

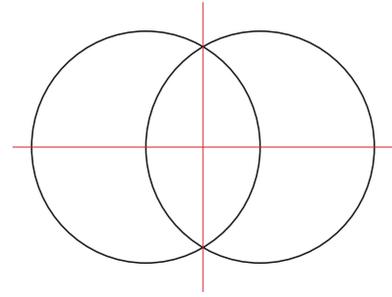
Knotwork

Knotwork is an over/under process of weaving. The best way to describe it is basket weaving, weather you have a basket in the house, or look one up on the internet, you'll be able to see the over/under weave. The knotwork weave is quite loose compared to a basket.

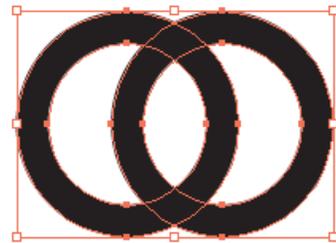
Practice Exercise 1

Step 1: The X,Y coordinates are given in inches. Place a 2 inch circle on the art board at 3.75 X, and 5.5 Y. Double click the Selection Tool (V hotkey, black arrow), input 1 inch for horizontal placement, and click the copy button. Select both circles, remove the fill, and increase the stroke value to 24 pt.

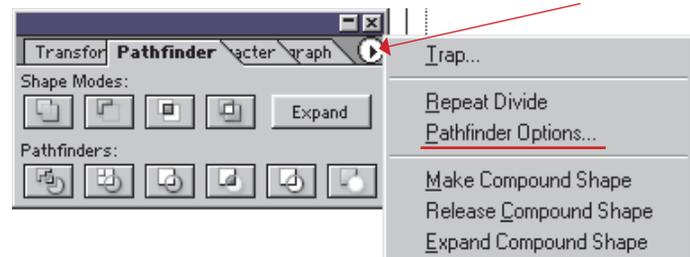
Step 2: With both circles selected, Object > Expand. Go to the Pathfinder menu, click on the right pointing triangle to bring up the palette menu. Open Pathfinder Options, and check the second option, Divide and Outline Will Remove Unpainted Artwork. Go back to the palette, and choose the Divide option (first icon, second row).



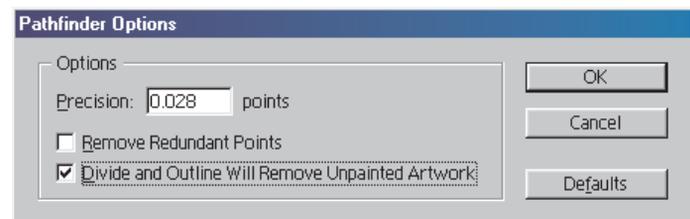
The red crosshair lines represent the X,Y coordinates of 4.25 in and 5.5 inch. The horizontal placement of the practice circles is off centered so that they overlap.



When the circles have been expanded, they are no longer simple paths with a stroke, they are compound paths.



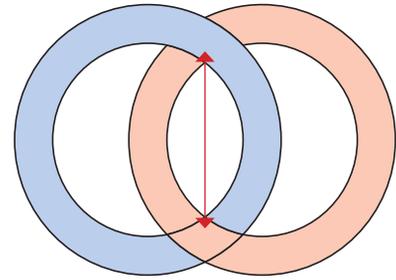
Most palettes have a menu that can be accessed from the right pointing triangle in the upper right corner of the palette.



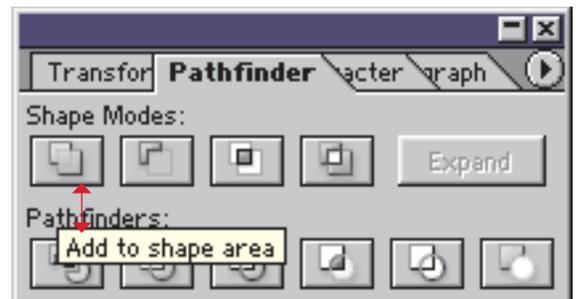
Options dialog box for Pathfinder Options. Check the option, Divide and Outline Will Remove Unpainted Paths. This reduces the amount of work involved in making knotwork.

