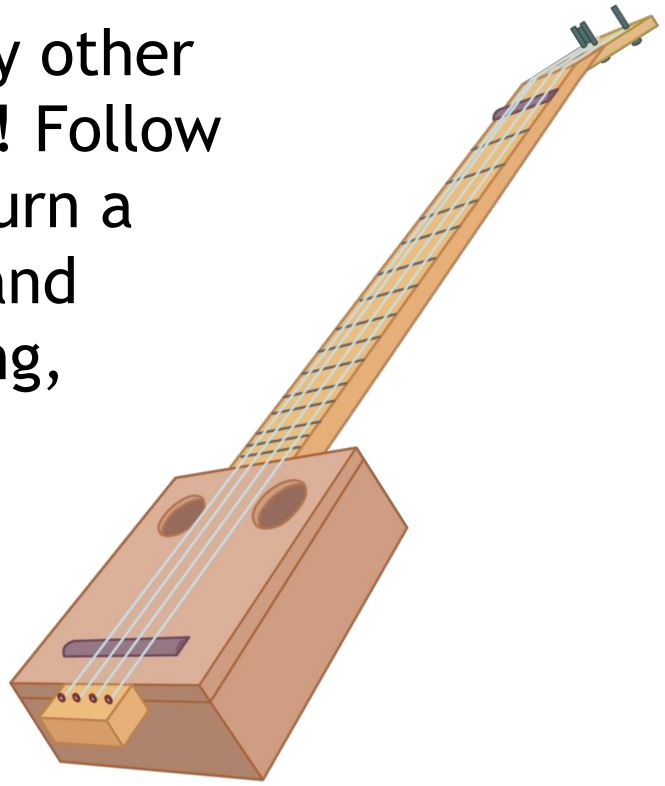
Building the Cigar Box Guitar Students' Guide

Developed by
Building to Teach
1-18-17

Building the Cigar Box Guitar -(c) Building To Teach 2014

Introduction

Cigar Box Guitars are just like any other guitar, only much easier to make! Follow the instructions in this guide to turn a cigar box, a few pieces of wood and some other supplies into a working, four string, fretless guitar, ready to play with a slide.



This guide is divided into four sections: The Box, The Neck The Fret Scale, and Stringing and Tuning. There are tool and material lists for each section. This allows the class to be divided into groups.

The Tools Needed (Overview) - Page 1

- **Ruler** or **Tape Measure**
- **Pencil**
- **Combination Square**
- **Compass** (Carpenter's Scribers)
- **Back Saw**, or **Hack Saw**
- **Crosscut Saw**, or **Bandsaw**
- **Drill**
- **Drill Bits** (for pilot holes and tuner holes: usually **1/16"** and **5/16"**)
- **Hole Saw (1"), Spade Bit,** or **Forstner Bit** (For Sound Holes)

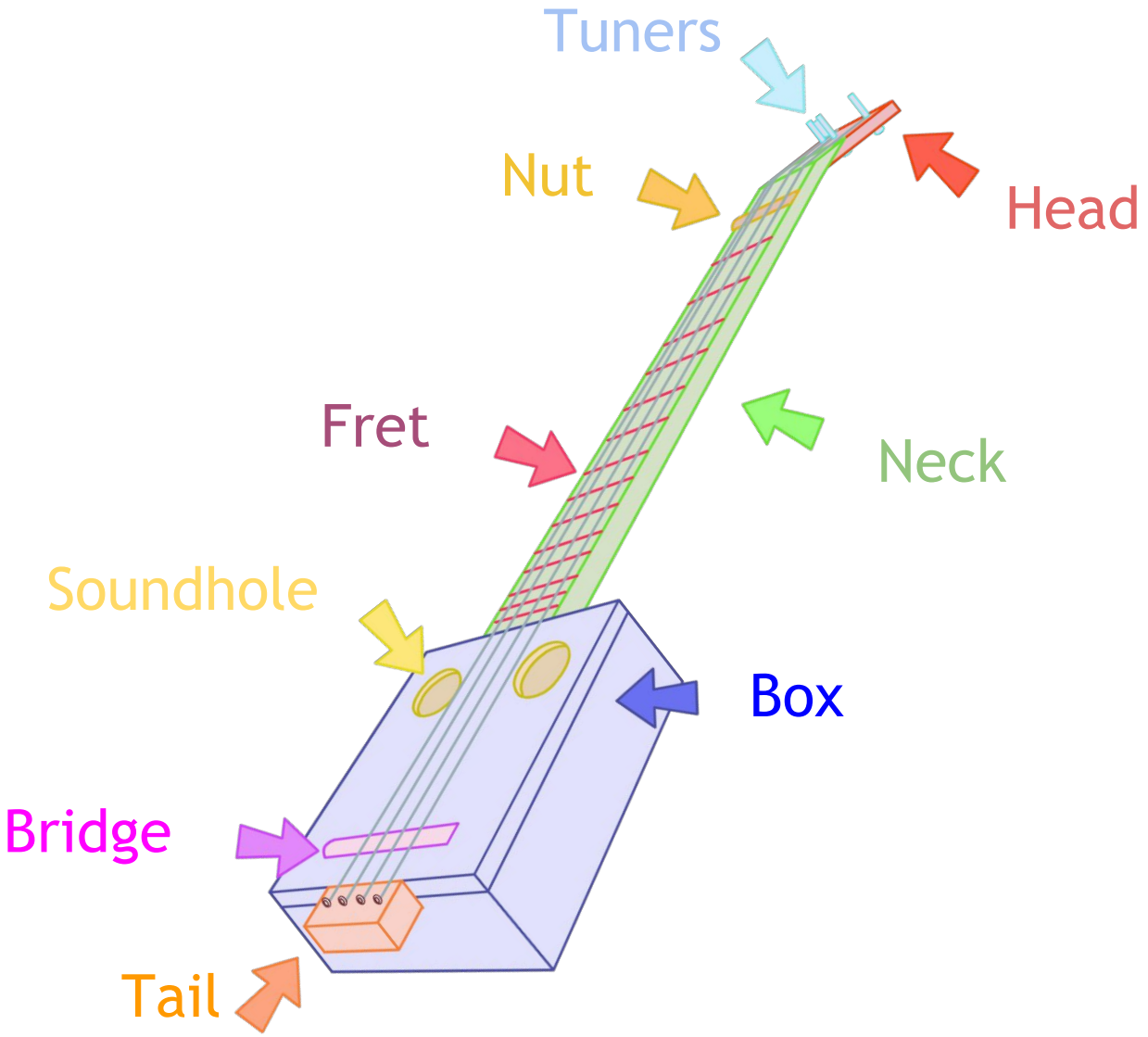
The Tools Needed (Overview) - Page 2

- **Chisel and Mallet** (optional)
- **Rasps** and **Files**
- **Awl,** or **Centerpunch**
- Small Round File- **5/32" chainsaw file**
- **Small "C" clamps**- 1 1/2" to 2 1/2" throat openings
- **Larger clamps-** 4-6" throat openings
- **Small (#1) Phillips Screwdriver**
- **Woodburner** (optional for marking fret spacing)
- **Bridge Tuner** (optional, but very nice for tuning the guitars)

The Necessary Materials

- **Neck- 11/16" x 1 1/2" x 36**- Straight grained hardwood is best
- **Cigar Box**- all wood is best
- **Nut - Machine Screw #10 x 1 1/2"**
- **Bridge - Eye Bolt** (or piece of **threaded rod**)**1/4" x 4"**
- **Masking Tape** - 3/4"- 1" wide
- **Fret Scale - 3" x 30" rectangle of pattern stock** (such as 1/4" plywood, or stiff cardboard). Paper will also work.
- **Four Guitar Tuners**
- **Type I Yellow Carpenters Glue** - Such as Titebond I (with the red cap)
- **Small Brads- 3/4"**
- **Guitar Strings:**
  - **#1 - .034" Bronze Wound,**
  - **#2 - .026" Bronze Wound,**
  - **#3 - .017" Plain Steel,**
  - **#4 - .013" Plain Steel**
- **Glass** or **Metal Guitar Slide**

Guitar Parts/ Terms- Illustration



Guitar Terms - Part 1

Before you start building, it's good to know exactly what it is you're building. Using complete sentences, please define each term as it relates to a guitar. Once you're done, get an instructor to check your answers.

- Neck- _____

  _____

- Head- _____

  _____

- Tail- _____

  _____

Instructor's Initials_____

Guitar Terms - Part 2

- Bridge- _____

  _____

- Nut- _____

  _____

- Soundhole- _____

  _____

- Fret- _____

  _____

Instructor's Initials_____

Safety First!

Make sure you use these while building:

- **Safety Glasses**
- **Hearing Protection**
- **Dust Masks**

You're brought into this world with two eyes, two ears, ten fingers and ten toes--make sure you keep them.

When you are using a tool with a sharp edge, keep your hands **on top of the tool**, or **behind the cutting edge** of the blade.

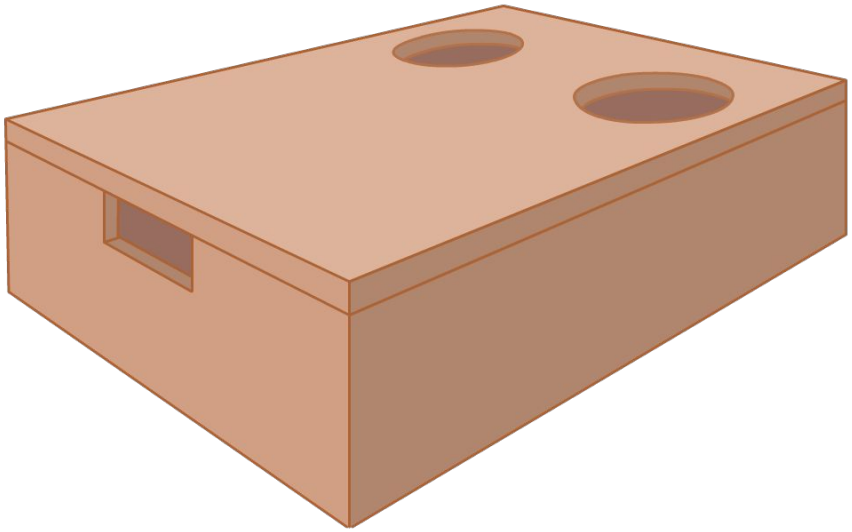
Most importantly, **use common sense**. It is your responsibility to know how to use your tools. If you don't know how to do something, **ask your instructor.**

Read the Directions all the way through before starting.

Part 1 - The Box- Intro

The objective is to build a cigar box that will take the vibrations of the guitar strings and pump out the sound. This involves notching the box to fit the neck and cutting holes in the box to let out the sound.

The Objective is to make the top surface of the neck flush with the top surface of the box. Boxes vary. So, keep the objectives in mind.



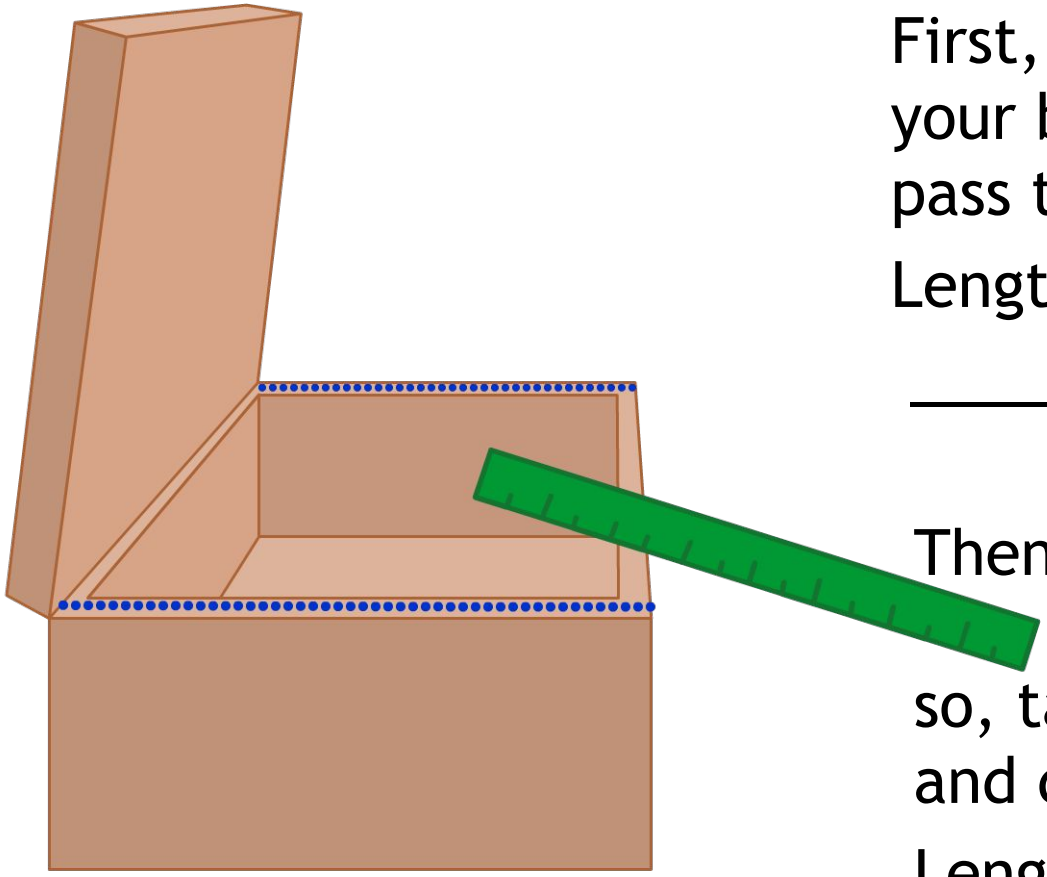
The Box -The Tools Needed

- **Ruler** or **Tape measure**
- **Pencil**
- **Combination Square**
- **Back Saw, Hack Saw**
- **Coping Saw**
- **Drill**
- **Hole Saw (1")**, **Spade Bit**, or **Forstner Bit** (For Sound Holes)
- **File and/ or rasp**

The Box - The Necessary Materials

- **Neck- 11/16" x 1 1/2" x 36**- Straight grained hardwood is best
- **Cigar Box**- an all wood box works best

Notching The Box- Page 1



First, measure out the sides of your box that the neck will pass through.

Length of each side =

_____ inches

Then, find the center of those sides. To do so, take your answer above and divide it by 2.

Length of side divided by 2=

_____ inches

Notching The Box- Page 2

Next, measure the width and thickness of the neck.

Width of Neck =

_____ Inches

Thickness of Neck =

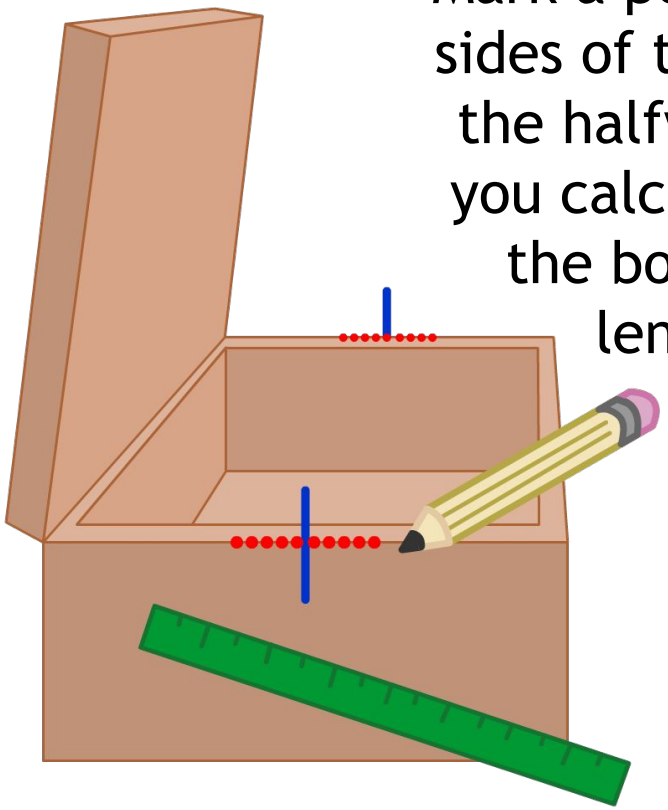
_____ Inches

Then, find the center of the width, dividing it by 2.

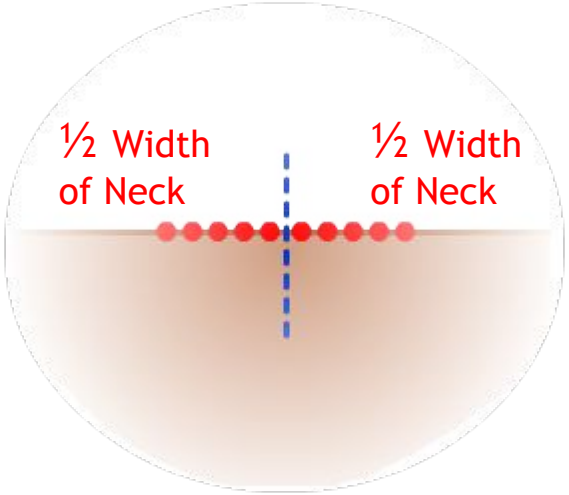
Width of Neck Divided by 2=

_____ Inches

Notching The Box- Page 3



Mark a point on the sides of the box, at the halfway point you calculated for the box sides' length.



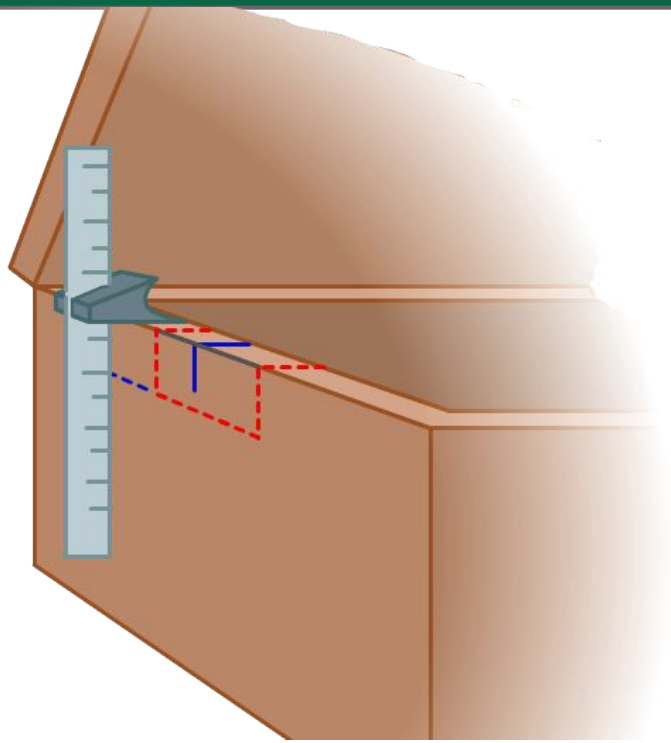
Then, make two marks in each direction from that point, each equaling half the width of your neck.

When you're done, have an instructor check your work.

Instructor's Initials _____

Notching The Box- Page 4

Use a combination square to draw vertical lines down from the ½ width neck points. These need to be the length of the thickness of your guitar's neck, so make sure your measurements match.



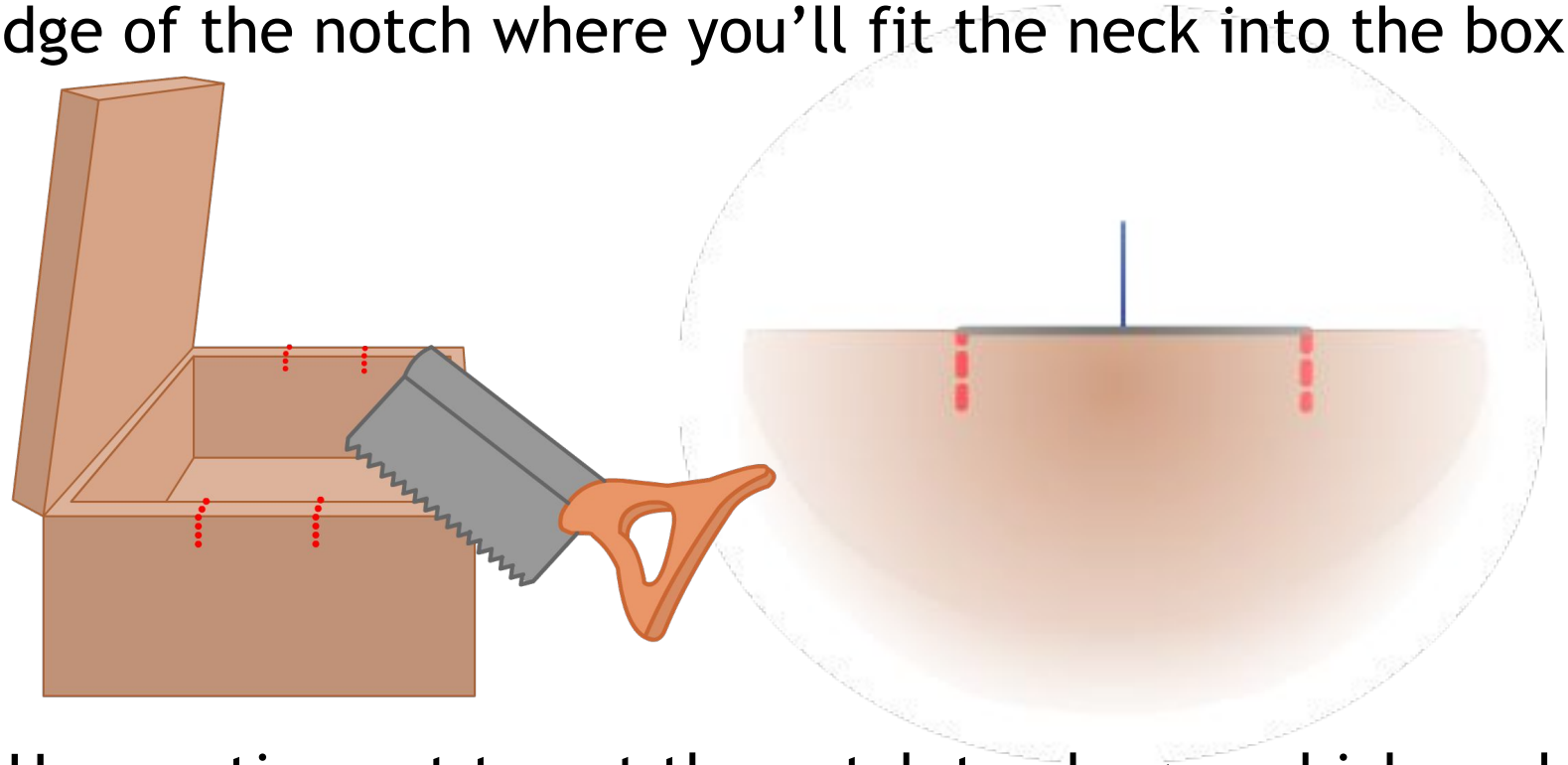
Then, draw the bottom, horizontal line, across. This should be equal to the full width of the guitar's neck.

Verify the measurements of their own pieces of wood. After they've drawn the lines, have an instructor check your work.

