

# International Symbols

Biotech Services manages large-scale manufacturing facilities specializing in everything from digital photographic equipment to machines used to drill for oil. The company builds plants all over the world that in many cases handle dangerous chemicals and undertake dangerous tasks — which means they must prominently display danger warnings. Biotech Services hired you to create a digital collection of universal symbols they can use to create signs, print on the side of large machines, place as icons on their Web sites, and embroider onto employee uniforms.

This project incorporates the following skills:

- ❑ Placing raster images into an Illustrator file to use as drawing templates
- ❑ Creating and managing simple shapes and lines
- ❑ Using various tools and panels to transform objects' color, position, and shape
- ❑ Cloning objects to minimize repetitive tasks
- ❑ Using layers to organize and manage complex artwork
- ❑ Drawing complex shapes by combining simple shapes and using Bezier curves



# The Project Meeting

## Client Comments

We have a set of universal warning symbols on our Web site, but we need to use those same icons in other places as well. Our printer told us that the symbols on our Web site are “low res,” which can’t be used for print projects. The printer also said he needs vector graphics that will scale larger and still look good. The printer suggested we hire a designer to create digital versions of the icons so we can use them for a wide variety of purposes, from large machinery signs to small plastic cards to anything else that might come up. We need you to help us figure out exactly what we need and then create the icons for us.

## Art Director Comments

Basically, we have the icons, but they’re low-resolution raster images, so they only work for the Web, and they can’t be enlarged. The good news is that you can use the existing icons as templates and more or less trace them to create the new icons.

The client needs files that can be printed cleanly and scaled from a couple of inches up to several feet. Illustrator vector files are perfect for this type of job. In fact, vector graphics get their resolution from the printer being used for a specific job, so you can scale them to any size you want without losing quality.

## Project Objectives

To complete this project, you will:

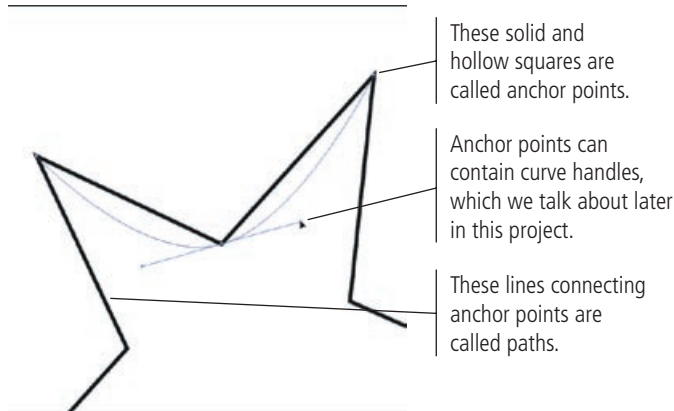
- Create a grid that will eventually hold all fourteen icons in one document
- Control objects’ stroke, fill, and transparency attributes
- Import and use the client’s raster images as templates, which you can then trace
- Use the Line tool to create a complex object from a set of straight lines
- Lock, unlock, hide, and show objects to navigate the object stacking order
- Scale, rotate, and reflect objects to create complex artwork from simple shapes
- Use Layers to manage complex artwork
- Use Live Trace to automatically create a vector outline of a raster image
- Use the Pathfinder to combine simple shapes into a single complex object
- Use the Pen tool to manually draw complex shapes



# Stage 1 Drawing Primitive Shapes

This lesson focuses on the real basics: creating **primitive** objects — such as circles, ovals, squares, stars, and rectangles. Shapes that you draw in Illustrator are fairly simple to understand once you know how they're built. In this project, you draw with Illustrator's primitive tools, which allow you to draw ovals, rectangles, spirals, and polygons, as well as perfect squares and circles.

Whatever Illustrator tool you use to draw, doing so creates anchored points — appropriately called **anchor points** — and connects them with mathematically accurate lines known as **paths** or **segments**. All anchor points contain information for controlling the shape of curves (which you learn about later in this project).



## Note:

*We call circles, squares, rectangles, stars, and other basic shapes “primitive shapes”; Adobe, however, calls them “geometric shapes,” so you might see some discrepancy between our terminology and Adobe’s.*

## Raster vs. Pixel Artwork

### ILLUSTRATOR FOUNDATIONS

There are two primary types of artwork: vector graphics and raster images. (Line art, sometimes categorized as a third type of image, is actually a type of raster image.) Adobe Photoshop is what some people call a “paint” program; it is primarily used to create and manipulate pixel-based or **raster images**.

**Vector graphics** are composed of mathematical descriptions of a series of lines and geometric shapes. These files are commonly created in illustration (“drawing”) applications such as Adobe Illustrator or in page-layout applications such as Adobe InDesign. Vector graphics are **resolution independent**; they can be freely scaled and are automatically output at the resolution of the output device.

Raster images are made up of a grid of individual **pixels (rasters or bits)** in rows and columns (called a **bitmap**). Raster files are **resolution dependent**; their resolution is determined when you scan, photograph, or create the file.

Why is it important for you to know the difference between rasters and vectors? Many of the files that you build in Illustrator will be placed in various print projects, so you have to build the files with the appropriate settings for commercial printing.

- **Pixels per inch (ppi)** is the number of pixels in one horizontal or vertical inch of a digital raster file.
- **Lines per inch (lpi)** is the number of halftone dots produced in a horizontal or vertical linear inch by a high-resolution imagesetter in order to simulate the appearance of continuous-tone color.
- **Dots per inch (dpi)** or **spots per inch (spi)** is the number of dots produced by an output device in a single line of output. DPI is sometimes used interchangeably with pixels per inch.

When reproducing a photograph on a printing press, the image must be converted into a set of different-sized dots that fool the eye into believing that it sees continuous tones. The result of this conversion process is a halftone image; the dots used to simulate continuous tone are called **halftone dots**. Light tones in a photograph are represented as small halftone dots; dark tones become large halftone dots. Prior to image-editing software, photos were converted to halftones with a large graphic arts camera and screens. The picture was photographed through the screen to create halftone dots, and different screens produced different numbers of dots in an inch — hence the term dots per inch.



## CREATE A NEW DOCUMENT

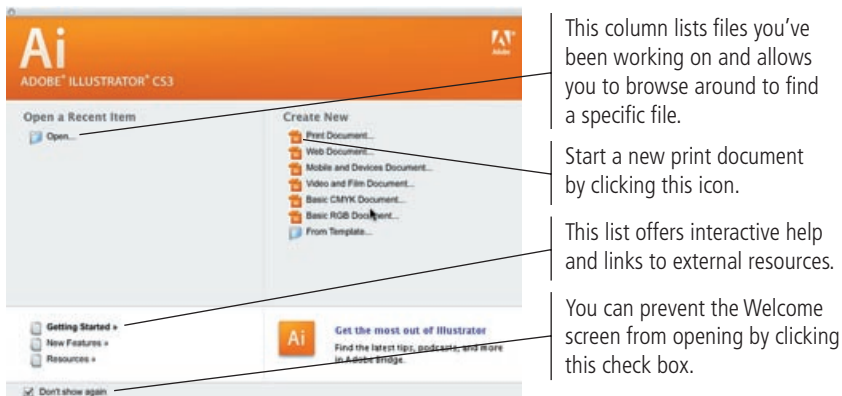
In this project, you will draw a variety of international warning symbols. For now, however, all you need is one new document to complete all of your preliminary work.

### 1. Start Illustrator.

When you launch Illustrator, the Welcome screen appears. If you don't see the Welcome screen, someone has stopped this feature from appearing when the program starts.

### 2. If you can't see the Welcome screen, choose Help>Welcome Screen.

The Open a Recent Item column on the left of the Welcome screen displays the last eight or ten images you worked on, along with an Open icon that allows you to browse around until you find the file you need. Different categories of new file types are available on the right side of the dialog box.

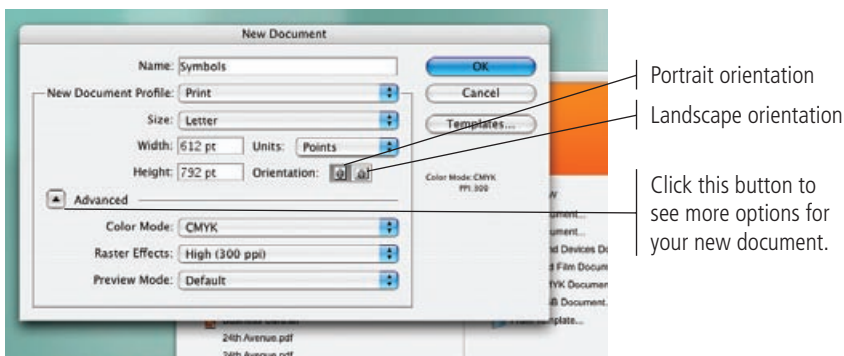


#### Note:

Before completing this project, copy the Symbols folder from the WIP folder on your Resource CD to your WIP folder wherever you are saving your work. When you save files for this project, you will save them in your WIP>Symbols folder.

### 3. Click Print Document in the Create New column on the right side of the Welcome screen.

### 4. In the resulting New Document dialog box, type “Symbols” in the Name field. Make sure the Portrait orientation option is selected, and then click the Advanced button on the lower left.



#### Note:

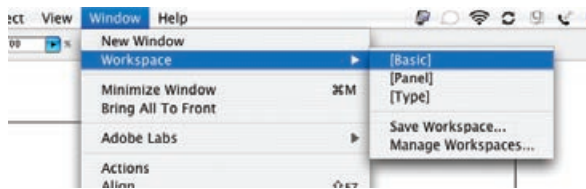
It's always a good idea to keep high-resolution copies of the files that you show on the Web; if you ever need to print that file, you'll already have the data you need. It's much easier to reduce a file from 300 dpi to 72 dpi than to increase from 72 dpi to 300 dpi.

When you first look at the New Document dialog box, it appears in Standard view. Clicking the Advanced button expands the dialog box, allowing you to change color mode (RGB for the Web or CMYK for print jobs) and resolution, which determines the number of pixels in a square inch of an image; higher resolution numbers are used for print jobs and lower numbers are used for Web distribution. The default setting is 300 dpi — the standard resolution used to print color magazines. If your artwork is destined for the Internet, 72 dpi is the preferred setting.

5. Click OK to create the new, blank document named **Symbols**.

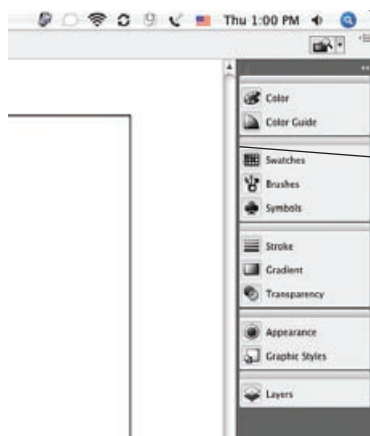
6. Choose **Window>Workspace>[Basic]**.

We want to ensure that what you see on your screen is the same as what we show you in this exercise; starting from a basic workspace is the first step in that process.



7. On the right side of the monitor you see a stack of icons. Drag the left edge of the stack until you can see the panels' names.

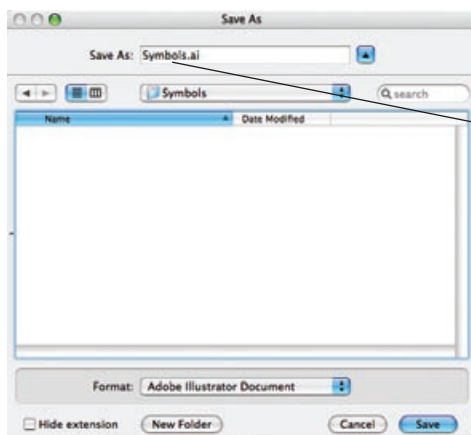
This stack is called the dock, and it contains active panels. This user interface appeared with the Creative Suite 3 applications. It is a significant improvement over older versions of Illustrator, in which panels had fixed minimum widths and couldn't be grouped.



Drag this thin bar to the left to widen the stack of panel icons (called the dock) until you can read the name of each icon.

8. Choose **File>Save As (or press Command/Control-S)** and navigate to your **WIP>Symbols** folder.

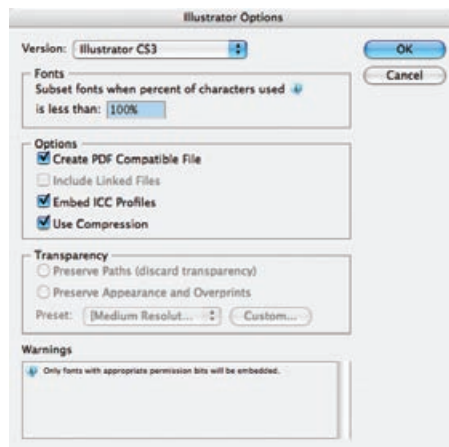
When you save an Adobe Illustrator file for the first time, you encounter the Save As dialog box. It gives a number of options, including the ability to save a file using a different name.



This name defaults to Symbols.ai since you named the file Symbols when you first created it. If you hadn't named the file when you first created it, the default name would be Untitled.ai.

## 9. Click Save, and then click OK in the Illustrator Options dialog box.

These options determine what will be stored in the file. In most cases, you can simply leave these options at their default values.



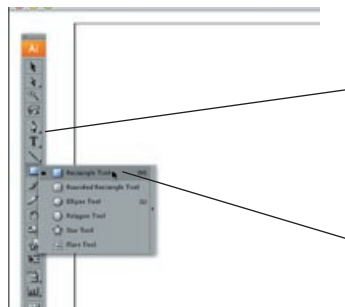
## 10. Leave the file open for the next exercise.

### DRAW SQUARES AND CIRCLES

The best place to start is at the beginning, and that holds true for learning how to use Illustrator. Before you can create award-winning illustrations, you have to learn the basics, such as drawing squares and circles.

#### 1. Continue working in the open file. In the Tools panel, click the Rectangle tool and hold down the mouse button.

As you may remember from reading the chapter about the Illustrator user interface, many tools have alternate or nested tools, and the Rectangle tool is one such tool.



Any tool that displays these tiny black icons in the lower-right corner comes in several different varieties. These sets of tools are called nested tools.

Select the Rectangle tool from the Toolbox. If you hold down the mouse button, you'll see the alternate (nested) tools.

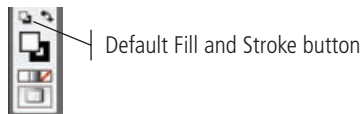
### What are Default Values?

A **default value** is a setting that was either originally set up by the manufacturer or (in many cases) was the last setting entered by the last person using the program. Default values (also called simply “defaults”) are related to such settings as the size of your document, how Illustrator interprets and translates colors (Web or print), and a host of other conditions. Almost every tool and function in the program has default parameters: How thick is a line? What color fills a circle? What is the transparency of the edge?

If you change a value that was originally set by Adobe, it's likely the change will remain in place until you change it again. Almost all default settings work that way — they can be modified and customized by the user. As you expand your knowledge of the Illustrator program, you'll become familiar with each of the default settings, and you'll know which ones you need to modify to better suit your unique workflow.

## 2. Click the Default Fill and Stroke button at the bottom of the Tools panel.

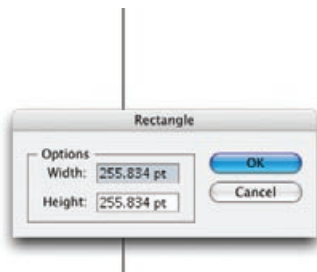
Clicking this button restores the fill to white and the stroke to black.