Step 3: Press D on the keyboard for the default colors. The segments are now outlined. Use the Direct Selection Tool (A hotkey, white arrow), and select segments of the left circle. The left circle, was given a blue fill, and the right circle was given a red fill. With only the segments of the left (blue) circle selected, click the first icon on the Pathfinder menu, Add to Area Shape. This creates a compound path, and retains fill and stroke properties. Click the Expand button, to convert the Compound Shape into a simple path. The expand button is grayed out until a compound shape path is selected. Lock the left ring, on the Layers palette, expand Layer 1 by using the pivot triangle on the left side of the layer bar. Another option would be to press the Alt key prior to clicking the Add to Area Shape key. Select the right circle, and join the segments. The Merge option, second row - third icon, is another option, it will remove all stroke attributes, and you will want the stroke to be visible.

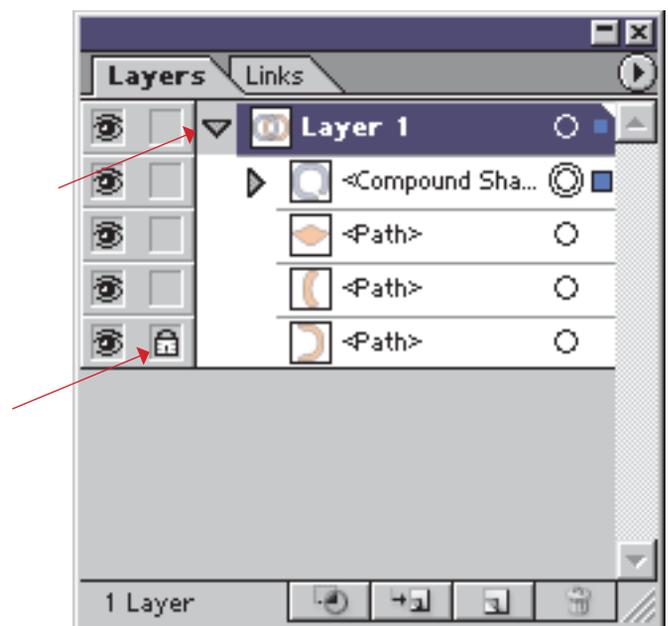
Note: The interlocking rings are a step to understanding knotwork, it's not a fancy knot. The rings represent an optical illusion. This type of knot, made of overlapping objects, is the easiest to create in Illustrator.



When the Divide option is used from the Pathfinder Palette, the overlapping areas of each Compound Path are broken up into smaller units. The two segments, where the circles overlapped, became one shape, instead of two shapes on top of each other.



If you're not familiar with the Pathfinder Palette and its options, let the mouse cursor hover above one of the icon buttons, and a balloon will pop up with a brief description of what it does.



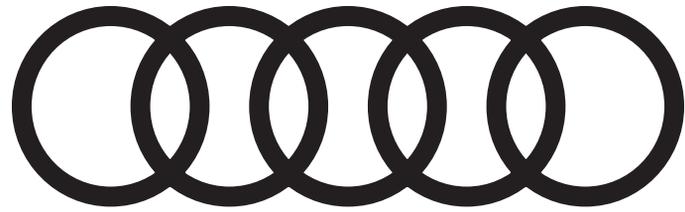
Once the compound shape has been made, it is recommended that you use the Expand option on the Pathfinder Palette to convert it to a simple path shape. The red arrows indicate the Pivot Triangle and the Lock Check Box. Once a path is complete, lock it.

