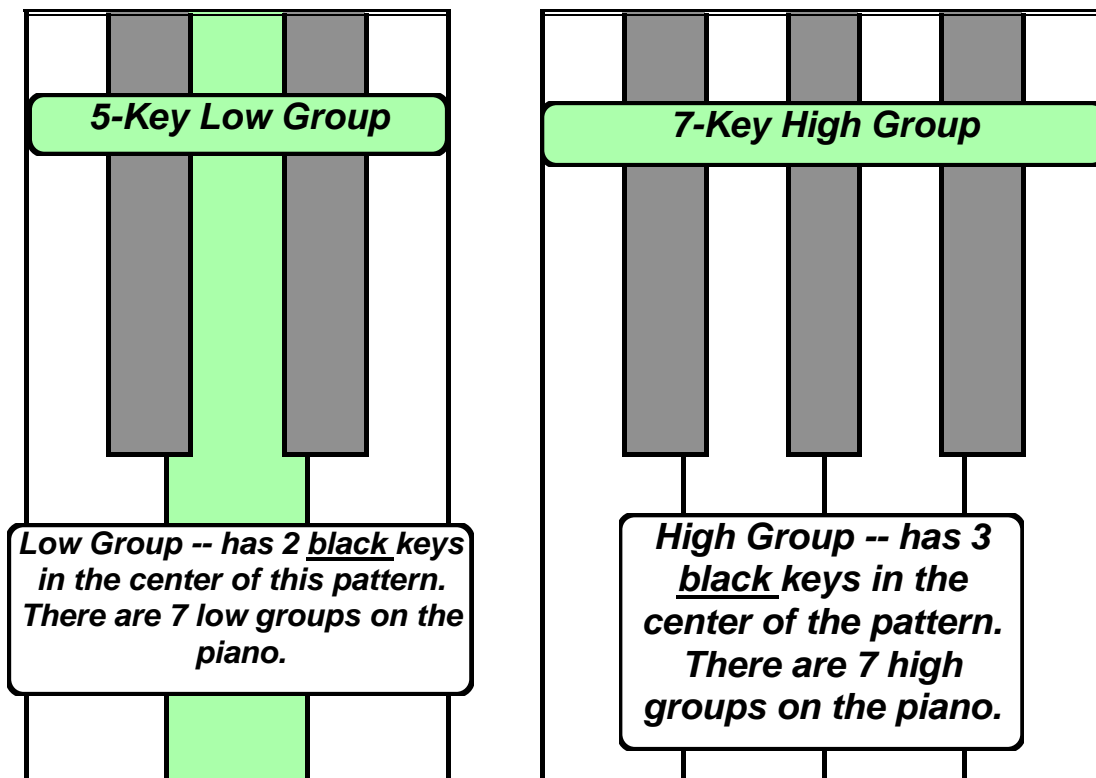
Highest
C
Key

The Essential Roles of the 2 Subgroups of Each Octave Group

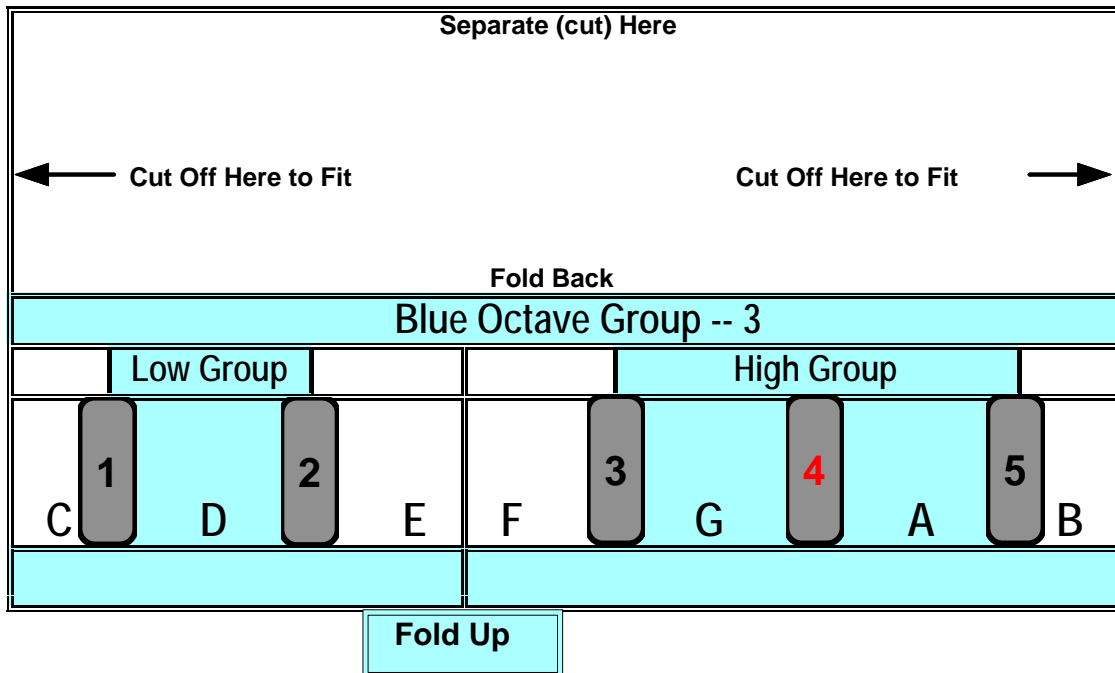
Each Octave Group contains 2 Subgroups: A 5-key Low Group and a 7-key High Group. Within each Octave Group, the Low Group has lower sounds than its High Group.

The most prominent visually and tactually identifiable keys on a musical keyboard are, of course, the BLACK keys. They