## 3. Option/Alt-click the Rectangle tool anywhere on the empty page.

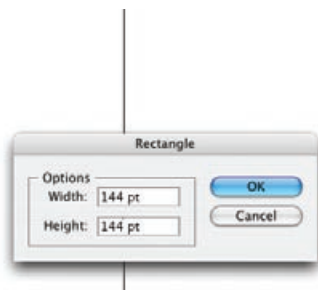
The resulting dialog box asks you how big you want the rectangle to be. The default measurement system is pixels, but if the machine you're working on has been used before, the dialog could show any of Illustrator's measurement units.

You can enter a number and type a different unit of measurement ("pt" for points, "i" for inches, "mm" for millimeters, and a few others that are rarely used) in these fields.



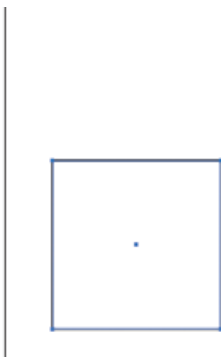
## 4. Type "2 in" into the Width field and press Tab to move to the Height field.

When you move to the next field, Illustrator calculates the conversion of inches (the "in" you put in the Width field) to points (the 144 pt that appears in the Width field after you moved to the Height field).



## 5. Type "2 in" into the Height field and click OK.

A box appears with its center exactly where you clicked the Rectangle tool. You now know one way to draw a box (or circle, or almost any other basic shape) that's exactly 2 inches square.



### Key Command:

Press Command/  
Control-H to show or  
hide the bounding box  
of any selected objects.  
Objects or functions  
that turn on and off by  
pressing the same key  
command are said to be  
**toggled functions** or  
simply **toggles**.

### Note:

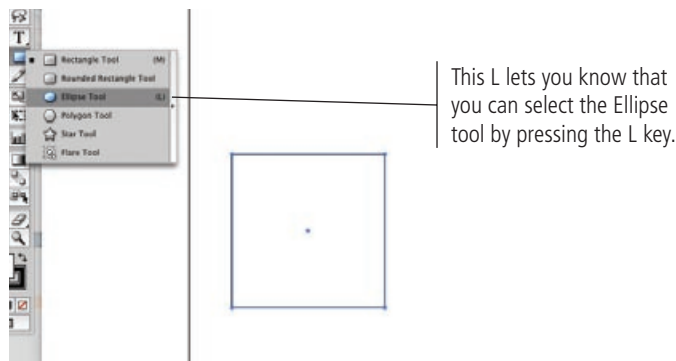
A **point** is a unit of  
measurement that comes  
from the traditional  
typesetting industry; there  
are 72 point in an inch.

## 6. Now choose the Ellipse tool from the nested tools under the Rectangle tool.

Ellipse is another name for oval. The Ellipse tool can draw ellipses or perfect circles if you hold down the Shift key while you draw the shape. Similarly, the Rectangle tool can draw perfect squares if you hold the Shift key while you draw or simple rectangles if you use only the mouse when you create the shape.

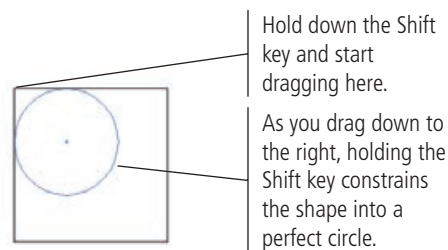
**Key Command:**

*Press the L key to access the Ellipse tool.*



## 7. Click the upper-left corner of the square that's already there and drag to the right and down.

The circle begins to appear in the square you already drew. Press the Shift key to keep the circle perfectly round.



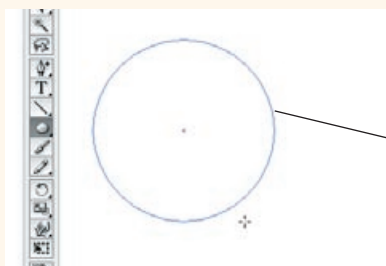
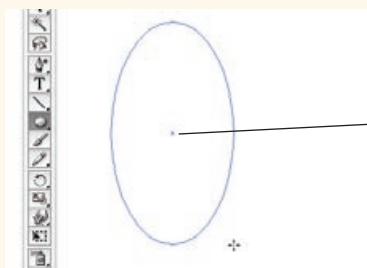
## Drawing Primitive Shapes

### ILLUSTRATOR FOUNDATIONS

If you simply Option/Alt-click a shape tool in the drawing window, you can determine the width and height of the shape by entering the appropriate values in the dialog box that appears. The center of the shape will be positioned exactly where you clicked, which is what you did in Step 3 of this exercise.

Second, you can click and drag immediately (which keeps the dialog box from appearing) and simply release the mouse button where you want to end the shape. If you hold the Option/Alt key while drawing a primitive shape, it grows outward from where you first click, with the exact center of the object as its starting or **origin** point.

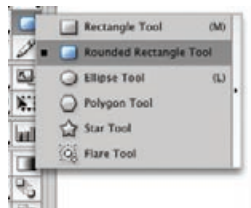
Lastly, if you press the Shift key while drawing any of these primitive objects, the height and width will remain equal, and the shape will be a perfect circle, square, star, or polygon. A primitive object drawn while pressing the Shift key, and thus with equal heights and widths, is said to be **constrained**.





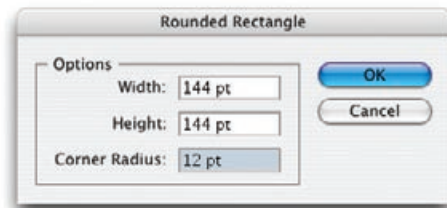
8. Release the mouse button to create the shape.
9. Select the two objects on the page (Edit>Select All) and press Delete/Backspace to delete them.
10. Select the Rounded Rectangle tool.

A rectangle or square can either have regular (square) corners or rounded corners. A rounded rectangle is the same as placing one-quarter of a circle in the corner of a regular square.



11. Click the tool cursor on the page and create a 2" rounded square with a 12-pt corner radius.

This will become the frame for all the symbols you create in this project.



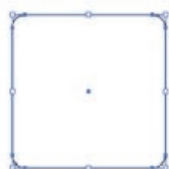
12. Save the file and keep it open for the next exercise.

## EDIT ANCHORS AND PATHS

As we mentioned earlier, all objects you create contain two basic building blocks: anchor points, which appear any time you click the Pen tool (and other tools) on the page, and paths, which are lines that connect anchor points. In this exercise, you learn to work with these primary components of an Illustrator drawing.

1. If it's not already open, open the Symbols.ai file you created earlier.
2. Choose the Selection tool (the solid arrow) and select the square you created in the previous exercise.

The hollow squares you see around the main object are the corners of the **bounding box** — the visual border around an object. The bounding box makes it easier to stretch, rotate, and scale objects.



These hollow squares are the corners of the object's bounding box.

### Key Command:

Press Command/Control-A to select all the objects on the page.

### Note:

A rounded-corner rectangle is a square with the corners cut at a specific distance from the end, and the two resultant edges connected with part of a circle whose radius is equal to the amount of the rounding.



This imaginary circle has a 12-point radius.

### Key Command:

Press Command/Control-Shift-H to show or hide the bounding box.

### 3. Choose Hide Bounding Box from the View Menu.



In the previous step, you could see the object's bounding box; it is no longer visible.

### 4. Use the Zoom tool to enlarge the upper-right corner of the box.

To zoom in this manner, simply draw a marquee with the Zoom tool. If you draw a three-inch marquee, those three inches of your page will expand to fill the screen.



#### Key Command:

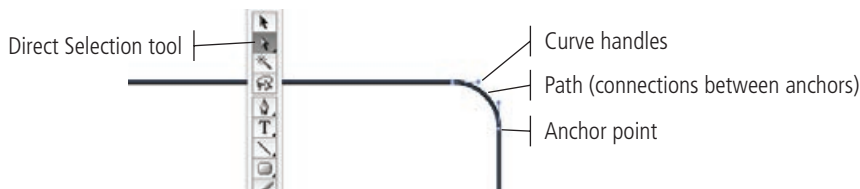
*Pressing the Option/Alt key when you click with the Zoom tool zooms out, or reduces your view percentage.*

### 5. Using the Direct Selection tool (the hollow arrow), click anywhere on the blank drawing window outside the shape.

This action deselects the square so you can select part of it.

### 6. Click the round corner to select its path. Do not release the mouse button.

When you draw primitive shapes, Illustrator creates the necessary anchor points automatically. Clicking between anchor points with the Direct Selection tool allows you to select individual paths (the lines that connect two anchor points). Curve handles come out of anchor points on either side of a curve. By pulling curve handles in one direction or another, you can bend and shape a curve — another foundational aspect of drawing with Illustrator.

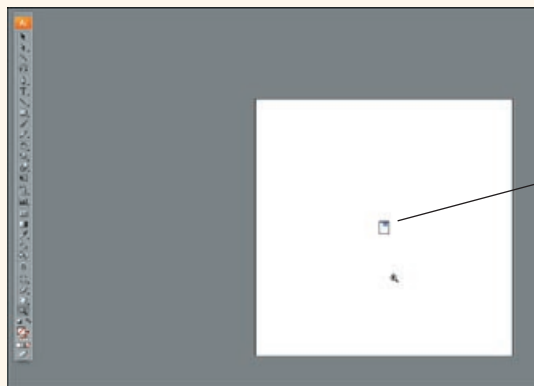


## Zooming In and Out

While creating a drawing, you will undoubtedly zoom in and out many times. At one moment, you may want to look at your drawing as if it were across the room; at another moment, you may want to look at the tiniest detail at very close range. There are a number of ways to step back from your drawing or move in closer for a detailed examination.

First, you can press the Plus (+) key to zoom in to a maximum of 6400%, or press the Minus (-) key to zoom out to the minimum of a little more than 4%.

You can fit a drawing into the available space by pressing Command/Control-0, or you can look at a drawing in the actual (100%) size by pressing Command/Control-1.



The page zoomed out to the minimum view percentage.

You can also simply click with the Zoom tool. Using only the Zoom tool zooms in; holding down the Option/Alt key with the Zoom tool zooms out (also referred to as “stepping back”). Finally, you can drag a marquee with the Zoom tool to zoom in on a specific area.

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**7. Pull the path (the curved part of the line) slightly up and to the right.**

You see the curve handles move a bit, and you see the path — or at least a very thin version of the path — move as you pull on it.



**8. Press Command/Control-Z to undo the shape change.**

**9. Save the file and keep it open for the next exercise.**

## Stage 2 Scaling, Cloning, and Alignment

Before learning how shapes and objects are filled and stroked, let's look at how objects interact. You'll do this by temporarily creating an object and moving it on top of and underneath another object (called **stacking**). At the same time, you can learn about **cloning**, or creating an exact duplicate of an existing object; **aligning** objects, which is lining up objects' tops, centers, bottoms, or sides; as well as **distributing** space between objects.

### SCALE AN OBJECT

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**Scaling** refers to re-sizing an object. You can scale an object in several different ways. For example, you can make an object smaller (*scale it down*) while maintaining the same proportion (height and width) of the original object. You can also make an object larger (*scale it up*), stretch an object, and make an object wider than higher or vice versa. To become familiar with scaling, let's make the rounded rectangle you created earlier a bit smaller so you have more room to work.

**1. With Symbols.ai open, use the Selection tool (solid arrow) to select the rounded rectangle.**

You'll know when an object is selected when you can see its anchor points and connecting paths.

**2. Choose View>Show Bounding Box.**

The bounding box shows the outer parameters of an object. Bounding boxes don't look like normal anchor/path objects; you only see eight anchors or handles regardless of the shape of the object — one on each corner and one on each side (top, bottom, right, and left). You can view the bounding box of any irregular-shaped object and still see the same eight handles.

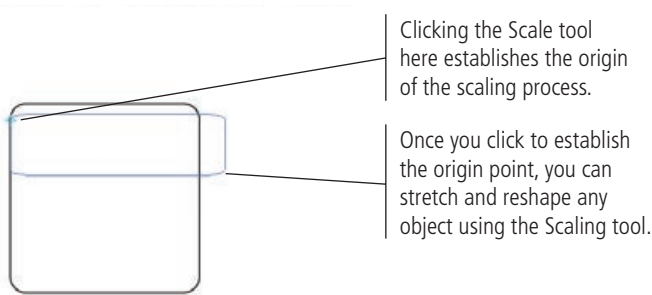
### 3. Select the Scale tool in the Tools panel.

Take a moment to look at the two alternate tools under the Scale tool. The first one is a **Shear tool**, which is used to distort and skew objects; the second is the **Reshape tool**, which is used to pull and push on the paths that connect anchor points.



### 4. With the Scale tool active, click once on the anchor point (not the bounding box handle) on the upper-left side, then click the bottom-right handle of the object and drag to resize it.

Clicking the upper-left anchor point establishes the origin point of the scaling process. The object is stuck to the page at the point you clicked the Scale tool. The rest of the object, however, is pliable, stretching horizontally and vertically, as you prefer.

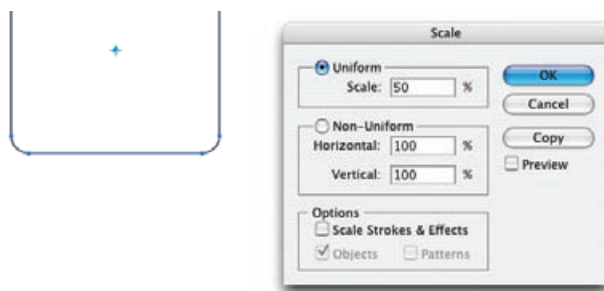


### 5. Press Command/Control-Z to undo the scaling of the object.

### 6. Still using the Scale tool, hold down the Option/Alt Key and click the center of the object.

The Scale dialog box that appears provides a variety of options relative to resizing a selected object: Uniform and Non-Uniform (whether the object retains its shape or is stretched differently on its horizontal and vertical axes), and whether you want to scale an object's strokes, effects, and patterns when you resize it.

### 7. Type "50" in the Scale field and click OK.



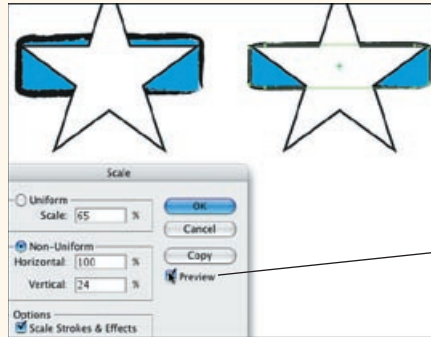
### 8. Save the file and keep it open for the next exercise.



## Previewing Transformations

The Scale function — and many other Illustrator functions — are better understood when you have some idea of what will happen when you click OK. That's where the Preview function comes in. Most (but not all) of the dialog boxes associated with visual-altering functions in Illustrator have Preview check boxes.

For functions such as scaling — particularly when you're changing scale non-uniformly (the horizontal and vertical scales are different from one another) — the Preview function can be invaluable.



This Preview check box is common throughout Illustrator and the other Adobe Creative Suite applications, as well.



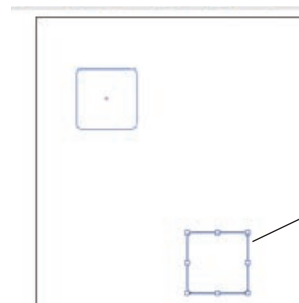
## CLONE AND ALIGN OBJECTS

Cloning is another way of saying, “make an absolutely perfect duplicate of this object.” In this exercise, you make clones of the rectangle.

Once you have more than one object (cloned or not), you can use the Align panel not only to ensure perfect alignment of many object attributes (tops, sides, centers, bottoms, etc.), but also to distribute objects evenly — using the edges (tops, sides, or bottoms) and an average space, or using precise values.