Practice Exercise 2

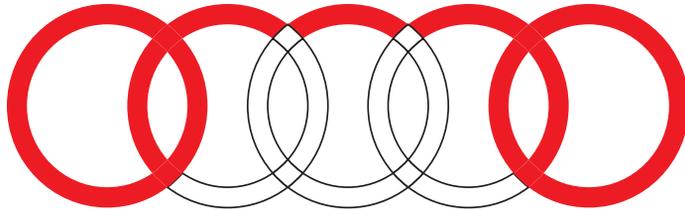
Step 1: Place a 3 inch circle on the art board at 0.25 X, 5.5 Y. Double click the Selection Tool (V hotkey, black arrow) to bring up the Move dialog box and input 2 inches for horizontal position, and click on copy. Key-stroke Command/Control D until you have 5 circles (it's ok if they fall over the boundaries of the art board). Remove fill, increase stroke to 24 pt.

Step 2: Object > Expand. Pathfinder Palette > Divide. Remove all segments that I marked in red. Select all, press D for default colors.

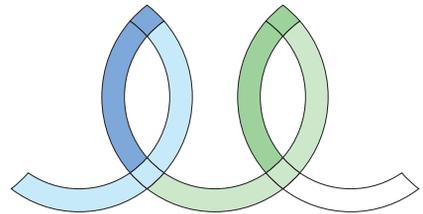
Step 3: This practice exercise deal with knots where the segments cannot be combined in the usual way. The segments bend around on themselves. I've marked a green and blue segment in the file. If you were to join all the blue segments, you would get an unwanted shape. The segments have to be joined in two sections. The blue segment is divided into two shades of blue, the same with the green. First join the light blue segments, then the darker blue segments. Make sure to Expand the segments, to get a simple path.



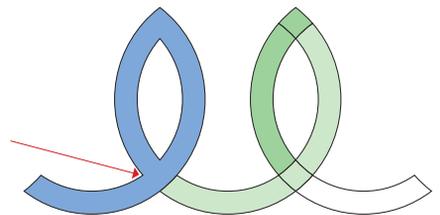
Five overlapping circles. Expand, assign default colors, and remove outer circle segments.



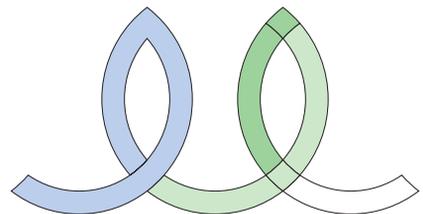
It was necessary to place so many circles on the art board to get enough segments for a repeating pattern. Repeating patterns will be covered in another lesson, so that this one isn't too long.



Once the outer segments are removed, you should be left with a curlyque, much like this one. The blue represents one segment of the loop, the green represents the continuation of the line. The colors were chosen so that you can see how the segments group.

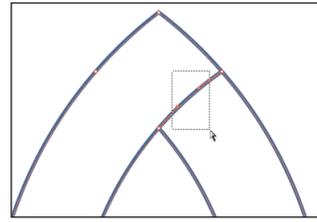


“The Unwanted Shape” in knotwork is defined by a line that loops around on itself and creates a loop without beginning or end.

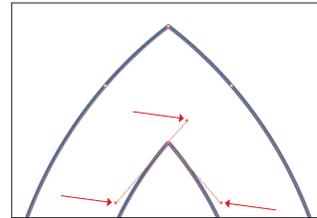


This is the correct appearance of a knot segment that loops around on itself. If the segment doesn't look like this, start again.

Step 4: Remove the fill on the blue segments. You should be left with a black stroke. Change the Stroke to blue. Zoom in on the top part of the knot loop. Use the Direct Selection Tool (A) to select only the line segments that separate the two blue pieces. Select the two unjoined points on the inside path, you should see three bezier curve handle bars going off into different directions. Command/Control J to join, select Corner option.



