ENG 331 Standard Operating Procedure
Alexander Allis

Vector Workflows

Developing better skills for graphic design production and beyond.

Introduction

The pen tool is the fundamental vector drawing tool in Adobe Illustrator. Previously referred to as the "bezier tool" in honor of its inventor Pierre Bezier, it allows the artist to draw vector paths directly by creating "anchor points" and scaling the curvature at those points with movable handles. Since its creation, many replacements to the pen tool have been devised to provide a more intuitive interface between the user and the vector path, (for example the pencil tool, the curve tool, the blob brush tool and eraser) but none are as precise or useful. Inevitably, any artist working with vector paths in Adobe Illustrator must eventually manipulate these paths directly, and to do so, make use of the pen tool.

Among the many vector-drawing tools in Adobe Illustrator, the pen tool is the hardest to master. Using it requires the artist to first visualize the desired shape and then draw it algorithmically, as a computer would draw. This runs contrary to the typical "bottom up" way of drawing, where the artist organizes sub-shapes into a larger super-shape. Using the proper methods, however, combined with a correct understanding of how the pen tool functions at a root level, will always yield a solution that is quick and elegant.

Background Info

For the past six years, I have worked as a graphic designer in many environments and have been exposed to many more. Much to my dismay, I find the vast majority of graphic designers woefully unequipped to develop designs in industry standard software like Adobe Illustrator. Instead, create their designs work in Adobe Photoshop, an application made for advanced photo editing, not graphic design. I found that the major reason these designers don't use Adobe Illustrator is that they don't realize the power of the software and are afraid to use the pen tool.

Files in Adobe Illustrator are more scalable, take up less hard-drive space, and are easier to edit later on. Not only is Adobe Illustrator based on vector math, meaning pixilation is a thing of the past, but Illustrator makes layers obsolete, making artwork easier to edit after the fact. This small compilation of standard operating procedures will help any designer or ad agency work more efficiently through better graphic development process and standardization.

Vector Workflows

A Graphic Designer's Guide to
Creating quick, scalable artwork

Scope & Purpose

This guide assumes the reader has a very basic knowledge of Adobe Illustrator, though a motivated student may be able to complete this tutorial without any prior experience. To facilitate this, a short glossary of terms has been appended for the reader's convenience. The objectives of this manual are to:

- Teach the reader how to use the pen tool effectively.
- Inform the reader about the advantages of the pen tool as a vector tool.
- Introduce the reader to effective graphics development pipelines.

Materials

- Adobe Illustrator
- Keyboard
- Three-Button Mouse (or Trackpad)

Summary of Method

Any shape can be easily drawn with the pen tool by placing a new anchor point each time the line turns ninety degrees or changes direction. The artist visualizes the shape before drawing to know where to place the anchor points before drawing.

Though this manual is concerned with the pen tool in Adobe Illustrator, the methods discussed apply to pen (or bezier) tools in any vector program.
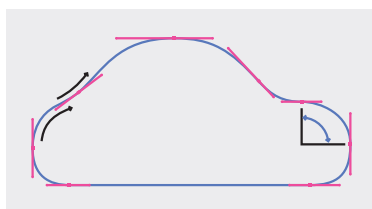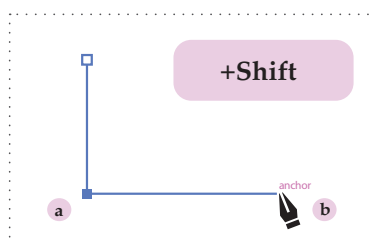
Project 1

- A detailed overview of how to use the pen tool and ellipse tool efficiently.

- Prepares the reader to complete project 2 without the typical beginner frustrations in Adobe Illustrator.

Project 2

- Builds on the tools addressed in Project 1 by introducing strategies to build complex vector shapes using additive and subtractive methods.