are visually (and tactually) the essential location markers for all of the keys on the keyboard.

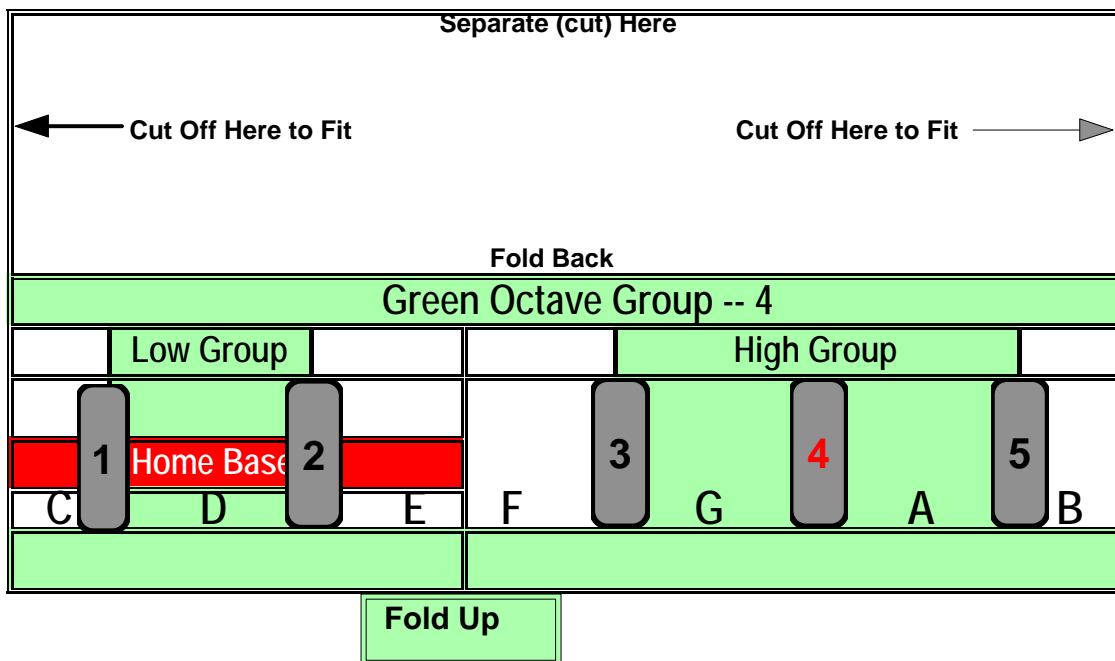
The essential role of the black keys is carried out by their spacing (and standing out above the white keys). This spacing in groups of 2 and 3, marks, identifies, and basically defines each octave group. These groups of 2 and 3 black keys make it possible to read the keyboard very quickly.



