

The Drawing Editor

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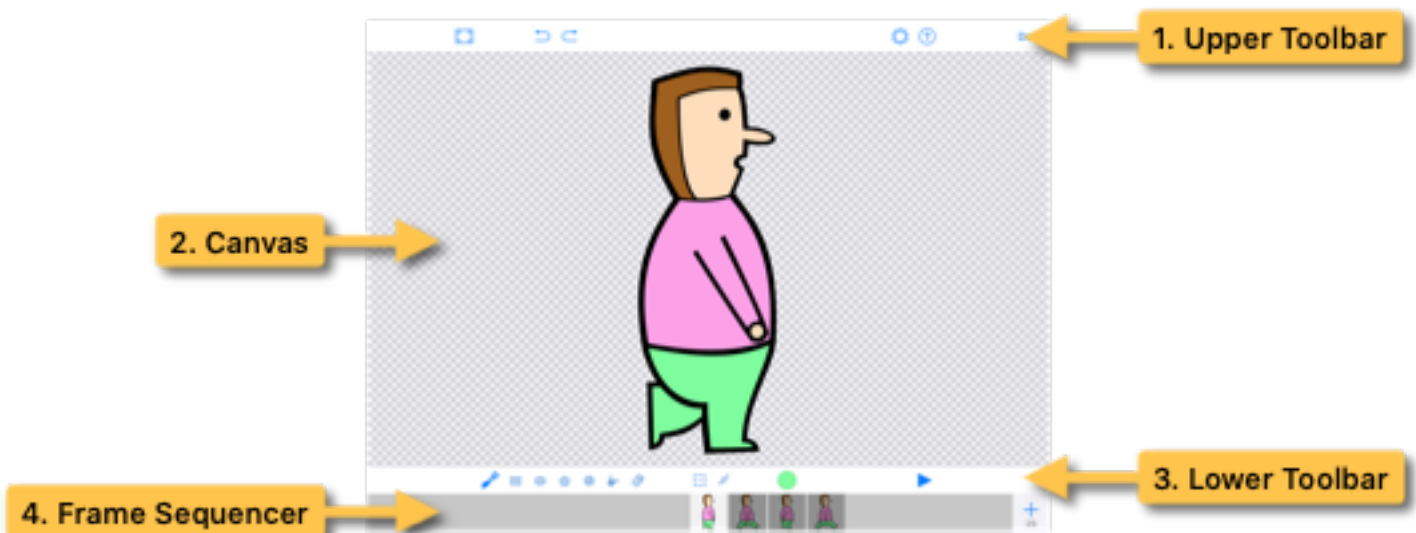
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User Interface

There are four primary areas in the Drawing Editor:



1. The **Upper Toolbar** contains an assortment of controls for managing editor settings, drawing properties, and layers in your drawing. It also holds the play button, used to preview your animations.
2. The **Canvas** is where you'll create your drawings. It shows the currently selected frame in your drawing sequence.

3. The **Lower Toolbar** contains all the tools you'll need to create and edit your drawings.
4. The **Frame Sequencer** contains thumbnail images for each frame in your drawing sequence. You'll scroll the frame sequencer to select a drawing to work on. The Frame Sequencer also holds tools for adding, deleting, and copying frames.

Drawing Tools

The tool palette on the lower toolbar includes several tools for creating new shapes. Some tools offer precision, others are great for sketching out ideas quickly, and still others are dedicated to specific geometric shapes.

The Drawing Editor produces “vector” shapes, using mathematically defined paths to create each shape’s outline. You’ve probably used other drawing apps that produce “raster” shapes, which are defined on a pixel-by-pixel basis. Vector artwork is particularly useful for creating animations. To learn more, see [Creating Vector Art](#)



The Brush Tool

The brush tool creates a shape by laying down a blob of “paint”, using the currently selected color. It’s totally free-form and easy to use – just touch and drag on the canvas to color in the shape you want. The brush tool even smooths out any rough edges for you automatically!

Selecting the brush tool opens a properties panel that lets you control the size of the brush. The brush tool also supports pressure sensitivity with Apple Pencil.



The Rectangle Tool

Touch and drag with the rectangle tool to create a rectangular shape. The initial touch defines one corner of the rectangle, and the release location defines the opposite corner.

Touch with a second finger to constrain the shape to a square.



The Ellipse Tool

Touch and drag with the ellipse tool to create an elliptical shape. The initial location defines one corner of the enclosing rectangle, and the release location defines the opposite corner.