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Glossary of Tools

	Tool	Shortcut	Description
	Direct Selection Tool	**A**	Selects parts of an object.
	Selection Tool	**V**	Selects whole objects.
	Pen Tool	**P**	Creates vector paths and modifies existing ones.
	Anchor Point Tool	**Shift+C**	Modifies or creates anchor point handles.
	Add Anchor Point Tool	**+**	Adds anchor points to a path.
	Delete Anchor Point Tool	**-**	Deletes anchor points from a path.
	Line Segment Tool	****	Creates straight vector lines.
	Ellipse Tool	**L**	Creates circles and ellipses. For details, see "Circular Shortcuts."
	Rectangle Tool	**M**	Creates rectangles and squares. For details, see "Geometric Shapes."
	Scale Tool	**S**	Scales objects from the midpoint. For details, see "Scaling."
	Rotate Tool	**R**	Rotate objects from the midpoint.

Shortcuts and Operting Systems

Unless otherwise specified, shortcuts are identical in
Windows and in Mac OSx. In general, **Command**
and **Option** in Mac OSx are analogous to **Control**
and **Alt** in Windows respectively.

Project 1

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Project 1 .... *Basic shapes*

Setup:
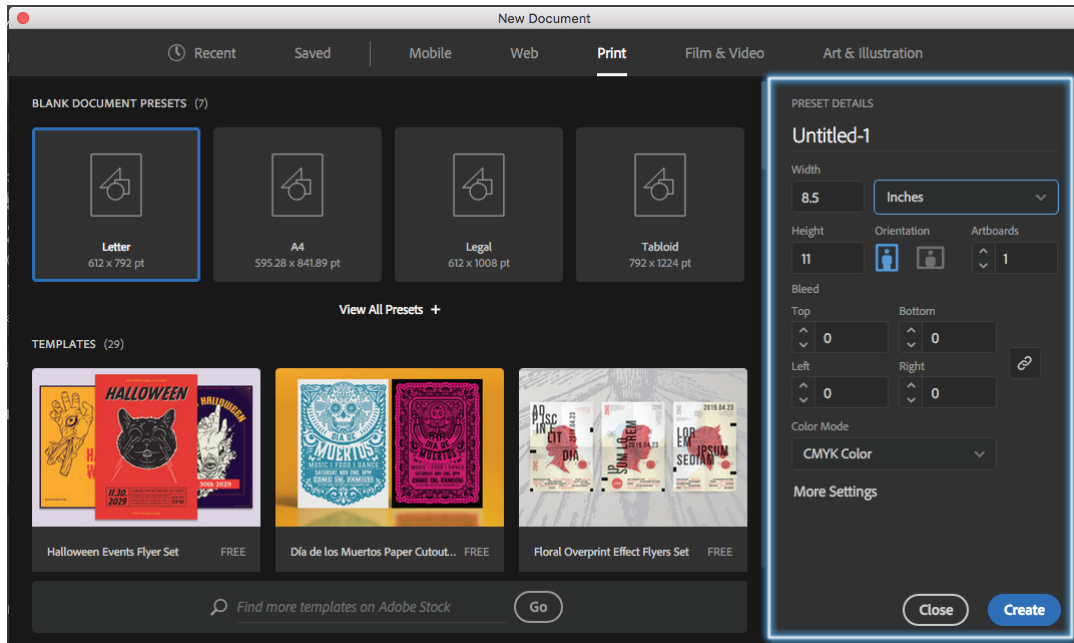
Fig 1.0: The New Document Dialogue Box

Create a new file by pressing **Cmd+n** (Mac) or **Ctrl+n** (Windows). Use the following settings for the **New Document Dialogue Box** and select **Create** (see Fig 1.0):

Width: **11″**
Height: **8.5″**
Color Mode: **CMYK Color**

A. Making a Rectangle

Shapes in Illustrator are created using "anchor points." These points define the boundaries and curvatures of all vector shapes. To make a rectangle in Illustrator, create four anchor points and apply a stroke or fill.

1. Select the pen tool.

Click on the pen tool in the toolbar, *shortcut **P**.......................*

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2. Create a new anchor point.

Click anywhere on the artboard to create the first anchor point.

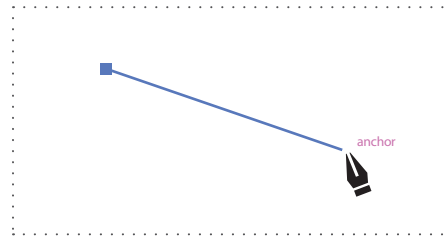*A blue preview line now follows between the anchor point and the cursor as a preview for the next line (Fig 1.1).