1. With the Symbols.ai file open, choose the Selection tool (solid arrow).
2. Press the Option/Alt key, and then click and drag the rectangle down and to the right.

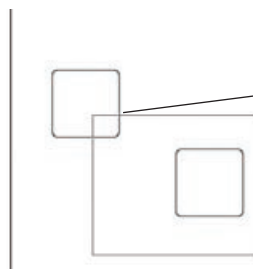
Dragging an object while holding down the Option/Alt key clones the object. The copy appears where you release the mouse button.



Option/Alt dragging an object creates a perfect copy (clone).

3. Use the Selection tool to draw a marquee that touches both rectangles.

When you use the Selection tool, you don't have to entirely surround an object to select it. Any object even partially within the selection marquee is selected.

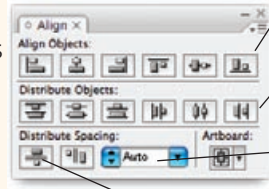


When you're selecting multiple objects with the Selection tool, you only have to touch them to select the entire object. If you were using the Direct Select tool here, only the lower right of this rectangle would be selected.



# Aligning and Distributing Objects

Drawings often require that you accurately distribute objects on the page. For example, you may need to align a company logo on a business card; or you may need to distribute a row of stars in a variety of ways on different-shaped paths. All this and more can be accomplished using the Align panel, which you use extensively in the remainder of this project.



These buttons align objects to each other or to the page on which they're located.

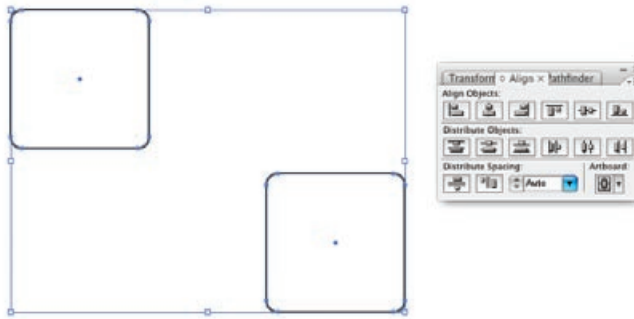
These buttons distribute objects, either relative to each other or to the page.

This button aligns selected objects to the page instead of to each other. (The small arrow allows you to align objects to a cropped area).

These buttons distribute selected objects relative to their horizontal or vertical spacing; the field allows you to enter exact values for the spacing.

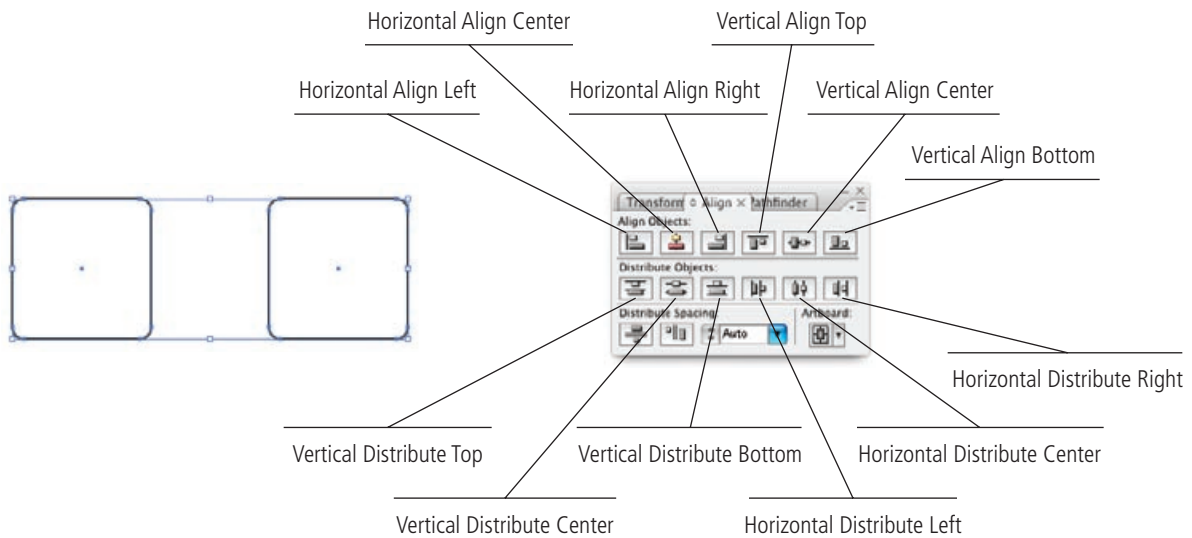
## 4. With both rectangles selected, choose **Align** from the **Window** menu.

The Align panel appears as a floating panel. It's not connected to the various panels in the dock.



## 5. Align the tops of both rectangles by clicking the **Vertical Align Top** button on the **Align** panel.

The buttons in the Align panel can be used to align and distribute objects in a wide variety of ways.



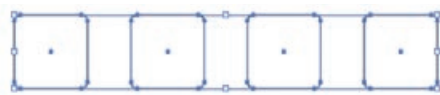
## 6. Press Shift, and then Option/Alt drag the two selected objects to the right.

This command clones both rectangles. Pressing the Shift key constrains the movement of the duplicate to 90° or 45° angles.



## 7. Select all four rectangles and click the Horizontal Distribute Center button on the Align panel.

This is a very efficient way to align and then instantly space/distribute a number of different objects, using only two clicks to accomplish the task.



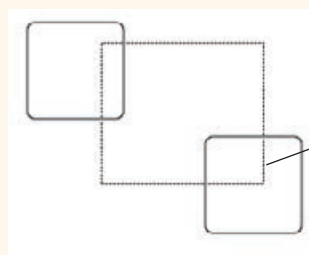
Click this button to evenly distribute the space between the objects' horizontal centers.

These two buttons allow you to control the specific (numeric) vertical or horizontal spacing between selected objects.

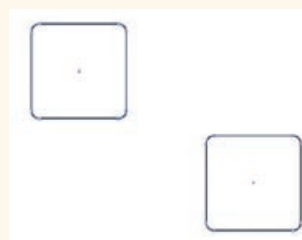
## 8. Save the file and keep it open for the next exercise.

## Selecting Objects and Anchor Points

A marquee created with the Direct Selection tool (the hollow arrow) selects only those anchor points and/or paths that the marquee touches. In the image on the left, you can see the marquee drawn with the Direct Selection tool. In the image on the right, you can see that only those anchors surrounded by the marquee are selected; the other ones are hollow and are therefore unselected.



Using the Direct Selection tool selects only those anchor points surrounded by the marquee and displays the anchor points as solid black.



These unselected anchors appear hollow.

## Stage 3 Controlling Fills and Strokes

The rounded squares you created in the previous lesson have two primary components. The first is the stroke, or the border that delineates the edges. The second component is what fills the square. Both attributes — stroke and fill — can either be invisible (with a value of None) or they can have color.

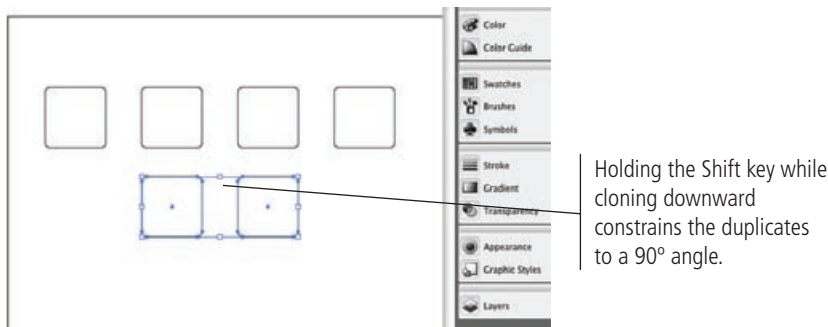
### CONTROL OBJECTS' FILL AND POSITION

In this exercise, you create a few temporary rectangles, and then use them to learn how to manage fills and strokes. When you're done, you'll simply delete the rectangles. Creating temporary objects to test a color, effect, or pattern before applying it to an actual document is a tried-and-true method that digital artists use every day in on-the-job situations.

#### 1. With Symbols.ai open, select the two objects in the middle of the row and clone them so you have two copies.

Drag the two clones while holding the Shift key so they align perfectly below the two originals. At this point, you should see six rounded rectangles; four on one row and two underneath.

You should also be able to see the dock, which should contain 11 **iconized** panels. These panels were positioned when you called the default workspace in the first part of this project. If you see something different on your screen, simply choose Window>Workspace>[Basic] to restore the Adobe-defined default settings.



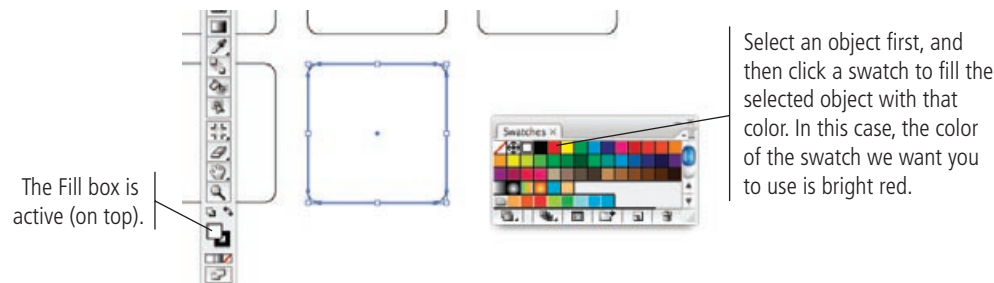
#### 2. Select the rectangle on the right side of the second row, and then click the Fill box at the bottom of the Tools panel.

Now that you have a couple of extra rectangles on the page, you can use them to experiment with changing the color of paths and fills.

#### 3. Click the Swatches icon in the dock and drag the panel away from the dock.

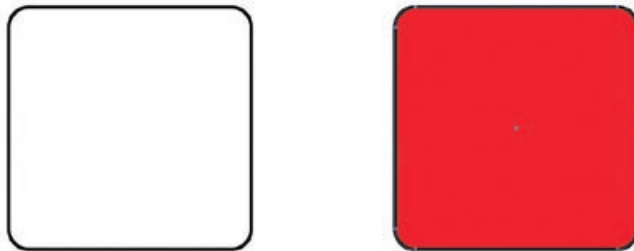
#### 4. Click the first red swatch in the first row of swatches.

When the Fill box is active in the Tools panel, clicking a swatch fills the selected object with that color.



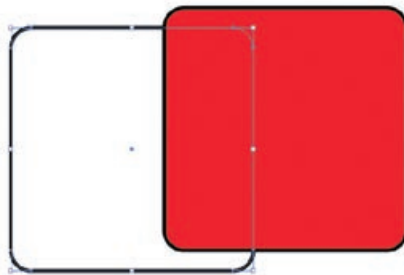
**5. Using the Zoom tool, zoom in on the two lower objects until they fill the drawing window.**

Without zooming in, you could easily see that picking the red swatch filled the selected rectangle with red. Looking closer, however, you can also see that a black stroke (outline) surrounds the red fill.



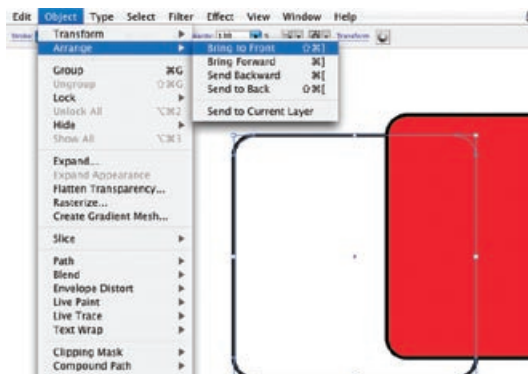
**6. Use the Selection tool (the solid arrow) to drag the left rectangle underneath the rectangle on the right.**

The lower left of the red object covers most of the right side of the white object. The position of an object, whether one is on top of or underneath another, is determined by the order in which the objects are created — unless you manually move an object up (higher) or down (lower) in the stack.



**7. With the white-filled rectangle selected, choose Object>Arrange>Bring to Front.**

With an object selected on the drawing page, you can use the Arrange menu options to bring that object forward to the top, to place it underneath another object, or to send it to the bottom of a stack.



**Key Command:**

*Stacking order refers to which object is on top and which is below. It's a good idea to learn the key commands associated with stacking and moving stacked objects:*

*Bring to Front:  
Command/Control-Shift-]*

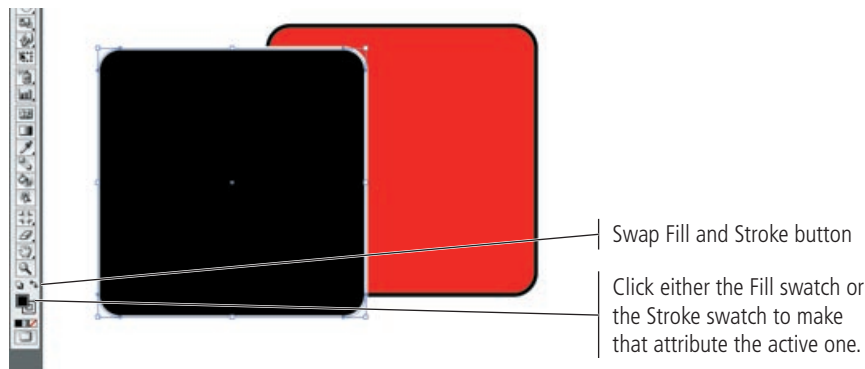
*Bring Forward:  
Command/Control-]*

*Send Backward:  
Command/Control-[*

*Send to Back:  
Command/Control-Shift-[*

## 8. Click the Swap Stroke and Fill button at the bottom of the Tools panel.

The red object remains unchanged, but the top rectangle is now quite different. The stroke color swapped with the fill color, so the fill is now black and the stroke white.



### Note:

*If you want to change an object's fill color, bring the Fill swatch to the front in the Tools panel. If you want to change an object's stroke color, bring the Stroke swatch to the front.*

## 9. Save the file and keep it open for the next exercise.

## ALTER STROKE ATTRIBUTES AND OBJECT TRANSPARENCY

By default, an object's fill is solid; if it's on top of another object, the underlying object is covered completely. Objects also possess an attribute known as **opacity**, which refers to an object's **transparency** or how much an underlying object "shows through." In this exercise, you change the transparency of the black rectangle you created earlier.

### 1. With Symbols.ai open, zoom in so the two rectangles fill your monitor.

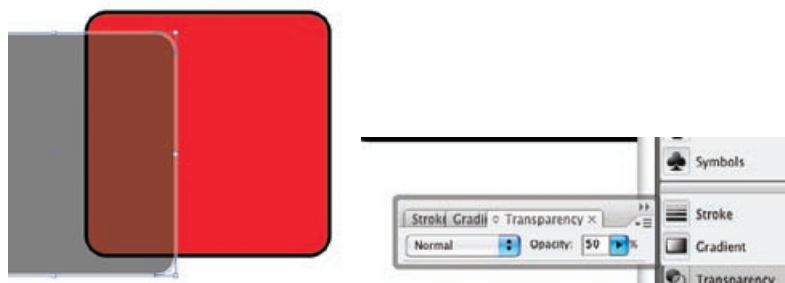
You can use the Zoom tool or another method of zooming in.

### 2. Click the Transparency icon in the dock.

The Transparency panel opens on your screen.

### 3. Make sure the black-filled shape is selected. In the Transparency panel, drag the Opacity slider (the small triangle) until the Opacity field says 50%, or enter the number manually.