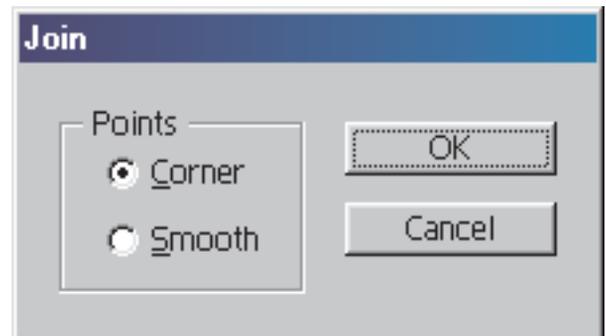
Use the Direct Selection Tool to select and delete only the lines separating the two segments.



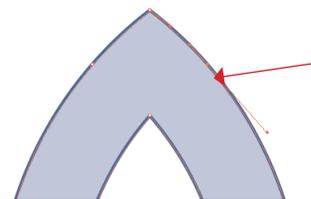
Use the Direct Selection Tool to select the two points on the inside path of the knot segment. You should see Bezier Curve handle bars pointing in different directions, as indicated by the arrows.

Step 5: Select the two unjoined points on the outside path. On these points, you don't see any bezier curve handle bars, but they may appear on other knots that you try. When you join the points, select the Smooth option. You'll notice that Illustrator calculated the bezier curve handle bars once the points were joined. Had you chosen corner point, there would have been no change on this angle. Had there been bezier curve points, the curvature of the knot segment would have changed.

Step 6: Now when the fill is changed to a light blue, and the stroke to black, you will see that it loops around and goes under itself. Practice with the green set.



The Join Dialog box. This box only appears when you join two points stacked on top of each other. The options, Corner and Smooth, act differently, so choose based on the line type you want.



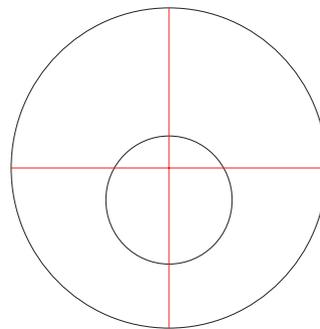
The outside points are indicated by the red arrow. When Smooth options is chosen in the Join Dialog box, Bezier Curve handle bars are calculated to keep the line in balance.

Knot Patterns

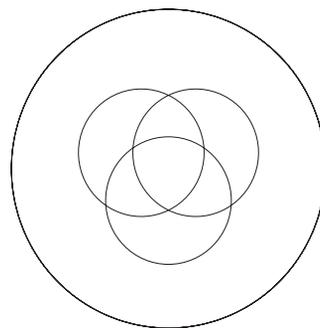
If you've seen the numerous variations of knot patterns in print and on the web, you'll know that the possibilities are great for this type of artwork. I will give you the foundations for some simply knots, and from there, you can build your own library of patterns.

Trinity Knot, Step 1: Place a two inch circle, with no fill, on the art board at these coordinates, 4.25in X, 5in Y. Make a larger circle, 5 inch circle and place it at 4.25in X, and 5.5in Y. *Refer to Practice Exercise 1.*

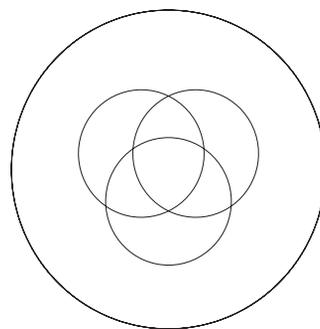
Step 2: Select both circles, and double click the Rotate icon on the tool bar, enter 120° for the rotate value, and click the copy button. This creates a duplicate set of circles. Command/Control D keystroke will create the third set of circles. The purpose of the 5 inch circles was to prevent the smaller circle from rotating on its center. You'll notice that the 5 inch circle rotated on its center for each of the transformations, while the smaller circle moved to a new location, because its center was offset from the larger circle. Use the Selection Tool (V) to select the 5inch circles, and expand the pivot triangle on the layer path, and you will notice that you have three objects selected. Delete, so that you are left with the three offset circles.



The smaller circle would rotate on its center coordinate without the larger circle. The red crosshair line represent the center spot at which the two circles will rotate, making copies of the smaller circle off-center, so that you get the desired effect of the Trinity/Cloverleaf knot.