Touch with a second finger to constrain the shape to a circle.



The Polygon Tool

Touch and drag to create a polygon or a star shape with straight edges. The initial location defines the center of the shape, and the release location defines its size and orientation.

Selecting the polygon tool opens a properties panel that lets you control the number of vertices (from 3 to 60) and the “inner radius percentage”, which determines whether the shape is a simple polygon (at 100%) or a pointed star shape (less than 100%).



The Flower Tool

Touch and drag to create a “flower” or “gear” shape with curved edges, or a polygon or star shape with straight edges. The initial location defines the center of the shape, and the release location defines its size and orientation.

Selecting the flower tool opens a properties panel that lets you control the number of vertices (from 3 to 60), the “inner radius percentage”, the “inner curve percentage”, and the “outer curve percentage”. You can create a wide variety of geometric shapes with this tool – experimenting with the controls is the best way to learn how it works.



The Fill Tool

Unlike all other drawing tools, which define the shape’s outline manually, the fill tool creates shapes automatically with a single tap on the canvas. The shape that’s created depends on where you tap:

- Tapping directly on the canvas, outside of any existing shapes, creates a shape that fills the empty region on the canvas. The new shape extends to the edges of any existing shapes that abut the empty region, but does not overlap them.
- Tapping inside of an existing shape creates a new shape that fills the contiguous visible region of that shape. Any existing shapes that lie in front of the tapped shape are excluded from the new shape. If there are no existing shapes in front of the tapped shape, the fill tool simply makes a copy of the tapped shape.

You can create complex shapes using the fill tool by making a “template” from simple shapes, then filling the template to create a new shape, and finally deleting the template shapes. For example, you could create a ring shape by drawing a circle (using the ellipse tool), then drawing a smaller circle in its center, then filling the outer ring using the fill tool.



The Eraser Tool

Use the eraser tool to erase a region on the canvas. You define the erased region just as you would using the brush tool, by “painting” its interior. Shapes that partially overlap the erased region are modified to remove the erased region; shapes that overlap the erased region completely are removed.

Selecting the eraser tool opens a properties panel that lets you control the size of the eraser.

The eraser tool is an easy way to create complex shapes. Create a simple shape using any of the drawing tools, then use the eraser to cut holes in the shape.

Advanced Tools: Modifying Shapes

The preceding section covered the tools used to create new shapes. This one discusses the tools used to modify existing shapes. It's helpful here to have a basic understanding of how vector paths are constructed – take a look at [Creating Vector Art](#) for an overview.

The advanced drawing tools are disabled and not visible by default. To enable them, return to the Gallery, open the App Settings panel, and enable the “Advanced drawing tools” switch.



The Transform Tool

The transform tool is the Swiss Army knife of drawing tools. Use it to select, move, resize, and rotate shapes on the canvas. Use the tools in the tool panel to copy and paste shapes, delete them, move them behind or in front of other shapes, flip them over, and group them together.

Selecting Shapes

The transform tool works on *selected* shapes. To select or deselect shapes:

- Tap a shape to select it. All other shapes will be deselected.
- Touch and hold (long press) a shape to select an unselected shape, or to deselect a selected shape, without changing the selection state of other shapes.
- Tap on the canvas (outside of any shapes) to deselect all selected shapes.
- With no shapes selected, touch and drag to select shapes using a selection box.

Selected shapes are outlined in red. You'll also see a blue rectangle enclosing all of the selected shapes.

Transforming Selected Shapes on the Canvas

On the drawing canvas, the selected shapes are enclosed by a blue box with circular handles at the corners and rectangular handles along the sides.

- To **move** the selected shapes, touch and drag anywhere on the canvas.
- To **resize** the selected shapes, touch any of the handles and drag either directly towards or directly away from the center of the selection box.
- To **rotate** the selected objects, touch any of the circular corner handles and drag *around* the center of the selection box (perpendicular to the direction you'd use for resizing).



Here are few more tricks and tips for using the transform tool:

- Using a *corner* handle to **resize** scales the selected shapes' widths and heights proportionally. Using a *side* handle stretches the shapes either horizontally or vertically.
- While using a *corner* handle to **resize**, tapping with a second finger unlocks the operation, so that the shapes' widths and heights can be scaled independently. Tapping again with a second finger relocks the operation.
- While using a *corner* handle to **rotate**, tapping with a second finger unlocks the operation, so that the shapes can be rotated and resized at the same time.