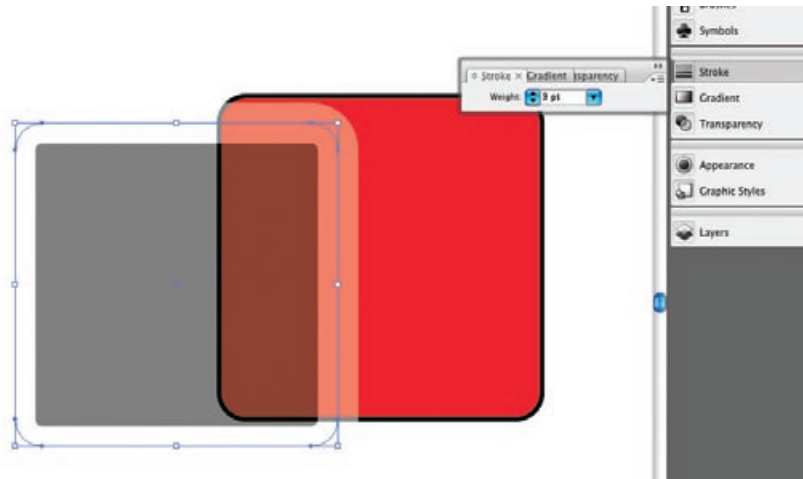
While both methods are equally effective, the field works best for entering specific values (for example, 42%), whereas the slider makes it easier to experiment with different effects.





**4. Access the Stroke panel in the dock and change the weight of the stroke to 9 pt.**

The new Stroke value — combined with the Transparency values, the visibility of the paths and anchor points, and the visibility of the bounding box — allows you to see how Illustrator handles individual vector objects, regardless of their complexity.

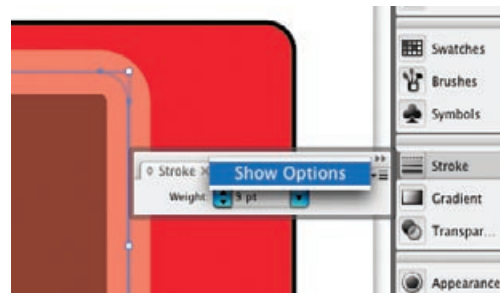


**Note:**

*The View>Hide Edges command turns off the visible nature of paths. If the edges were hidden, the screen image in Step 4 wouldn't look the same; you would see the thicker stroke but not the actual paths.*

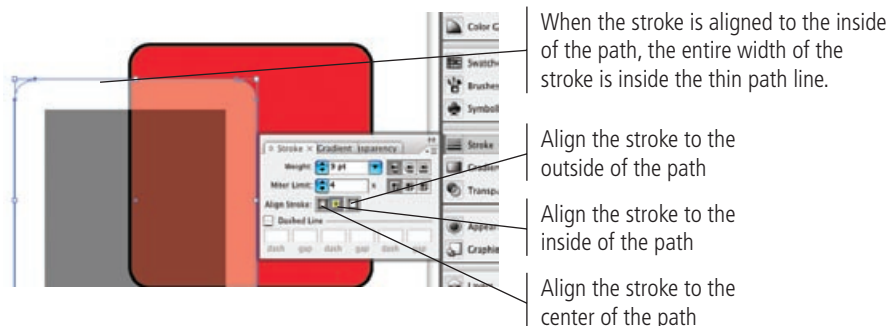
**5. On the Stroke panel, click the small button on the upper-right corner and choose Show Options from the panel options menu.**

By default, the thin path of the shape is in the exact center of the thicker stroke. The stroke and the path are connected, but they are separate, individual attributes. You can change a number of stroke attributes using the stroke options.



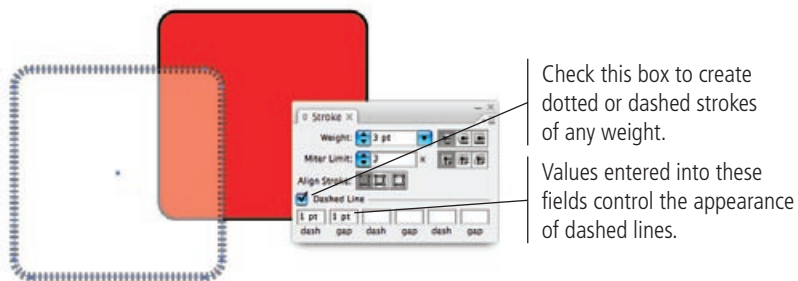
**6. Click the Align Stroke to Inside button (the center button) in the Stroke Options area.**

Using the stroke options, you can determine where the stroke ends relative to the path, how the path is aligned to the stroke, and more.



7. Click the **Align Stroke to Center** button to return the stroke to its original position.
8. **Swap the stroke and fill colors for the black rectangle.**  
The rectangle again has a white fill and a black stroke (the default settings).
9. **Change the Weight field (thickness) to 3 pt, and change the Miter Length field (the width of the stroke's edge) to 3.**
10. **Click the Dashed Line check box and enter "1 pt" for the first dash and gap of the dashed line.**

The Dash value defines how big each "stretch" of the line will appear. The gap is the space between each dash.



11. **Delete the two temporary objects, save the file, and keep it open for the next exercise.**

## Bridging the Space Between Adobe Applications

The screen image shown here came from Adobe Bridge, an application that came with Adobe Illustrator. Bridge is designed to server as a centralized repository for "all things Adobe." You can store, organize, and manage the multiple file types and media formats supported by the various families of Adobe applications — everything from EPS illustrations to native Adobe Illustrator, Photoshop, InDesign, Flash, and Dreamweaver files, as well as Premiere, Fireworks, and more. For more information, visit [Adobe.com](http://Adobe.com) and search for "Bridge."



## Stage 4 Drawing Other Simple Objects

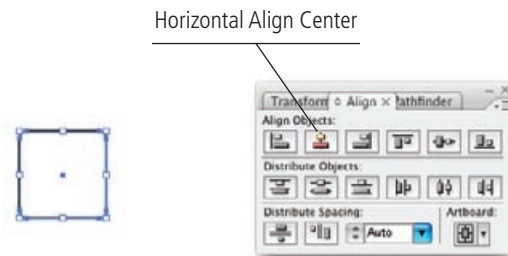
At this early stage of the project, you've already developed many of the necessary skills for creating Illustrator drawings. The next step is to draw something meaningful, such as a snowflake or a skull.

To complete this project, you must draw 4 different international warning symbols. Drawing these objects — within the confines of your already-perfect frames — will teach you a great deal about drawing complex illustrations.

If you remember from the client meeting, the client's bitmap icons work fine on the Web, but they look terrible in print. After you redraw the icons in Illustrator, the client will be able to print the icons anywhere, with no loss in quality — which is the primary advantage of vector-based artwork vs. raster-based images.

### USE GROUPS TO DEVELOP ARTWORK

1. In Symbols.ai, select the four rectangles on the page.
2. Display the Align panel (if it's not already open) and click the **Horizontal Align Center** button.



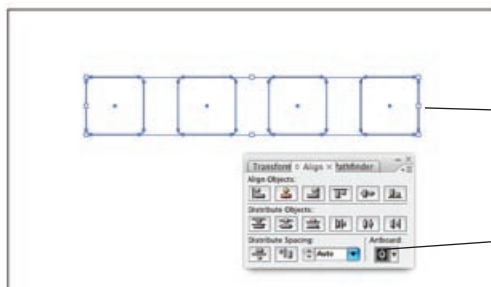
#### Key Command:

Press **Command/Control-G** to group selected objects. Press **Command/Control-Shift-G** to ungroup grouped objects.

That's not at all what you need to do. Instead, you want to center the row of four squares to the **artboard** (another word for the page you're working on). To do that, you first need to group the row of four rectangles.

3. Press **Command/Control-Z** to undo the error.
4. Choose **Object>Group** to group the four rectangles.

A **group** is a set of individual objects connected together so they behave as a single, discrete object (or a component of a larger, more complex object).
5. Click the **Artboard** button on the Align panel, and then click the **Horizontal Align Center** button to align the entire row on the artboard.

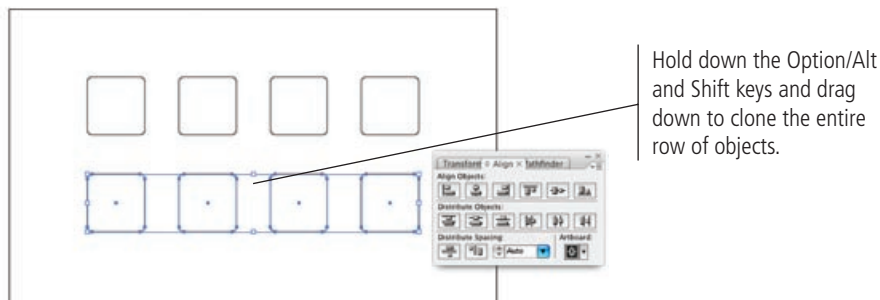


Since you already clicked the Artboard button, the objects become centered relative to the width of the page.

Clicking the Artboard button aligns the group to the page, not to each other.

## 6. Clone the row so there are two rows of rectangles on the page.

Make sure there's a good amount of space between each row, as shown below.



## 7. Choose Object>Transform>Transform Again.

This command duplicates the last transformation you applied, whether on the artboard or in a dialog box. For example, if you used the Move dialog box to both move and rotate an object at the same time, the Transform Again command would both move and rotate the current selection.

### Key Command:

Press Command/  
Control-D to apply  
the Transform Again  
command.

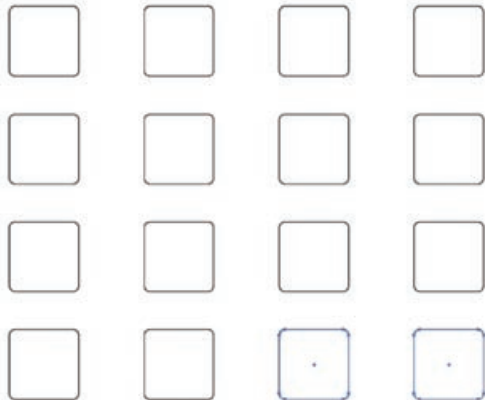
## 8. Transform the selection again to make another copy of the selected row.

## 9. Try using the Selection tool to select and delete the last two rectangles in the bottom row.

Each row is a group, and the Selection tool can't select individual pieces of a group. To delete individual pieces of a group, you must use the Direct Selection tool.

## 10. Press Command/Control-Z to restore the fourth group.

## 11. Using the Direct Selection tool (hollow arrow), drag a marquee around the last two objects on the bottom row.



## 12. Delete the two selected rectangles.

## 13. Select all objects on the page and turn all fourteen objects into a single group.

## 14. Save the file and keep it open for the next exercise.

Now you have everything you need to create the international warning signs: you have the page to draw on, and you have 14 borders in which to place the graphics. The graphics will act as templates that you can trace to create the symbols.

## IMPORT TEMPLATES AND PLACE GUIDES

Many of your projects will require you to start with something outside the realm of computer graphics. It's possible that some of your best illustrations will start with old drawings or photographs. Many award-winning designs started out with very humble beginnings, such as a quick sketch on a napkin at a roadside café.

In this exercise, you bring an existing piece of art into your project and transform it into perfect Illustrator artwork. You start the process by importing your template, which is a pre-existing object supplied by your client.

### 1. In Symbols.ai, zoom in to the upper-left corner of the 14-rectangle grid.

When we say “grid,” we're not talking about the actual Adobe Illustrator grid; we're referring to the 14 rectangles that look like a grid on your screen. You'll learn more about the Illustrator grid later in this book.

### 2. If you can't see rulers on the left and top of the document window, choose View>Show Rulers.

### 3. Choose File>Place and double-click the file named Cold.tif from the RF\_Illustrator>Symbols folder.

The image appears in the center of your monitor, but that's not where we want it to be. We want it to be perfectly centered inside the first rectangle on the first row.

#### Key Command:

Press Command/  
Control-R to toggle rulers  
on and off.

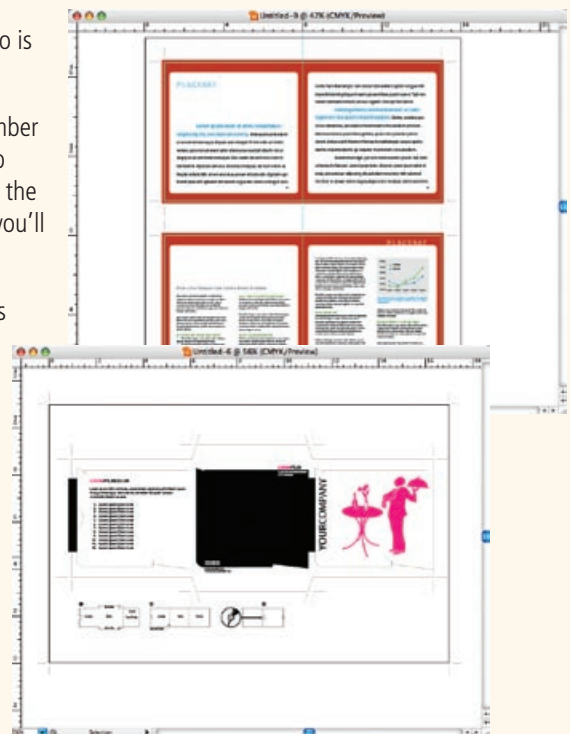
## Using Templates

**Templates** are Illustrator files that are saved in such a manner that they can't be altered, but they can be saved as all-new documents. Templates contain information, illustrations, layouts, backgrounds, and workspaces that you can use to create other projects. For example, if you create a template for your company's business card, you can use that template to create business cards for your clients as well — all you need to do is save the template under a unique file name and make the necessary changes. You will save hours of development time using templates. The hard work is done once, and then all you need to do is “tweak” (make minor changes) the template to create new files.

When you first start Illustrator, the Welcome screen provides a number of different categories of new drawings such as Print projects, Web projects, Devices (such as telephones), and more. At the bottom of the list on the right is a folder icon named Templates, which is where you'll find the templates the artists at Adobe supplied for you.

The images to the right show two examples of the many templates that come with Illustrator. Artists working on these types of projects could save hours of development time if they used the guides, shapes, type positions, font selections, and general production information contained in the templates. It would be easy to change client logos, copy, and typefaces without having to re-invent the entire document from scratch.

The use of templates differs widely from one user to the next. Some people make their own templates, choosing not to rely on the dozens of templates that ship and install with Illustrator. Other people — particularly those in corporate environments where they need a flyer today and a Web site tomorrow — use the pre-built Adobe templates with excellent results. And then there are certain people who have been using Illustrator for decades but don't realize that the program includes templates.



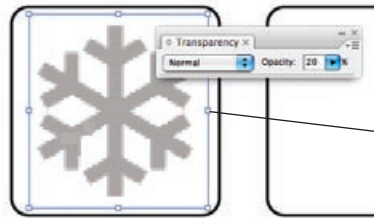


**4. Drag the imported Cold.tif image into the center of the first rectangle. Use the Arrow keys to fine-tune its position.**

The Arrow keys move selected objects by 1 pixel at a time. Pressing Shift with any of the Arrow keys moves the selection by 10 pixels at a time.

**5. Using the Transparency panel, lower the Opacity value of the object to 20%.**

Reducing the opacity of an imported template image is quite common. Illustrator can automatically identify something as a template and reduce its opacity, but it's best to learn how to do it done manually.



The bounding box of a placed image has the same eight handles as any other object, but it also has crossed diagonal lines.