Instructor's Initials _____

Notching The Box- Page 5

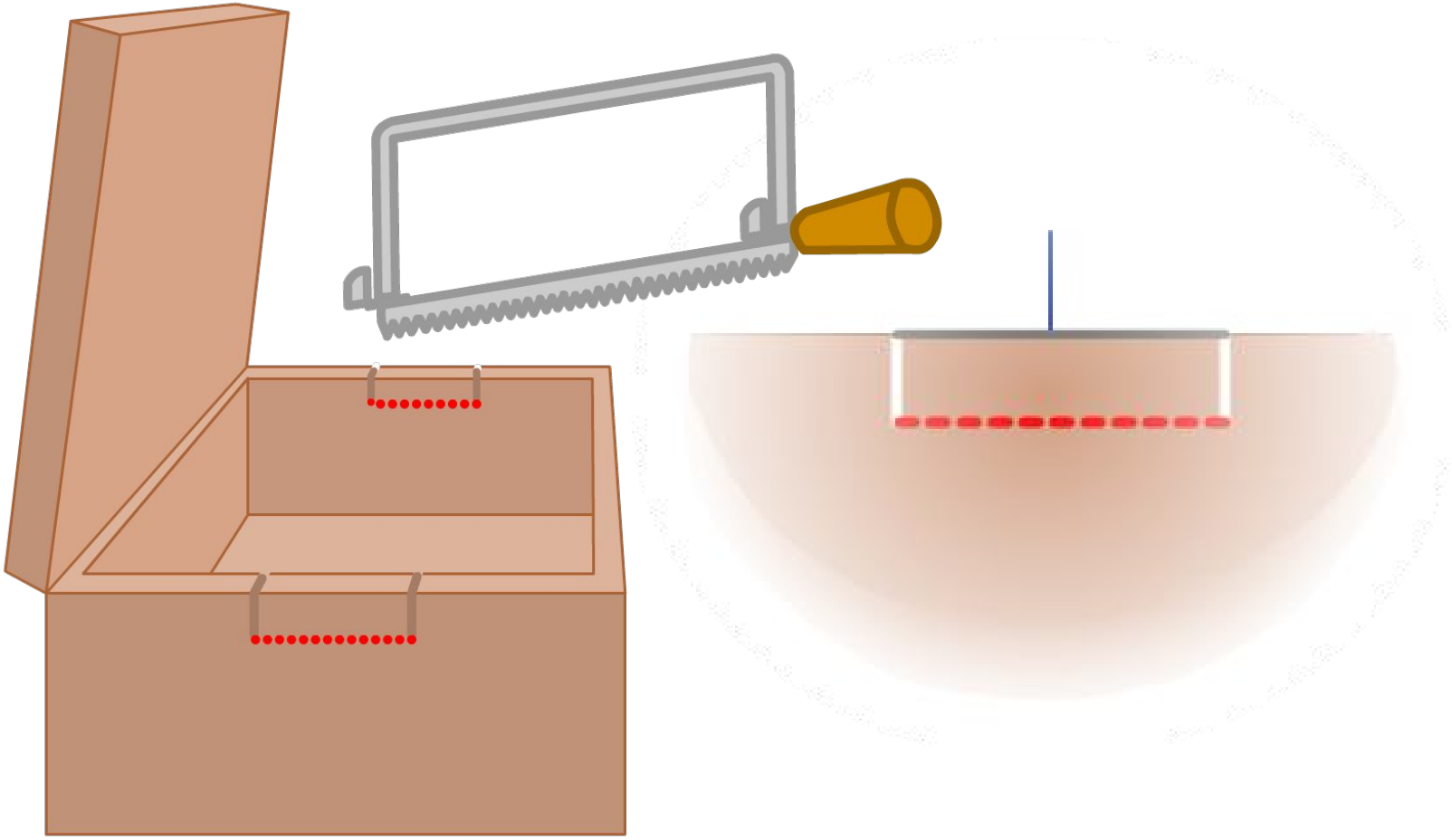
Now, take a back saw, hack saw, or any fine toothed saw and cut down from the ½ Width of Neck points, making the edge of the notch where you'll fit the neck into the box.



Use caution not to cut the notch too large, which could cause a large gap between your box and neck.

Notching The Box- Page 6

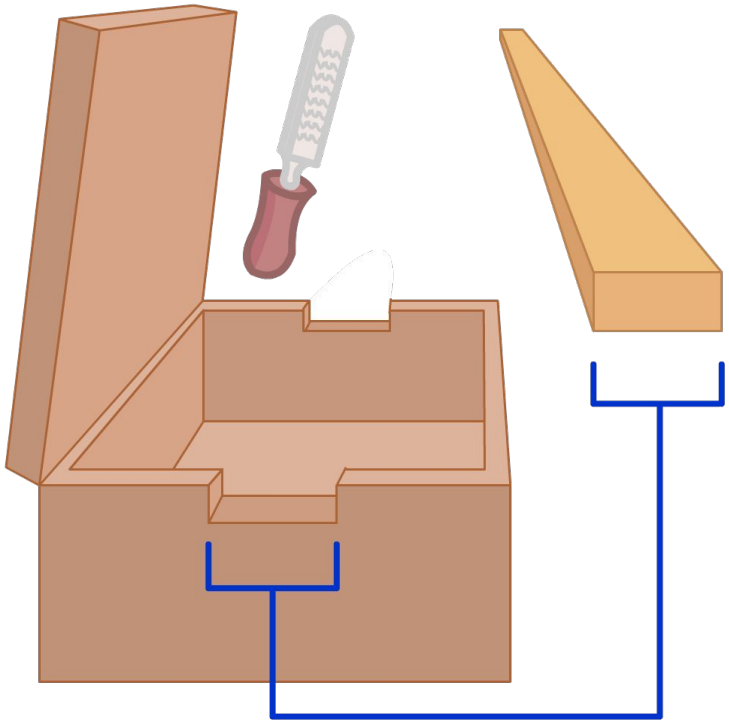
Next, use a coping saw to cut the bottom of the notches.



Notching The Box- Page 7

Test the neck in the notch. Use a rasp or hand file if you need to make any fine adjustments.

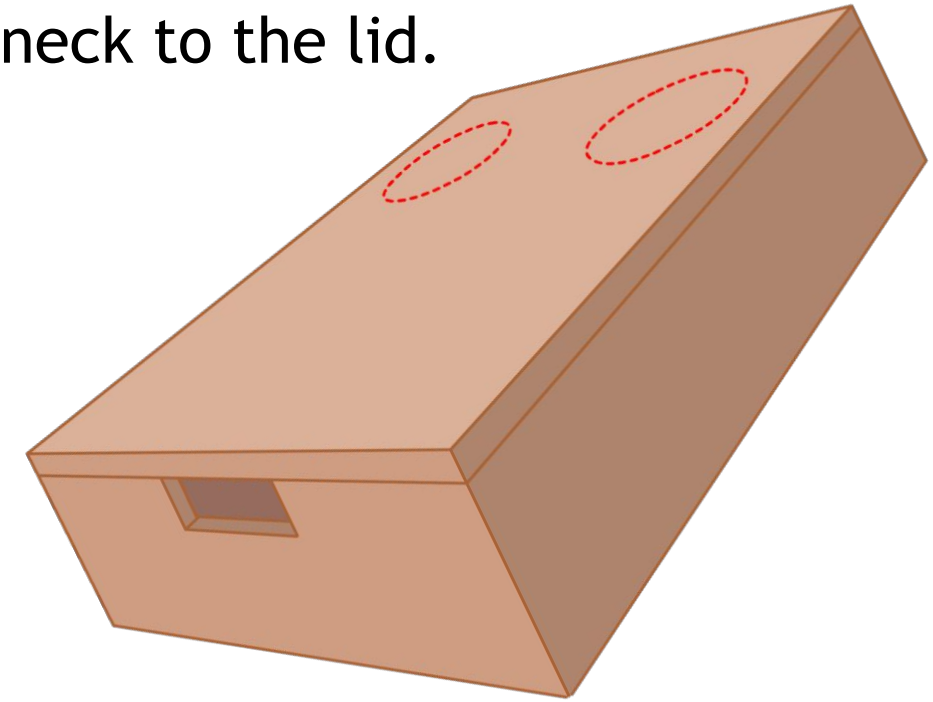
Once the neck fits securely in the notch, have an instructor check your work and initial below.



Instructor's Initials _____

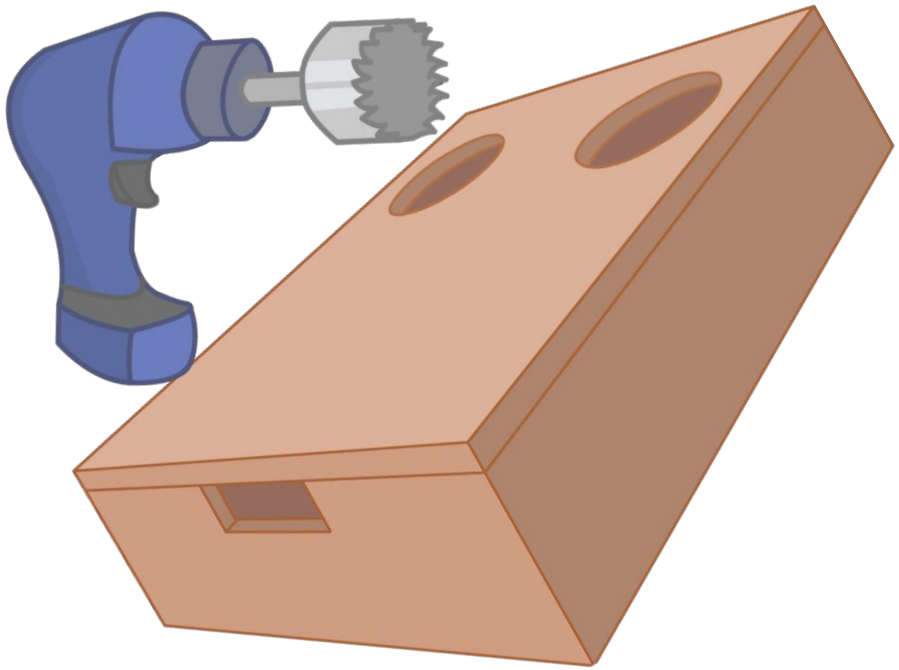
Drill Soundholes into Box- Page 1

Locate two holes, greater than 1" in diameter, above and below the neck, forward of the bridge. Keep the holes close to the neck; they will be useful when clamping and gluing the neck to the lid.



Drill Soundholes into Box- Page 2

Drill them with a hole saw, forstner bit or spade bit.

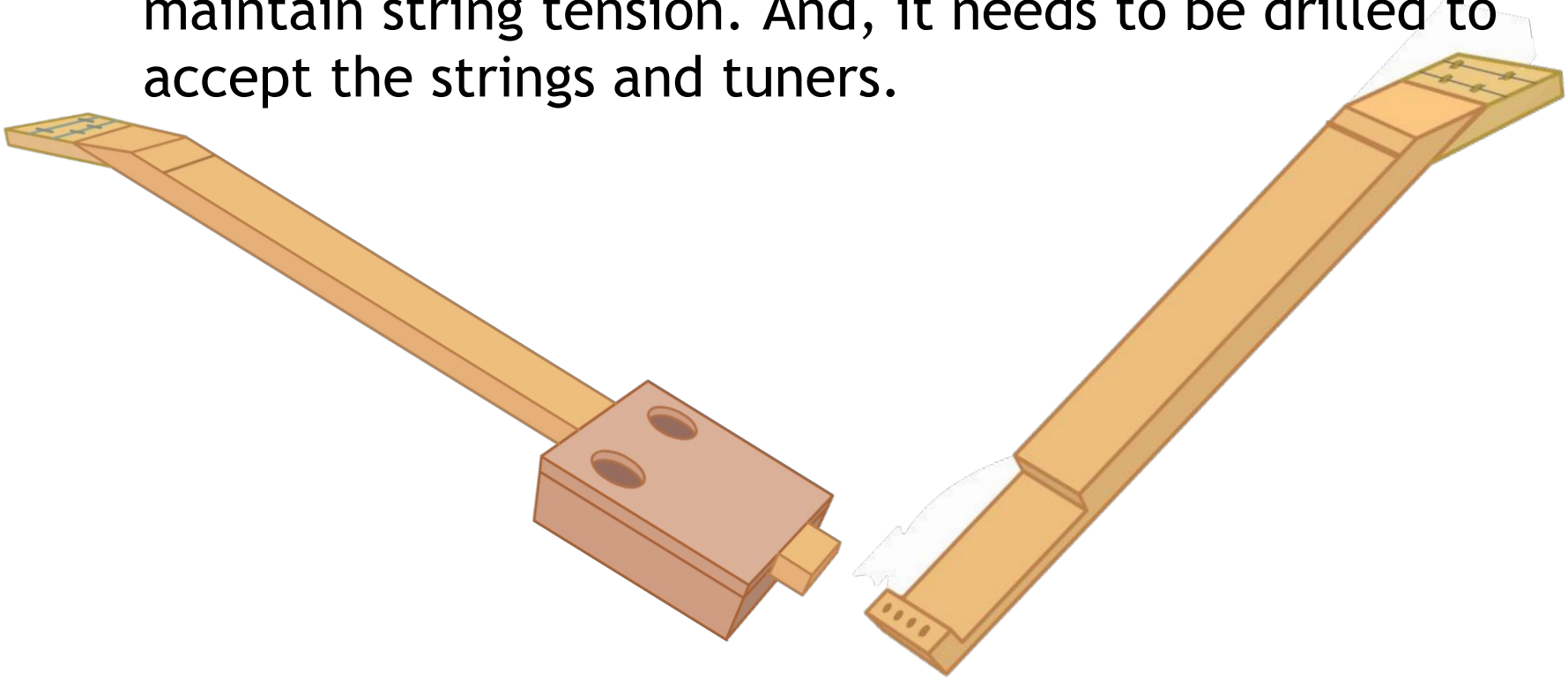


Have an instructor check your work.

Instructor's Initials _____

Part 2 - The Neck

- The neck holds the strings and transfers their vibrations into the box. The neck has to be notched to fit the box's lid. Its head has to angled in order to maintain string tension. And, it needs to be drilled to accept the strings and tuners.



The Neck - The Tools Needed

- **Ruler** or **Tape measure**
- **Pencil**
- **Combination Square**
- **Back Saw**, or **Hack Saw**
- **Traditional Hand Saw, or Band Saw** (to cut Headstock angle)
- **Drill**

The Neck - The Tools Needed

- **Drill Bits** (for pilot holes, string holes and tuner holes: usually **1/16"** and **5/16"**)
- **Chisel and Mallet**
- **Awl**, or **Centerpunch**
- **Small Round File-** a 5/32" chainsaw file works well
- **Small "C" clamps**- 1 1/2" to 2 1/2" throat openings

The Neck - The Necessary Materials - Page 1

- **Neck- 11/16" x 1 1/2" x 36**- Straight grained hardwood is best
- **Cigar Box**-
- **Machine Screw #10 x 1 1/2"**- for the Nut
- **Masking Tape- 3/4"- 1" wide**
- **3" x 30" rectangle of pattern stock** (such as 1/4" plywood, or stiff cardboard)- to layout Fret Scale. Paper will work, in a pinch.

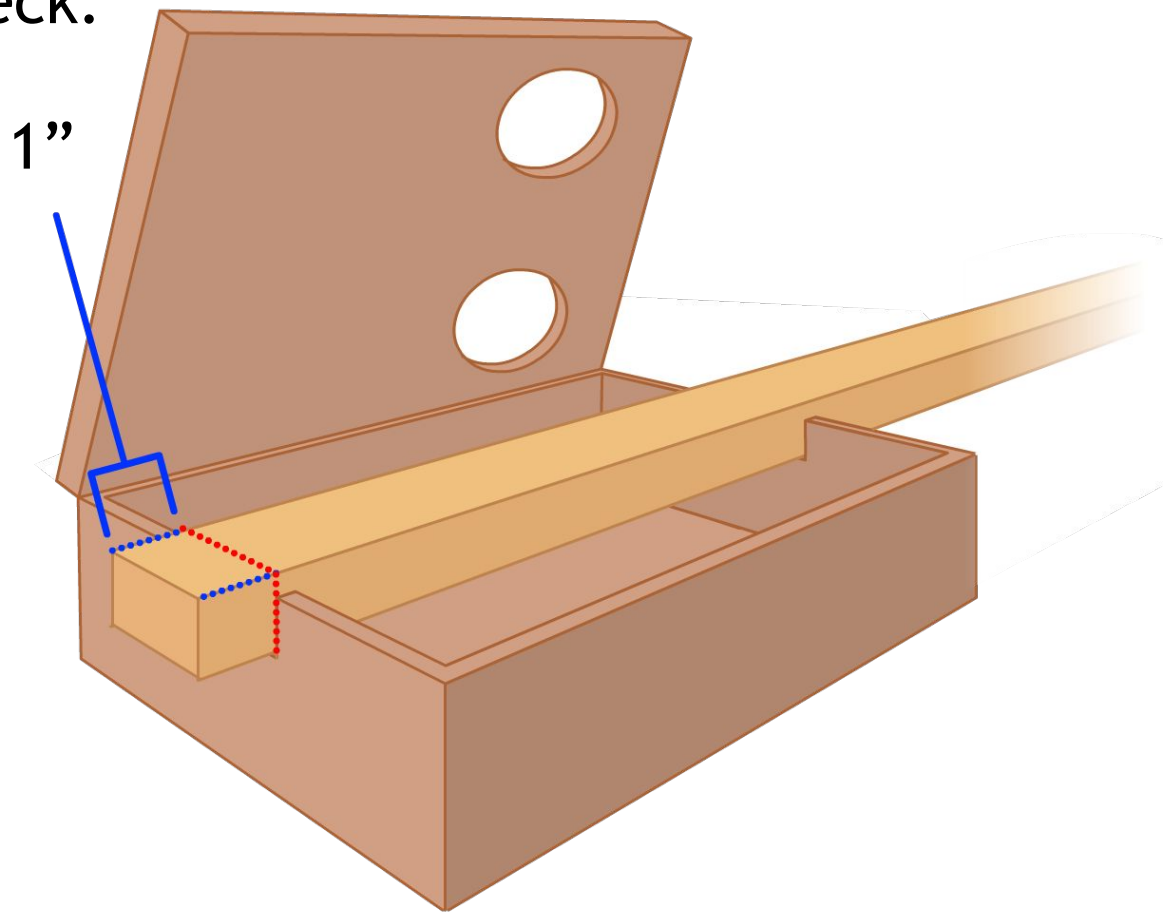
The Neck - The Necessary Materials - Page 2

- **Guitar Tuners (four)**
- **Type I Yellow Carpenters Glue**- Such as Titebond I

  (with the red cap)
- **Small Brads- 3/4"**

Locating the Box on the Neck

Figure that the tail end of your neck will be located 1” forward from the back edge of your box’s lid. Locate this point on your neck.



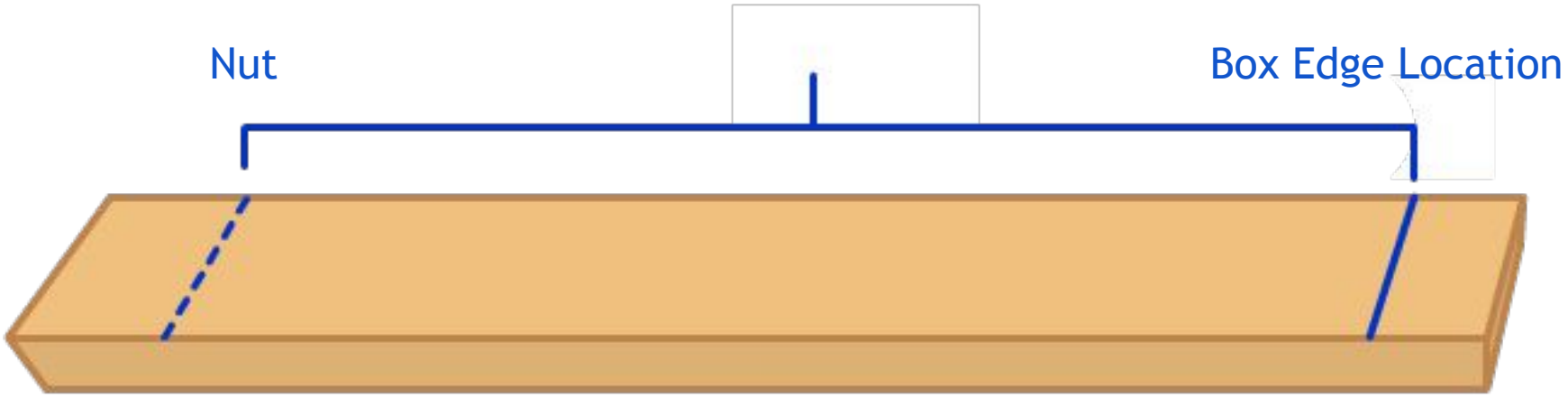
Determining Fret Scale Length- Page 1

Now comes the first design choice, determining the fret scale, or the distance from the nut to the bridge. Fret scales can be anywhere from 22” to 25 1/4”. It’s up to you, the builder.

Figure that the tail end of your neck will be located 1” in from the back edge of your box. (This is 2” forward from the tail end of your neck.) Locate this point on your neck.

Determining Fret Scale Length- Page 2

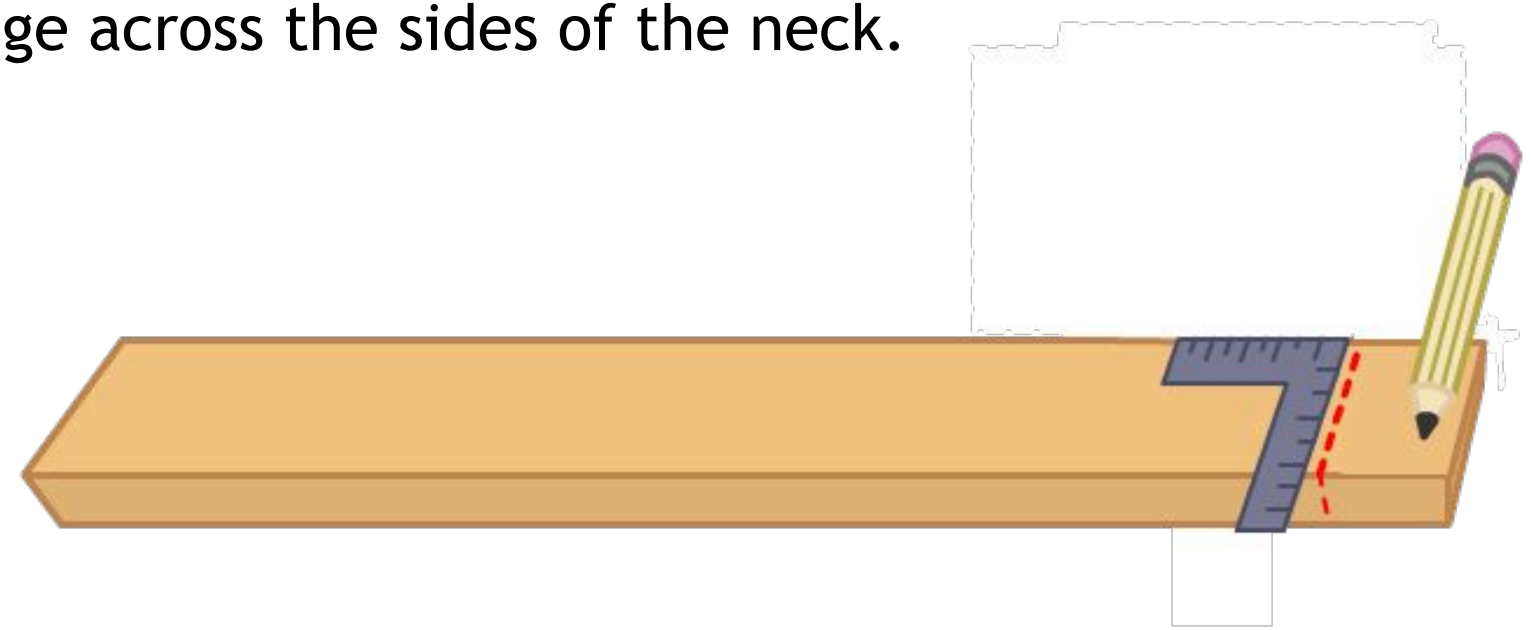
From this point, measure your Fret Scale length along the neck and make a mark which locates your nut placement.



Cutting the Notch for the Box Lid- Page 1

First, mark a notch in the neck for the box lid.

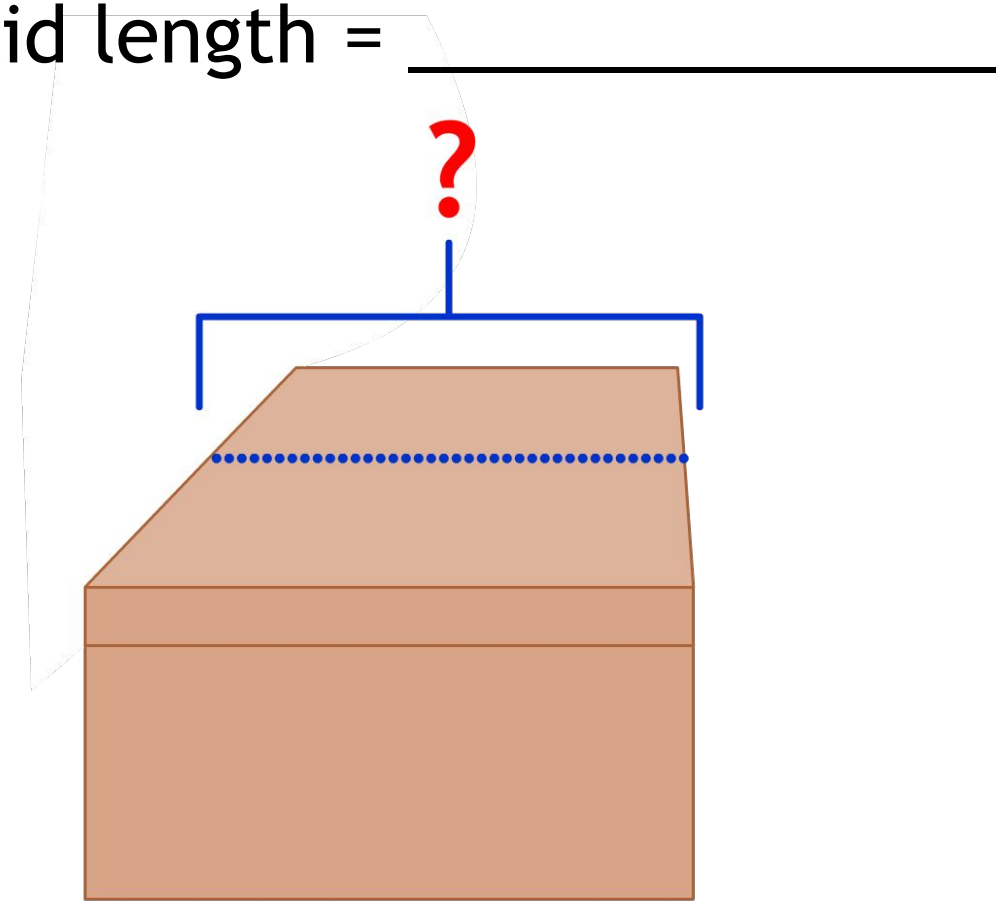
Make a mark that matches up with the line for the box's edge across the sides of the neck.