Using the Transform Tool Panel

When you activate the transform tool, you'll see a panel containing various supplemental tool buttons. These tools act on the currently selected shapes and paths.



SELECT

- *  selects all shapes in the drawing.
- *  deselects all shapes.





EDIT

- *  cuts the selected shapes to the pasteboard.
- *  copies the selected shapes to the pasteboard.
- *  pastes shapes from the pasteboard onto the canvas.
- *  duplicates the selected shapes.
- *  deletes the selected shapes.



GROUP

- *  groups the selected shapes. Groups are discussed in detail [below](#).
- *  ungroups the selected shapes.

ARRANGE




- *  brings the selected shapes to the front.
- *  brings the selected shapes one step toward the front.
- *  sends the selected shapes one step toward the back.
- *  sends the shapes element to the back.

FLIP

- *  flips the selected shapes horizontally.
- *  flips the selected shapes vertically.

Groups

A **group** is a collection of shapes that are treated as a single object by the selection tools. When you tap on *any* of the shapes in the group with a selection tool, *all* of the shapes in the group are selected. That’s really all there is to it – the shapes in the group aren’t modified in any way, and you can easily “ungroup” the shapes at any time. Groups make it easier to move, transform, copy, and arrange related shapes, because you only need to tap once to select the shapes.

- To **group** shapes, open the transform tool palette by tapping the  button on the lower toolbar. Select the shapes you want to group, then tap the  button on the tool palette.
- To **ungroup** shapes, select the group, then tap the  button on the tool palette.

Groups can be “nested” – that is, a group can contain other groups. Also note that shapes in a group must be contiguous in the front-to-back ordering of the drawing, and in the same layer. The app handles these requirements automatically, meaning that when you create a group, the front-to-back ordering of other shapes in the drawing may be adjusted.



The Node Tool

Use the node tool to modify an existing shape in any way and with a great deal of precision. It is an advanced tool that may take some practice to use, but it will enable you to create shapes that wouldn’t be possible using the basic drawing tools.

To use the node tool, it’s important to understand how vector shapes are constructed. See [Creating Vector Art](#) for more information.

To begin, let’s review terminology. Each **shape** is made up of one or more **paths**, which define the edges of the shape. Each path is constructed from a series of connected **segments**, which may be straight lines or curves. Each segment has two **nodes**, one at each end, which determine the location of the segment. Each node may have **control points**, which determine the curvature of the node’s segment.

The node tool lets you modify shapes, segments, and nodes in a variety of ways. You can:

- Add new nodes to a shape, or remove existing nodes.
- Modify the location and curvature of a segment with a single operation.
- Move nodes to a different location.
- Fine-tune the amount of curvature at each node.
- Convert smooth curves into corners or and vice-versa.

Selecting Shapes and Nodes

To use the node tool, you first need to select one or more shapes to modify. Selecting and deselecting shapes with the node tool works in exactly the same way as with the transform tool. Tap a shape to select it, tap and hold (long press) to select or deselect a shape without deselecting other shapes, tap the canvas to deselect all shapes, or, with no shapes selected, touch and drag on the canvas to select shapes with a selection box.

Selected shapes are outlined in red, and the nodes are shown as red circles.

Once you have selected one or more shapes, you can then select one or more nodes. Selecting nodes is very similar to selecting shapes. You can:

- Tap a node to select it. All other nodes will be deselected.
- Touch and hold (long press) a node to select an unselected node, or to deselect a selected node, without changing the selection state of other nodes.
- Touch and drag *anywhere other than on a node or a control point* to select nodes using a selection box.

Selected nodes are shown as blue circles that are a bit larger than the unselected nodes. Any control points associated with a selected node are shown as smaller blue circles connected to the node by a straight blue line.

Modifying Shapes on the Canvas

You can modify a shape directly on the canvas manipulating the nodes, the control points, and segments between the nodes. Here's how:

- Touch and drag any *segment* to change its curvature and move it around.


This is the easiest way to adjust a segment's shape without moving its end points. You don't need to select any nodes or fiddle with the control points. Just touch and drag anywhere along the red segment between any two nodes (but not directly on a node or control point). Give it a try!

- Touch and drag any selected node to move all of the selected nodes.
- Touch and drag any control point to modify the curvature at that node.