**6. Click within the horizontal (top) ruler and drag down until you see a guide on the exact center of the bounding box.**

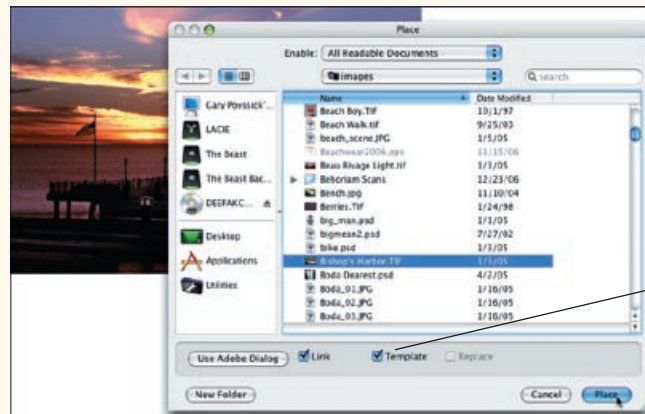
Remember, the bounding box is the external border of any object or group of objects, including placed images. In addition to a bounding box, placed images also have crossed diagonal lines. You can use the bounding box handles and the crossed lines to identify the vertical and horizontal centers of an object.

## Placing Images

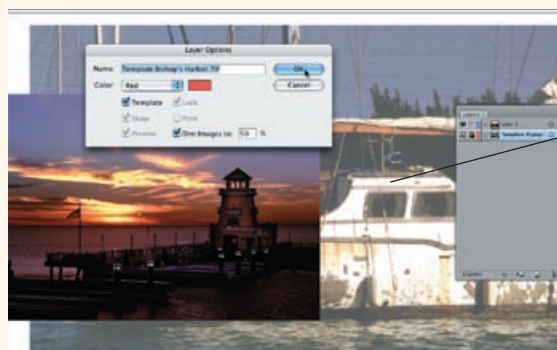
There are many cases where Illustrator projects require pieces from other Illustrator documents or entire documents from other programs such as Photoshop, InDesign, Flash, or Dreamweaver. (Extended functionalities, which are outside the realm of this book, actually provide the ability to work with video formats.)

When you place files into Illustrator, you can either **embed** them (make them part of the document you're working on) or you can **link** them (to print or publish your drawing, you need the placed files, as well as the file itself, available to the program). Embedding is the default condition for placed files. If you want to link a file, you can make that selection in the Place dialog box.

You can also automatically place a file as a template object (which is different than the page templates we discussed earlier). The first image to the right shows one TIFF file already placed on the page. When we placed a second image, we checked the Template option in the Place dialog box. In the layout, the second image is placed on its own locked and dimmed layer, which allows you to trace the template image without moving it.

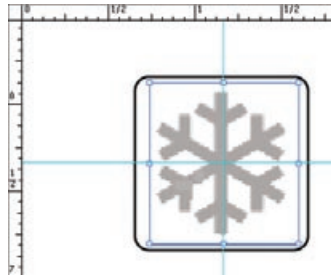


This image is going to serve as a template.



You can see how dim the second image is compared to the first one. The Dim Images To field in the Layer Options dialog shows that the layer is set to 50%.

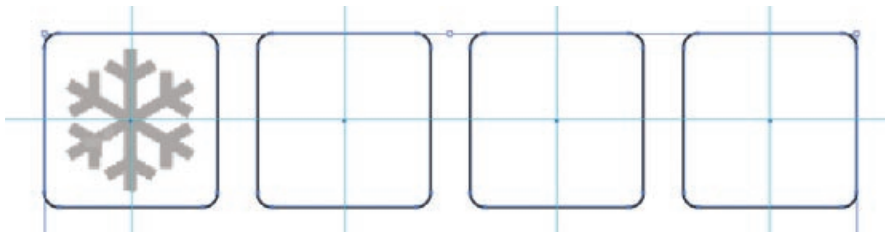
7. Drag from the vertical (left) ruler onto the center of the image's bounding box.



8. Using the Selection tool, click the group of rectangles to select them and show the center points of the rectangle shapes.

9. Drop vertical ruler guides on the centers of the remaining rectangles in the first row.

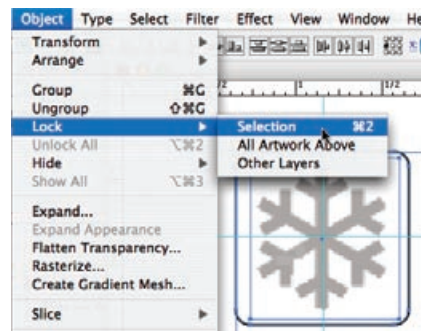
You're now ready for the remaining graphics that must be converted from bitmaps to vectors. These guides will come in handy as you move forward.



10. Use the Selection tool to select both the rectangle group and the snowflake graphic, and then choose Object>Lock>Selection.

The two selected objects (the group that makes up the first row of rectangles and the snowflake) no longer display their bounding boxes, anchor points, or paths. They're locked to the page and can't be touched unless you unlock them.

For more complex locking requirements, you can use layers — which you'll do in virtually every Illustrator project you develop. For now, though, this method works fine: selecting and locking the objects to the page and leaving non-printing guides in place.



**Key Command:**

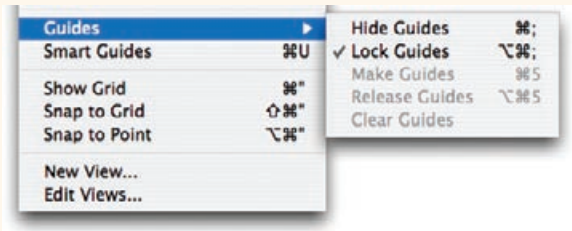
Press Command/  
Control-2 to lock a  
selected object.

Press Command-  
Option-2/Control-Alt-2  
to unlock all locked  
objects.

11. Save the file and continue to the next exercise.

# Managing Guides

Guides are visible on the artboard but do not appear in print or in exported files. You use guides to position objects, to mark edges, and for a host of other tasks. In addition to simply dragging horizontal or vertical guides onto the page, you have a number of other options for working with guides. Most guide controls are available in the View>Guides menu.



**Hide Guides** toggles guides off temporarily. When guides are hidden, you can turn them back on again by choosing View>Guides>**Show Guides**.

**Lock Guides** prevents you from selecting or moving guides already placed on the page. By default, guides are not locked; you can select and move placed guides by simply clicking and dragging in the document window. If you drag a selection marquee around an area that includes a guide, you will also select the guide — meaning you would move the guide if you moved the selection, and that would be an error. The Lock Guides command prevents this frequent mistake. When guides are locked, you can unlock them again by choosing View>Guides>**Unlock Guides**.

**Make Guides** allows you to convert a selected object into a guide. This means you can create a guide in any shape that you can draw — round, square, star, or freeform. When you convert an object to a guide, you effectively hide the stroke and fill attributes of the object.

**Release Guides** allows you to convert a guide object into a regular object; the object's original fill and stroke (before you converted it to a guide) are restored.

**Clear Guides** removes all guides from the page. If you want to remove only a single guide, you can select it (as long as it's unlocked) and press Delete.

The **Smart Guides** command, which maintains its own position in the main View menu, effectively allows you to use existing objects as guides without physically converting those objects to guides, providing valuable feedback about the location of the cursor in relation to other object on the page.

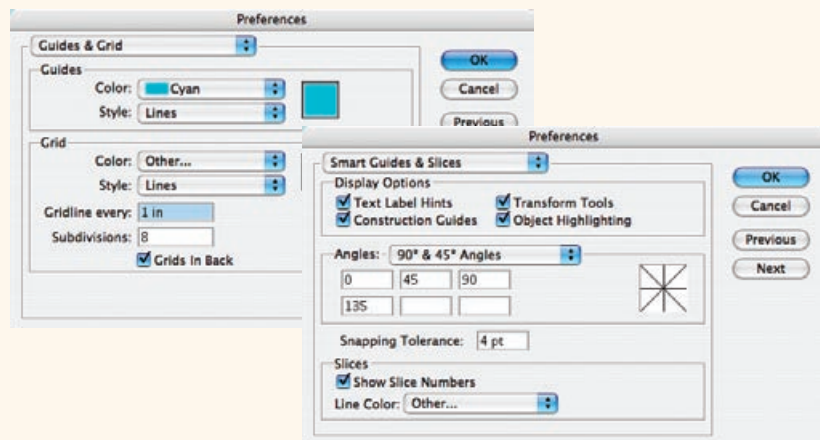


The anchor point of an unselected object is addressed by the Smart Guide feature.

Using Smart Guides, dragging the guide near the existing object shows the position (align 135°) of the cursor relative to the anchor point of the object.

You can control the appearance and behavior of guides in the Preferences dialog box. The **Guides & Grid** pane defines the color and style of guides, frequency of lines in the Illustrator grid, and the position of guides (front or back) relative to existing artwork

The **Smart Guides & Slices** pane defines which hints display in the cursor, which angles are recognized by the Smart Guide feature, and how close the cursor can be to an object before that object is recognized (called the **Snapping Tolerance**).

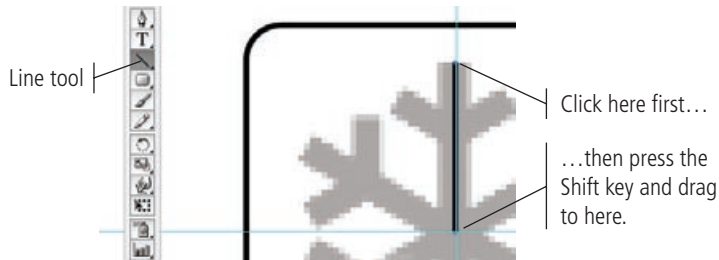


## DRAW STRAIGHT LINES

Using a combination of simple, straight lines, you can create some very intricate objects. In this exercise, you practice the technique by creating a relatively complex snowflake out of only straight lines.

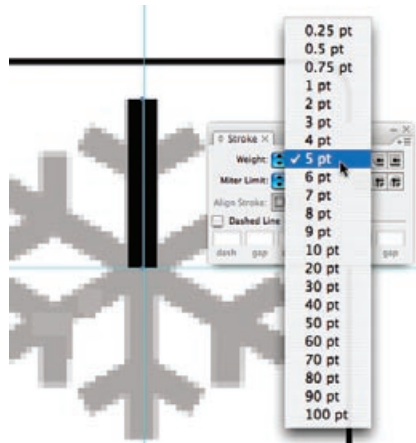
1. Continue working in the open file. Select the Line tool from the Tools panel.
2. Click at the top of the center snowflake branch, hold down the mouse button, press the Shift key, and drag to the junction of the vertical and horizontal guides.

The line stays at a 90° angle because the Shift key is constraining the drag.



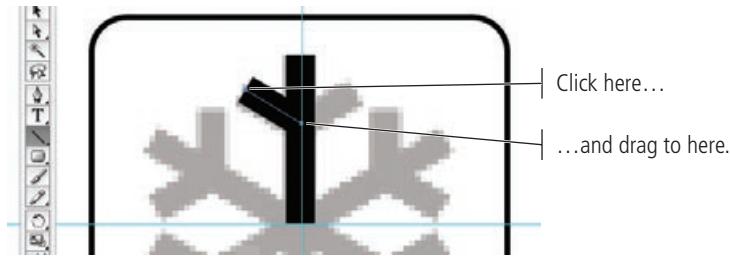
3. On the Stroke panel (in the dock), change the Weight value to 5 pt.

A range of typical stroke weights is built into the pop-up menu — everything from 1/4 (0.25) of a point to 100 points. In fact, you might consider trying several different weights, such as 3 point or 8 point, to see why we used 5 point as the best stroke width for this assignment.



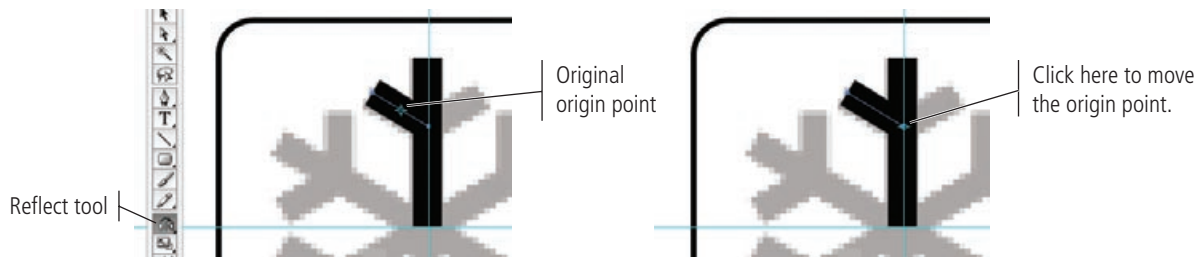
- Using the Line tool, click the upper center of the left angled line and drag to where that branch meets the vertical guide.

This creates the left side of the first “branch” of the snowflake. It’s starting to take shape.



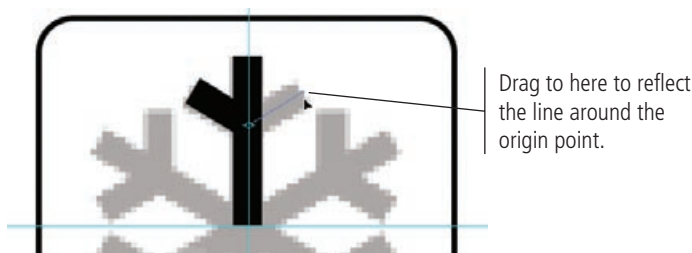
- Choose the Reflect tool in the Tools panel (it might be nested under the Rotate tool).
- Click the junction of the angle and straight lines to move the origin point of the angled line you just drew.

The **origin point** is the point from which something grows, shrinks, spins (rotates), stretches, or reflects during a **transformation**. You’ll set the origin point for a number of different transformation tools, including the Rotate tool that you use in the next exercise.



- Hold down the Option/Alt key and drag the angled line from the upper left to the upper right of the image.

It might take a few tries to get this right. Don’t forget that Command/Control-Z will undo almost any action (or mistake). When you get it right, the clone will be an exact reflection of the line you started with.

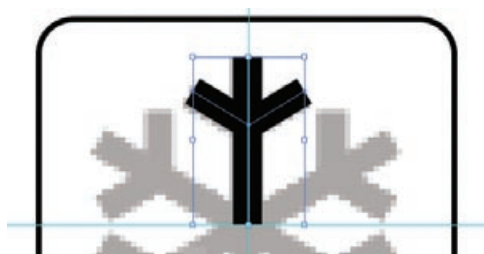


**Note:**

*Clicking once with a transformation tool such as the Reflect tool places the origin point. If the origin point is already in the correct place, you can simply click and drag to apply the transformation you want.*

## 8. Select all three line segments and group them.

Now you see the value of locking the row of rectangles and the placed Cold.tif file — you can create anything you want on top of the objects without moving them.



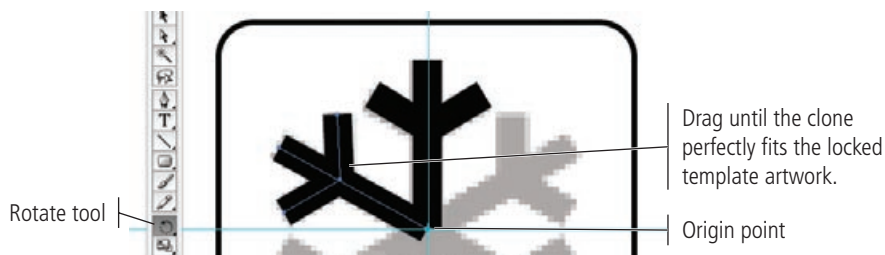
## 9. Save the file and keep it open for the next exercise.



### ROTATE AND MIRROR OBJECTS

In this exercise, you rotate, flip, and reflect copies of the set of lines you created earlier to complete the snowflake. Using these transformation techniques, you can use existing design elements (such as three straight lines) to create a complete drawing (such as a snowflake with eighteen separate and manageable components).