Octave Group Locator Labels. Here are samples of 2 of the 7 octave group labels that are designed for placing temporarily behind the black keys on the keyboard. These label the octave groups with the colors shown on the key diagrams and maps. The labels also show the names of the white keys. This way one can easily match the notes in a key map's blue octave group, for example, with the corresponding keys in the blue octave group on the keyboard. The labels can be left in place on the keyboard until no longer needed. (The full set of 7 labels is found in Unit PK-10 - Octave Group Labels.) If you don't have those labels, you can start now by cutting out and using the labels below. To begin, you will only need these two labels at the middle of the keyboard because your first pieces and exercises will just be using the keys at the middle of the keyboard.



Sample



Back side of Octave Group Labels

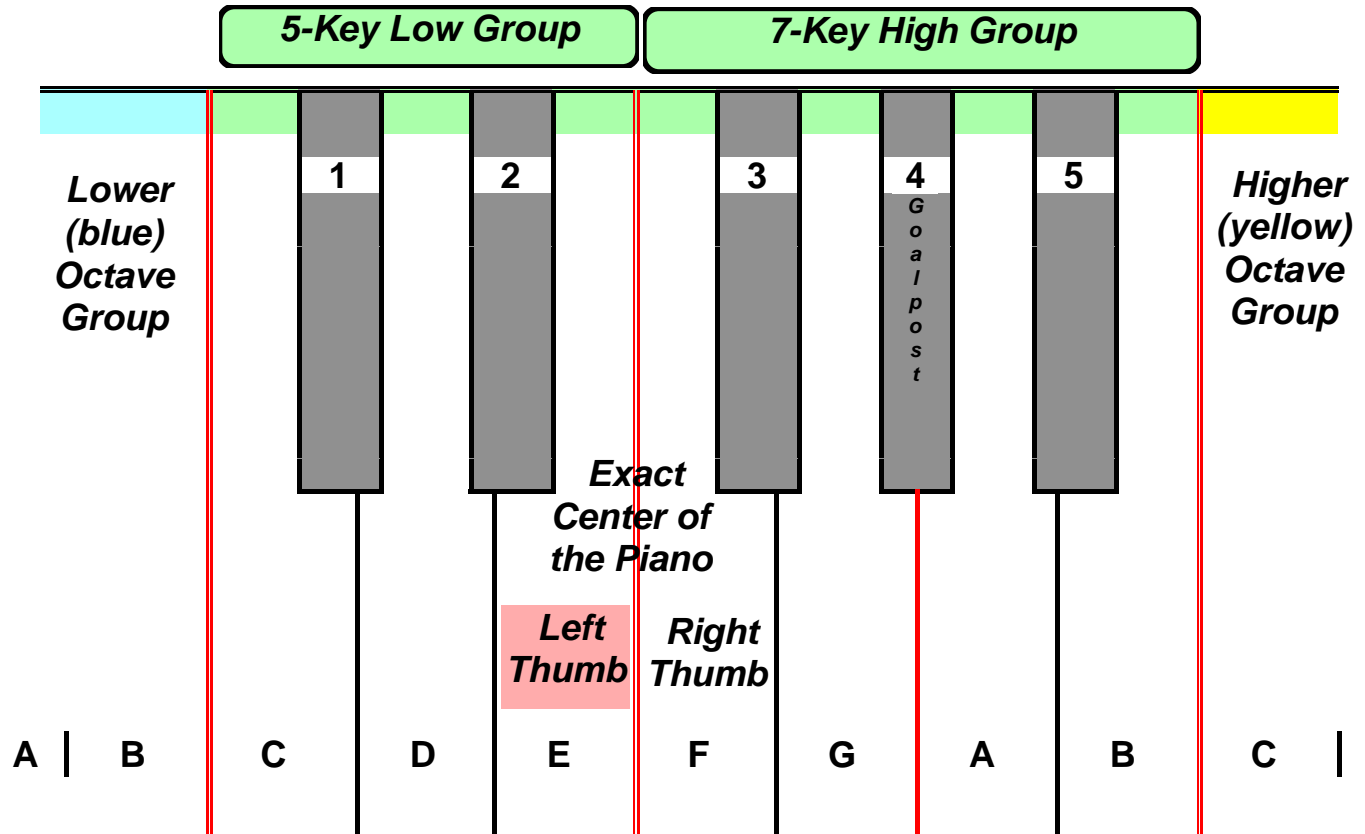
About Beginning to Play. Now that you have the necessary information on how the keyboard is designed and organized, we can turn our attention to how you know and find which keys to play. How do you know which keys to play? Someone or something needs to tell or show you which keys to play. That something is called "sheet music." Sheet music isn't really "music," its really a set of instructions telling what keys or sounds to play. There are different kinds of sheet music that do this. Some kinds are very hard to learn and others, not so hard. Sometimes you will remember how to play a song that you have learned, and will be able to play it without needing to use its sheet music any more. You will also learn to make up your own music without any sheet music at all. It just depends on how advanced a pianist you become over the coming years.