Nodes can be "locked" or "unlocked". When a node is locked, moving either of its control points automatically adjusts the opposite control point's position to keep the curve smooth at the node. When a node is unlocked, moving a control point has no effect on the opposite one, so you can produce a "corner" at that node. To unlock a locked node, or to lock an unlocked one, tap with a second finger while dragging either of the node's control points.



Adding and Removing Nodes

To **add** a new node, simply tap on the segment where you want the node to be located.

To **remove** a node, tap the node to select it, then tap the  button on the node tool panel. You may select multiple nodes and remove them all with a single operation.

Using the Node Tool Panel



In addition to the delete tool, the node tool panel provides a couple of additional tools:

-  converts the node to a corner node. Corner nodes don't have control points, meaning that the connected segments are straight lines at that node (although they may still be curved at their other ends).
-  converts the node to be a smooth curve. You can use this to convert a corner node or an “unlocked” node back into a smooth, continuous curve.

Selecting Colors

When you create a new shape with any of the drawing tools, it is filled using the **fill color**. To select a new fill color, tap the circular color button on the lower toolbar, which opens the **color chooser**.

The color chooser gives you two ways to select a color. Select the method you prefer using the tab bar at the bottom of the color chooser.

-  Use the **palette** to choose from a pre-set selection of colors. Just tap the color you want!
-  Use the **ring** tool to create any color you need. Touch and drag inside the color ring to select a hue. Then touch and drag inside the triangle to adjust the color's saturation and lightness.

The color sample at the top of the panel shows the original fill color on the left and the current fill color on the right.

Changing a Shape's Color

In addition to selecting the color to use for new shapes, you can also change the colors of existing shapes. There are two steps:

1. Select the shape (or shapes) you want to change using either of the selection tools (the transform tool or the node tool).
2. Open the color chooser and select a new color. The selected shapes will change to that fill color.

Notice that after you select a shape (step 1, above), the current fill color is updated to match the fill color of the selected shape.


Using the Color Picker

The color picker tool “picks up” the fill color of any existing shape, then updates the current fill color and applies it to any selected shapes. To use the color picker, touch the color button on the lower toolbar and drag your finger up onto the canvas. You'll see a ring that shows the fill color of the top-most shape at your current touch location. When you

release, the current fill color and any selected shapes are updated.

Using the Frame Sequencer

The drawing editor isn't just for making drawings. You can use it to create frame-by-frame animations – sequences of drawings, which, when displayed in rapid succession one after another, create the illusion of motion. To create an animated **drawing sequence**, you'll need a separate drawing for each frame in the animation. The **frame sequencer** tool, located at the bottom of the drawing editor, is where you'll go to create new frames and to select the current frame for editing.

To **add a new frame**, tap the  button on the right side of the frame sequence panel. The new frame is inserted immediately after the current frame.

When you have more than one frame, scroll the frame sequencer horizontally to view and edit any of the frames. The current frame is shown at the center of the frame sequencer, and the thumbnail images for the other frames are dimmed. While you scroll the frame sequencer, you'll see a red box just above it showing the index number of the current frame.

To **copy, duplicate, or delete a frame**, first select the frame by scrolling to it on the frame sequencer. Then, tap the selected frame's thumbnail image on the frame sequence to show the edit menu. When you **paste** a copied frame, it is inserted after the currently selected frame.

To **rearrange frames**, touch and hold (long press) on the frame's thumbnail, then drag it to the new position on the frame sequencer.

Tips and Tricks


Adjusting the Frame Rate

The frame rate determines the number of frames displayed per second when the animation is played. For example, when the frame rate is set to 15 frames per second, you'll need 15 frames in your drawing sequence to create a one second of animation.

To **set the frame rate**, tap the  button on the upper toolbar to open the animation settings panel.

Using Ghost Frames


When you're working on a multi-frame drawing sequence, it's often helpful to see how the current frame compares to the frames that come before or after it. Having a view of the preceding or succeeding frames makes it easier understand how changes in the current frame will affect the animation. The app supports up to three **ghost frames** preceding the current frame, and another three following the current frame. The ghost frames are rendered semi-transparently on the canvas, with increasing transparency as the ghost frames become more distant from the current frame.

To **set the number of ghost frames**, tap the  button on the upper toolbar to open the animation settings panel.



Panning and Zooming the Canvas

You can focus on a particular are of the drawing canvas by panning and zooming. “Panning” is when you slide the canvas to put a different location at the center of the view, and “zooming” is when you magnify the canvas to focus on a particular area. Use a **two-finger gesture** to pan and zoom the drawing canvas.