Cutting the Notch for the Box Lid- Page 2

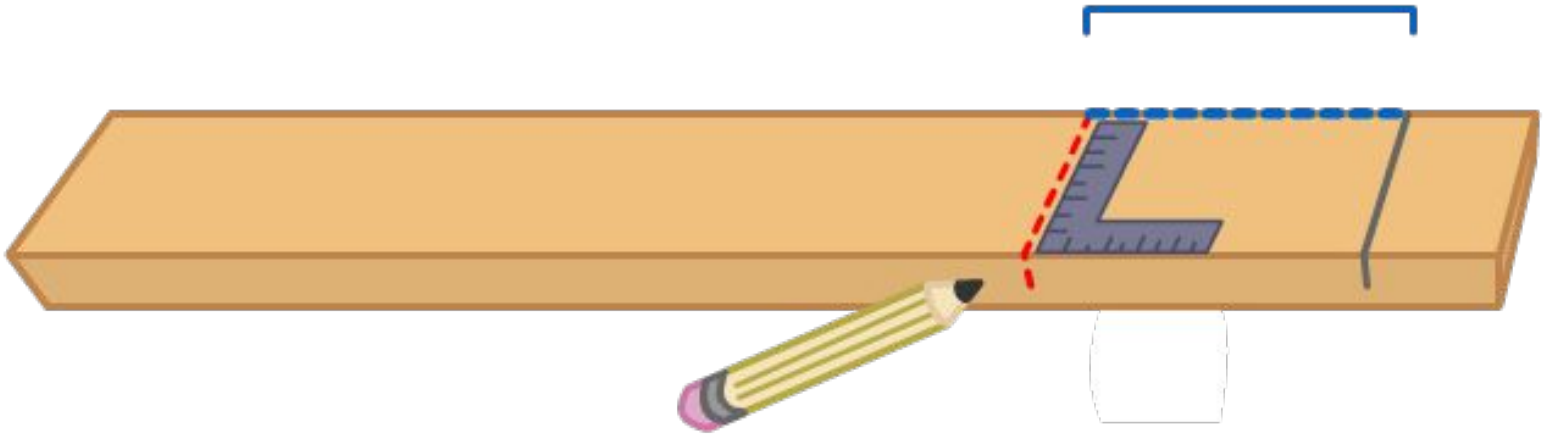
Measure the length of your cigar box's lid.

Lid length = _____



Cutting the Notch for the Box Lid- Page 3

Mark this measurement on the neck, starting from the previous 1 ½” mark.

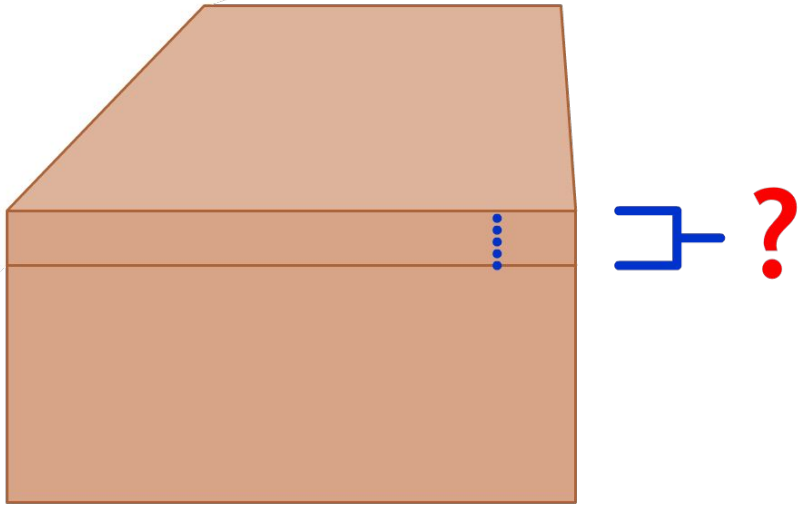


Draw a perpendicular line across the face of the neck from this point. Make marks on the sides.

Cutting the Notch for the Box Lid- Page 4

Next, measure the thickness of the box lid.

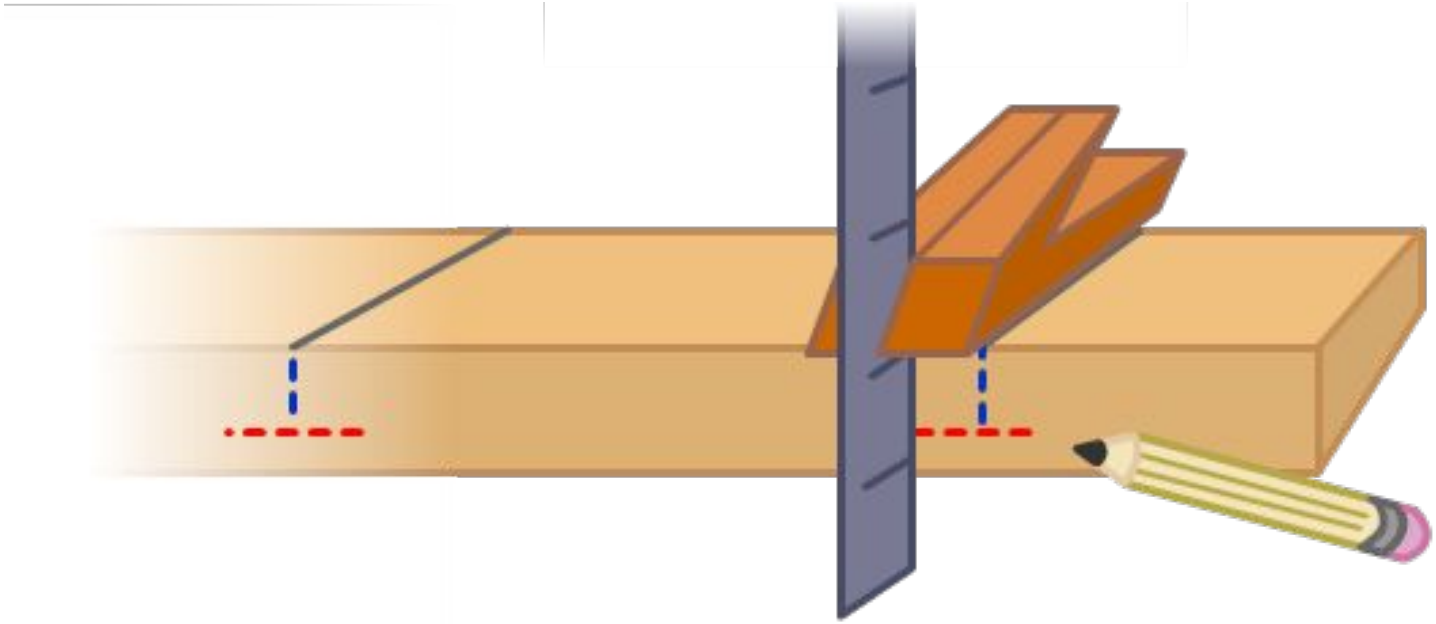
Lid Thickness = _____



Set a combination square to this distance. This is the depth of the notch.

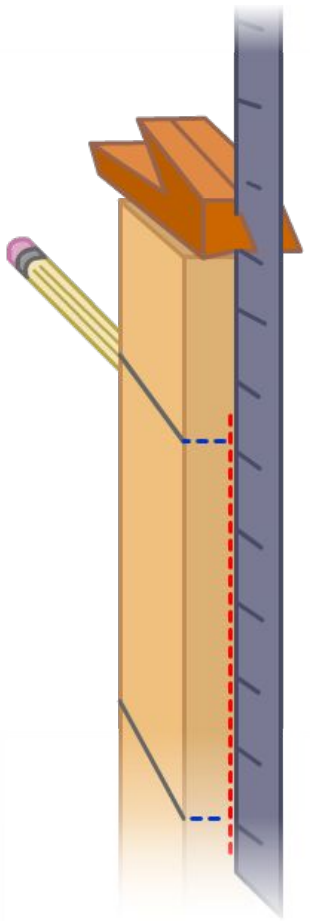
Cutting the Notch for the Box Lid- Page 5

Use a depth gauge to mark the lid thickness on both sides of the neck.



Cutting the Notch for the Box Lid- Page 6

Make perpendicular lines from your tick marks on the sides down to the notch line. (Use a combination square to do this.)

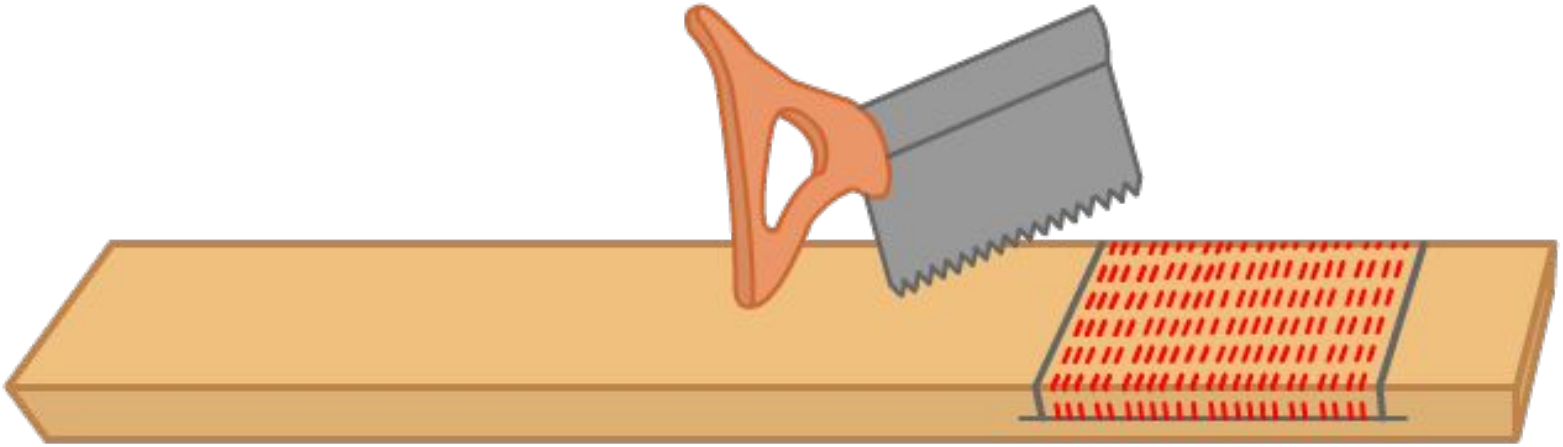


Have an instructor check your work.

Instructor's Initials _____

Cutting the Notch for the Box Lid- Page 7

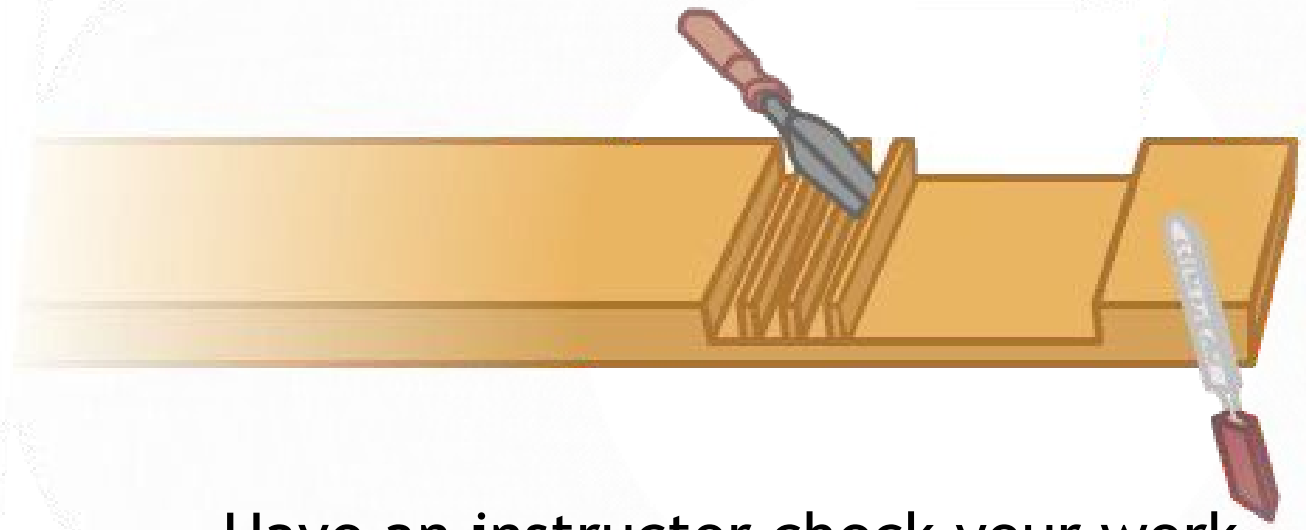
Using a back saw, or a hacksaw, make a series of parallel cuts across the neck within the marks for the "Neck Notch." The cuts need to be close together and to only go to the depth of the notch.



Cutting the Notch for the Box Lid- Page 8

Use a chisel to break out and remove the wood between the cuts.

Use a rasp and file to smooth the bottom of the notch.

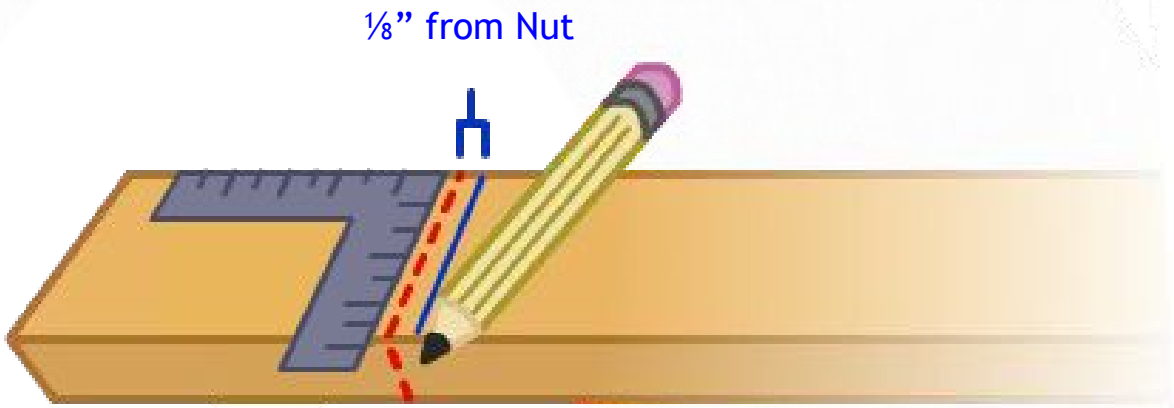


Have an instructor check your work.

Instructor's Initials _____

Laying Out the Neck for the Headstock Joint- Page 1

Draw a perpendicular line across the front face of the neck ⅛” towards the head from your Nut location.



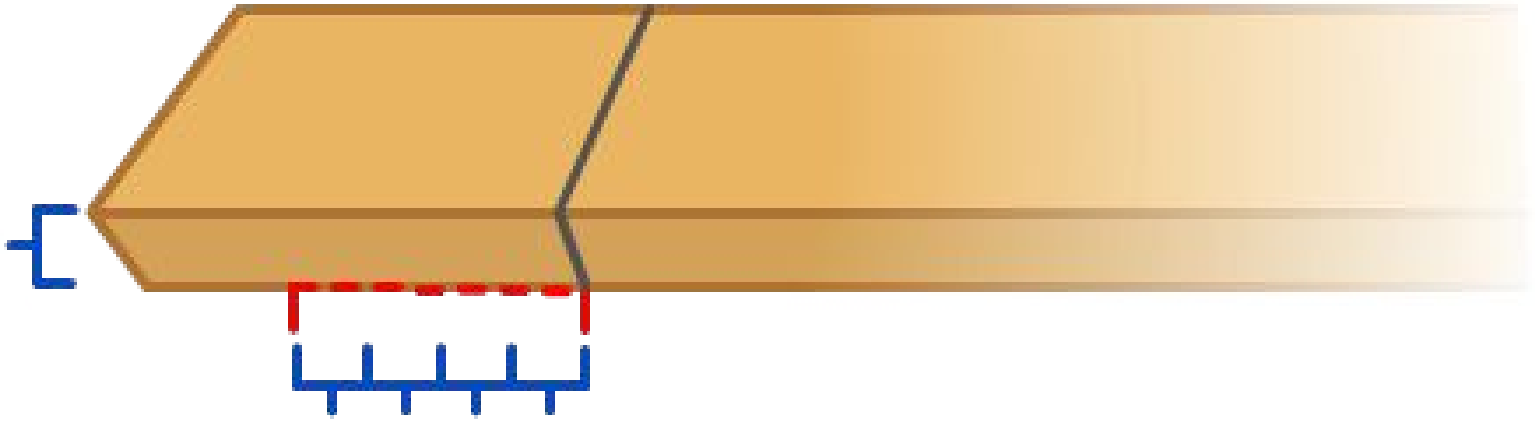
Make "tick" marks from this line onto the sides.

Draw perpendicular lines on the sides from these tick marks.

Laying Out the Neck for the Headstock Joint- Page 2

The ratio of the cut will be 4:1, length: thickness. (So if the neck is 3/4" thick, the length will be 3".)

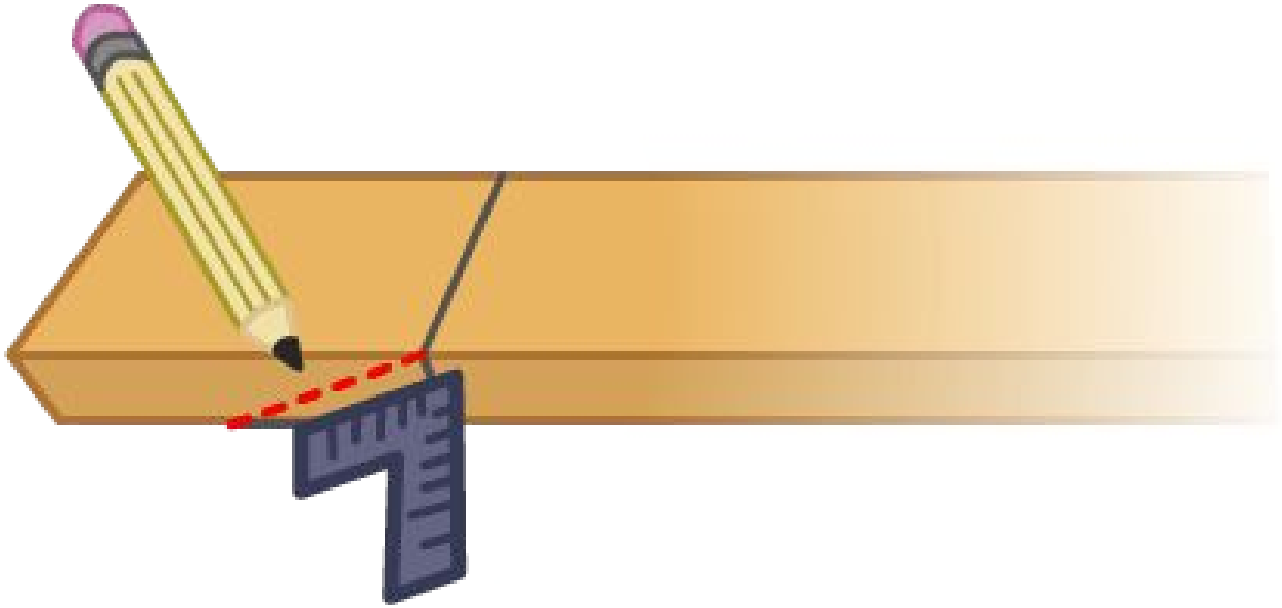
On the back face of the neck measure 3" towards the head of the neck.



Draw this distance on both sides.

Laying Out the Neck for the Headstock Joint- Page 3

Once you've determined the distance, draw a diagonal line from that point to the perpendicular line drawn for the nut location.

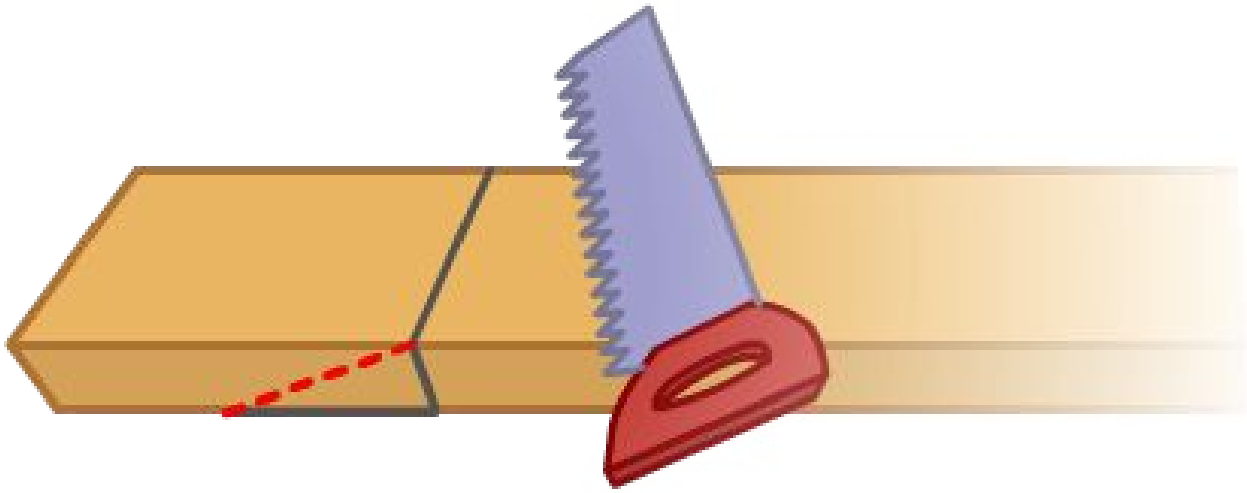


Have an instructor check your work.

Instructor's Initials _____

Making the Headstock Joint- Page 1

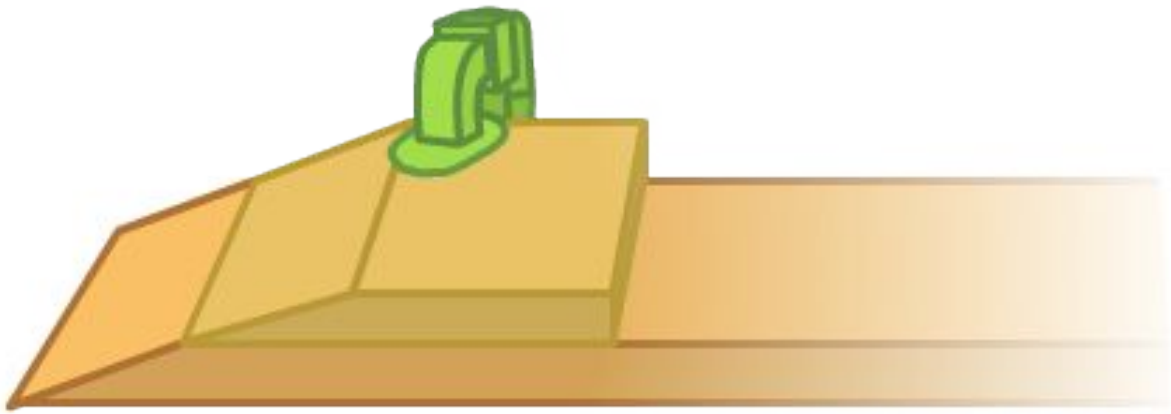
First, use a hand saw, or bandsaw to cut the sloping line.



Making the Headstock Joint- Page 2

Once the cut is made, flip the off cut- the "headstock" over and clamp it to the top of the neck. You want to make a continuous "ski slope" with both pieces.

Use a sanding block, or block plane to flatten the sloping surface.