On the coming pages, we begin with a simple chart format to show (or tell) you which keys to play. Later on you will move on to other formats that will work better with more-advanced music - the key diagrams, the key maps, and the grand staff notation. It takes a lot of knowledge and skill to play the piano well. You can't learn this all at once, so you'll need to start with what you can do now, and then gradually build up your knowledge and skill as you continue learning how to play.

About Up and Down. The words "up" an "down" are very important words that are often used to described movements on the piano keyboard. Unfortunately, these words do NOT have the same every day meanings that you have already learned. These words come from the sounds of the music. We have HIGH sounds and LOW sounds. The HIGHEST sounding key on the keyboard is at the FAR RIGHT end and the LOWEST sound is at the FAR LEFT end of the keyboard. The sounds of the keys go from the lowest sound at the far left end of the keyboard and proceed gradually, by "half steps," to the highest sound on the 88th key at the far right end.

About Moving Up and Moving Down. In piano music, we describe moving from one key to another as either going up or going down, The movement is UP if the movement is toward the right (high) end of the keyboard, and the movement is DOWN if it is toward the left (low) end of the keyboard. This seems like a small thing, but it's essential that you understand this use of "up" and "down" because these words are used constantly to describe movements of your fingers on the keyboard.

Diagram of the Green Octave Group



Getting Ready to Play. The physical aspects of playing the piano are extremely important. These have to do with how you sit at the keyboard, how and where you touch the keys, how you move your hands and arms, your lighting, and the like. Your teacher or coach will help you with these things. The following discussion will cover other things that you will need to know and do to get ready to play.

Getting Started. The above diagram of the green octave group at the middle of the keyboard shows where on the keyboard you will first start playing. As the diagram shows, the crack between the keys E and F is located at the exact center of the piano keyboard (It is also at or near the center of other keyboards.) This octave group is where you will start playing. You will place your thumbs on keys E and F at the middle of the keyboard - and spread out your fingers over each of the other white keys shown in the diagram. We call this the 10-finger position. You will find this position very helpful for finding the keys that you want to play. You will also use another position in which your thumbs remain on E and F, but 5 of your other fingers are moved to the 5 black keys in the group. These positions will be of great help as you seek to play the keys (shown in your instruction sheet) **WITHOUT** looking at your fingers or the keys.

Example of a Keyboard Chart for White Keys

The examples below use all of the 7 WHITE KEYS of an octave group. As you use these charts to begin learning to play, you will find that you need to learn the names of the 7 white keys of an octave group so that you can match the keys on the keyboard with the letter names on the charts.

C Major Scale - Up and Down

Play with your thumbs on E and F (10 Finger Position)

	LH	RH			
	L	R			
Colored shading in a column shows which octave group the keys are in.	C				
		D			
		E			
			F		
The markers for the Left hand are in the LEFT column.				G	
				A	
				B	
			C		
Notes going to the right are for higher sounds -- going to the left are for lower sounds.			B		
			A		
			G		
			F		
The RED markers are for the sounds that go DOWN.		E			
	D				
	C				

The chart has a simple plan:

The **MARKERS** show names and addresses of the keys to play.

The column **SHADING** shows which octave the notes are played in.