Panning and zooming the canvas doesn’t change your artwork in any way. You’re just adjusting your view to get a better look at things.

Tap the  button on the upper toolbar to reset the drawing canvas to its “home” state.

Previewing Your Drawing Sequence

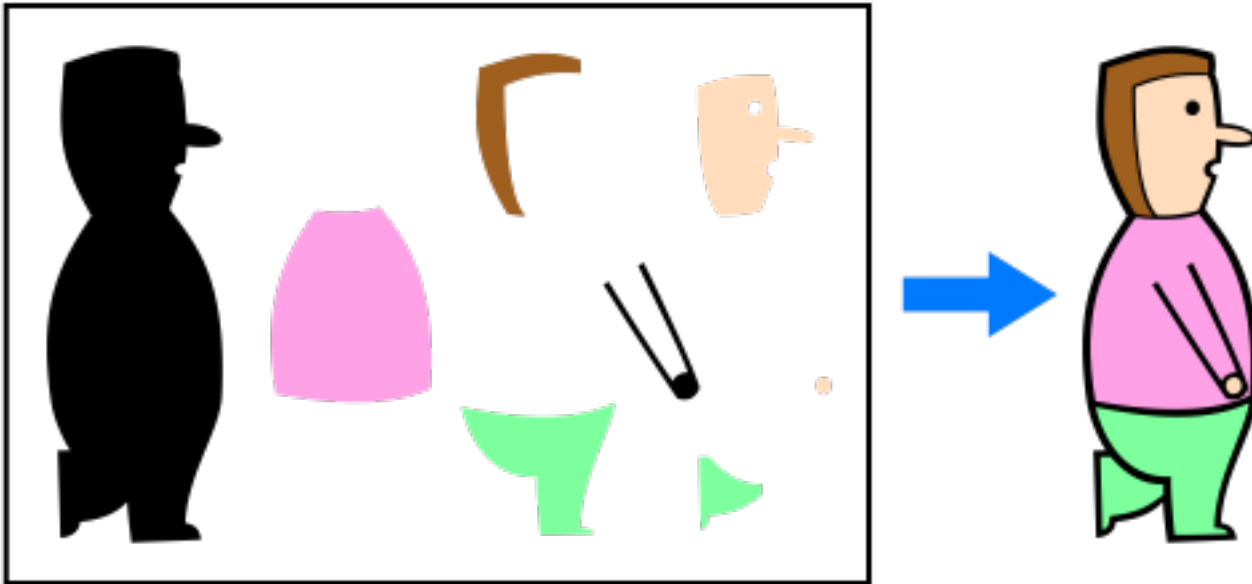
Tap the  play button on the lower toolbar to preview your drawing sequence. Your animation will play and then automatically loop back to the beginning and play again. Use the  pause button to pause the animation.

Creating Vector Art

In order to use the Drawing Editor effectively, it’s important to understand the basics of “**vector art**”. This style of drawing is less commonly used than the primary alternative, “**raster art**”, but it offers significant benefits for creating animations. Tools for creating raster art enable you to modify the drawing canvas on a pixel-by-pixel basis, and they’re great for producing a wide range of artistic styles and effects. Vector tools don’t provide as much artistic range, but they do have a compelling advantage: vector art can be transformed with no loss of precision, making it easy to reuse in many different situations. When you import your artwork into the Composition Editor, it will continue to look great no matter how you scale or rotate it. Raster-based artwork becomes pixelated and grainy when subjected to these operations.

With vector drawing tools, you don’t manipulate the canvas on a pixel-by-pixel basis; instead, you create and edit **shapes**. Drawings are simply a collection of shapes, which may overlap each other, and which are displayed in a specific order. A shape is defined by its edges and by various properties, such as its fill color. The edges of a shape are **paths**; you’ll use the drawing editor’s tools to create and modify these paths.