Fig 1.1: The blue preview line appears after the first anchor point is placed.

3. Create a second anchor point

3.1 Move the cursor below your first anchor point, as seen in Figure 1.2.

3.2 Press and hold the **Shift** key to make the line perfectly vertical or horizontal.

3.3 When the line preview is in the desired position, click to form the first side of the rectangle (Fig 1.2 step a).

3.4 Repeating steps **3.2** through **3.3**, form the bottom edge of the rectangle as seen in Fig 1.2.
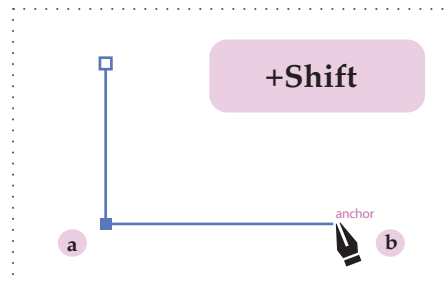

Fig 1.2: The shift key keeps the line vertical or horizontal.

3. Create the final anchor point

Click to create a properly aligned final anchor point.

* To know when the cursor is aligned with an anchor point, the pink "Smart Guides" appear and the cursor snaps into the correct position, see Fig 1.3.
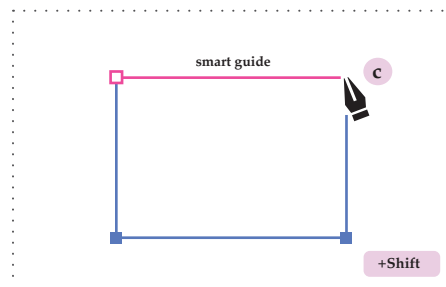
Fig 1.3: Use the pink "Smart Guides" to know when the cursor is lined up with the first anchor point

4. Complete the Rectangle

Click on top of the first anchor point to create the top side of the rectangle and complete the shape, Fig 1.4.

*Notice that the blue preview line is no longer active because the shape is now complete. The pen tool is now ready to create the next shape.

Fig 1.4: Clicking on the open anchor point completes the rectangle and prepares the pen tool for the next shape.

Problem: Can't find smart guides?
Toggle smart guides with **Cmd+U** or **Ctrl+U**

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B. Making an Ellipse

1. Select the ellipse tool
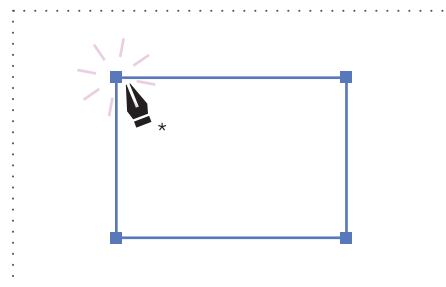
Click on the pen tool in the toolbar, *shortcut **P.*** ....

2. Set origin and expand

Click anywhere on the artboard and drag to form the ellipse.

Optional:

- Press and Hold **Alt** (Mac) or **Option** (Windows) to expand the ellipse from the center.
- Press and hold **Shift** to constrain the ellipse to a perfect circle.

Techniques for Drawing Ellipses

When dragging out the shape of the circle or ellipse, it can be difficult to place the circle or ellipse exactly in the desired position. Instead of drawing an ellipse and then transforming it into the correct position and size, imagine the ellipse bounded by a rectangle as in Fig 1.5. It is often easier to draw a rectangle in the correct position than an ellipse. The origin point, where the cursor starts drawing the ellipse, sets the bounds. In Fig 1.5, the cursor expands the ellipse down and to the right of the origin. Consequently, the top and left sides of the ellipse will always be aligned with the origin point no matter how large the ellipse becomes.
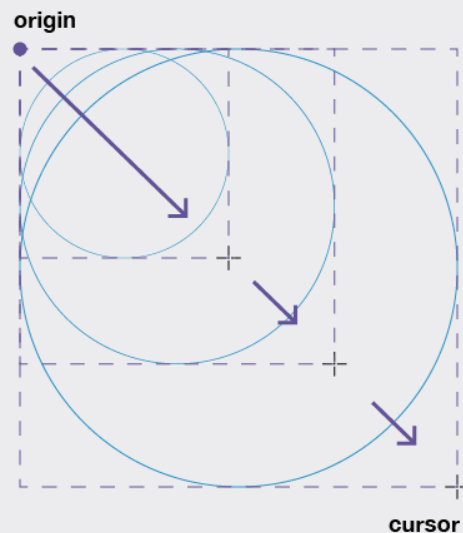
Fig 1.5: All three ellipses are aligned with the origin point on the top and left sides regardless of size.