Movement to the left and right shows the direction of the sounds.

The horizontal **LINES** mark the beats and measures (which you'll learn more about later).

The **FINGERS** remain in place for most (beginner's) songs.

Example of a Keyboard Chart for (mostly) Black Keys

The example below uses all of the 5 BLACK KEYS of an octave group plus B and E. As you use these charts to begin learning to play, you will find that you need to learn the addresses of the 5 black keys and the names of the 7 white keys of an octave group so that you can match the keys on the keyboard with the markers on the charts.

B Major Scale - Up and Down

Play with your thumbs on E and F (10 Finger Position)

LH	RH
L	R
B	
1	
2	
E	
	3
	4
	5
	B
	5
	4
	3
E	
2	
1	
B	

The same chart format is used for black keys and for white keys.

Getting Started With Short Patterns

The easiest way to play this music is with your thumbs on E and F (10 Finger Position).

L		R	
		3	4
			5
		3	
		o	4
			5
		3	

Are you sleeping,
Are you sleeping?

L		R	
C			
	D		
C			
o			
	D		
C			
	E		

L		R	
1			
	2		
1		F	
o			
	2		
		F	
	1		

L		R	
		F	
			G
		F	A
		o	
			G
		F	A

L		R	
	1		
	o		
		4	
		o	
			5
		o	
		4	

Twinkle twinkle,
Little star.

L		R	
	C		
	o		
		G	
		o	
			A
		o	
		G	

L		R	
	2		
	o		
		5	
		o	
			C
			o
		5	

L		R	
	D		
	o		
		A	
		o	
			B
		o	
		A	

L		R	
		F	
	2		
1			
	2		
		F	
		o	
		o	

Mary had a little lamb.

L		R	
	2		
1			
B			
	1		
	2		
	o		
	o		

L		R	
			5
		4	
		3	
			4
			5
			o
			o

L		R	
			C
		5	
		4	
			5
			C
			o
			o

This page introduces a marker that was not shown on the previous 2 pages. This marker is "o" and it simply means "repeat" the same key again.

More Short Patterns For Practice

The easiest way to play this music is with your thumbs on E and F (10 Finger Position).

Aloys Schmitt

L		R	
1			
	2		
		F	
			3
			4
		3	
		F	
	2		
1			

L		R	
			4
		3	
		F	
	2		
1			
	2		
		F	
			3
			4

L		R	
1			
	2		
			3
		F	
			4
		3	
		F	
	2		
1			

L		R	
1			
		F	
	2		
			3
		F	
			4
		3	
	2		
1			

L		R	
1			4
		3	
		4	
		F	
			3
	2		
		F	
	1		

L		R	
			4
1			
	2		
1			
		F	
	2		
			3
		F	
			4

L		R	
C			
	D		
	E		
		F	
			G
		F	
	E		
D			
C			

L		R	
			G
		F	
	E		
D			
C			
D			
	E		
		F	
			G

L		R	
C			
	D		
		F	
	E		
			G
		F	
D			
	E		
C			

L		R	
C			
	E		
D			
		F	
	E		
			G
		F	
	D		
C			

L		R	
C			
		G	
			A
		G	
	E		
		F	
D			
	E		
C			

L		R	
		G	
C			
	D		
C			
	E		
D			
		F	
	E		
		G	

On this page and on several of the following pages you will find some songs and exercises that are played mainly on BLACK keys. We begin with the black keys because they are easier to find than the white keys (which can only be found by referring to black keys). Following this group played on the black keys, you will find a group of the same songs and exercises played mainly on WHITE keys. (You will find that most piano pieces are played on combinations of BLACK and WHITE keys.)

Play with your thumbs on E and F (10 Finger Position). Other fingers on BLACK keys.

Twinkle, Twinkle, Little Star

Focus on Key Addresses

Slowly, with expression b: 5 Beats: 4

L		R			L		R			L		R		
1				Twin-				4	Up	1				Twin-
o				kle,				o	a-	o				kle,
		4		twin-			3		bove			4		twin-
		o		kle,			o		the			o		kle,
			5	lit-			F		world				5	lit-
			o	tle			o		so				o	tle
		4		star.		2			high,			4		star.
			3	How				4	Like				3	How
		o		I				o	a-			o		I
		F		won-			3		dia-			F		won-
		o		der			o		mond			o		der
	2			what			F		in		2			what
	o			you			o		the		o			you
1				are,		2			sky.	1				are.