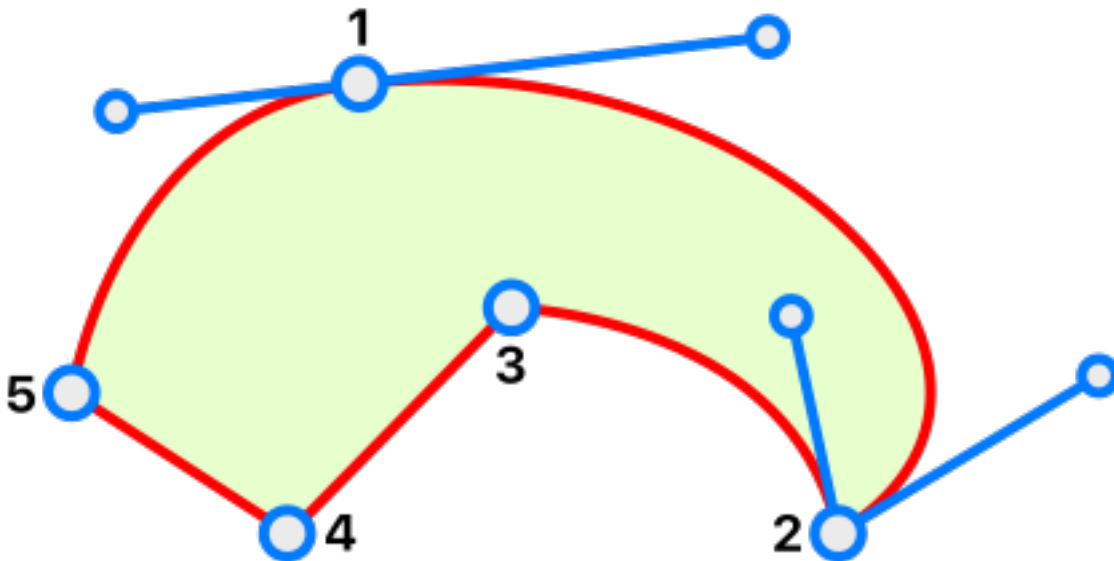
Here’s an example of how you can combine shapes to make a complete drawing:



There are seven shapes in the drawing. Six of them are simple shapes, with a single path that defines the outer edge. One of the shapes uses two paths: the outer edge, and another inner path that makes a “hole” in the shape. Can you find the shape with the hole?

The Anatomy of a Vector Shape

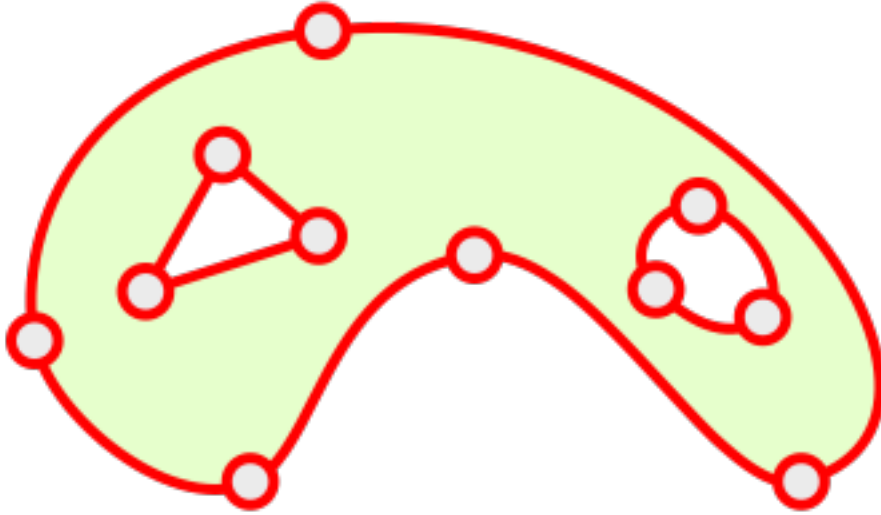
Shapes are composed of one or more **paths**, which define the edges of the shape. A path is a close loop composed of one or more connected **segments**, each of which may be curved or straight. Here’s an example of a simple path with three curved segments and two straight segments:



We’ll refer to the connection points at the ends of each segment as **nodes**; there are five nodes shown in the example above, identified by the blue dots along the path. Nodes may have **control points** associated with them. The control points determine the slope of the curve at the node, as well as the amount of curvature across the attached segments.

In the example above, only nodes 1 and 2 have control points. Notice that node 1's control points are directly across from each other, meaning that the curve makes a smooth transition between the two segments that connect to that node. Node 2 also has control points, but they are not across from each other; consequently, the shape has a "corner" at that node. Nodes 3, 4, and 5 don't have control points, so the segments between them are straight lines.

Let's look at one more example:



The shape shown above contains three separate paths – one that defines the outer edge of the shape, and two that create holes. You can create shapes with holes in them using the brush tool, and you can also use the eraser tool to make a hole in an existing shape.