1. In the open Symbols.ai file, zoom into the upper-left side of the first row of rectangles.
2. Select the grouped lines on the page, and then select the Rotate tool in the Tools panel (nested under the Reflect tool).
3. Click where the two guides meet to position the origin point for the rotation.  
You did this earlier when you cloned the angled portions of the first stroke of the snowflake. You must do it again here. This origin point is also known as the **transform point**, meaning it's the spot from which objects rotate, mirror, grow, shrink, and morph (short for metamorphose).
4. Press the Option/Alt key, and then drag left to rotate a clone of the branch around the origin point.





5. With the rotated clone selected, switch back to the Reflect tool. Option/Alt-click-drag to create a clone that fits the right side of the original.

Since the origin point is already in place (at the intersection of the guides), you don't have to reposition the origin point before using the Reflect tool.

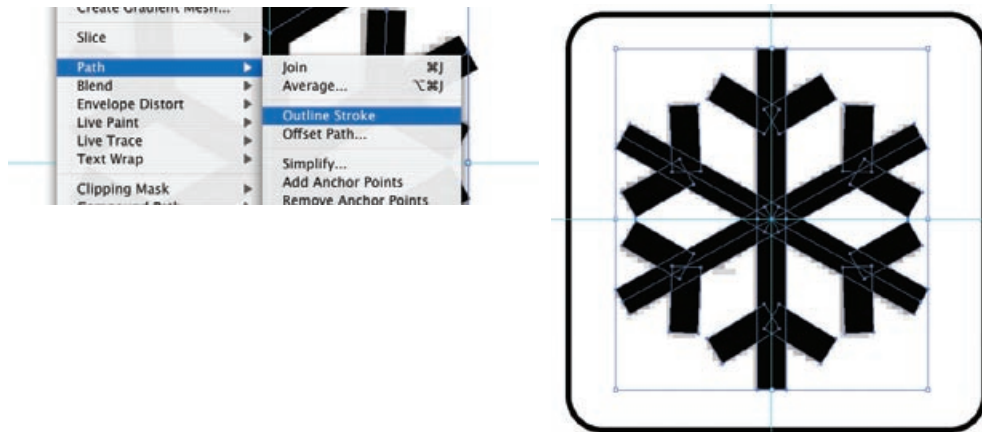


6. Select all three of the branches and reflect a clone to complete the lower half of the original snowflake.



7. Select all the branches and choose Object>Path>Outline Stroke.

The Outline Stroke command converts strokes to discrete objects. The new objects have a fill (which is the same color as the original stroke) but no stroke.



8. Select the paths and use the Object>Group command to create a single object from several components.

The Cold.tif file is now re-created as a grouped and structured collection of organized rectangles, filled with black. This image can be printed on golf balls or the side of a twenty-story building without losing a single pixel of accuracy or resolution.

**9. With the entire snowflake group selected, choose Object>Hide>Selection.**

Similar to the Lock command you used earlier, you can hide selected objects on the artboard. When objects are hidden, they are effectively locked as well, since you can't select or change a hidden object.

Also similar to locking objects, hiding and showing selections in this way can be complicated because you can only show *all* hidden objects, not just certain ones. For better control of specific objects' visibility, you should use layers.

*Key Commands:*

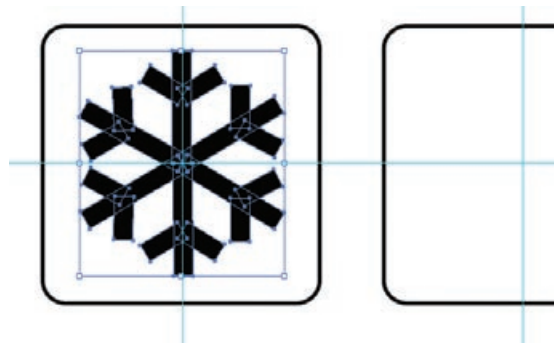
*Press Command/Control-3 to hide the current selection. Press Command-Option-3/Control-Alt-3 to show all hidden objects.*

**10. Choose Object>Unlock All to unlock the rounded rectangles and the placed snowflake image.**

**11. Select and delete the now-unlocked original snowflake image.**

**12. Choose Object>Show All to re-show the snowflake icon you created.**

When you show a hidden object, it is automatically selected.



**13. Save the file and keep it open for the next exercise.**

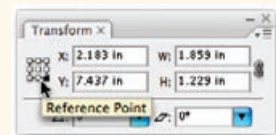
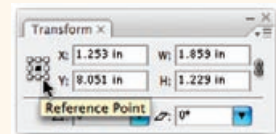
## More On Transformations

You've already had some experience with transformation: you've rotated objects while cloning them, you've changed their size, and you've reflected them. (The fourth of the major transformations is shearing, which is a form of distortion.)

It's important to consider where Illustrator considers an object to be located when you apply a transformation. You can use the Reference Point icon in the Transform panel to determine where the measurement or transformation begins. This is particularly important when you need to work on more than one object at a time, or (for example) when you need to position an object a specific distance from the center of another object.

To understand the reference point, think of the object's bounding box. The points on the Reference Point icon correspond to the object's bounding box handles and center point. Whichever point is selected in the Reference Point icon determines which bounding box handle is being measured and reflected in the Transform panel fields.

If you move the reference point from the center (top image) to the lower right (bottom image), the x-y values change to show the location of the new reference point (bounding box handle), but the height and width of the object remain the same.



## Stage 5 Drawing Complex Objects

You have learned about drawing primitive shapes, manipulating their anchor points and path components, and placing them appropriately. Now it's time to expand that core knowledge and skill set.

You learned that you can use the Object>Lock command to lock a specific object on the page. But when it comes to locking 14 objects, the Object>Lock command can be somewhat clumsy. It locks and unlocks all objects at the same time. You don't have the option of locking or unlocking individual objects. Layers, however, provide much more flexibility in locking and unlocking individual objects on the page.

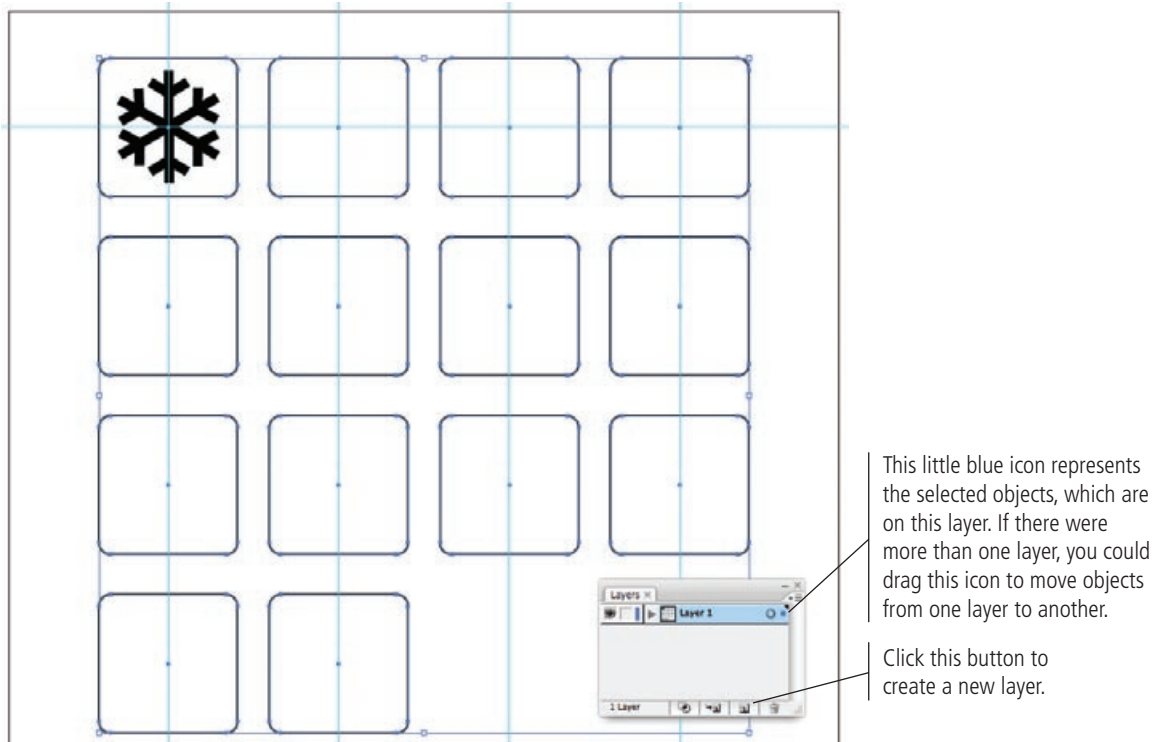
### Use LAYERS TO LOCK INDIVIDUAL OBJECTS

In this exercise, you use the Layers panel for the first time, create a new layer, and move your 14 rectangular frames onto the new layer. This way, as we move forward, you can lock imported template graphics without bothering with the frames in which they reside.

1. In the open Symbols.ai file, select the group of rounded rectangles. Don't select the snowflake icon you already drew.

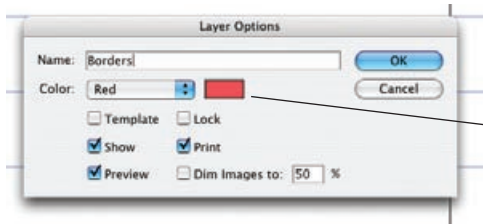
You're going to lock all of the rectangles at once by dragging them to their own layer, and locking that layer instead of the individual rows of rectangles.

2. Click the Layers icon on the dock to access the Layers panel.



3. Click the New Layer button at the bottom of the Layers panel, and then double-click Layer 2 to open the Layer Options dialog box.

**4. In the Layer Options dialog box, type “Borders” in the Name field.**

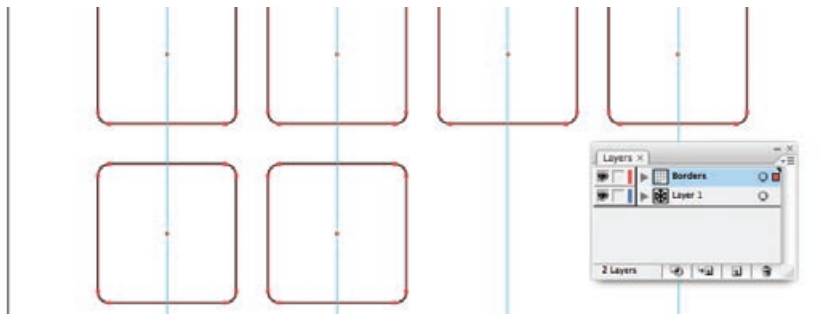


This color swatch matches the one in the Layers panel. The paths and bounding boxes of objects match the color of the layer on which they reside.

**5. Click OK to close the Layer Options dialog box.**

**6. Drag the blue square icon from Layer 1 to the Borders layer.**

When you release the mouse button, the icon turns red to match the layer color defined in the Layer Options dialog box. In the document window, the bounding box handles of the selected objects are also red to reflect the layer on which they now reside.

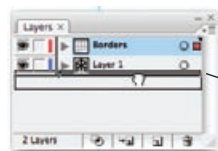


In the document, notice that you can't see the snowflake anymore; it's completely hidden by the rectangle. (If you remember, that rectangle is filled with solid white, so you can't see through it.) Dragging the rows of rectangles onto the new layer — which is on top of the old Layer 1 — covers anything on the underlying layer with solid white.

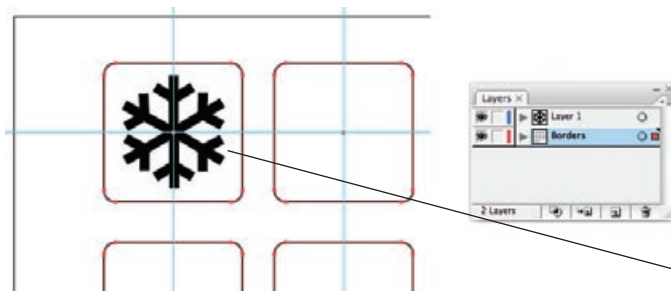
**Note:**

*Moving objects from one layer to another is as simple as selecting the objects and dragging the little square in the Layers panel to wherever you want to relocate them.*

**7. Drag the Borders layer to the bottom of the stack in the Layers panel.**



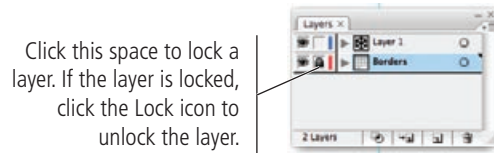
You can change the stacking order of layers by dragging them up and down.



The layer with the rounded rectangles is now below the layer with the snowflake, so you can see the snowflake again.

**8. On the left side of the Layers panel, click the empty square to the right of the eyeball icon to lock all the rows at once.**

Locking a layer locks all objects on that layer. When objects are locked — either individually or by locking the layer — the bounding boxes are no longer visible. The ruler guides remain visible even when a layer is locked.

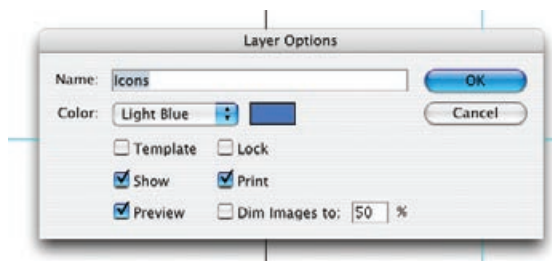


**9. Save the file and keep it open for the next exercise.**

## LIVE TRACE AN OBJECT

The **Live Trace** tool is a quick and easy way to draw a simple object, an object comprised of only one or two elements, or an object that is otherwise relatively easy to trace. In the following exercise, you import another template image, lock it, use the Live Trace tool to trace it automatically, and then manually refine the trace until it's perfect.

**1. In the open Symbols.ai file, double-click Layer 1 in the Layers panel and rename it “Icons”. Click OK.**



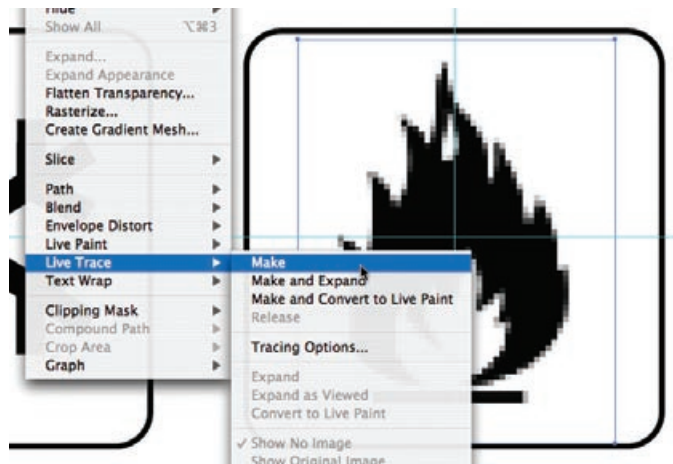
**2. Choose File>Place and double-click the Fire.tif file in the RF\_Illustrator>Symbols folder.**

**3. Zoom into the second rectangle. Use the guides to position the Fire.tif object in the second rectangle in the first row.**



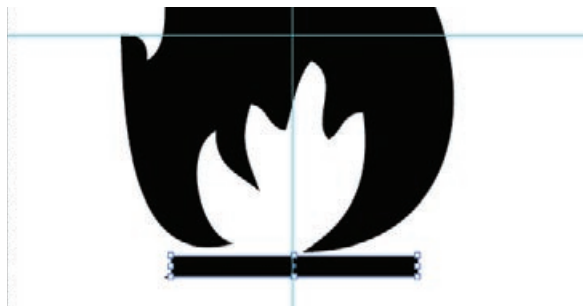
**4. With the placed object selected, choose Object>Live Trace>Make.**

The Live Trace tool draws the entire flame with a single click. Drawing these flames using the Pen tool (which you'll learn about soon) could take 20 minutes or more to complete — even for an experienced illustrator.