Brother John

Focus on Key Addresses

Moderately b: 5 Beats: 4

L		R			L		R		
1				Are			4	5	Morn-
	2			you			4		ing
		F		sleep-			3		bells
							F		are
1				ing,		1			ring-
o				Are			4	5	ing
	2			you			4		bells
		F		sleep-			3		are
							F		ring-
1				ing,		1			ing
		F		Bro-		1			Ding,
			3	ther	4				Dong
			4	John?		1			Ding,
		F		Bro-		1			Ding,
			3	ther	4				Dong
			4	John?		1			Ding,

Play with your thumbs on E and F (10 Finger Position).

Exercises 1 & 2 - Aloys Schmitt

Focus on Key Addresses

Moderately *b*: 5 Beats: 4

These and the following 5-finger exercises are based on exercises by Aloys Schmitt, composed about 150 years ago. His exercises are among the most famous and often used exercises available for learning to play the piano. You will find adaptations of several of these famous exercises here and on some of the following pages.

The exercises are intended to be repeated many times, to help you develop the necessary perfect control of your fingers on the keyboard.

L		R	
1			
	2		
		F	
			3
			4
		3	
		F	
	2		
1			
	2		
		F	
			3
			4
		3	
		F	
	2		
1			
	2		
		F	
			3
			4
		3	
		F	
	2		
1			

L		R	
			4
		3	
		F	
	2		
1			
	2		
		F	
			3
			4
		3	
		F	
	2		
1			
	2		
		F	
			3
			4
		3	
		F	
	2		
1			

Play with your thumbs on E and F (10 Finger Position).

You might enjoy playing the Schmitt exercises as fast as you can. But don't play them any faster than you can at an EVEN AND STEADY PACE.

Play with your thumbs on E and F (10 Finger Position).

Happy Birthday

Focus on Key Addresses

Happily, With Enthusiasm *b: 6* *Beats: 3*

L		R			L		R		
1				Hap- py birth-				1	birth- day
o								5	
	2			day			3		dear
1				to			F		(Insert)
			3	you,					(Name)
		F		Hap- py birth-				B	Hap- py birth- day
				day			5	o	
1				to			3		to
o	2			you,				4	you,
				Hap- py			3		
			4						
		3							
1									
o									

Exercises 3 & 5 - Aloys Schmitt

Focus on Key Addresses

Moderately *b*: 5 Beats: 4

Play with your thumbs on E and F (10 Finger Position).

L		R	
1			
	2		
			3
		F	
			4
		3	
	2	F	
1			
	2		
		F	
			3
			4
		3	
		F	
	2		
1			
	2		
			3
		F	
			4
		3	
	2	F	
1			
	2		
			3
		F	
			4
		3	
	2	F	
1			

L		R	
1			
		F	
	2		
			3
		F	
			4
		3	
	2		
1			
	2		
		F	
			3
			4
		3	
		F	
	2		
1			
	2		
		F	
			3
			4
		3	
	2	F	
1			

Play with your thumbs on E and F (10 Finger Position).

London Bridge

Focus on Key Addresses

Lively #: 5 Beats: 4

L		R			L		R		
		3		Lon-			3		Lon-
			4	don				4	don
			3	bridge			3		bridge
	E			is		E			is
2				fal-	2				fal-
	E			ling		E			ling
		3		down,			3		down,
1				Fal-	1				My
	2			ling					
	E			down,			3		fair
2				Fal-		2			La-
	E			ling	B				dy.
		3		down,					

Exercises 9 & 10 - Aloys Schmitt

Focus on Key Addresses

Moderately *b*: 5 Beats: 4

Play with your thumbs on E and F (10 Finger Position).