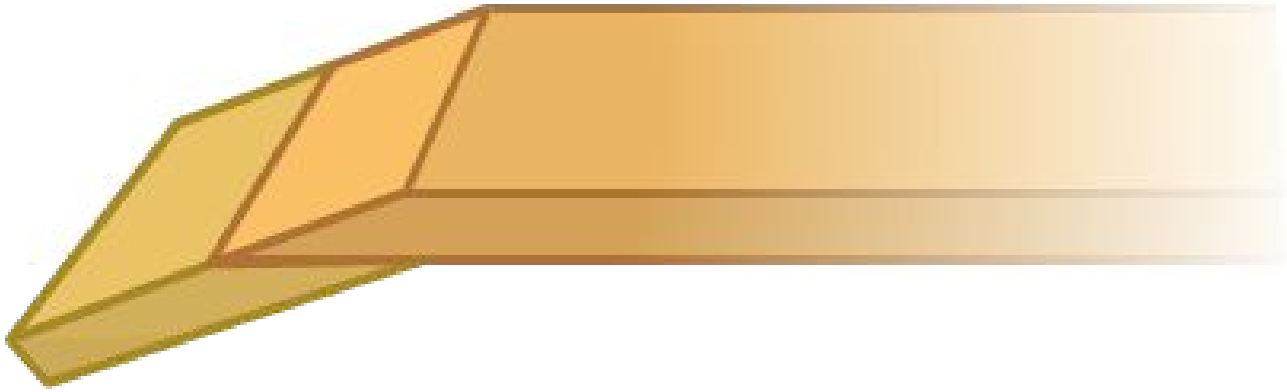


Have your instructor check your work.

Instructor's Initials_____

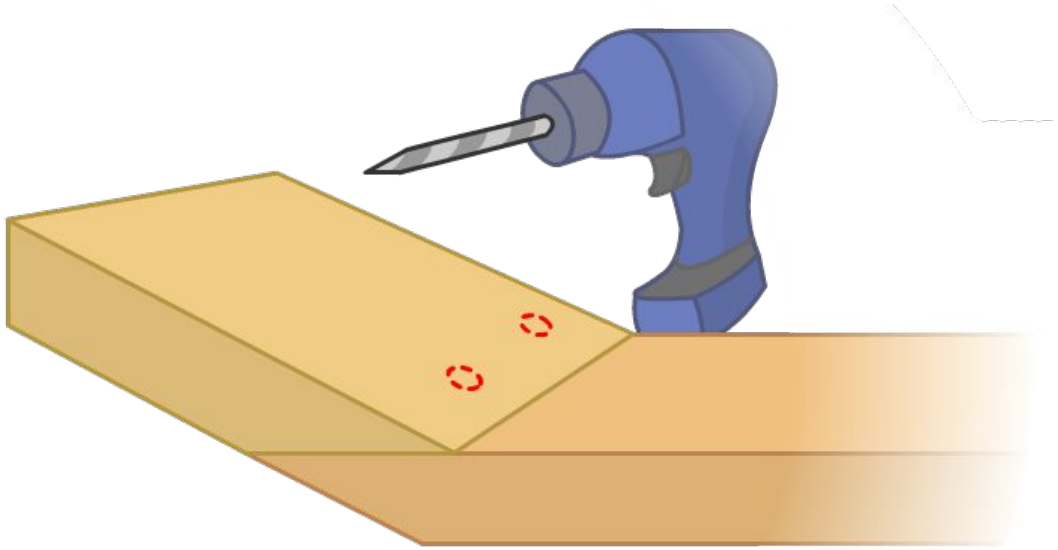
Making the Headstock Joint- Page 3

Flip the headstock so that it joins the back face of the neck and creates a continuous sloping surface.



Making the Headstock Joint- Page 4

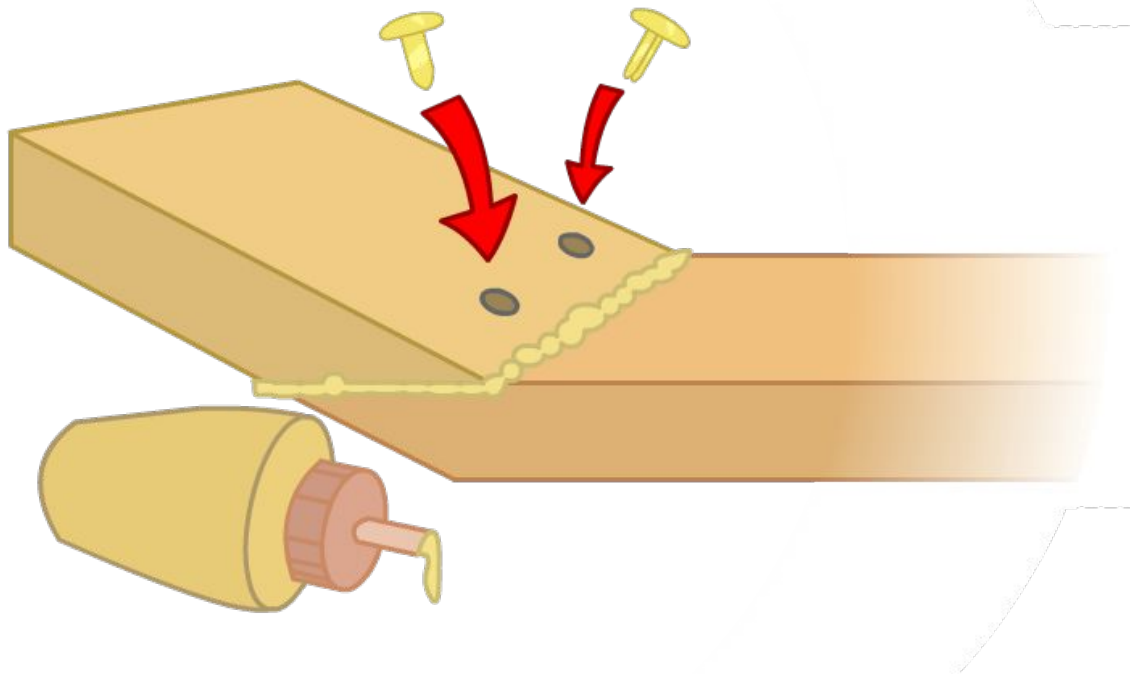
Flip over the neck with the headstock joint, and drill two small (about 1/16") pilot holes in the feather edge of the headstock. Only drill them deep enough to receive the ends of the brads, no deeper than ½”.



Making the Headstock Joint- Page 5

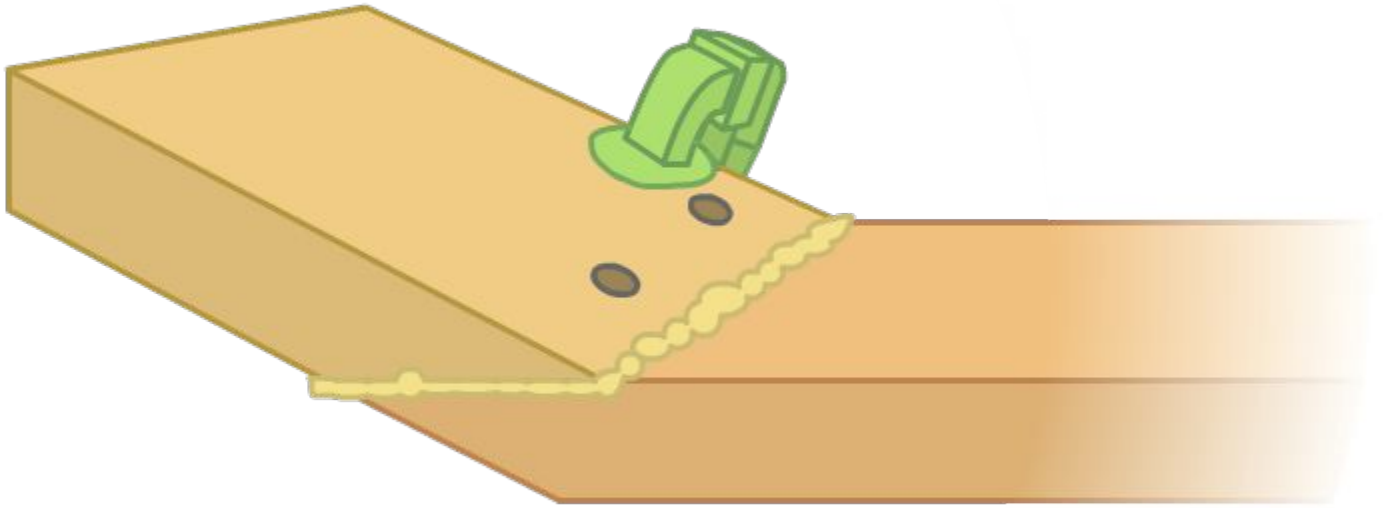
Spread both mating surfaces with Type I, yellow glue.

Then, tap brads in the holes to stop the pieces from slipping when glued and clamped. If you don't drive the brads in too far, you can remove them later.



Making the Headstock Joint- Page 6

Clamp and let the joint dry and cure (Read the instructions on the glue for this information.)



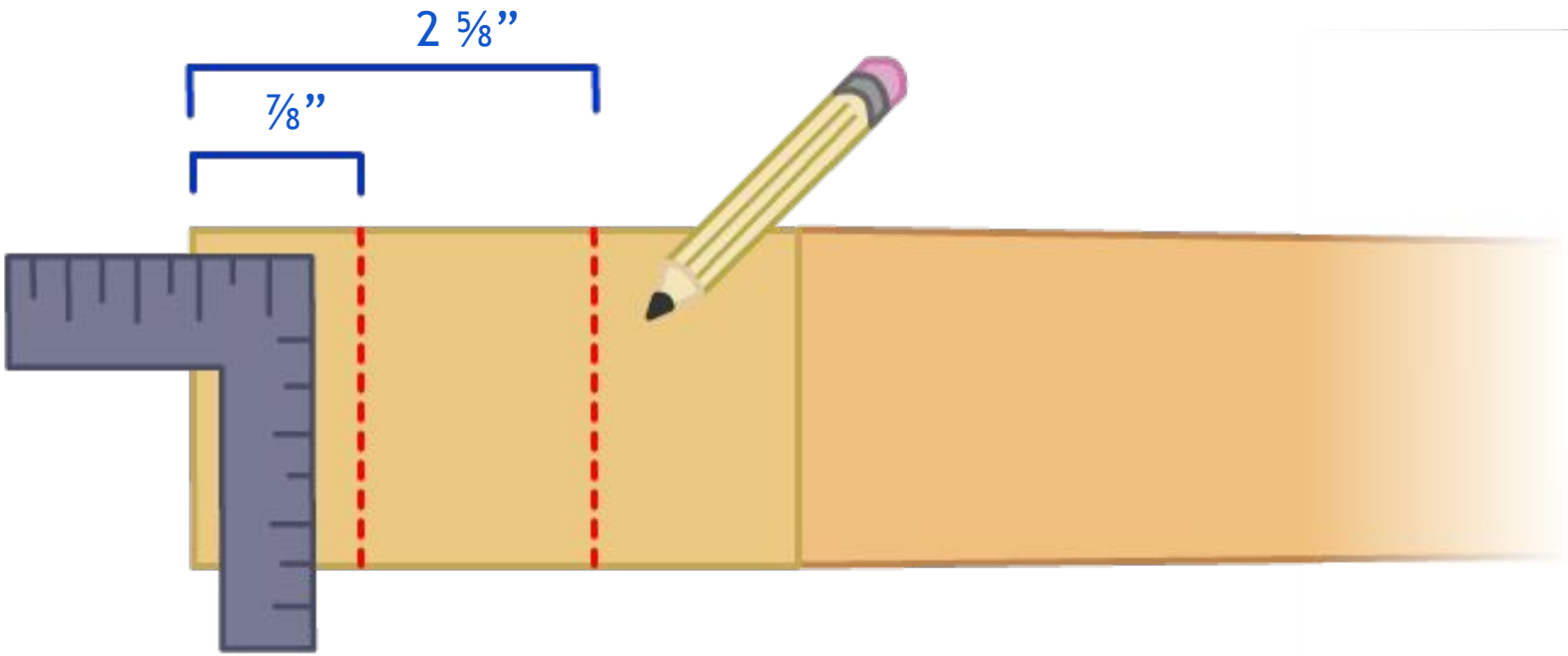
Have your instructor check your work.

Instructor's Initials_____

Layout Neck for Tuners- Page 1

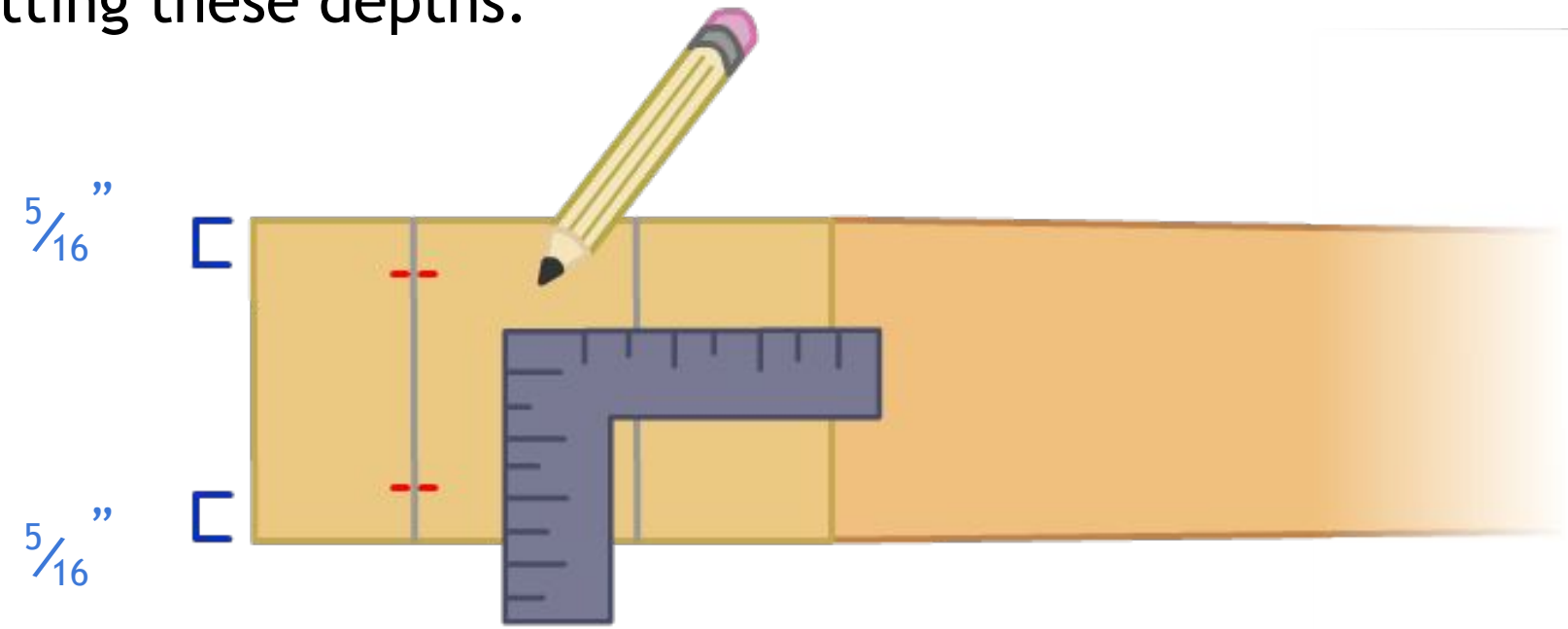
From the head of the neck, measure and mark ⅞" and 2 ⅝".

Use a square to draw perpendicular lines from these marks across the face of the headstock.



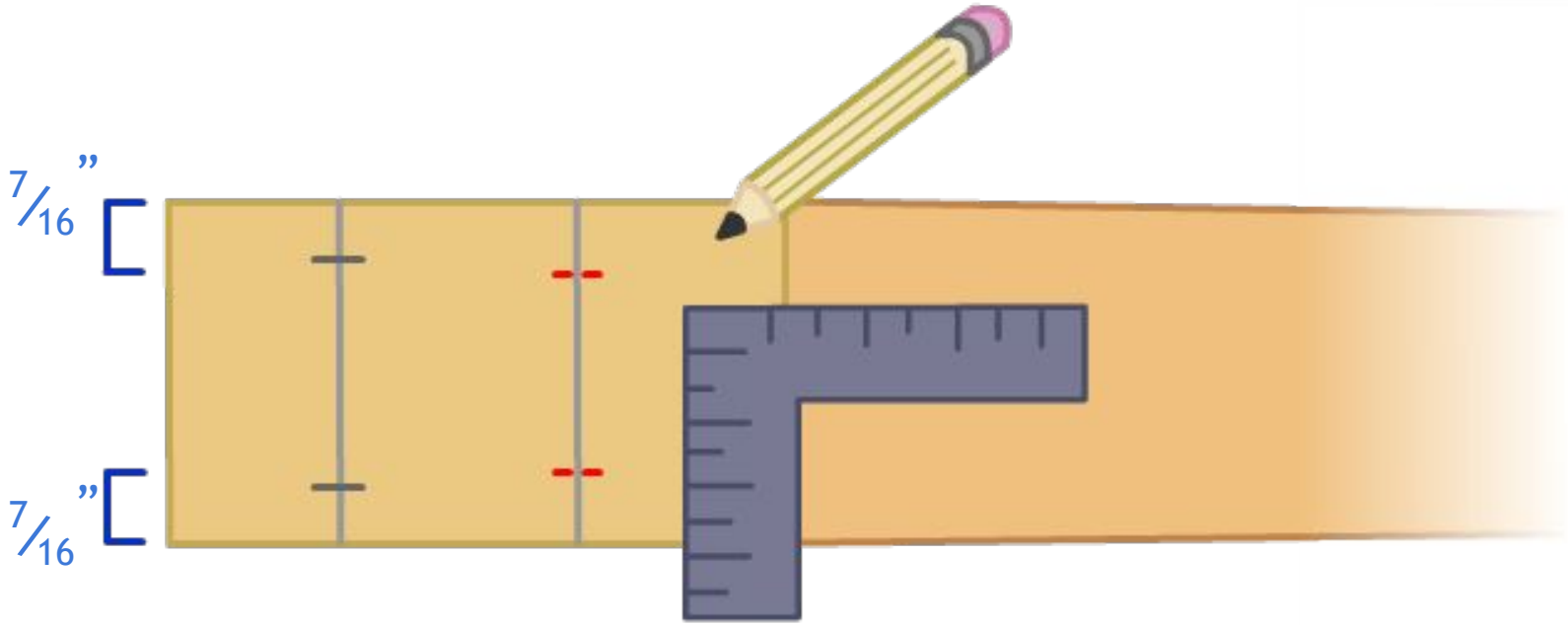
Layout Neck for Tuners- Page 2

Along the ⅞ line, measure in $\frac{5}{16}$" from each side. A combination square used as a depth gauge is great for setting these depths.



Layout Neck for Tuners- Page 3

Along the 2 ⅝ line, measure in $\frac{7}{16}$" from each side.

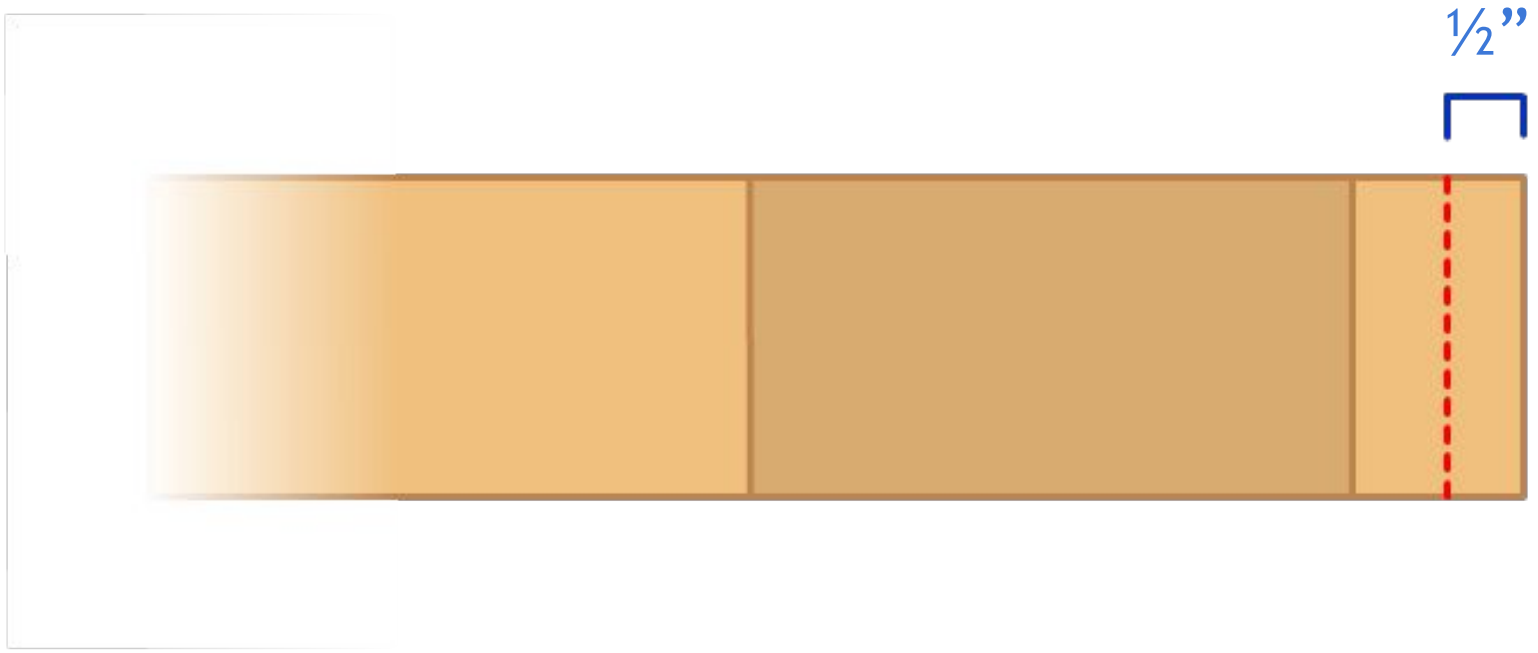


Have an instructor check your work.

Instructor's Initials _____

Layout Neck for String Holes- Page 1

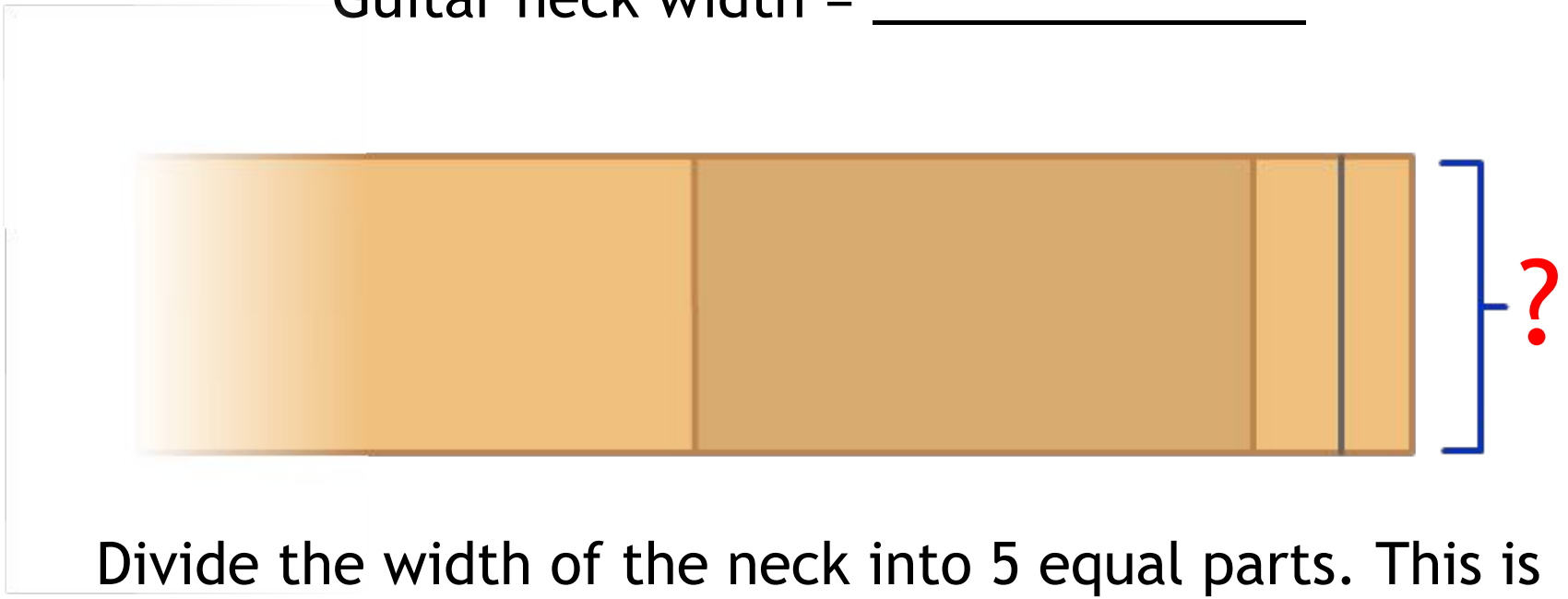
Draw a line ½" from the tail of the neck.