Alternatively, holding **Alt** or **Option** while dragging, will expand the ellipse from the center. Placing the cursor in the center of the desired position (perhaps using "smart guides" to align with anchor points) will also facilitate correct positioning without having to transform the object later on.

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C. Transforming Your Object

Direct Selection Tool vs. Selection Tool

To move an entire object, use the Selection Tool to drag an object anywhere on the artboard.

Use the Direct Selection tool to move an anchor point or an edge.

Moving an Anchor Point

1. Select the Direct Selection tool, *shortcut A*.

2. Click and drag the anchor point to the desired position (Fig 1.6).

Moving an Edge

1. Select the Direct Selection tool.

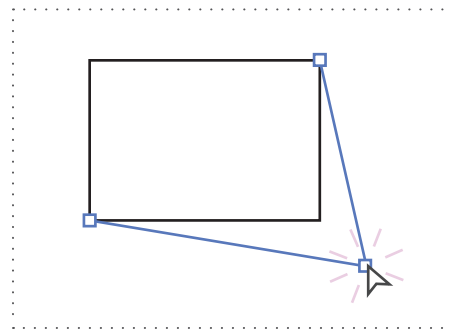**2.** Click and drag an edge to the desired location

Fig 1.6: Preview lines appear when moving anchor points in addition to when creating them.

Moving an Entire Object

1. Select the Selection Tool (do not confuse with the Direct Selection Tool), *shortcut V*.

2. Click and drag anywhere on the object to move it.

Alternatively, the Direct Selection tool will move an entire object when dragging from the inside of an object that has a fill.

Problem: Direct Selection Tool moves entire object

Solution

1. Click once on an edge or anchor point to enter direct editing mode. Be sure to click precisely on the anchor point.

2. Drag the desired anchor point or edge.

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Project 2 ....*Drawing a Car*

With the basic vector shapes established, creating organic shapes is the best way to learn how to use the pen tool in a variety of circumstances. Learning a few key concepts will preare any Illustrator user to draw any shape.
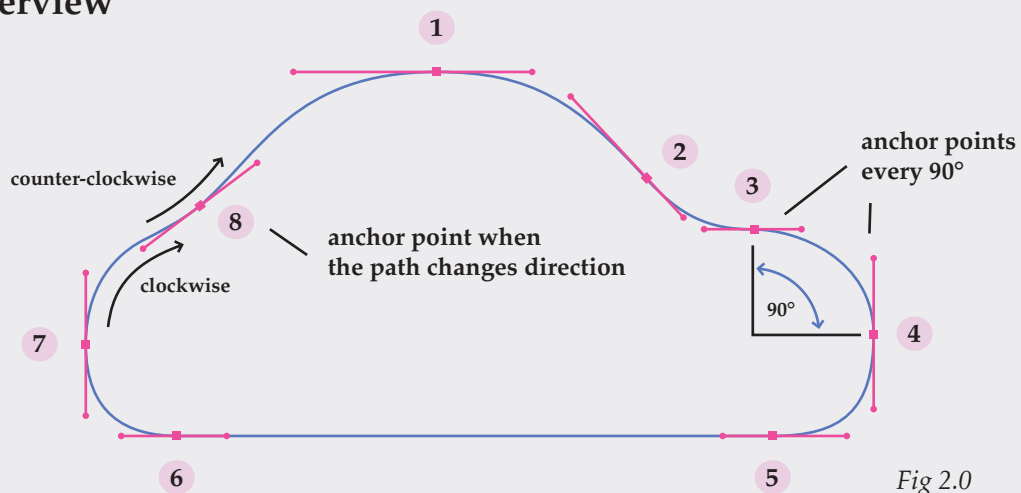
Overview

Fig 2.0

counter-clockwise

anchor points every 90°

anchor point when the path changes direction

clockwise

90°

When drawing any vector shape, keep the number of anchor points at a minimum. Add an anchor point every 90 degrees on a curve and at each point the path changes direction.