L		R	
1			4
		3	4
		F	3
	2	F	
1			4
		3	4
		F	3
	2	F	
1			
	2	F	
			3
			4
		3	
		F	
	2		
1			4
		3	4
		F	3
	2	F	
1			

L		R	
			4
1			
	2		
1			
		F	
	2		
			3
		F	
			4
			3
			4
		3	
		F	
	2		
1			4
1			
	2		
		F	
			3
		F	
			4

Mary Had a Little Lamb

Focus on Key Addresses

Brightly #: 6 Beats: 4

Play with your thumbs on E and F (10 Finger Position).

L		R			L		R		
			5	Ma-				5	Ma-
			4	ry				4	ry
			3	had				3	had
			4	a				4	a
			5	lit-				5	lit-
			o	tle				o	tle
			o	lamb,				o	lamb,
			o					o	its
			4	lit-				4	fleece
			o	tle				o	was
			o	lamb,				5	white
			o					4	as
			5	lit-				3	snow.
			1	tle					
			o	lamb,					

Michael Row the Boat Ashore

Focus on Key Addresses

Quietly *b/#: 5* Beats: 4

Play with your thumbs on E and F (10 Finger Position).

L	R		L	R	
	1	Mi-		4	Row
	F	chael		F	the
	4	Row		3	boat
	F	the		F	a-
	4	boat	2		shore.
	5	a-			
	4	shore,	1		Ha-
			2		le-
	F	Ha-		F	lu-
	4	le-			
	5	lu-	2		u-
			1		jah!
	4	jah.			
	F	Mi-			
	4	chael			

This song and the following songs are repeats of the previous songs, but are designed for mostly WHITE keys, in place of the black keys of the previous set of songs. It's intended that they be played with the thumbs on E and F, but you can use other options as described at the bottom of the page.

Twinkle, Twinkle, Little Star

Focus on Key Names

Slowly, with expression b/#: None Beats: 4

L		R			L		R			L		R		
C				Twin-				G	Up	C				Twin-
o				kle,				o	a-	o				kle,
		G		twin-			F		bove			G		twin-
		o		kle,			o		the			o		kle,
		A		lit-		E			world				A	lit-
		o		tle		o			so				o	tle
		G		star.	D				high,			G		star.
		F		How				G	Like			F		How
		o		I				o	a-			o		I
	E			won-			F		dia-		E			won-
	o			der			o		mond		o			der
D				what		E			in	D				what
o				you		o			the	o				you
C				are,	D				sky.	C				are.

Options -- You are welcome to use ANY fingers to play the song. Finger positions are DESIGNED TO HELP you play. You can use other finger positions that you like better - as long as they work for you. One option is to play the whole song with just one hand. Try it. You may like it! Note that these charts are specially designed to work well with the thumbs on E and F. They could have been designed to work well with the fingers on other keys, but that comes later in your piano studies.

Brother John

Focus on Key Names

Moderately *b*: 5 Beats: 4

L		R				L		R		
C				Are				G	A	Morn-
	D			you				G		ing
	E			sleep-				F		bells
C				ing,		E				are
										ring-
C				Are				G	A	ing,
	D			you				G		Morn-
	E			sleep-				F		ing
C				ing,		E				bells
										are
	E			Bro-	1					ring-
		F		ther	4	G				Ding,
			G	John?	1		C			Dong
										Ding,
	E			Bro-						Ding,
		F		ther	4	G				Dong
			G	John?	1		C			Ding,

Play with your thumbs on E and F (10 Finger Position).

Exercises 1 & 2 - Aloys Schmitt

Focus on Key Names

Moderately *b*:5 Beats: 4

The easiest way to play this is with your thumbs on E and F (10 Finger Position).

These and the following exercises are similar to the ones that you played on the previous pages.

The difference is that the following exercises focus on the NAMES of the white keys, unlike the previous exercises, that focused on the ADDRESSES of the black keys.

You will, of course, need to learn to play equally well BOTH on the white keys and on the black keys. Most musical pieces are played on a mix of both the black and the white keys.

L	R		
C			
	D		
	E		
		F	
			G
		F	
D	E		
C			
	D		
	E		
		F	
			G
		F	
D	E		
C			
	D		
	E		
		F	
			G
		F	
D	E		
C			

L	R		
		F	G
	E		
D			
C			
	D		
		E	F
			G
		F	
D	E		
C			
	D		
		E	F
			G
		F	
D	E		
C			
	D		
		E	F
			G
		F	
D	E		
C			

You might enjoy playing the Schmitt exercises as fast as you can. But don't play them any faster than you can at an EVEN AND STEADY PACE.