Layout Neck for String Holes- Page 2

Measure the width of your guitar neck.

Guitar neck width = _____

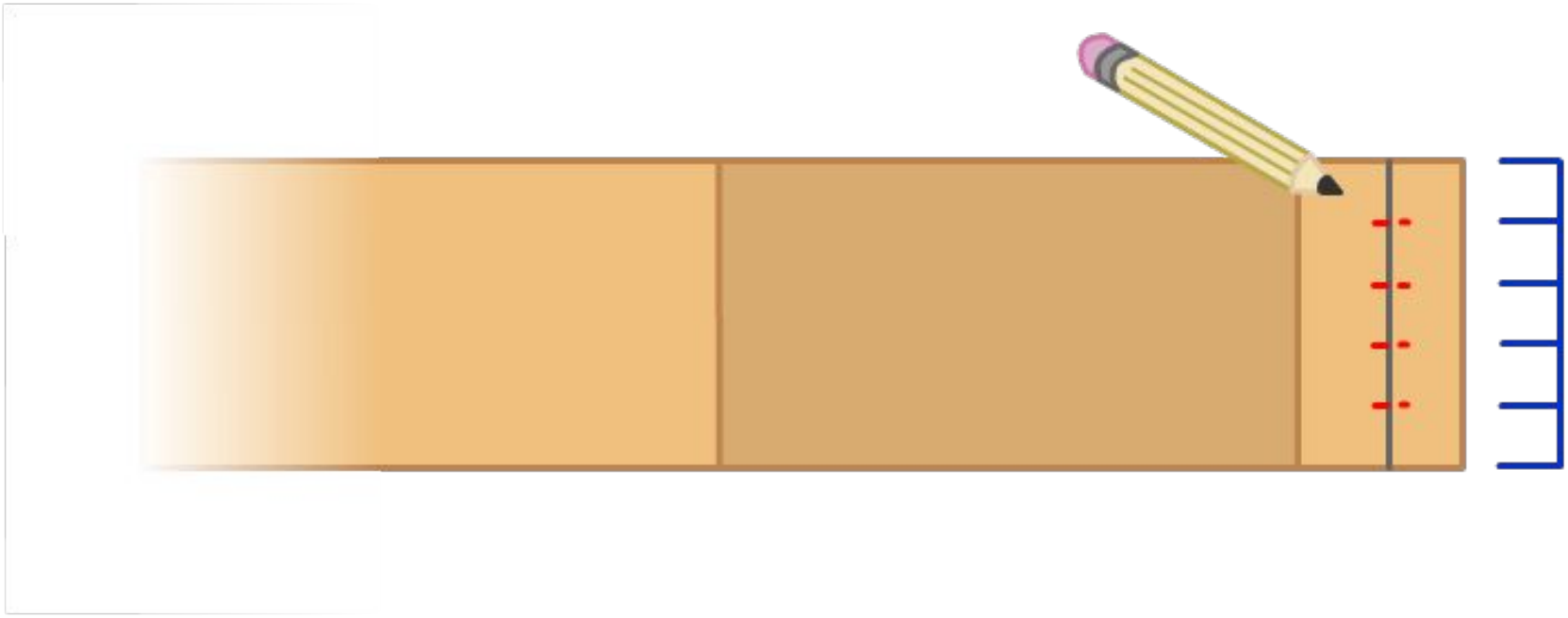


Divide the width of the neck into 5 equal parts. This is your string spacing.

String spacing = _____

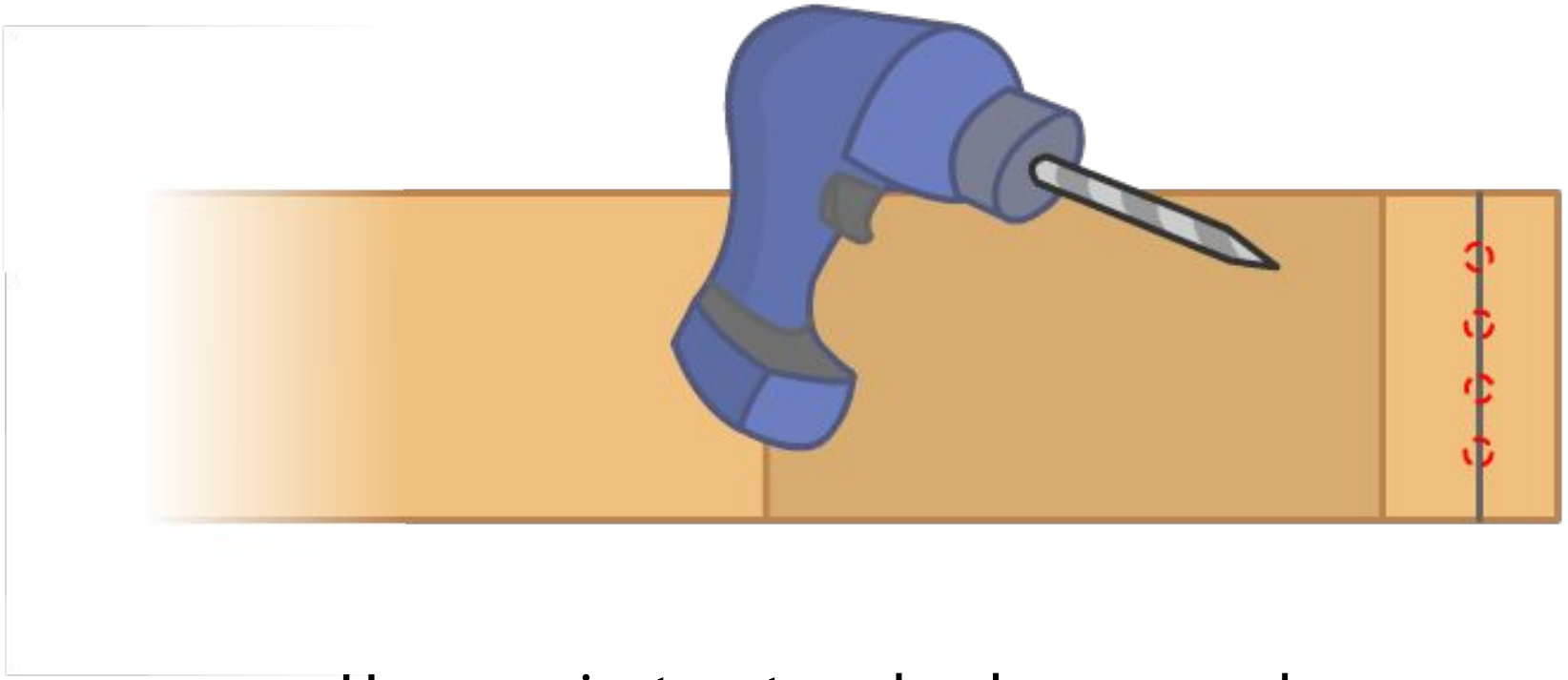
Layout Neck for String Holes- Page 3

Make 4 equidistant marks along the line at the tail, spacing them out with your String Spacing measurement against each other and the edges of the neck.



Layout Neck for String Holes- Page 4

Drill four 1/16" holes for the strings at the points you just marked. A drill or drillpress will work for the job.



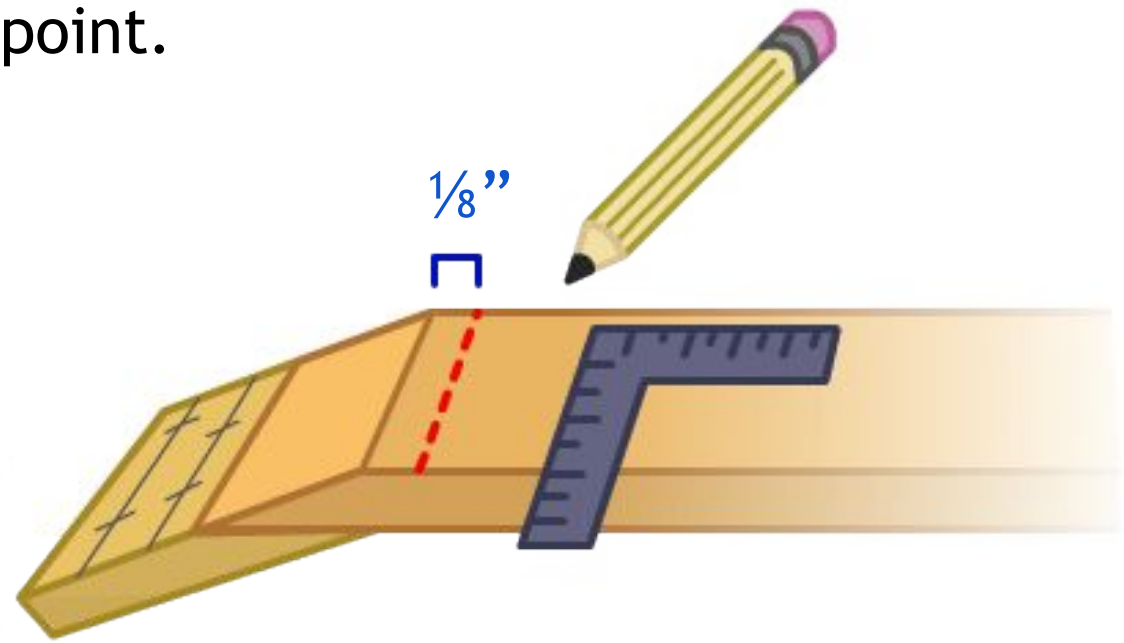
Have an instructor check your work.

Instructor's Initials _____

Cut a Groove for the Nut- Page 1

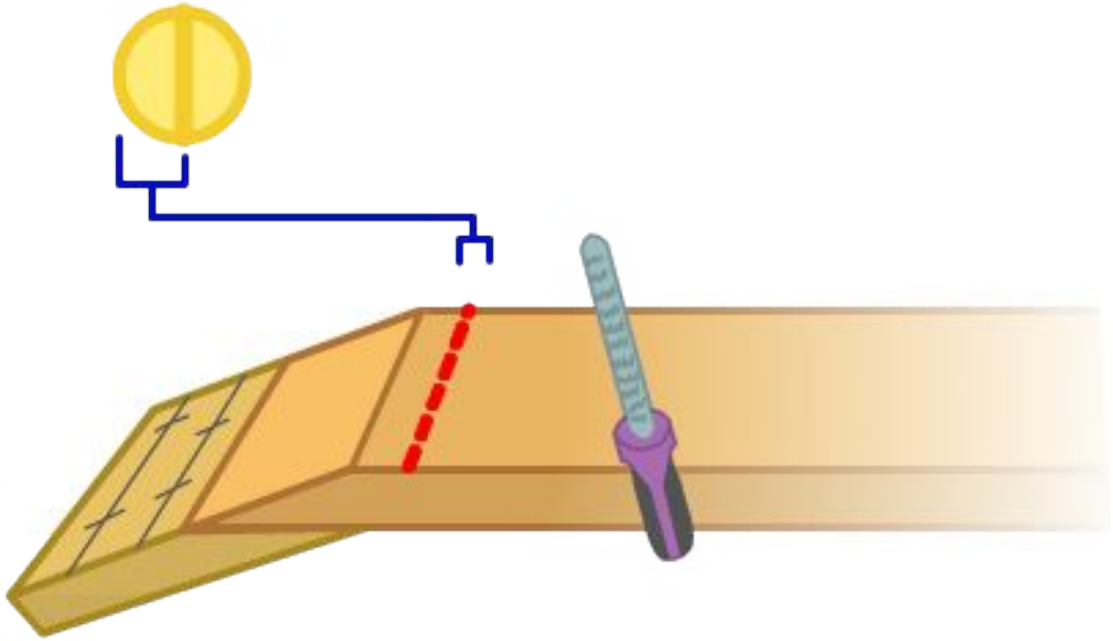
On the neck mark ⅛" towards the tail from the start of the headstock “slope”.

Use a square to draw a perpendicular line across the face from this point.



Cut a Groove for the Nut- Page 2

Using a small rounded file, make a groove to receive half the diameter of a #10 machine screw. You can also use a saw to start the slot.

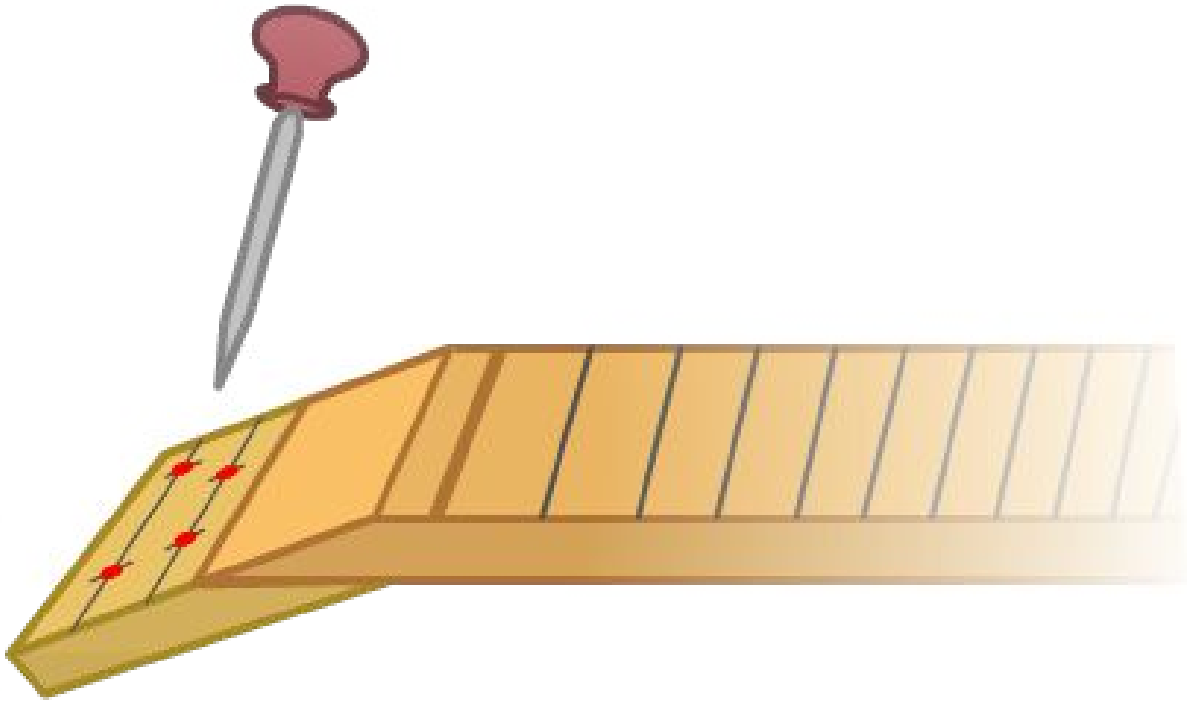


Have an instructor check your work.

Instructor's Initials _____

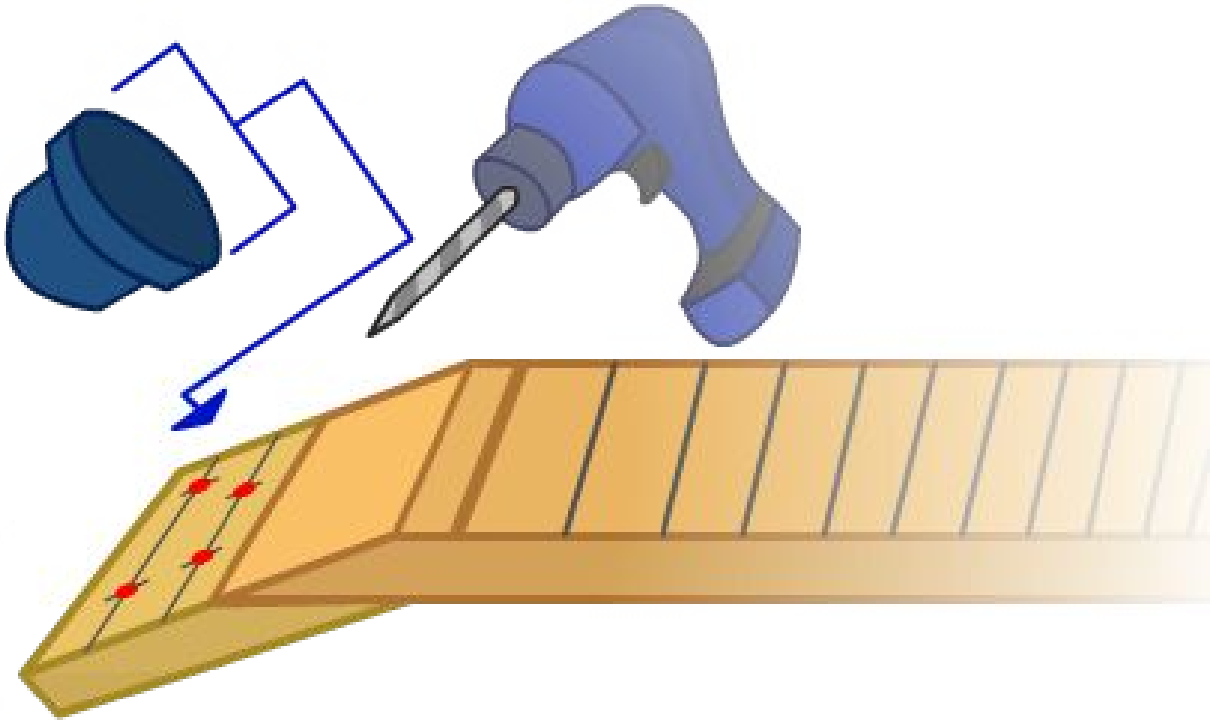
Drilling Tuner Holes- Page 1

Use an awl or centerpunch to mark for the tuner holes, right on the intersections of the marks you made on the headstock.



Drilling Tuner Holes- Page 2

Measure the diameter of your own tuner's bushing. Once that's measured, drill the necessary hole for the tuner.

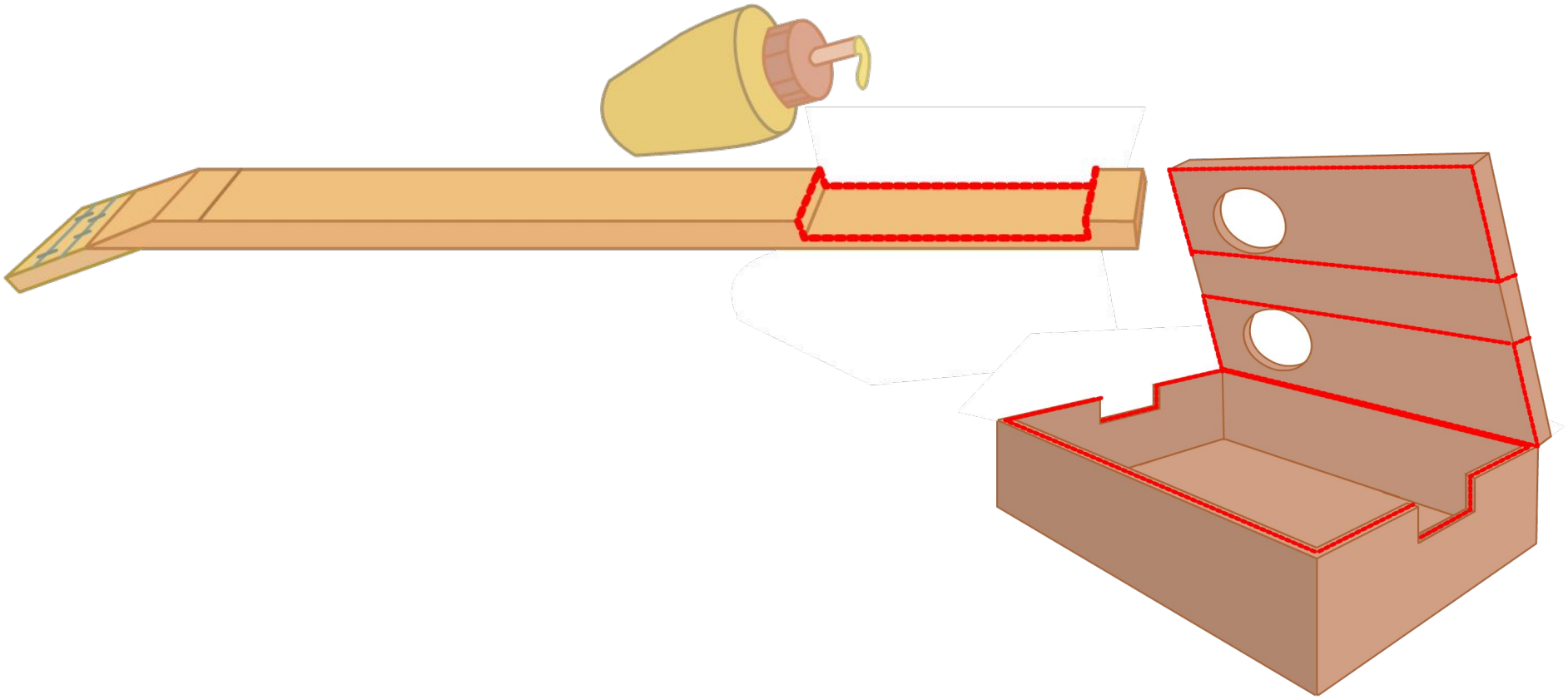


Glue Box to Neck- Page 1

You will be gluing the neck to the box and gluing the lid of the box closed. Do a dry run before you spread glue.

Glue Box to Neck- Page 2

Spread glue (Type I yellow carpenter's) on the mating surfaces of the neck and lid, as well as the lid and body of the box. Make sure that both sides of each joint have glue.



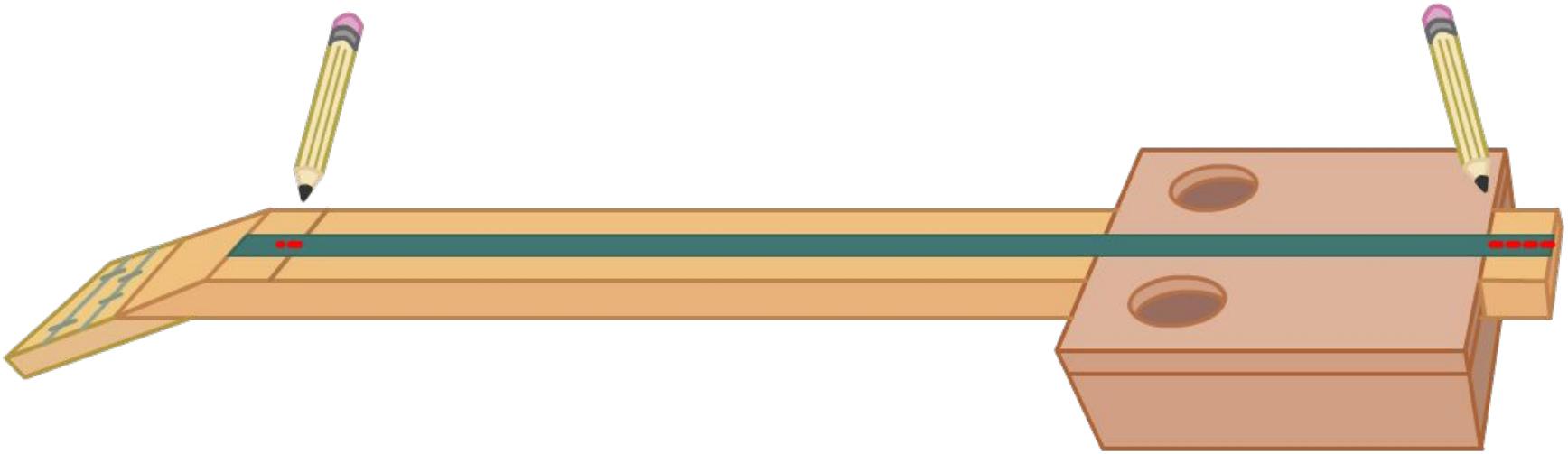
Glue Box to Neck- Page 3

Set the neck into the box.

Clamp the neck to the box with small "C" clamps located in the sound holes. Clamp the lid to the box with larger clamps.

Locate Bridge Bolt- Page 1

Put a piece of masking tape down the middle of the neck for its entire length- use good tape and don't let it stay on the box too long. It will pull the paper off the box.