**5. If necessary, move the artwork up or down slightly so its white fill covers none of the border.**

**6. Use the Rectangle tool to draw a thin, black-filled rectangle to cover the rounded base of the Fire icon.**



**7. Select both sections of the illustration and group them.**

When using the Live Trace tool, the placed image you used as the template is automatically deleted from the document.

**8. Save the file and keep it open for the next exercise.**





## USE THE PATHFINDER

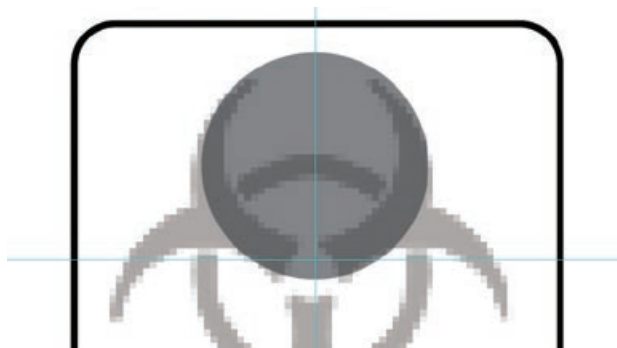
The Pathfinder allows you to combine multiple shapes into one object, use one object as a “cookie cutter” to remove a shape from another object, and many other combination and merge functions. Again, you will learn more about the Pathfinder as you work with the toolset. In the meantime, it’s a good idea to experiment with the Pathfinder panel to get a better idea of what it does.

In this exercise, you use a small circle to cut its shape from a larger circle to create an entirely different shape for your third icon.

1. **In the open file, import Biohazard.tif and position it in the third rectangle on the first row.**
2. **Set the transparency of the object to 20% and lock it in place.**



3. **Select the Ellipse tool, set the fill color to black and the stroke color to none, and then draw a circle by pressing the Shift key while you drag.**
4. **Using the Selection tool, drag the circle into place over the top “horn” shape in the template image.**
5. **Change the transparency of the object to 50% so you can see the artwork below.**

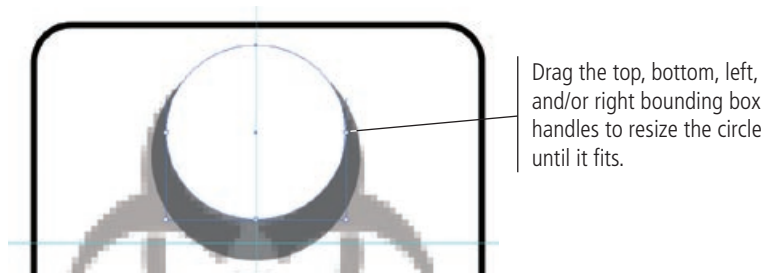


6. **Choose Select>Deselect so nothing is selected on the artboard, and then change the fill color to white and the stroke to None.**

If something is selected when you change the fill and stroke colors, the fill and stroke of the selected object will change — which isn’t what you want in this case.

7. **Draw a smaller white circle and drag it onto the inside area of the “horn” shape, overlapping the first circle you drew.**

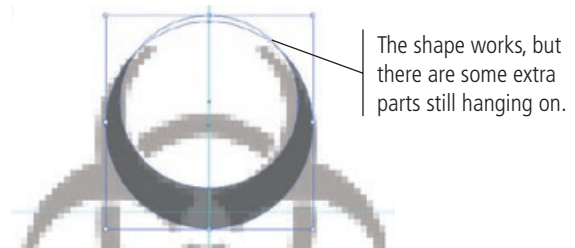
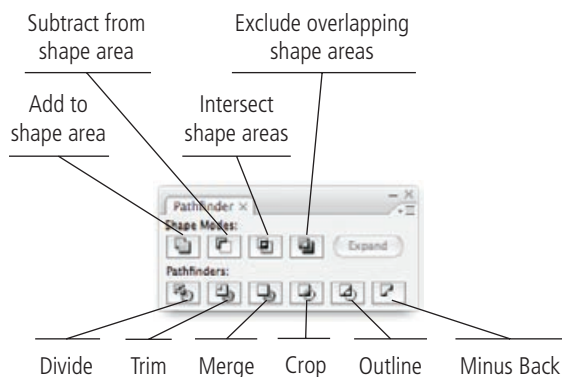
- Use the top, bottom, left, and right bounding box handles to resize the smaller circle until it matches the template image.



- Choose Window>Pathfinder to open the Pathfinder panel.

- Select both circles, and then click the second button on the top row of the Pathfinder panel.

This is the “cookie-cutter” we mentioned earlier. When you select two objects and click this button, Pathfinder cuts the bottom shape out, using the upper shape as the guide.



- Click the Expand button to simplify the shape.

Clicking the Expand button removes those portions of the circles that the Pathfinder function left behind. In this situation, the artwork would have worked without expanding, but that’s seldom the case. It’s always a good idea to expand Pathfinder objects that display extraneous (unwanted) fragments.

- Select the Rotate tool. Click where the guides intersect to place the origin point for the rotation, and then Option/Alt-drag to clone-rotate the horns to the lower-left side of the original template image.



13. Use the same technique to create the last (lower-right) set of horns.
14. Select all three sets of horns, return their opacity to 100%, and group them.
15. Using the Ellipse tool with a fill of none and a 3-pt. black stroke, draw the black circle part of the template shape.
16. Draw a second circle, with a white fill with no stroke, in the area where the three sets of horns overlap.  
Use the template image as a guide. You're creating the white space in the center of the image.
17. Unlock the template image (Object>Unlock All) and delete it.
18. Select all the pieces of the icon and group them.



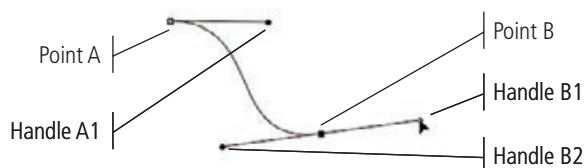
19. Save the file and leave it open for the next exercise.

## USE THE PEN TOOL

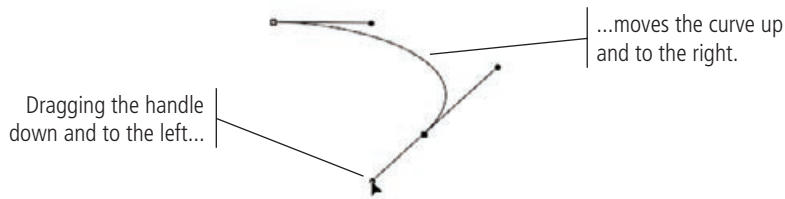
As you've already seen, many objects can be drawn without ever picking up the Pen tool. That being said, however, there are numerous objects you can't draw without considerable effort unless you use the Pen tool. Some artists will argue that the Pen tool is the most important tool in the Illustrator Tools panel.

When you draw with the Pen tool, an anchor point marks the end of a line segment, and the point handles determine the shape of that segment. That's the basic definition of a vector, but there is a bit more to it than that.

Each segment in a path has two anchoring end points and two associated handles. In the following image, we first clicked to create Point A and dragged (without releasing the mouse button) to create Handle A. We then clicked and dragged to create Point B and Handle B1; Handle B2 is automatically created as a reflection of B1 (Point B is a **symmetrical point**).



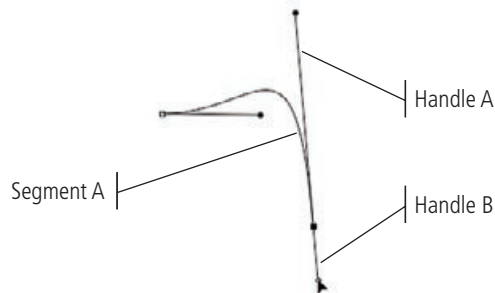
The next image shows the result of dragging Handle B1 to the left instead of to the right. Notice the difference in the curve, as compared to the curve above. When you drag the handle, the segment arcs away from the direction of the handle.



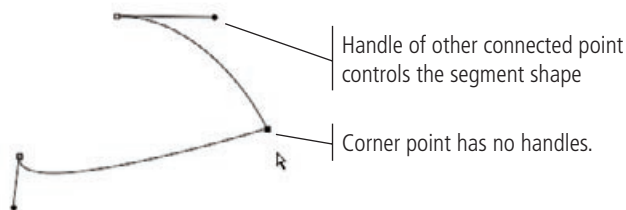
It's important to understand that a segment is connected to two handles. In the next image, dragging the handle to the right pulls out the arc of the connected segment. You could change the shape of Segment A by dragging either Handle A1 or A2.



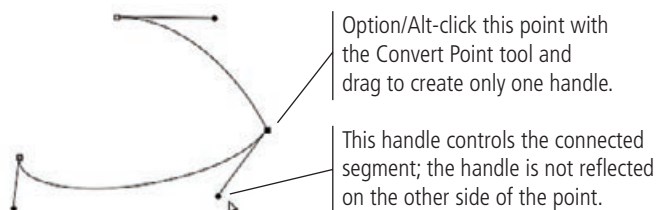
The final concept you should understand about anchors and handles (for now, at least) is that clicking and dragging a point creates a symmetrical point. Dragging one handle of a symmetrical point also changes the other handle of that point. In the next image, dragging Handle B also moves Handle A, which affects the shape of Segment A.



You can create corner points by simply clicking with the Pen tool instead of clicking and dragging. **Corner points** do not have their own handles; the connected segments are controlled by the handles of the other associated points.



You can convert a symmetrical point into a corner point by clicking the point with the Convert Point tool (nested under the Pen tool). You can also add a handle to only one side of an anchor point by Option/Alt-clicking a point with the Pen tool and dragging.



1. In the open Symbols.ai file, place the Fingers.tif file into the last rectangle in the first row.
2. Change the Opacity value of the placed file to 20% and lock the template image.



**3. Change the fill to None and the stroke to black.**

Use the Stroke panel to make sure the stroke weight is set to 1 pt.



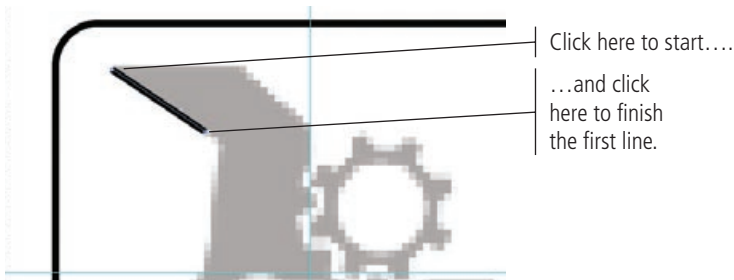
Set the fill to None and the stroke to 1-pt black.

**4. Zoom in so the Fingers image fills the workspace.**

The exact zoom percentage you're using may be slightly different than ours. Get close enough so you can see the jagged edges around the fingers.

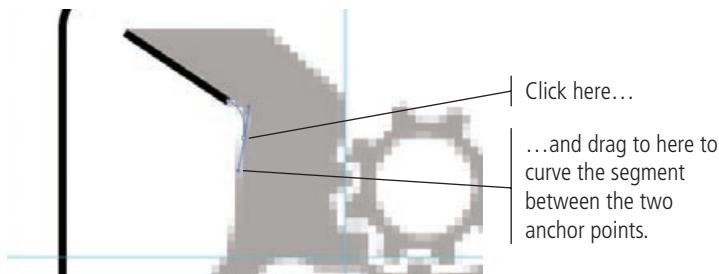
**5. Select the Pen tool in the Tools panel.**

**6. Click in the upper-left corner of the Fingers image, and then click slightly down the hand, just before the bend in the wrist.**



**7. Click just below the lower curve in the wrist and pull down and to the left to create a curved segment between the two anchor points.**

Without releasing the mouse button, drag the handle until the curve fits the template image. If you released the mouse button before the curve fit perfectly, you can select the point with the Direct Selection tool and drag the associated handle to reshape the curve.



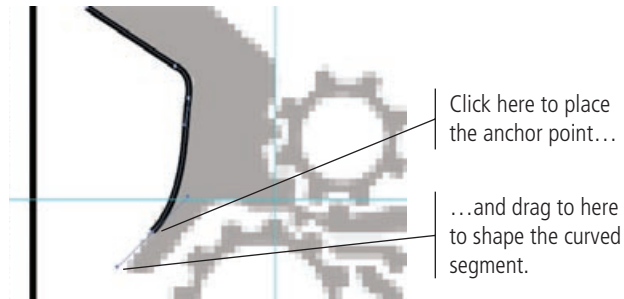
*Note:*

*If you don't change the fill to None before you start using the Pen tool, whatever shape you create by adding anchor points and pulling the handles will instantly fill with the color set for the Fill value.*

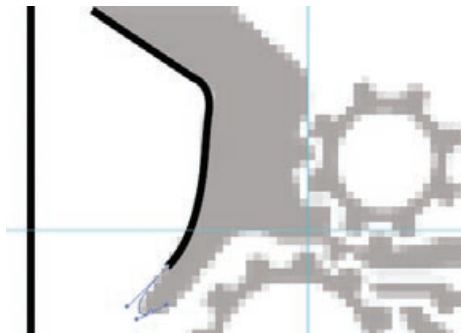


8. Click near the point of the thumb and again pull down and left to create the handle. Pull the handle until the curve matches the template image.

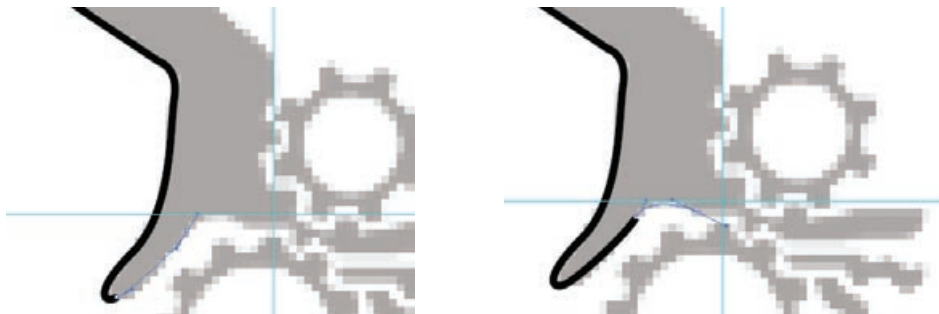
It takes time and practice to get used to the Pen tool. Don't get frustrated as you pull and bend these curves. There are other ways of doing this – such as drawing all straight lines, and then pulling and stretching them till they fit. This is the best way we've found, however, and the way most professional designers and illustrators accomplish the task.



9. Click the Pen tool to create a new anchor point on the other side of the tip of the thumb. Pull the handles until the object fits.

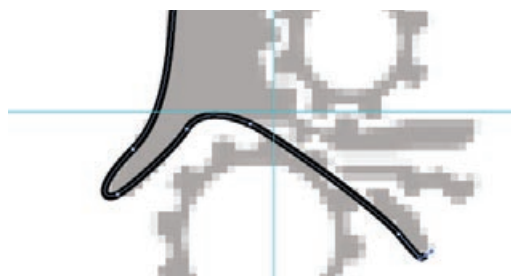


10. Continue adding curved anchor points to complete the shape to the beginning of the lower gear.



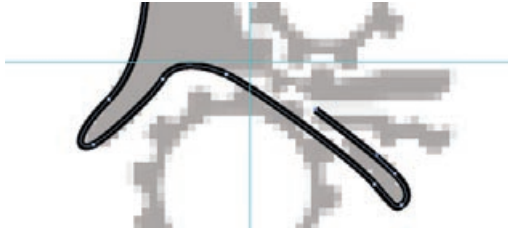
11. Click to add another anchor point to the right of the lower gear.