Need Help? Download the car template to guide you through Project 2
https://pages.github.ncsu.edu/aallis/Vector_Workflows/

A. Creating the Basic Car Shape

1. **Add an Anchor Point with Handles**

   Using the pen tool, click and drag to create the first anchor point (1), as seen in Fig 2.0.

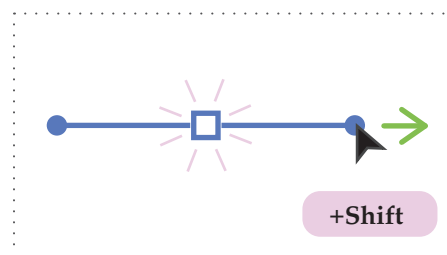   *Hold **Shift** to snap the handles to the horizontal or vertical position.

+Shift

Fig 2.1: Click once to place an anchor point, click and drag to create an anchor point with handles.

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2. **Add more Anchor Points**

    2.1 Add the second anchor point (2), in Fig 2.0 where the outline of the car begins to change direction towards the bottom of the windshield.

3. **Adjust handles**

    3.1 While the pen tool is still active, press and hold **Cmd** (Mac) or **Ctrl** (Windows) to toggle the Direct Selection tool.

   *See "Transforming Your Object" on pg 8, or "Glossary: Direct Selection tool" on pg 3.*

    3.2 Fine tune the handles from the previous anchor points (now using the toggled Direct Selection Tool) into the desired position as you go along. The vector path should line up with the outline of the car.

    3.3 Release **Cmd** or **Ctrl** to toggle back to the pen tool and continue adding anchor points.

4. **Place Remaining Anchor Points**

    Repeat steps **2** and **3** for anchor points 3, 4, 5... See Fig 2.0.

B. Creating the Fender and Wheels
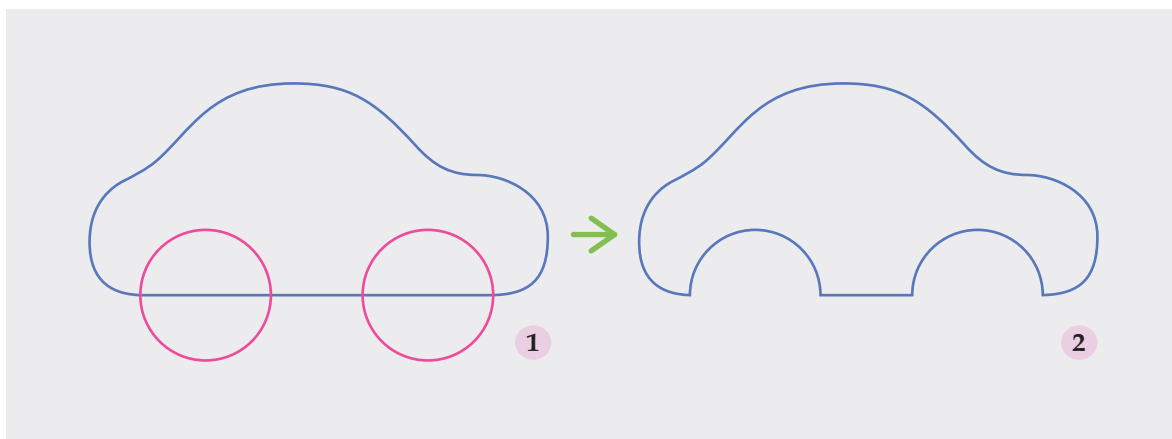
Instead of drawing the fenders as part of the car body in Step A, use Illustrator's **"minus front"** function to subtract perfect half-circles from the shape of the car.

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1. **Create the First Fender Shape**

    1.1 Create a circle by expanding it from the center using the **Alt** or **Option** key. Place the center of the circle on the bottom edge of the outline of the car, Fig 2.2.

    See "Making an Ellipse" on pg 7.