You might also like to know that each exercise can be played with either hand alone by spreading your 5 fingers out on the CDEFG keys of the green octave group or on any of the other 6 octave groups of the keyboard.

The easiest way to play this is with your thumbs on E and F (10 Finger Position).

Happy Birthday

Focus on Key Names

Happily b: 1 Beats: 3

L		R			L		R		
C				Happy birth- day day to you, Happy birth- day day to you, Happy				C	birth-
o									day
	D							A	day
C								F	dear
		F				E			(Insert)
	E					D			(Name)
								5	Happy
								o	py
C								A	birth-
o								F	day
	D							day	
C							G	to	
			G				F	you,	
		F							
C								Happy	
o								py	

Exercises 3 & 5 - Aloys Schmitt

Focus on Key Names

Moderately b#: None Beats: 4

The easiest way to play this is with your thumbs on E and F (10 Finger Position).

L	R		
C	D		
	E	F	
			G
D	E	F	
C	D		
	E	F	
			G
D	E	F	
C	D		
	E	F	
			G
D	E	F	
C	D		
	E	F	
			G
D	E	F	
C			

L	R		
C	E		
D		F	
	E		G
		F	
C	E		
D		F	
	E		G
D	F		
C	D		
	E	F	
			G
D	E	F	
C	E		
D		F	
	E		G
		F	
C			

London Bridge

Focus on Key Names

Lively b/#: None Beats: 4

The easiest way to play this is with your thumbs on E and F (10 Finger Position).

L		R			L		R		
		G		Lon-			G		Lon-
			A	don				A	don
		G		bridge			G		bridge
		F		is			F		is
E				fal-	E				fal-
		F		ling			F		ling
			G	down,				G	down,
D				Fal-	D				My
	E			ling					
		F		down,			G		fair
E				Fal-		E			La-
		F		ling		C			dy.
			G	down,					

Mary Had a Little Lamb

Focus on Key Names

Brightly b/#: None Beats: 4

L		R			L		R		
	E			Ma-		E			Ma-
D				ry	D				ry
C				had	C				had
	D			a		D			a
	E			lit-		E			lit-
	o			tle		o			tle
	o			lamb,		o			lamb,
						o			its
D				lit-	D				fleece
o				tle	o				was
o				lamb,		E			white
					D				as
	E			lit-	C				snow.
		G		tle					
		o		lamb,					

The easiest way to play this is with your thumbs on E and F (10 Finger Position).

Ode to Joy from Beethoven's 9th Symphony

Focus on Key Names

Boldly, with expression *b/#: None* *Beats: 4*

Beethoven

		L	R		L	R		L	R		L	R	
3		E			E			D			E		
		o			o			o			o		
			F			F			E			F	
				G			G	C					G
				G			G		D				G
			F			F			E	F			F
		E				E			E				E
		D				D			C				D
		C				C			D				C
		o				o			E	F			o
		D				D			E				D
		E				E			D				E
		E				D			C				D
		D				C			D				C
		o				o			G				o

In addition to playing this famous (5-note) song in the 10-finger position, it can easily be played with the 5 fingers of EITHER hand without changing the hand position while playing (except for the low G near the end of the song). Begin with finger 3 (the middle finger) of either hand.

Ode to Joy from Beethoven's 9th Symphony

Focus on Key Addresses

Boldly, with expression *b: 5* *Beats: 4*

Beethoven

L		R		L		R		L		R	
			<i>F</i>				<i>F</i>				<i>F</i>
			<i>o</i>				<i>o</i>				<i>o</i>
			3				3				3
			4				4				4
			4				4				4
			3				3				3
			<i>F</i>				<i>F</i>				<i>F</i>
			2				2				2
			1				1				1
			<i>o</i>				<i>o</i>				<i>o</i>
			2				2				2
			<i>F</i>				<i>F</i>				<i>F</i>
			<i>F</i>				2				2
			2				1				1
			<i>o</i>				2				1
							4				1

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