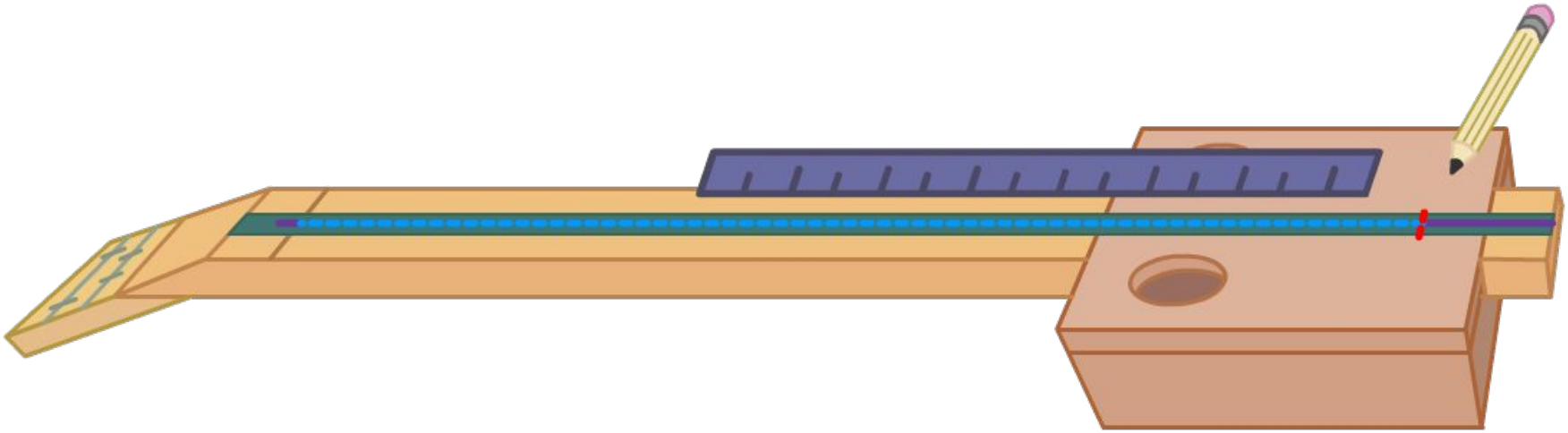


Measure the width of the neck and make center marks of the neck at the nut and tail.

Locate Bridge Bolt- Page 2

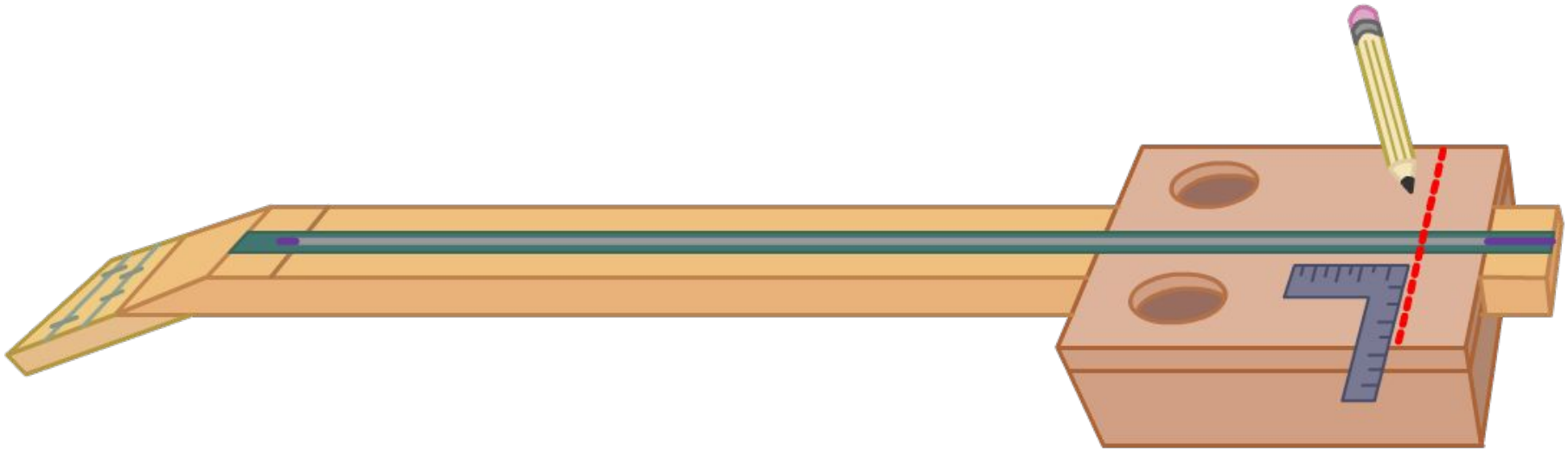
Draw a line that connects these marks with a straight edge.

Measure back from the nut to the distance you want your fret scale length to be, and mark that point.



Locate Bridge Bolt- Page 3

Construct a perpendicular line from this point using a flat square or geometry. This is the location of the center of your bridge/eye bolt.



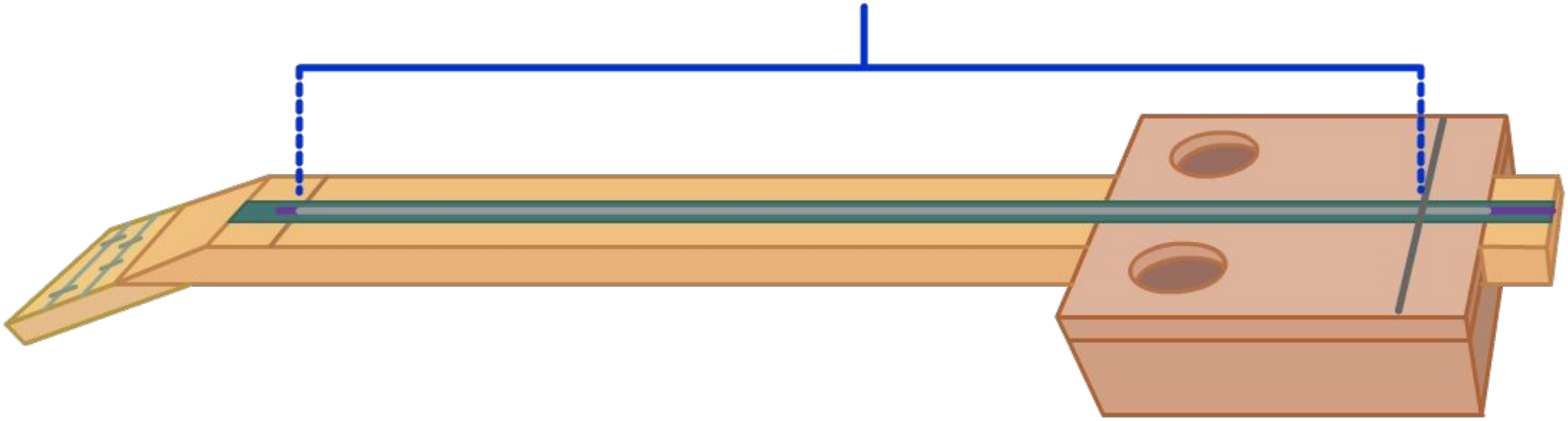
Have an instructor check your work.

Instructor's Initials _____

Locate Bridge Bolt- Page 4

Along the centerline of the neck, measure the distance from the center of the nut to the center of the bridge. This distance is called “D”. It should be your anticipated fret scale length.

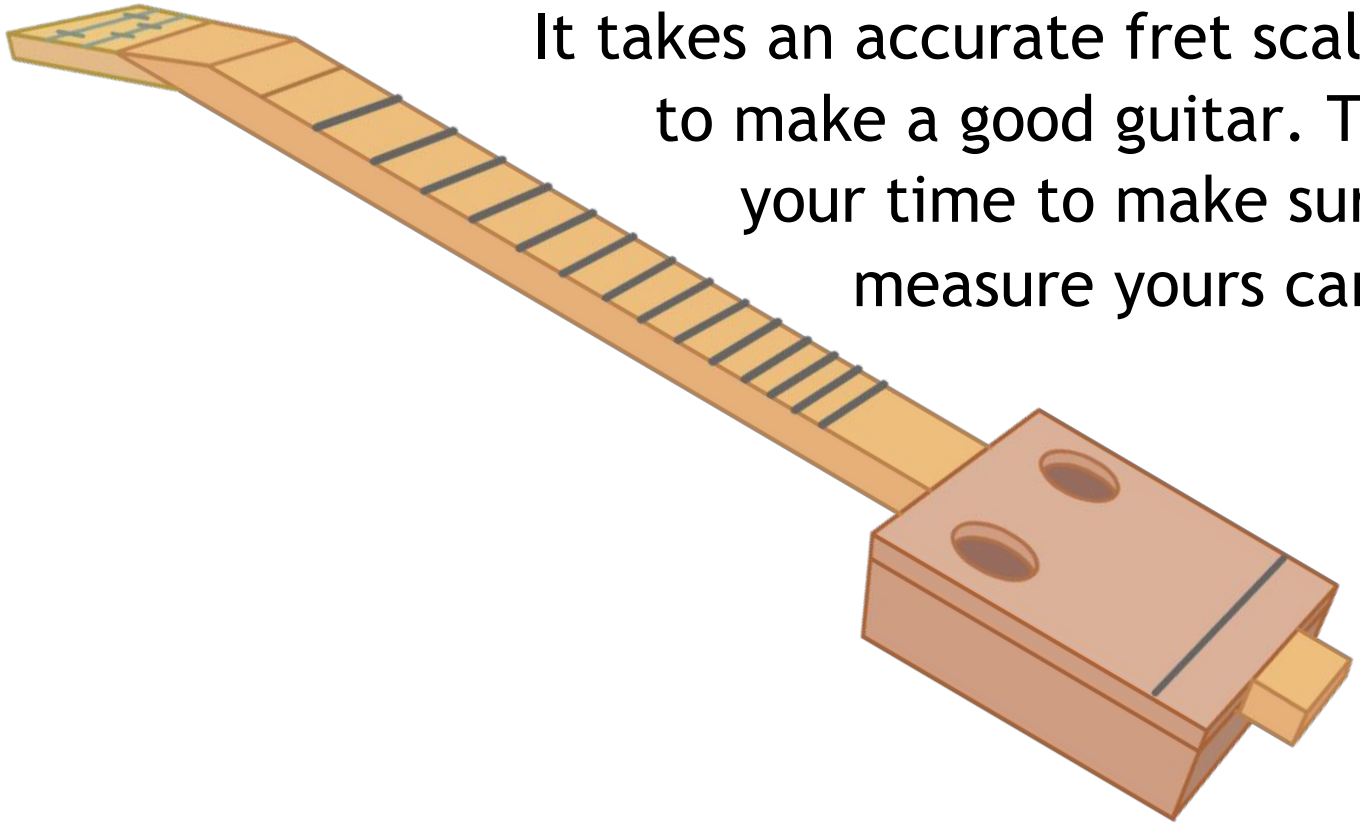
D = _____



Have an instructor check your measurement.
(It’s very important!)

Instructor’s Initials _____

Part 3 - The Fret Scale



It takes an accurate fret scale to make a good guitar. Take your time to make sure you measure yours carefully.

Fret Scale - The Tools Needed

- **Ruler** or **Tape measure**
- **Pencil**
- **Combination Square**
- **Compass** (Carpenter's Scribers)

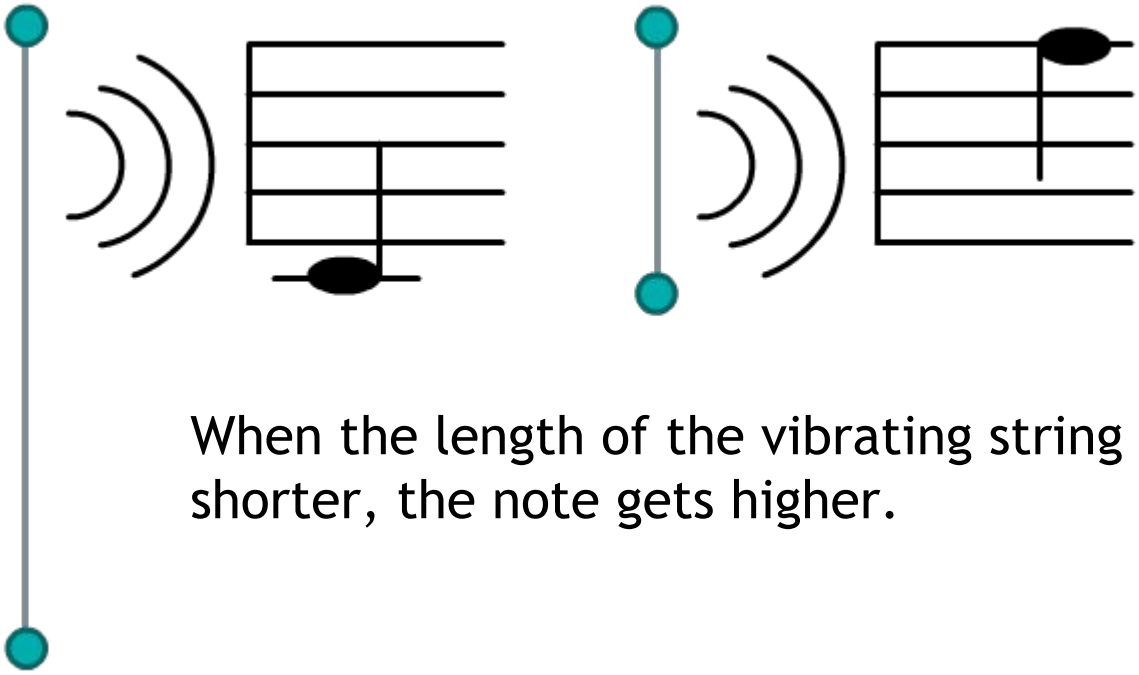
The Fret Scale - Necessary Materials

- **Your Guitar**
- **3" x 30" rectangle of pattern stock** (such as 1/4" plywood, or stiff cardboard)- to layout Fret Scale. Paper will work, in a pinch.

Layout Fret Scale Pattern- Page 1

The fret scale indicates the notes on a stringed instrument.

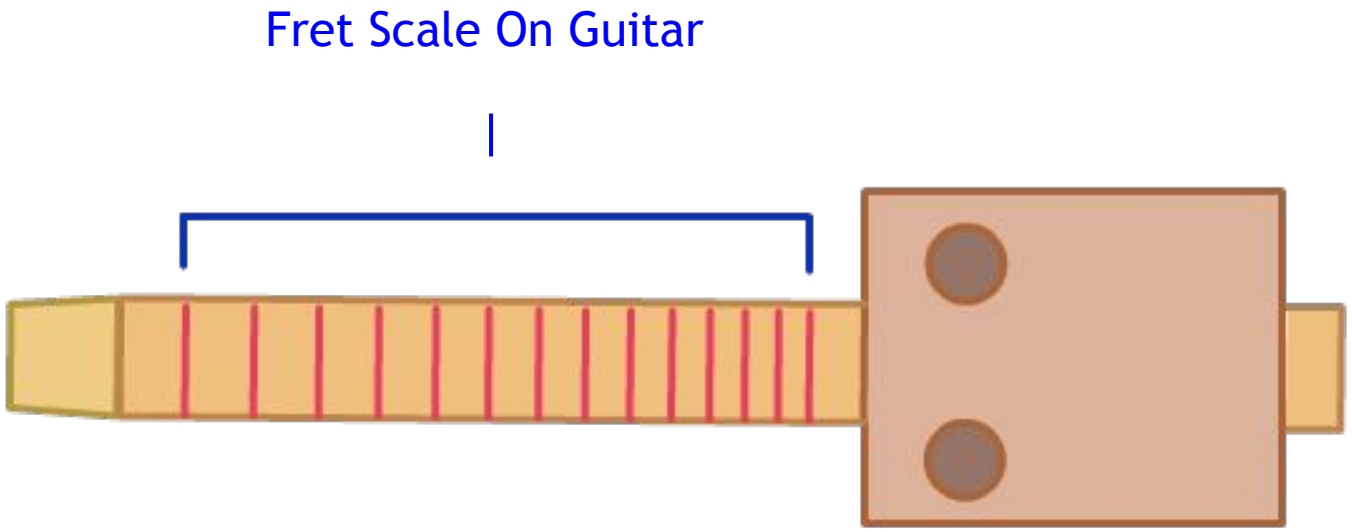
It is dependent upon the length of the vibrating string.



When the length of the vibrating string gets shorter, the note gets higher.

Layout Fret Scale Pattern- Page 2

As the notes get higher, the spacing between their frets gets shorter.



Layout Fret Scale Pattern- Page 3

The spacing is dependent upon a ratio:

The Length of the Vibrating String

DIVIDED BY

17.817

=

The space for the next fret.

Every different distance between a nut and it's bridge has a different fret scale with different spacing between frets.

Layout Fret Scale Pattern- Page 4

Divide the distance from the nut to the bridge, "D", by 17.817.

In order to do so, you will have to convert the measurement from inches and fractions of an inch into decimal inches. This will calculate the spacing from the center of your nut to the center of the first fret, "F-1". So:

D

DIVIDED BY

17.817

=

The First Fret, F-1

To convert a fraction into decimal inches, treat it as just another division problem. Divide the numerator by the denominator and you have your decimal inch! (For example, 5/6 equals 5 divided by 6, equals .83)

Layout Fret Scale Pattern- Page 5

At this point there are two ways to calculate the rest of the fret spacing: One way is to use Algebra and to keep finding the spacing of the next fret by subtracting the distance of the previous fret and dividing by 17.817.

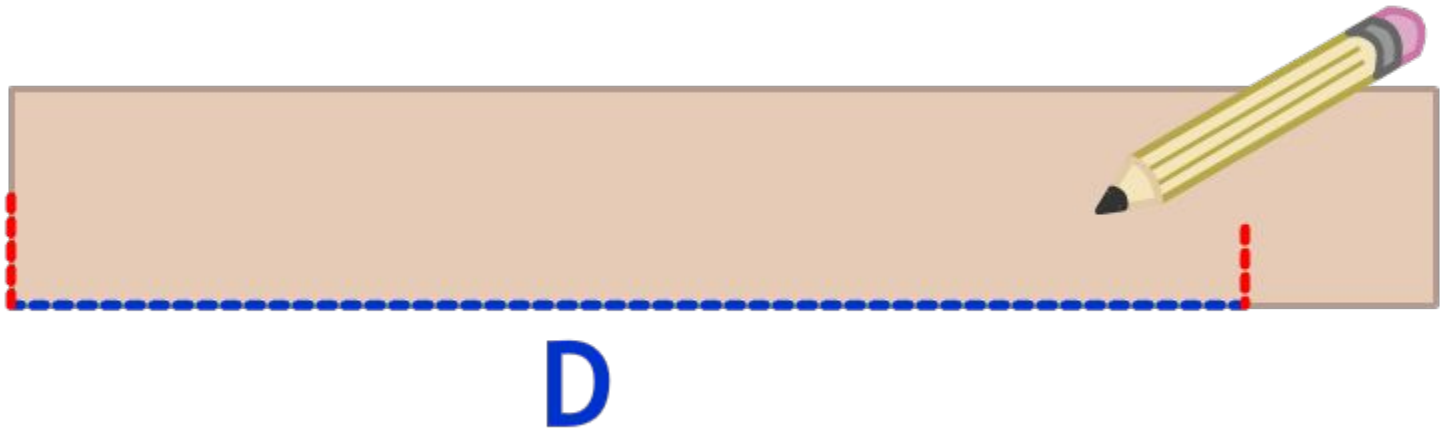
Fret
DIVIDED BY
17.817
=
The Next Fret

The second method is to create a geometric representation of this Algebraic function. We usually use the second method because it is more accessible and yields a fret scale pattern.

Calculating the Fret Scale with Geometry- Page 1

Make a fret scale pattern from a thin piece of rigid material- approximately 3" x 30". Quarter inch plywood, masonite or thick chipboard will all work. Paper, in a pinch.

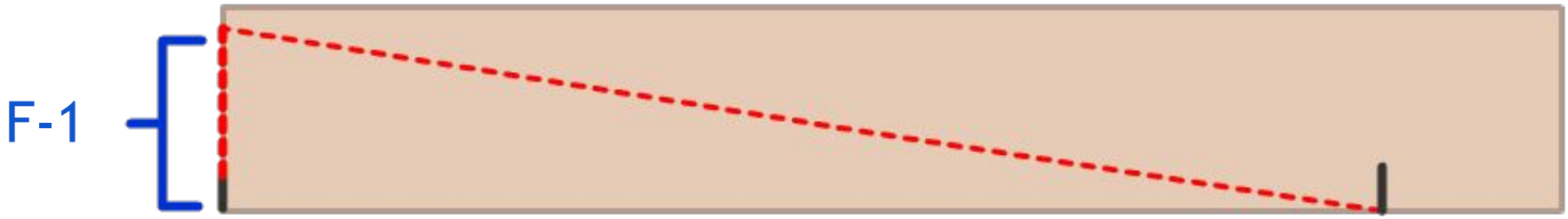
Mark the distance from the bridge to the nut onto an edge of the pattern. This can be done with a ruler, but is better done directly.



Calculating the Fret Scale with Geometry- Page 2

Erect a perpendicular line from the nut mark. Mark off the "F-1" distance along this line.

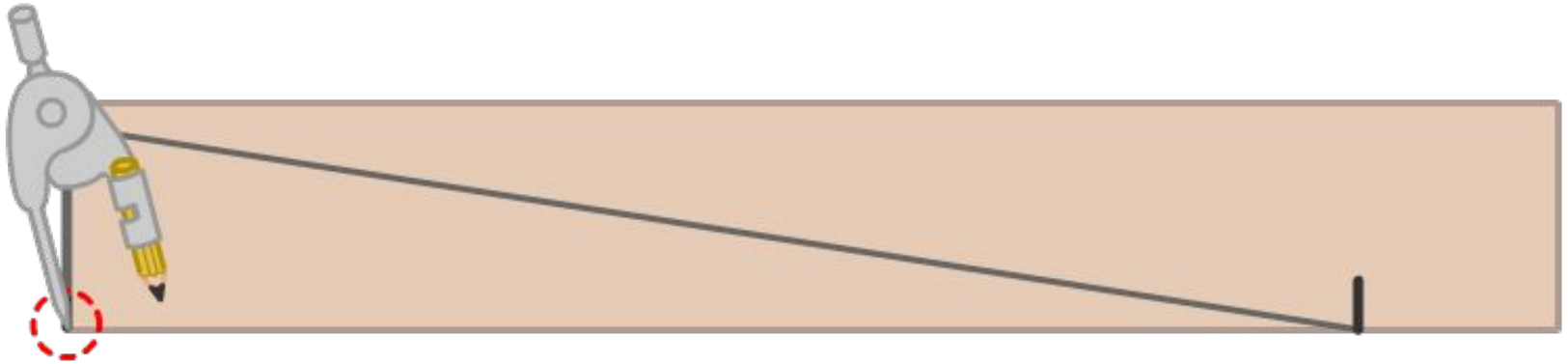
Draw a line from this point to the "bridge mark" on the edge of the pattern stock. The slope of this line, the hypotenuse of the triangle, is the algebraic function.



Calculating the Fret Scale with Geometry- Page 3

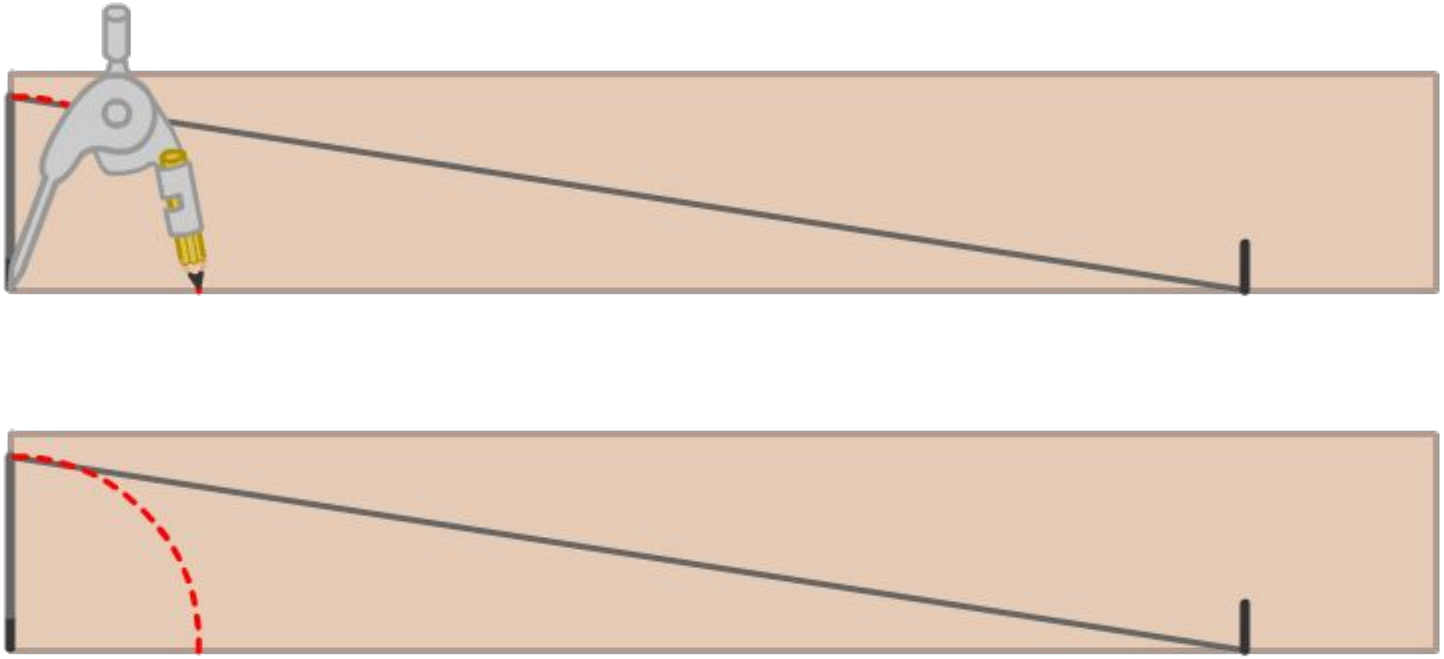
Take a compass and set it to the "F-1" distance.