When both circles are rotated, the top circle rotates on its own center, and the smaller circle is off-centered when Rotated 120° and copied.



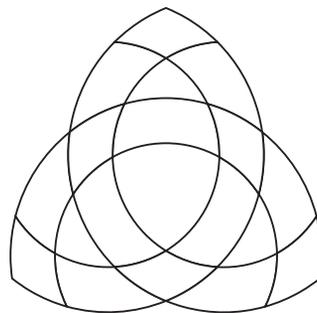
When both circles are rotated, the top circle rotates on its own center, and the smaller circle is off-centered when Rotated 120° and copied.



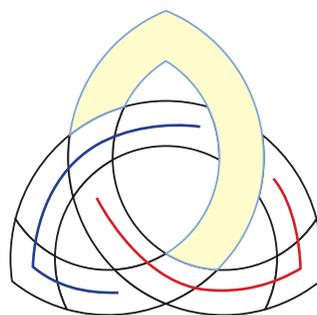
Step 3: Select the three offset circles and expand the stroke to 24pt. Object > Expand. Check Pathfinder Palette options to make sure Divide and Outline will Remove Unpainted Artwork, and choose the Divide option from the palette.

Step 4: Ungroup objects, and remove the outer circle segments.

Step 5: Assign default colors to remaining segments, and join, following under over procedures.



With the outer circle segments removed, you have a standard looking Trinity/Cloverleaf Knot.



The top leaf segments were selected, with two segments from the interior of the leaf, they were joined. The red lines marks the second group to be joined, the blue line marks the third. Refer to Practice Exercise 1, if need be.



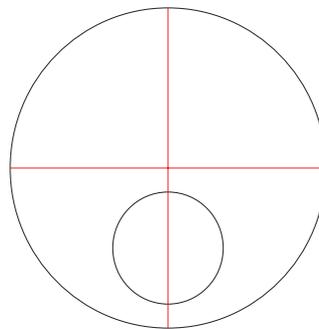
Star Knot

Star Knot, Step 1: Place a 1.75 inch circle at 4.25in X, and 4.25in Y coordinates. Place a 5 inch circle at 4.25in X, 5.5in Y. *Refer to Practice Exercise 2.*

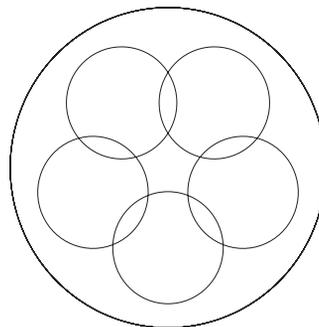
Step 2: Select both circles, rotate 72° and copy. Command/Control D until you have a ring of 5 circles. Delete the 5 inch circles.

Step 3: Expand stroke on the small circles to 15 pt. Expand circles, and Divide from Pathfinder Palette. Ungroup, remove outer circle segments.

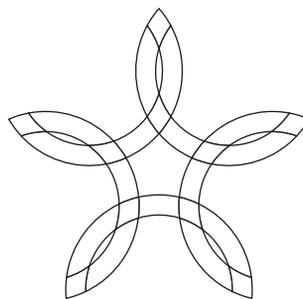
Step 4: Assign default colors, and join segments.



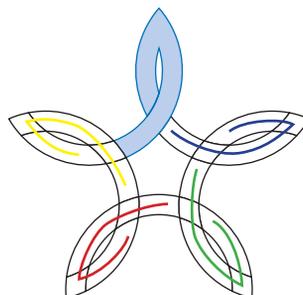
The Starknot is an illusion of one single line that bends and turns upon itself.



Again, the larger circle is used to give reference to the offset of the smaller circle.



Once the outer circle segments are removed, you may begin the process of joining segments.



Finish joining, refer to Practice Exercise 2, if need be.



Notes: Artwork other than knots can be created using this method. Here are some samples of traditional knot styles, as well as art created in this method.

