

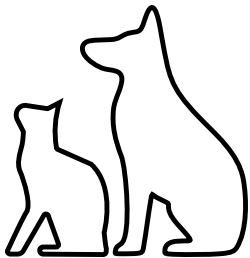
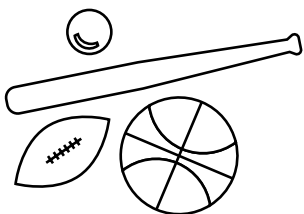
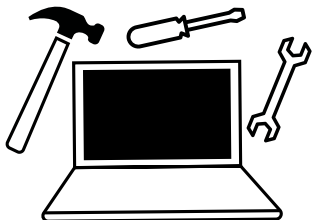
Automotive Design

Vehicle Design Guide

For Step Three: Choose Your Vehicle's Design Criteria

All vehicles need some of the same parts—like a body and wheels—to make them move. They also have other parts, or design features, that make the vehicle even more useful. For example, heated seats are great if you live in a cold place, and cell phone chargers are helpful features for people on the move. The list of parts and design features is called the vehicle's design criteria.

Criteria is a list of things that a product, such as a car, needs to have.

We're going to design...	With...
A mobile clinic for a veterinarian 	☐ space for the veterinarian to care for animals ☐ cages for different sized animals ☐ storage space for medicines ☐ storage space for animal food and water ☐ space for the veterinarian to meet with pet owners
A vehicle to transport a sports team and their equipment 	☐ seats for all the team members and coaches ☐ storage space for the team's equipment ☐ a white board for coaches to use ☐ storage space for first aid supplies ☐ storage space for food and water
A mobile maker space, where kids work together on projects with tools and technology 	☐ space for a 3D printer ☐ space for computer workstations ☐ storage space for supplies or materials ☐ tables for people to work on projects ☐ white boards

For Step Three: Choose Your Vehicle's Design Criteria (continued)

Interior Criteria Checklist (Inside)	
Required Parts	Special Features
☐ Steering wheel	☐
☐ Dashboard	☐
☐ Seat	☐
☐ Seatbelts	☐
☐ Gear shift	☐

Exterior Criteria Checklist (Outside)	
Required Parts	Special Features
☐ Axles	☐
☐ Body	☐
☐ Bumpers	☐
☐ Doors	☐
☐ Headlights and taillights	☐
☐ Hood	☐
☐ Trunk	☐
☐ Wheels	☐
☐ Windows/Windshield	
☐ Windshield wipers	

Color and Trim

For Step Four: Sketch a Vehicle to Meet Your Criteria

When you've imagined a great new vehicle, you want to share your idea with others. One of the best ways to do that is to draw it! Once you have design criteria, you can use it to sketch your vehicle.

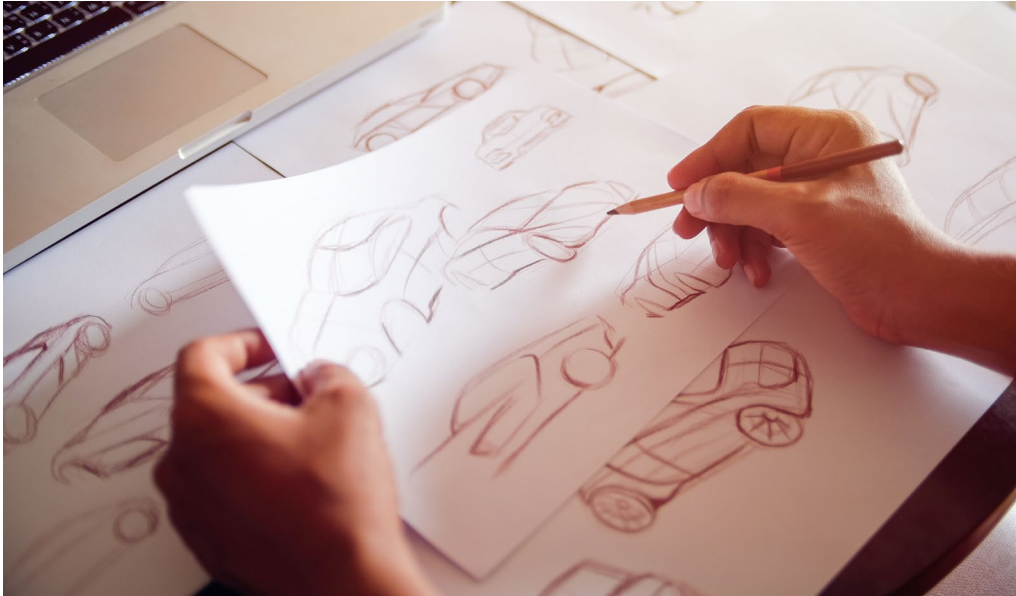
Creative designers will sketch their vehicle in several different ways. They'll draw the exterior, or outside, from different angles: the front, top, sides, and back. They'll draw the interior, or inside, too. And if there's a feature they really want people to notice, like a new kind of seat or steering wheel, they'll even draw a special picture of that.