Put the metal point of the compass on the edge of the pattern piece at the "nut mark".



Calculating the Fret Scale with Geometry- Page 4

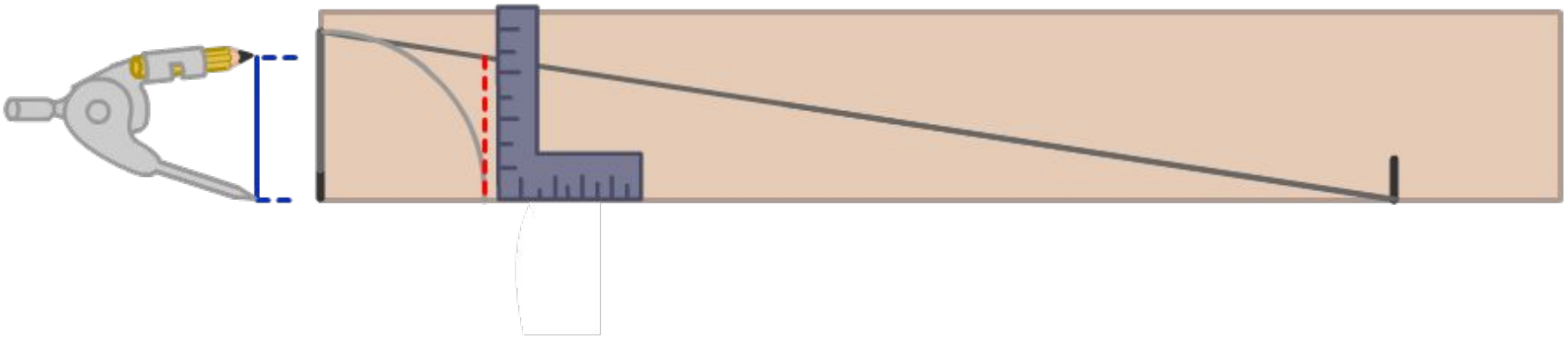
Swing an arc that marks that distance along the edge of the pattern. This is the spacing of the second fret.



Calculating the Fret Scale with Geometry- Page 5

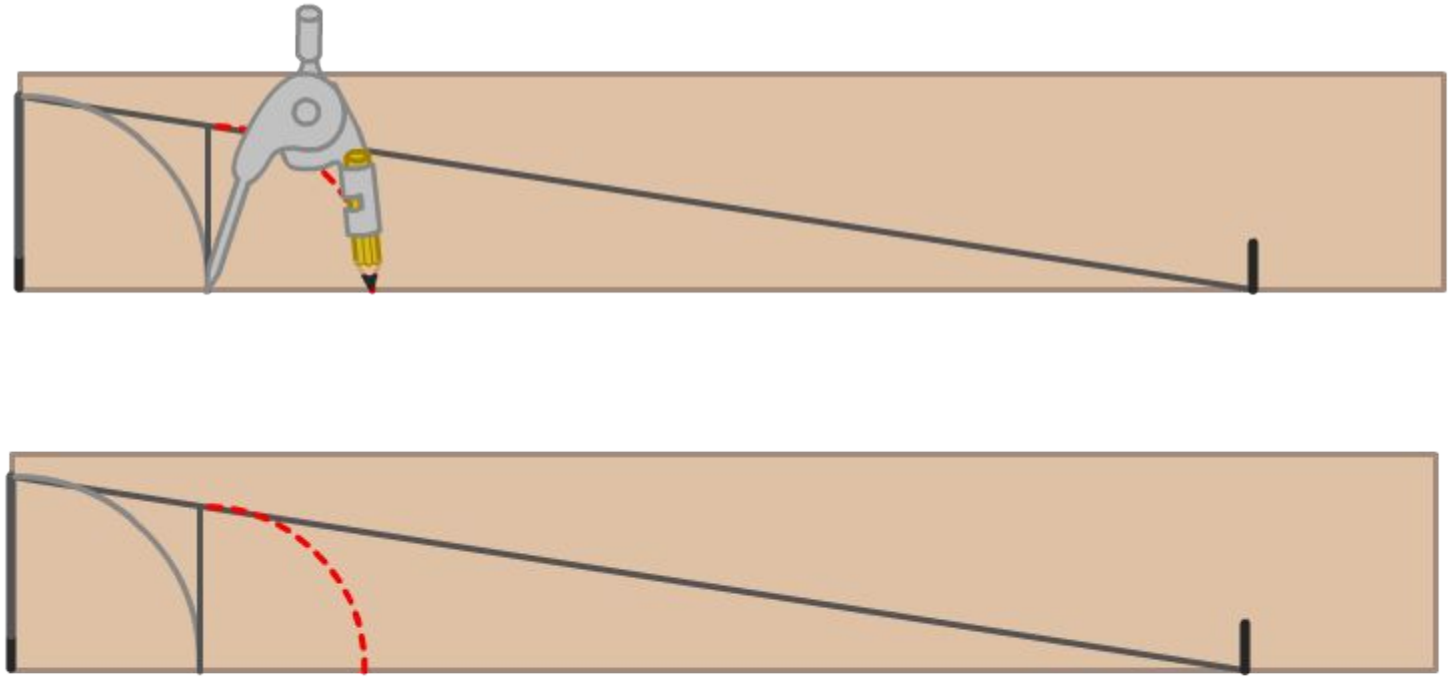
Using a square, erect a perpendicular from the first fret mark.

Set the compass to distance from the mark on the edge of the pattern piece to where the perpendicular line intersects the hypotenuse of the larger triangle.



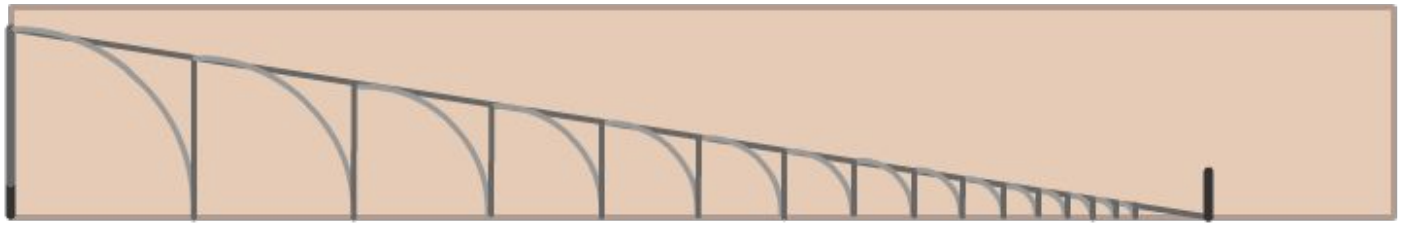
Calculating the Fret Scale with Geometry- Page 6

Swing an arc down so it marks the second fret on the edge of the pattern



Calculating the Fret Scale with Geometry- Page 7

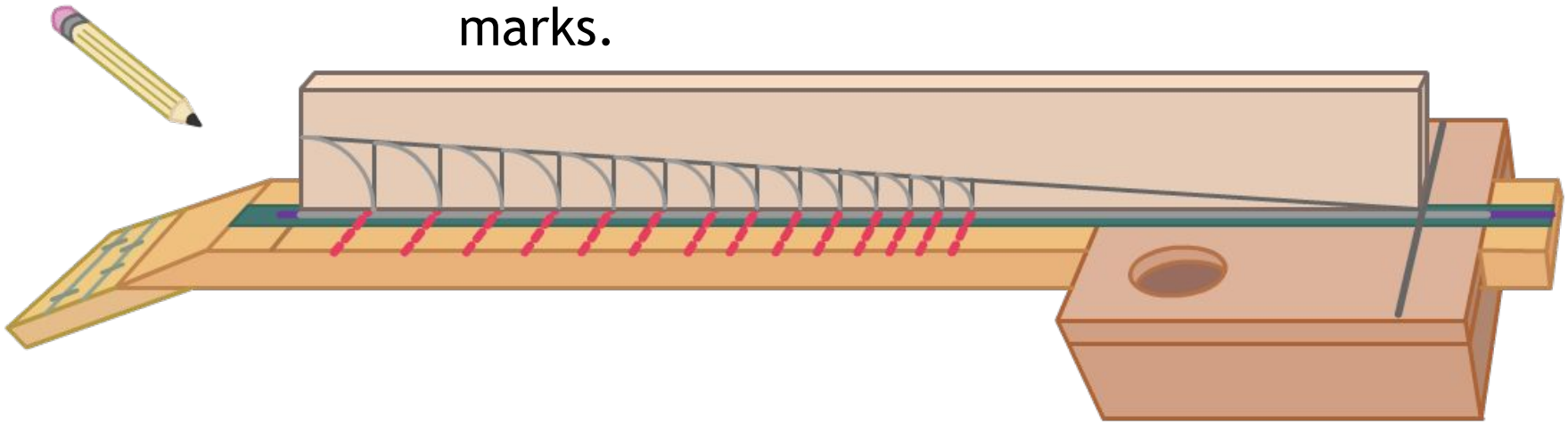
Continue for at least 12 frets. (one octave) Fourteen frets are standard.



Marking the Fret Scale on the Neck- Page 1

Holding the pattern piece so that its marked edge touches the centerline of the neck, line the "Nut Mark" on your pattern piece with the center of the nut slot.

Transfer the fret spacing from the pattern to the neck with a series of "tick" marks.

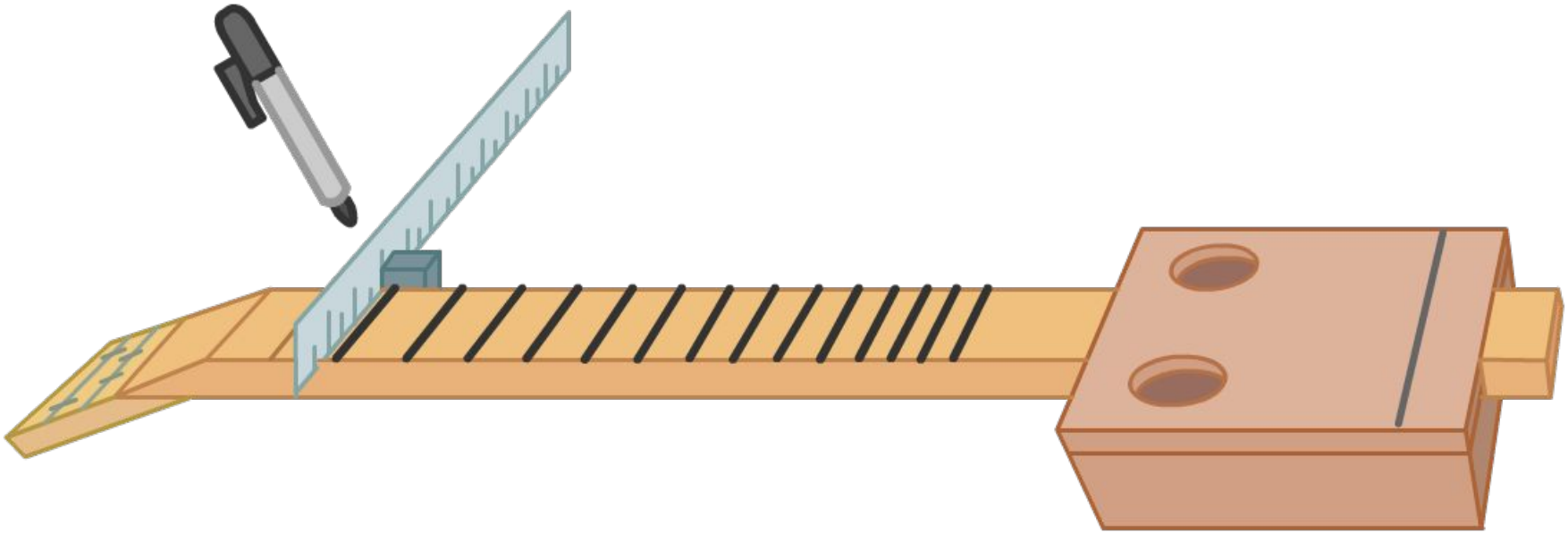


Have an instructor check your work.

Instructor's Initials _____

Marking the Fret Scale on the Neck- Page 2

Using a combination square, take a “Sharpie” marker or a wood burner, draw your fret marks all the way across the neck.

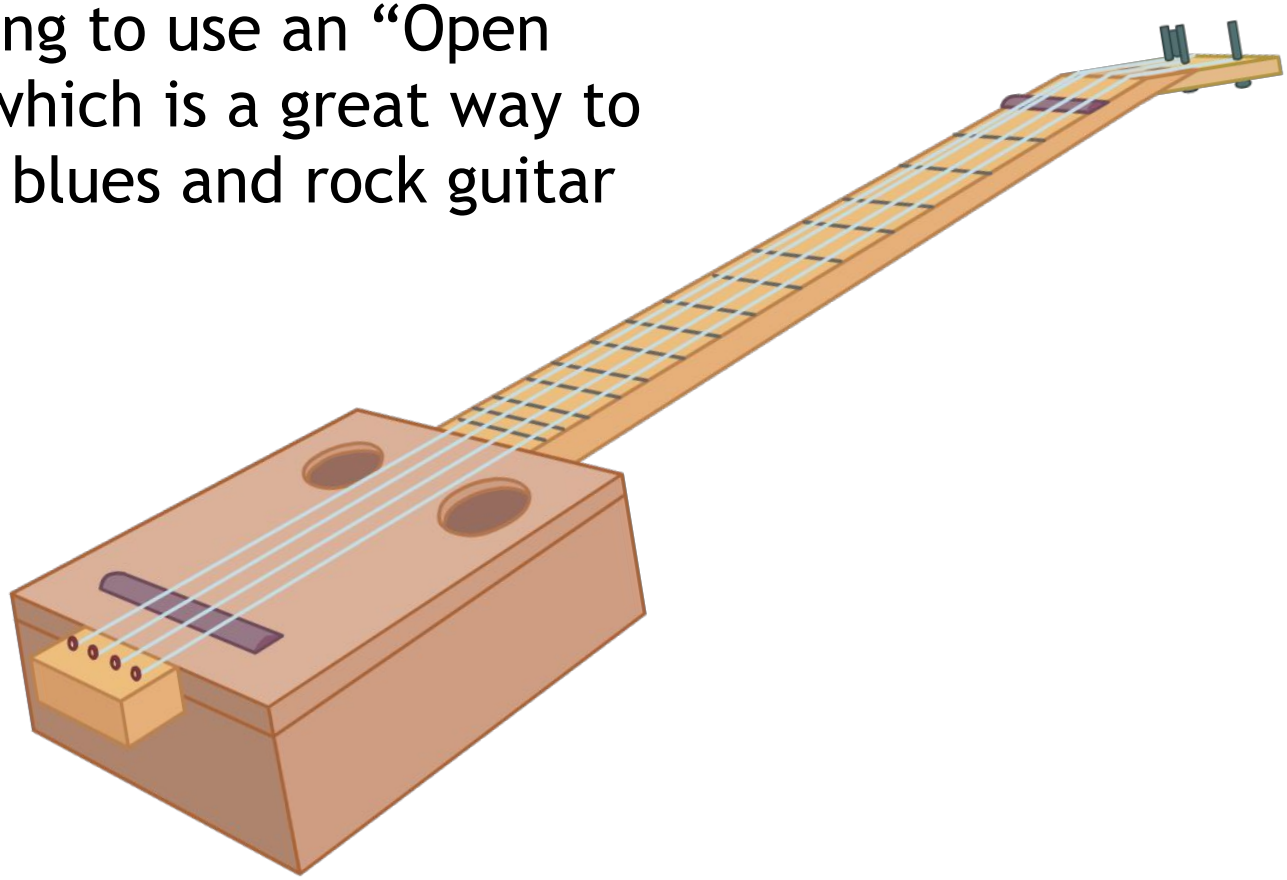


Have an instructor check your work.

Instructor’s Initials _____

Part 4 - Stringing and Tuning

- Now, it's time to string and tune your guitar.
- You're going to use an "Open Tuning", which is a great way to play basic blues and rock guitar



Stringing and Tuning - The Tools Needed

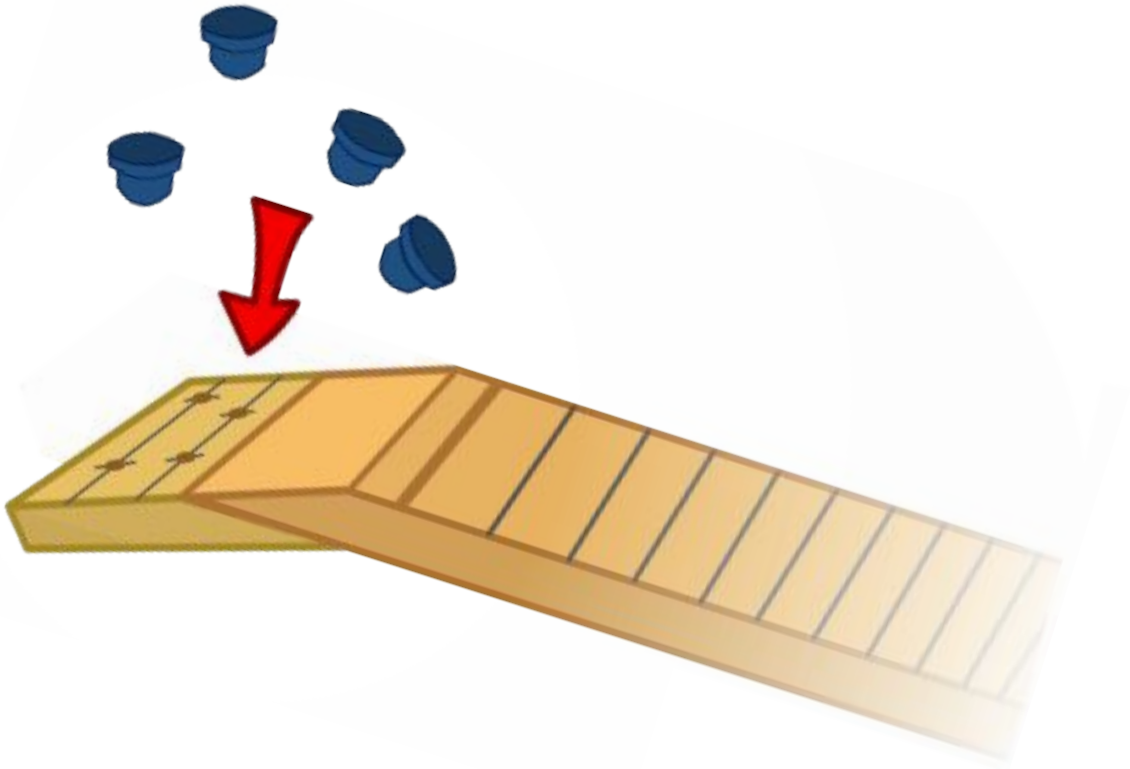
- Wrenches
- Pliers
- Wire Cutters

Stringing and Tuning - Necessary Materials

- **Your Guitar**
- **Machine Screw #10 x 1 1/2"**- for the Nut
- **Eye Bolt** (or **piece of threaded rod**)**1/4" x 4"**- for Bridge
- **Guitar Tuners (four)**
- **Strings (4) : #1 - .034" Bronze Wound, #2 - .026" Bronze Wound, #3 -.017" Plain Steel, #4 - .013" Plain Steel**

Installing the Tuners- Page 1

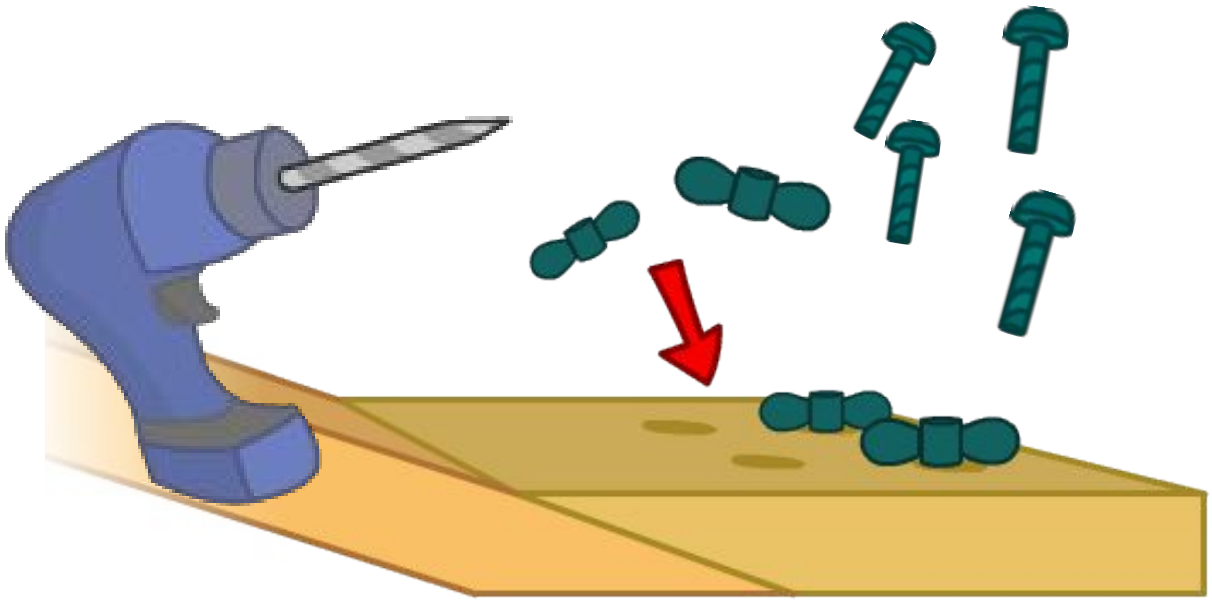
Make sure the headstock is supported (otherwise it might break off from the neck) and tap the bushing in place from the **top** of the headstock.



Installing the Tuners- Page 2

Push the tuners up from the back of the headstock

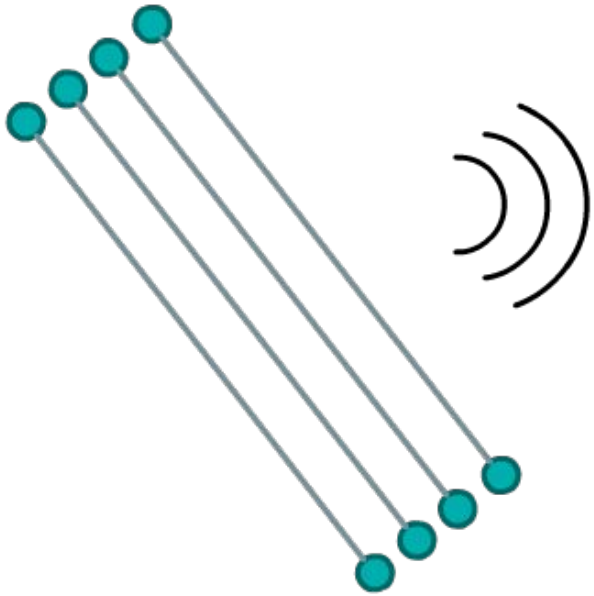
On the back of the headstock, drill 1/16" pilot holes for the small tuner screws before driving those screws.



Some Tuners have parts that need to be tightened with wrenches.

Stringing The Guitar- Page 1

We're building a four string guitar which will be tuned in **"Open G" tuning.**



This means that when you strum the tuned strings, they will combine to make a G chord.

The Major Scale notes/ tones for the key of G are:

G A B C D E F #G. The tones are numbered 1-8. (G is "1", A is "2"...)

Stringing The Guitar- Page 2

We're going to string our guitar with the tones 5/1/3/5, so it will be the notes D, G, B, D.