    1.2 Repeat step **1.1** for the second fender shape.
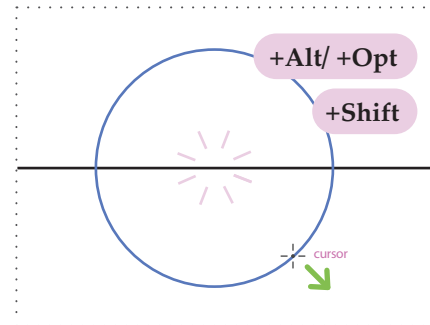

Fig 2.2: The circle expands from the center for optimal placement.

2. **Create the Wheels**

    2.1 Select one of the two fenders and scale it down, holding **Alt** or **Option**, to create a second circle inside the first. This will be the wheel inside the fender.
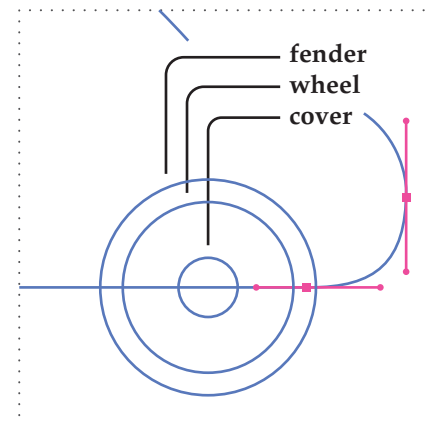
    2.2 Repeat step **2.1** for the second wheel.

3. **Create the Wheel Covers**

    Create a smaller circle inside each wheel using the technique from step 2.1. This will be the wheel cover.

Fig 2.3: Placement of the fender, wheel and wheel cover.

C. Using "Minus Front" to build shapes

1. **Subtract the Fenders**

    1.1 Group the two outer circles (the fender shapes) by selecting each one with the "**Selection Tool**" and pressing **Cmd+G** or **Ctrl+G**.

    1.2 Select the grouped circles and the outline of the car and press "**Minus Front**" from the **Pathfinder** menu, Fig 2.3.
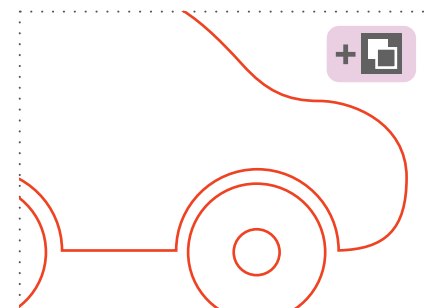
    Minus Front. . . . .

Fig 2.4: It is easier to subtract a circle from the shape of the car than trying to draw a half-circle with the pen tool.

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2. Subtract the Wheel Covers

2.1 Select a wheel and the respective wheel cover and subtract the wheel cover shape from the wheel, Fig 2.5.

2.2 Add a fill to make the effect visible.

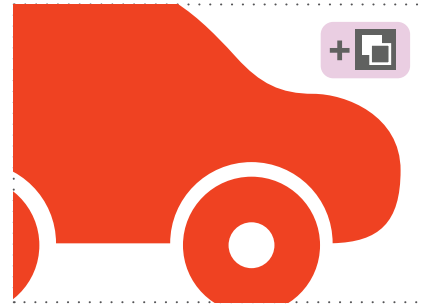Be sure that the wheel cover is arranged in front of the wheel, see **Problem: "Minus Front."**

Fig 2.5: Swithing from stroke color to fill color makes the effect in 2.1 visible.