You can use a straight line here. When you draw the gear later, it will cover part of the hand and create the “crushed” appearance.

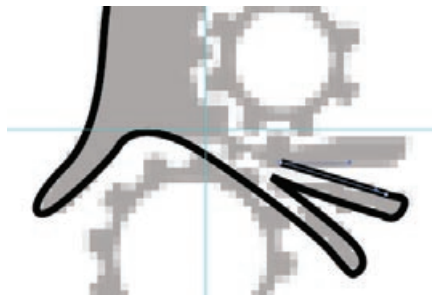




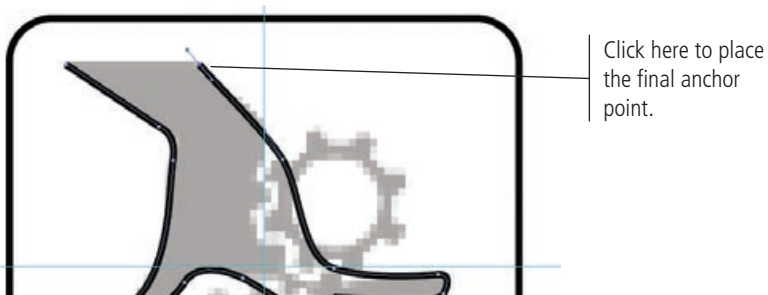
12. Continue adding anchor points to complete the tip of the first finger. When you get to the crotch of the two fingers, click to create a corner point.



13. Using the same techniques, continue clicking and dragging to outline the second and third fingers. Use a corner point where the second and third fingers meet.



14. Work your way around the rest of the hand shape. Ignore the right gear shape, as you did the one on the left. End your drawing by single-clicking to place a point at the top-right edge of the arm.

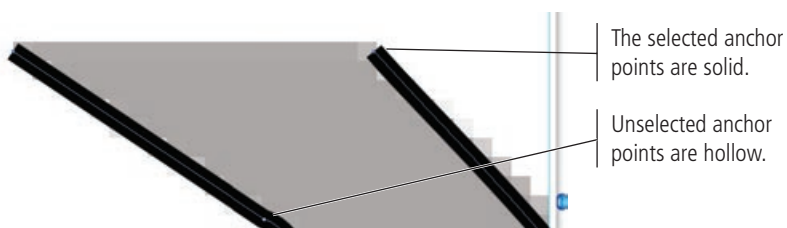


15. Save the file and continue to the next exercise.

## CLOSE OPEN PATHS

You're almost done. All that's left to do is connect the two anchor points at the top of the arm and straighten out the top line on the hand. Illustrator includes tools that make these two operations very simple. Then you can move on to creating the gears.

1. In the open file, zoom into the top of the hand. Using the Direct Selection tool, draw a marquee around the two top anchor points.

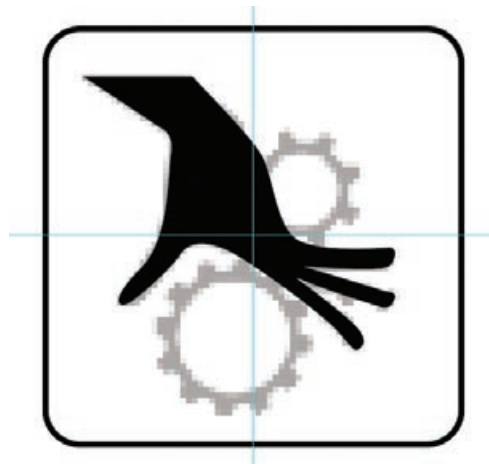


2. Choose **Objects>Path>Join** to connect the selected anchor points with a path.
3. Choose **Objects>Path>Average**. In the **Average** dialog box, click the **Horizontal** radio button, and then click **OK**.

This command aligns the two selected anchor points on the horizontal axis.



4. Swap the fill and stroke colors to fill the hand with black and turn off the stroke.



5. Hide the hand shape (**Object>Hide>Selection**).
6. Save the file and keep it open for the next exercise.

## **USE MATH TO STRUCTURE OBJECTS**

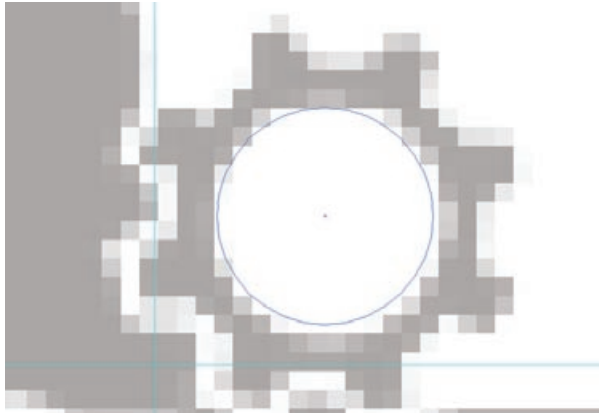
In this exercise, you use mathematics to calculate the specific distance you need to clone each of the teeth on the two gears. The smaller gear has 8 teeth, and the larger gear has 12. Since a complete circle has 360 degrees, all you have to do is divide 360 by the number of gears (either 8 or 12) to arrive at the amount you need to rotate a clone to end up with the proper amount of teeth on each of the gears. Sound complicated? It's actually quite easy using Illustrator's built-in tools.

$$\begin{array}{lcl} 360 \text{ degrees} / 8 \text{ teeth on the small gear} & = & 45^\circ \text{ per tooth} \\ 360 \text{ degrees} / 12 \text{ teeth on the bigger gear} & = & 30^\circ \text{ per tooth} \end{array}$$

1. In the open file, make sure nothing is selected. Set the fill to black and the stroke to white.

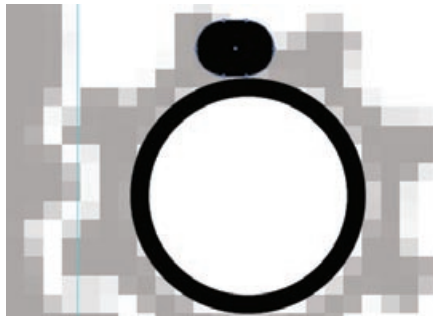
You should always check your Fill and Stroke values before you start to draw an object. Just as a solid fill can be distracting when you use the Pen tool, so can applying a heavy stroke when all you need is the fill.

- Using the Ellipse tool, draw a circle to fit the smaller of the two gears (on the right).



- Draw a rounded rectangle approximately the size of one of the teeth. Change the shape's fill to black and the stroke to none.

The exact size and shape of the first cog doesn't have to be perfect. As with any object you draw in Illustrator, you can change and modify the cogs after you create the basic shape.



- Using the Direct Selection tool, select the two bottom anchors on the cog shape.



- Press Delete/Backspace to delete the bottom anchors and the paths connected to them.

You could connect the two remaining anchors using the Join command, but there's no need to do so. The join area is going to end up underneath the gear.

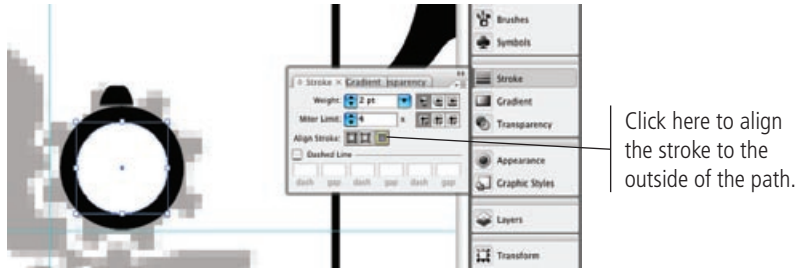
- Using the Direct Selection tool, pull the top of the cog up a little.



**Note:**

*We know you can't see the original perfectly. If you had a 300-dpi original bitmap that measured 8 × 10", you could have traced the image perfectly – but you don't. What you're doing in this exercise is a fairly accurate reflection of what actually happens in on-the-job assignments.*

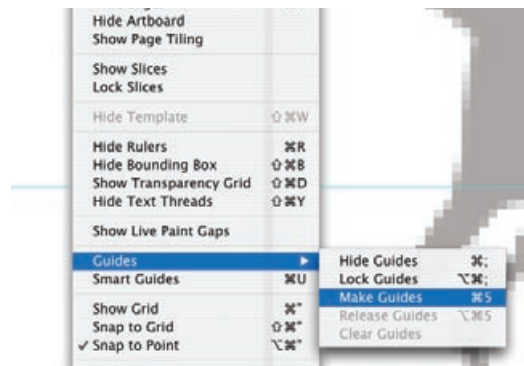
- Use the Stroke panel to change the circle's stroke to 2 pt. and align the stroke to the outside of the path.



- Drag the cog until the bottom of the shape touches the circle's stroke. Use the Align panel to center the cog on top of the circle.

- Select the circle and choose View>Guides>Make Guides.

This command changes the stroked path into a guide so you can see the center point even when the circle isn't selected. The 2-pt. black stroke is now gone (but only temporarily).



**Key Command:**

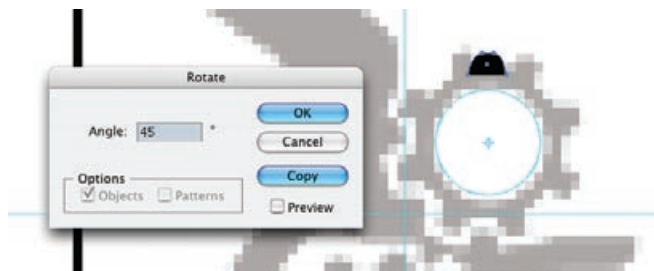
*To make a guide from a regular object, first select the object, and then press Command/Control-5. To turn a guide object back into the regular object (with its same stroke weight, color, and other attributes), add the Option/Alt key to the Command/Control-5 combination.*

- Select the cog with the Selection tool, and then choose the Rotate tool in the Tools panel.

- Option/Alt-click the Rotate tool on the center of the circle guide.

Remember, clicking the first time places the origin point for the transformation. Option/Alt-clicking places the origin point and opens the related dialog box where you can make specific numeric transformations and copies.

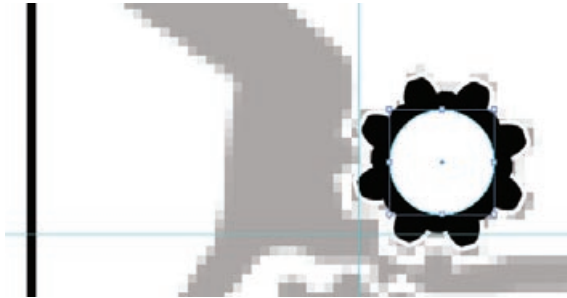
- Type "45" in the Angle field and click the Copy button.



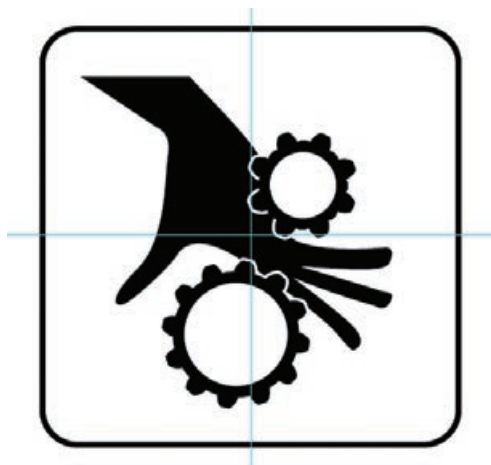
- Choose Object>Transform>Transform Again (Command/Control-D) to make six more copies of the gear tooth.

- Select all of the cogs at once and apply a 0.5-pt. white stroke to all of them.

15. Group the eight cog shapes.
16. Rotate the grouped cogs around the gear center until the gears you drew match the position of the cogs in the template image.
17. Choose View>Guides>Release Guides to return the circle guide to a regular object.
18. Select all the pieces of the gear and group them.



19. Using the same process we outlined in the preceding steps, create the larger gear on the left side of the hand. When you clone/rotate the cogs, use a 30° angle for 12 total cogs.
20. Show the hidden hand artwork, unlock and delete the template image



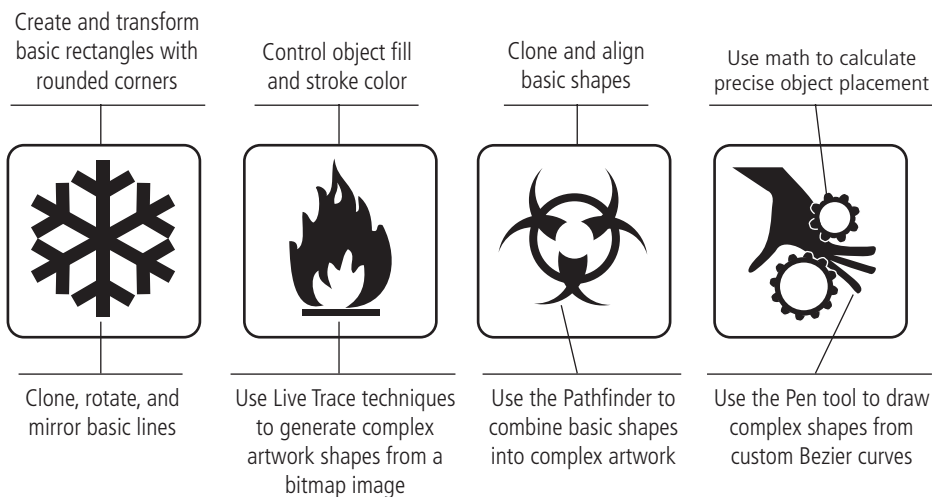
21. Save the file and close it.

# Summary

The skills you used to complete these four icons will be the foundation for most work you do in Illustrator. You learned how to draw primitive shapes and transform them by scaling, rotating, cloning and aligning objects to meet specific needs. You also learned how to place raster images as templates, from which you created scalable vector graphics that will work for virtually any printed application.

Creating the individual icons required a number of different techniques and skills: transforming simple lines (for the snowflake), Live Tracing a bitmap image (for the fire), combining simple shapes into complex artwork (for the radioactive icon), and creating custom Bezier lines with the Pen tool (for the crushed hand).

As you move forward through the projects in this book, you'll build on the basic skills that you learned in this project.







## Portfolio Builder Project 1

The client is pleased with the first four icons, and they want you to complete the rest of the warning icons. They also want you to create an additional set of icons for travel and outdoor activities that they offer as benefits during their international corporate conferences.

To complete this project, you should:

- Complete the remaining international warning icons.  
The bitmap versions are in your RF\_Illustrator>Symbols folder.
- Carefully consider the best approach for each icon and use whichever tool (or tools) you feel is most appropriate.
- Create a second Illustrator file for the six new recreation icons.

*“We host a number of large, international conventions and conferences every year, and many attendees bring their families along for a working vacation. To keep everyone happy, we’ve started offering different outdoor activities for the families while their spouses are attending sessions, but the international nature means that a lot of people need visual help getting to the right place.”*

*“Since you did such a good job on the first four icons, we’d like you to finish those. But first, we want you to create icons for horseback riding, sailing, swimming, hiking, rock climbing, and nature walks.”*

*“We don’t have the images for these ones. Can you find something on the Internet to use as a guide? Remember, icons need to be easily recognizable in any language, so they should very clearly convey visually what each one is for.”*