Tips for Sketching Vehicles:

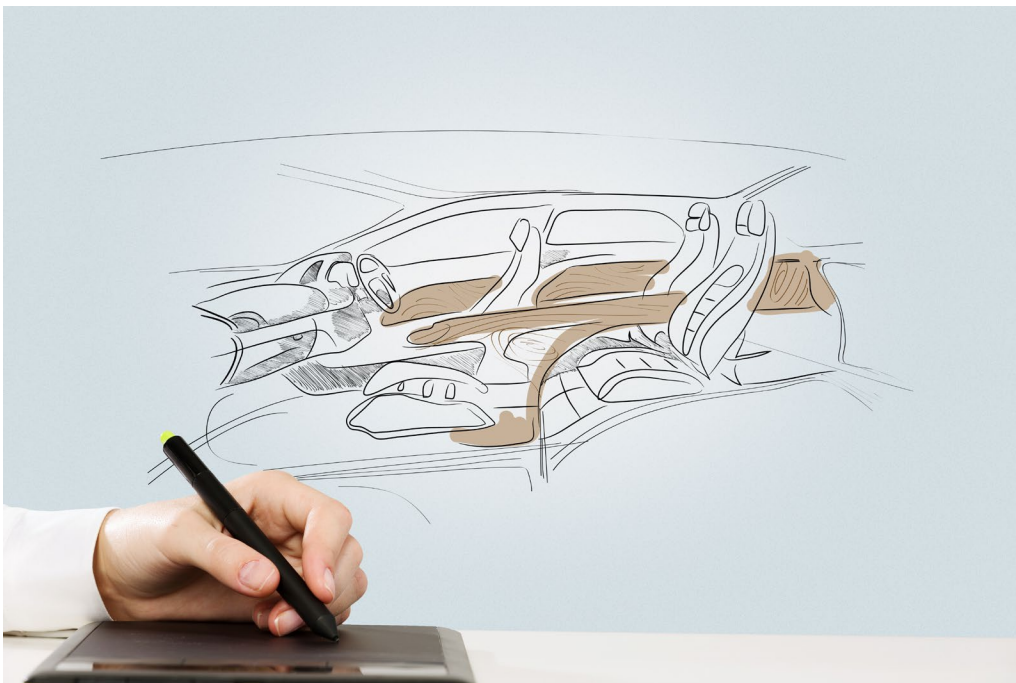
- **Imagine your vehicle.** Close your eyes and think about what your vehicle needs to do and how it will help people. What does it look like?
- **Design a vehicle that's good at its special job.** What does your vehicle need to do? What sort of conditions will it need to work in? Will it need to move through weather like snow or rain? What special features or parts can you include in your design criteria?
- **Use your market research.** Remember why your customer needs a special vehicle and how the vehicle will help them. Do your criteria and sketches reflect what your customer needs and wants?
- **Start simple, then add details.** First, draw the shape and size of your vehicle. Then, add in your criteria, including all the important parts and special features.
- **Use tracing paper to try out different ideas.** If you have tracing paper, you can see what a special feature looks like before adding it to your sketch. First, draw the feature on a piece of tracing paper. Then, place the tracing paper over your drawing to see if you like it as part of your final design.
- **Sketch like a professional!** Draw more than one view of your vehicle: top, side, back, or front. This helps others to understand what your vehicle looks like from every angle.
- **Be bold!** Use crayons, markers, or colored pencils to add color to your sketches.

For Step Four: Sketch a Vehicle to Meet Your Criteria (continued)

Here's an example of how a creative designer sketches the exterior:



Here's an example of how a creative designer sketches the interior:



For Step Five: Sculpt and Share Your Vehicle

What's even better than a picture to help people understand your design? A model! An automotive designer uses her design criteria, sketches, and model to share her ideas with others. **Clay sculptors** make models of new vehicles out of clay.

Tips for Sculpting Vehicles:

- **Learn how to use your material.** Knead, or mash up, the modeling foam to soften it up. Then, use the different tools to shape and add details to the foam.
- **Let your sketches be your guide.** Don't forget to look at your sketches (front, back, top, and/or side) as you sculpt. If you can, use scissors to cut around your drawings (front, back, side, and top). Then, hold them up around the foam to show the 3-D shape of their vehicle from each angle.
- **Start with the vehicle body, then add other parts and features.** First, sculpt the body of your vehicle. Then, sculpt in the parts, features, and other design criteria, like the wheels, doors, etc. into the vehicle body.
- **Use tools to add details.** Use rolling pins, cookie cutters, or any other tools to shape the foam or add patterns and details. For example, you might use the tools to form the different parts, make cut outs, or stamp impressions.
- **Don't worry about color.** People can see your color choices in your sketches. The sculpted model lets people see the shape and features of your design.
- **Be bold!** If your foam dries in time, use markers to add color and other details to your model.
- **Iteration is a good thing.** It's okay to make changes to your design as you sculpt the model. That's what design is all about: exploring an idea and making it better.

For Step Five: Sculpt and Share Your Vehicle (continued)

To make a vehicle that people can drive, designers first come up with an idea of what the vehicle will look like. Then, they share their designs with other people, like those who will build and test the vehicle.

Automotive designers use their design criteria, sketches, and model to share their ideas with others. They include information about the vehicle's purpose, their customer, and safety and sustainability. They make sure the other teams have everything they need to build the vehicle so people can one day drive it on the road.



Vehicle Design Questions:

- What parts or features did you add based on your market research?
- What special features did you add to your vehicle to make it more useful?
- What's your favorite thing about your design?