Problem: "Minus Front" creates the effect seen in Fig 2.6
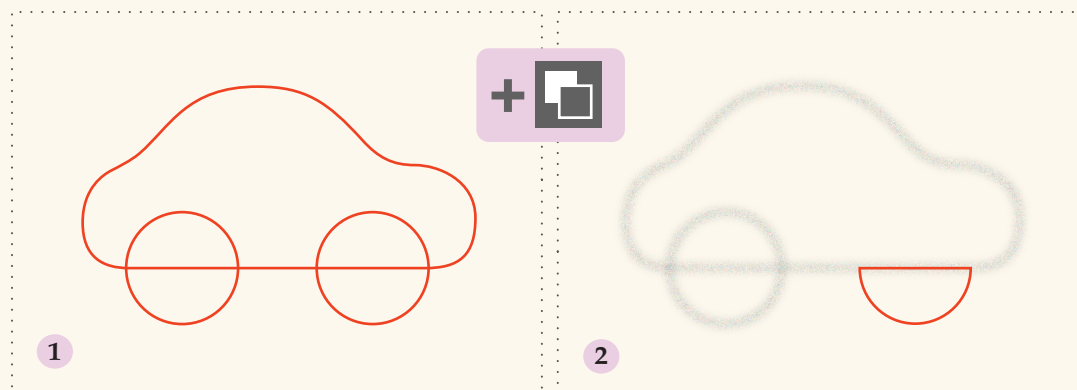

Fig 2.6: The car disappears when pressing "minus front," leaving only half a circle behind.

P.1 Undo using **Cmd+Z** or **Ctrl+Z** until the car is back to **step 1** in Fig 2.6.
P.2 Select the grouped circles and right click on one of the two paths.
P.3 Select **Arrange > Bring to Front**.
P.4 Subtract the circles from the body of the car.

D. Creating the Windows

1. Draw the Window Shapes

Use the **Pen Tool** to draw the two windows using the "**Anchor Point Tool**," *shortcut Shift+C* to "break" the path handles, see Fig 2.7.

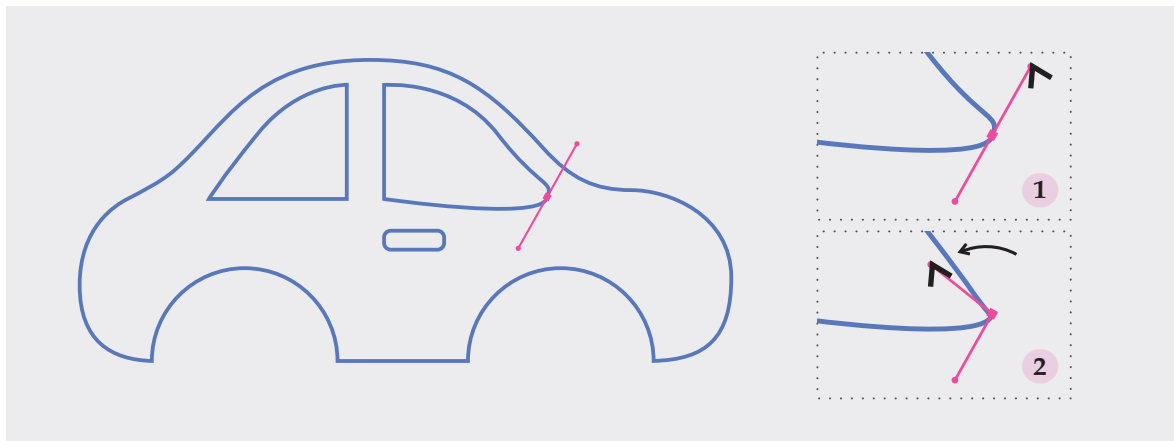ENG 331 Standard Operating Procedure
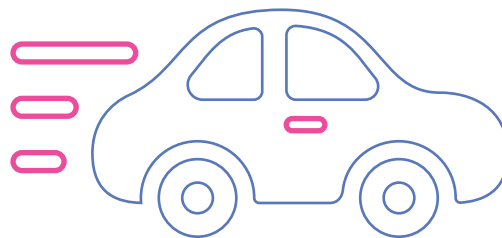Alexander Allis

Fig 2.7: Use the "Anchor Point Tool" to "break" the handles and have different curvatures on each side of the anchor point.

E. Creating the Door Handle and Speed Lines

1. **Make a rounded rectangle**

    1.1 Use the **Rectangle tool** (**M**) to draw a rectangle the size of the door handle and each speed line.

    1.2 Drag one of the four circles in each corner of a rectangle to round the corners.

    1.3 Use "**Minus Front**" to subtract the shape of the handle from the body of the car.

    1.4 Group all the elements of the car to finalize the graphic.

2. **Subtract the Window Shapes from the Car**

    Group both windows and subtract them from the body of the car.

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Workflows**