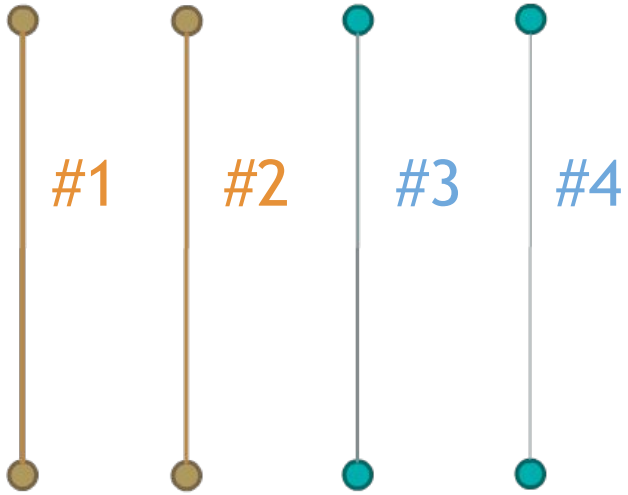
The strings are different thicknesses (diameters.) We're using Medium Gauge strings. Our string diameters will be:

#1 - .034" Bronze Wound

#2 - .026" Bronze Wound

#3 - .017" Plain Steel

#4 - .013" Plain Steel

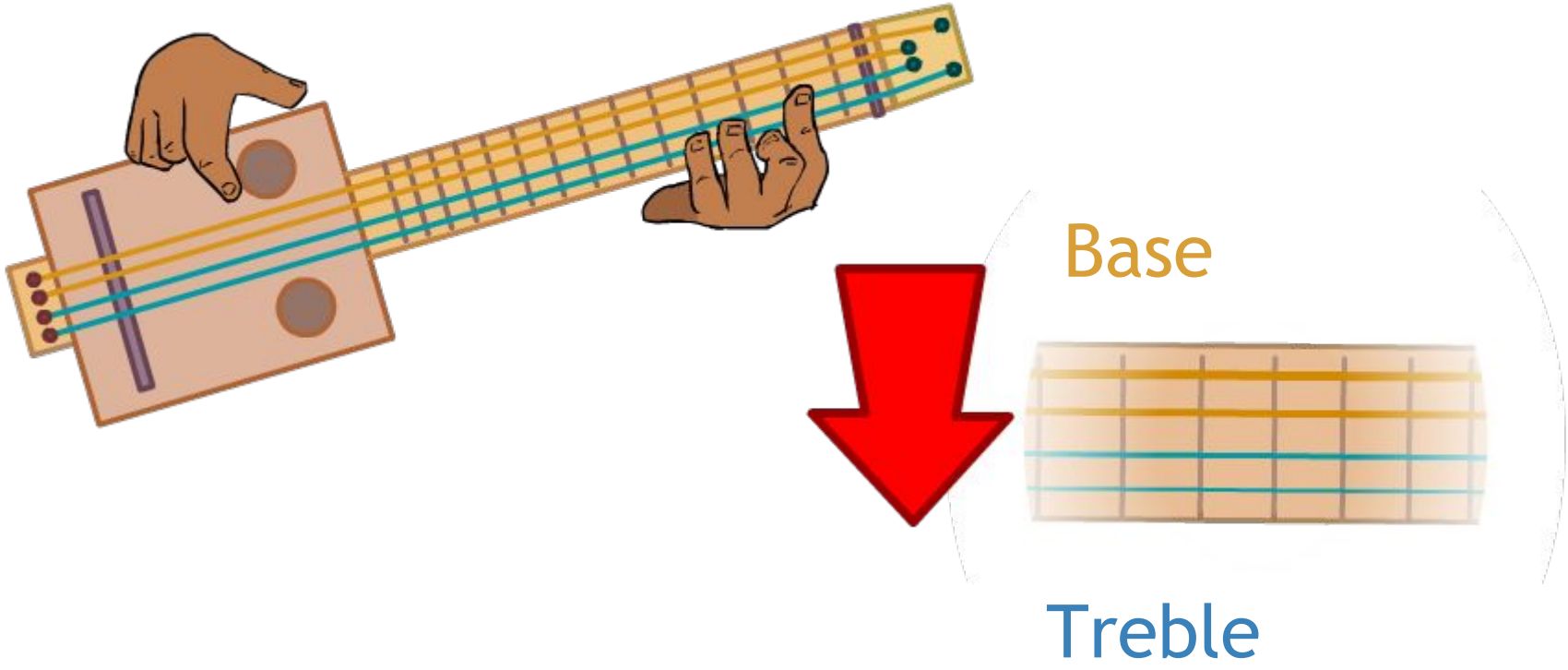


The thickest string (#1) is the base string. The thinnest string (#4) is the treble string. (Don't be confused by the tones and strings having different numbers…)

Stringing The Guitar- Page 3

If you are right handed, when you're playing the guitar, your left hand will be on the neck and the base string will be on top.

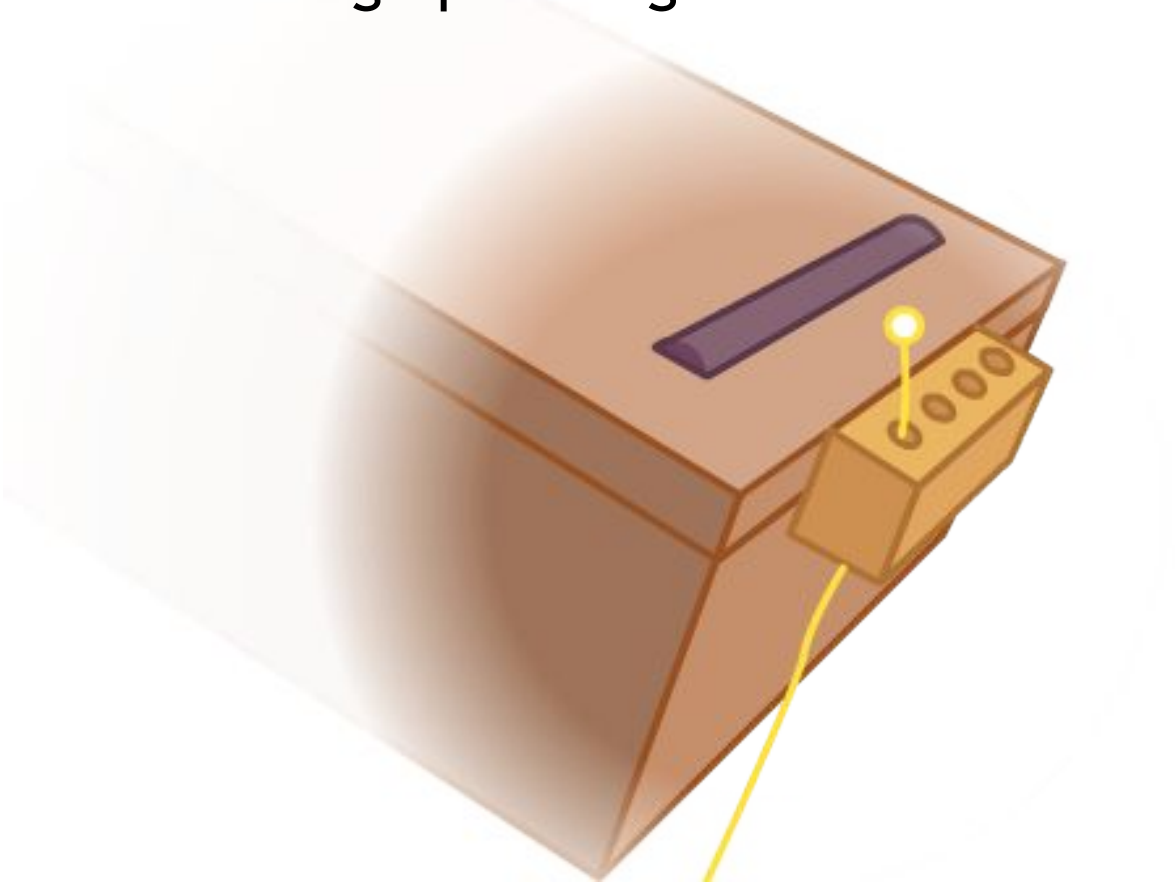
The strings will progress from base to treble going "down" the width of the neck.



Stringing The Guitar- Page 4

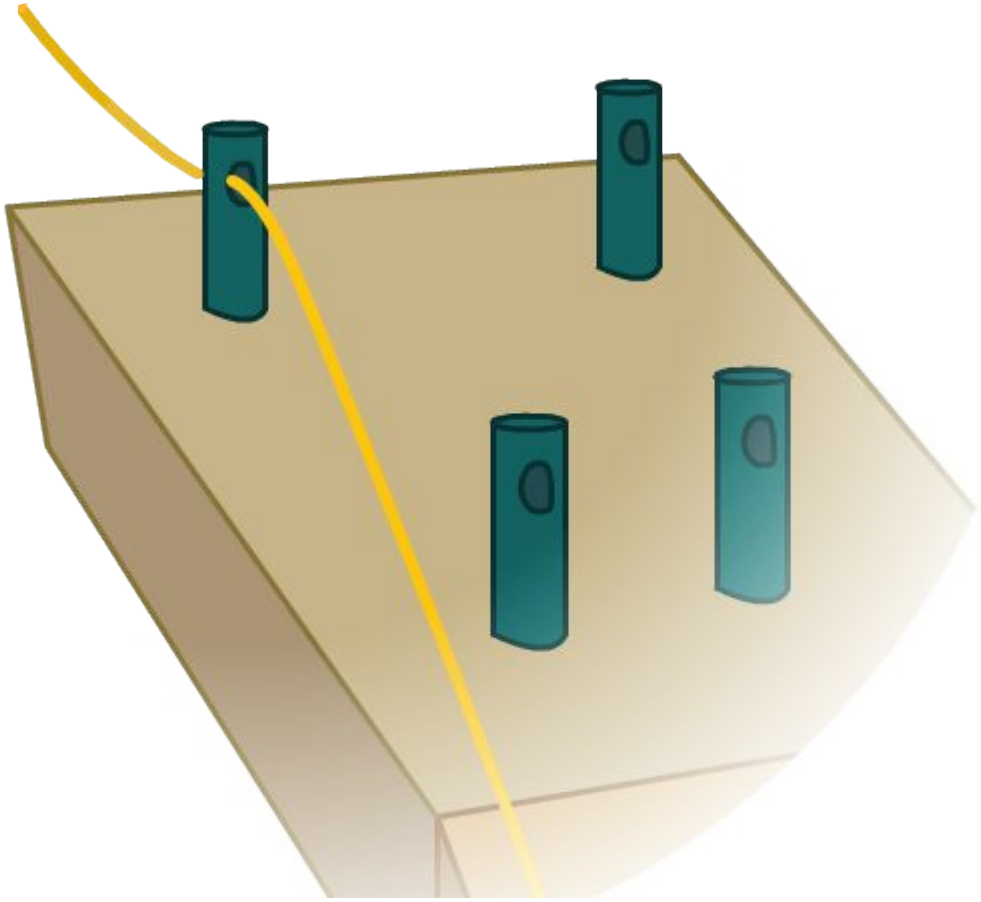
The strings have beads on their ends. These will stop the strings from pulling through the tailstock.

Pass the #1 string up through the tailstock.



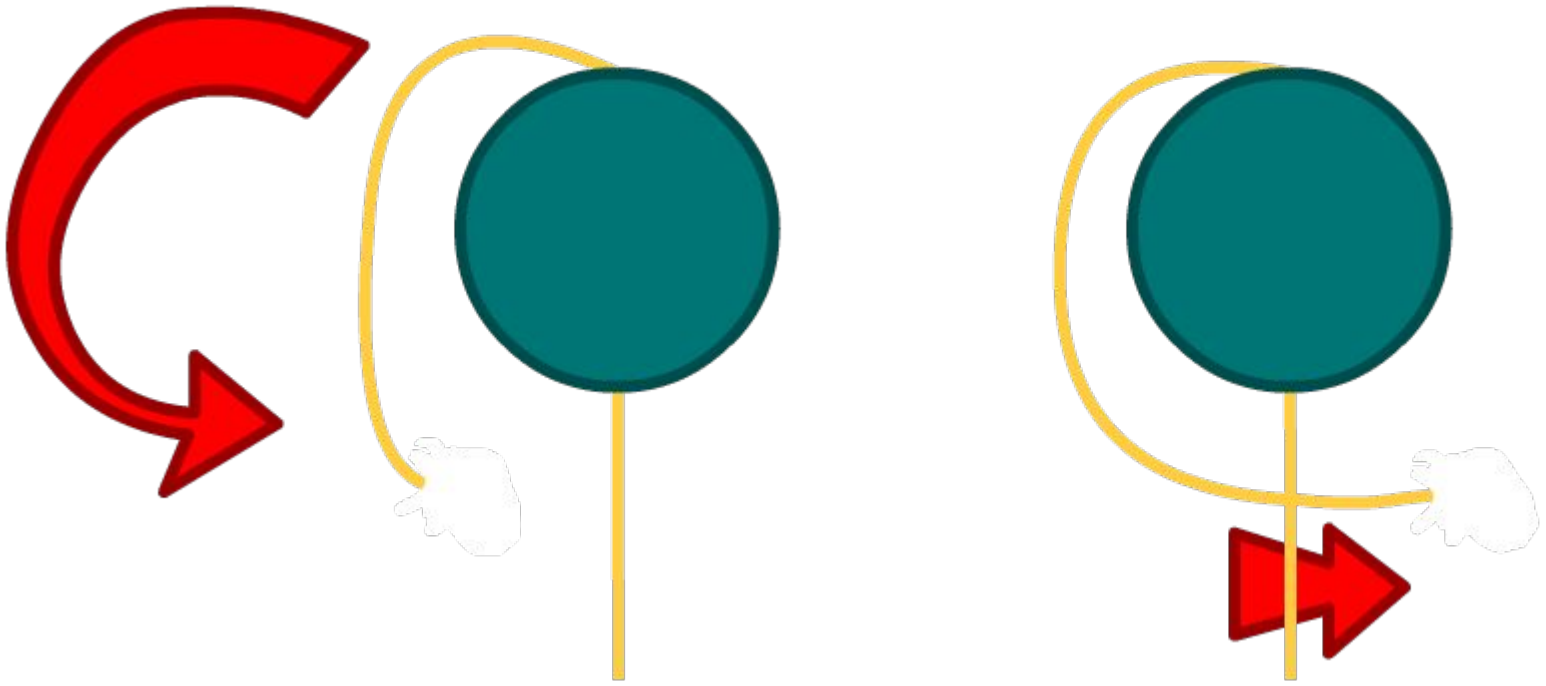
Stringing The Guitar- Page 5

Pull the string reasonably tight and pass the string through the tuner.



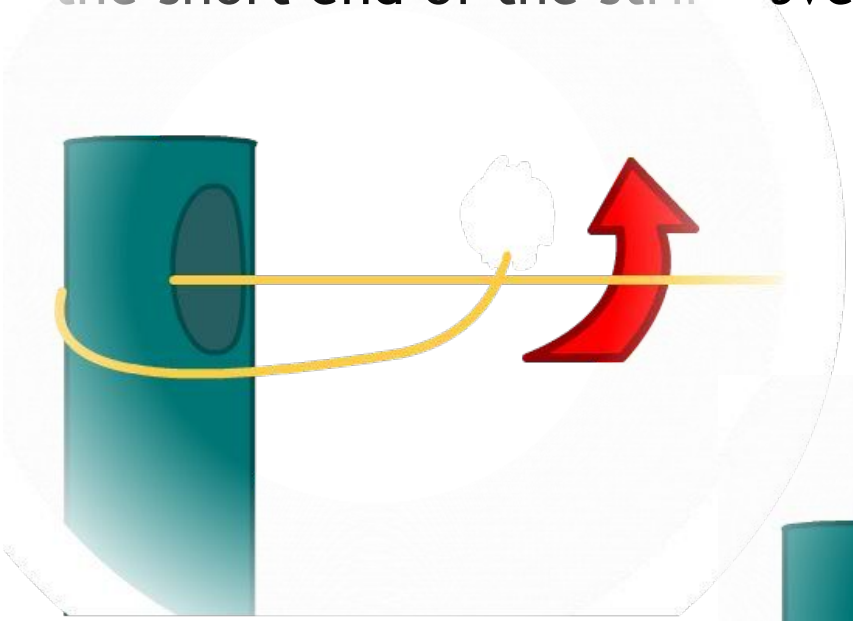
Stringing The Guitar- Page 6

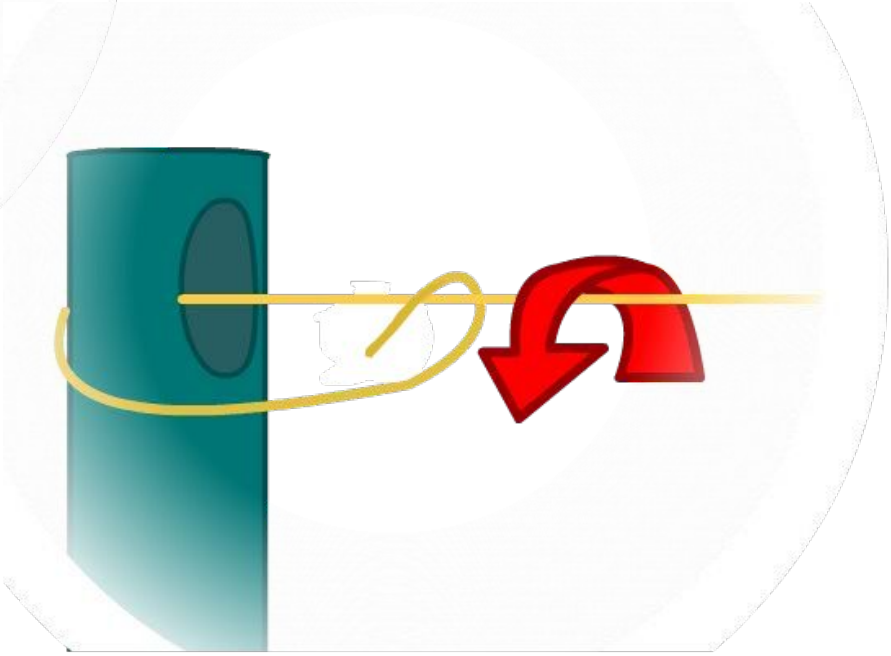
Then take the short end of the string and go halfway around the post, underneath the long end of the string.



Stringing The Guitar- Page 7

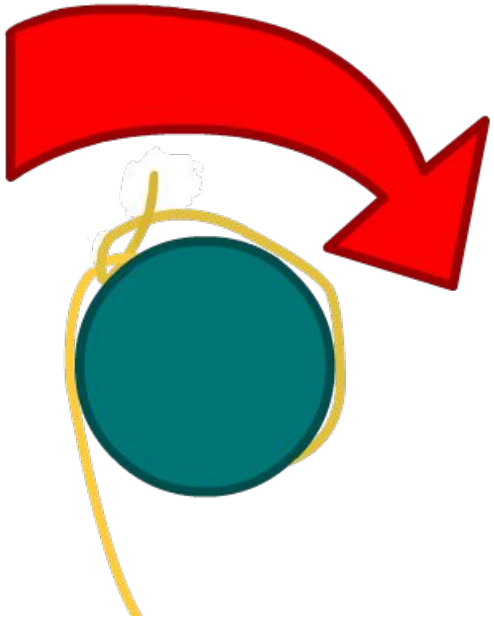
Bend the short end of the string over the long end of the string.

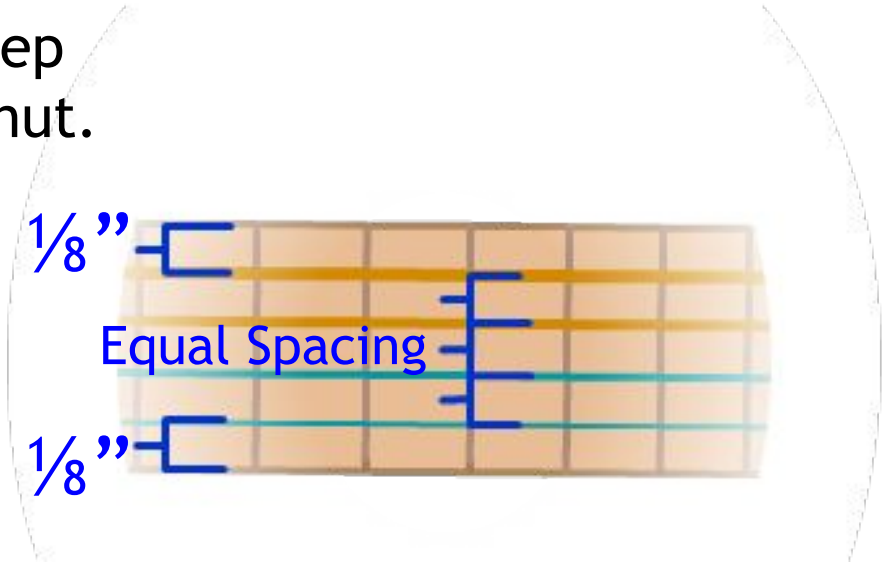




Stringing The Guitar- Page 8

Wind the tuner so the post moves in a clockwise direction. This will keep the string towards the top of the nut.

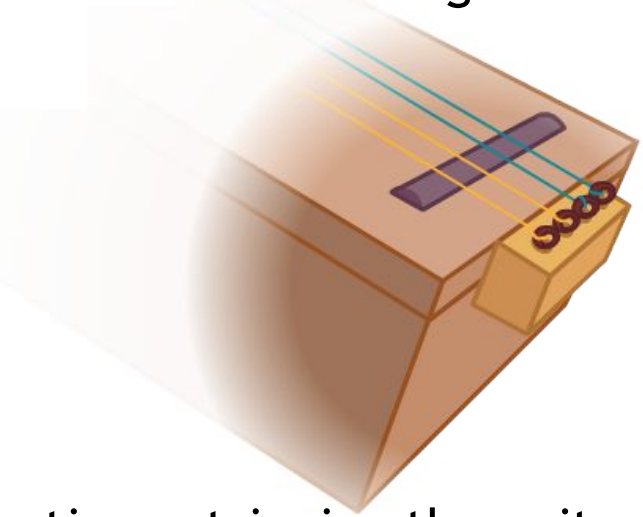


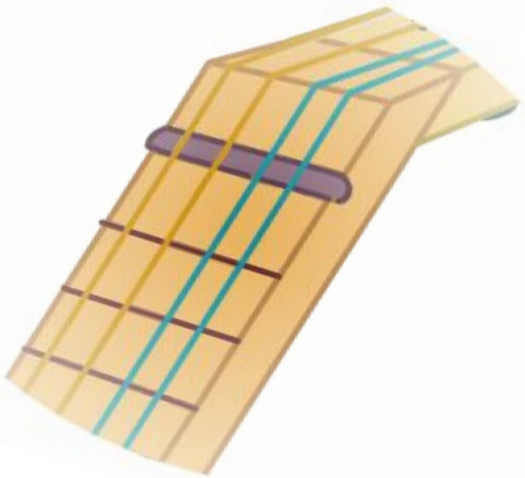


Remember, you want to have your strings equally spaced on the nut. There should be about ⅛” from the edge of the neck to the first and last strings.

Stringing The Guitar- Page 9

When there is enough tension on the string to hold them in place, insert the nut and bridge.





Continue stringing the guitar. You may need to string the “Far” tuners (the ones closest to the head of the guitar) in a counter clockwise direction in order to maintain string spacing.

For more information look at steps 4-7 in this article: Care and Feeding.:

http://www.acousticfingerstyle.com/CareAndFeeding.htm

Tuning The Guitar

The guitar will be tuned to the following notes:

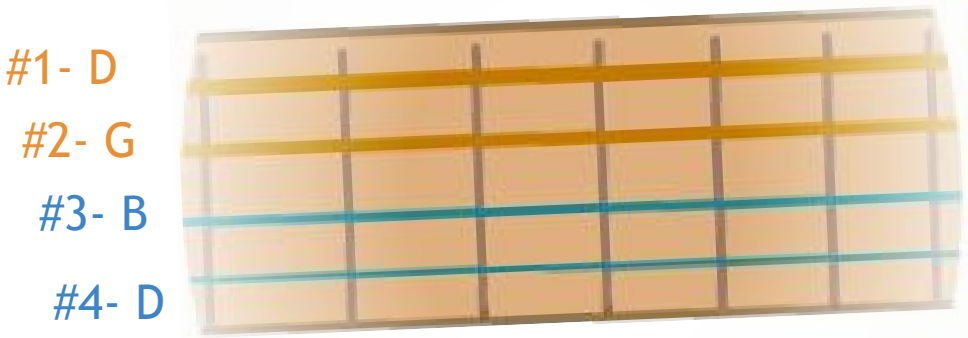
#1- D- This is the thickest string. It's the top string.

The rest follow in order.

#2- G

#3-B

#4- D



Using a headstock tuner is the easiest way to go.

We like the Planet Waves:

http://www.planetwaves.com/pwProductDetail.Page?ActiveID=4115&productid=592&productname=NS_Micro_Headstock_Tuner

Resources

General Resources

Cigar Box Nation

http://www.cigarboxnation.com/

Wiki Cigar Box Guitar Article

http://en.wikipedia.org/wiki/Cigar_box_guitar

Wiki Guitar Article

http://en.wikipedia.org/wiki/Guitar

How to Tune the Guitar

Keni Lee Burgess at Cigar Box Nation

http://www.cigarboxnation.com/video/a-cigar-box-guitar-builders

Supplies

CB Gitty

www.cbgitty.com

Stewart MacDonald (StewMac)

http://www.stewmac.com/