



How to Build the Best Pinewood Derby Car Ever



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Please enjoy this ebook to help you build your best Pinewood Derby® car ever! Whether you're participating in your first ever Derby or you're an old pro, you're sure to find new tips and tricks.

Before you begin working, review the rules for your pack's Pinewood Derby®. They do vary from pack to pack, and you want to make sure you design and build an eligible car.

Parents, don't forget that your son should do as much work as he can on the car. It's easy to forget this and build most of the car yourself, but it really should be your son's project.

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How to Build the Best Pinewood Derby® Car Ever

It must be that time of year again! Cub Scout packs are gearing up for their annual Pinewood Derbies®, and we at Cub Scout Ideas are here to help you build the best Pinewood Derby® car ever.

To do this, we're going to focus on building a high-quality car with all fully working parts, an aerodynamic design that propels the car forward while decreasing wind resistance, lubricated wheels and axles to decrease friction and a heavy rear end that increases speed.

Let's get started with the basics first.

Chapter 1: Rules for Your Derby

At most Pinewood Derbies®, the cars are inspected to ensure that they meet all of the requirements. Race officials may disqualify cars that don't meet them. There's nothing worse than the face of a little Cub Scout whose car has been disqualified.

To avoid disqualification, it is crucial that you know the rules for your pack's Pinewood Derby®. If your pack doesn't distribute them, ask for them. You can find [sample rules](#) here.

Our pack has always inspected the car and then given the Scouts an opportunity to make corrections. We have a Pinewood Derby® "garage" set up with tools, weights, etc. For example, if a car is less than 5 oz., the Scout can add more weight. If it's more than that, a parent can drill small holes in the bottom of the car to make it lighter.

The cars are inspected again, and if they pass inspection, they are officially checked in.

This is not a comprehensive list, but here are some of the reasons a car might be disqualified. Again, these will depend on your pack's rules.

- Car is too long or too wide.
- Wheels are not official BSA wheels.
- Bottom of body does not have enough clearance due to added weights that are not recessed into the body.
- Liquid lubricants were used.

If your district has a district race, find out what those rules are. In our area, the top four Cub Scouts get to participate at the district level, so we don't want them to be disqualified there.

To avoid this, our pack decided to adopt the district rules as our pack rules.

Chapter 2: Parts of the Car

Get your parts together.

Whether you are taking a block of wood and crafting the car out of it or you received a Pinewood Derby® car kit with all pieces included, it is important to take the time to inspect your parts. Doing this step now could prevent disappointment later if there is an issue with one of the parts come race day.

THE BLOCK

- First, do a thorough inspection of the wood block, checking for any chips, cracks or scratches. If there are issues with the wood near the axle slots or in areas that will not be removed when you craft the car, replace the block.
- Next, lay the block on a table or a desk and push down on one side. If the block rocks at all, the wood is warped. This will definitely impact the way the car "runs," so replace this block.
- Lastly, check the location of the axle grooves. They should be perfectly perpendicular to the side of the block. If it is not, the car will not "run" straight down the track. If they do not line up, replace this block.

SPEED TIP: Once you have a good block to use, bake it! With the help of an adult, bake your block in an oven set to 250 degrees for approximately two hours. The baking process will dry out any moisture in the wood and make it lighter going down the racetrack.

THE AXLES

- Inspect your axles for any issues, defects, scratches or broken pieces. If they are not straight, they should be replaced. One way to check this is to place the axle in the head of a drill and spin it. If it does not spin straight, replace it.
- Check the axles for marks along the shaft and rough edges beneath the head. These will need to be removed and sanded. You can use a jeweler's file and high grit sandpaper to polish the axles.

SPEED TIP: By bending your axles slightly, the wheels will ride closer to the nailhead. This reduces overall friction because the wheel isn't rubbing against the body of the car.

THE WHEELS

- Inspect the wheels for any defects and make sure they spin properly by placing them on the axles. If it wobbles or does not continuously spin, replace the wheels.

SPEED TIP: To increase the speed of your car, use your sandpaper to smooth the tread and other rough spots.

SPEED TIP: Check your race's rules, but if it's allowed, use lightweight wheels. The lighter the wheels, the more kinetic energy is produced – thus, more speed!

Chapter 3: Design Your Car

Design your car

This is where it really gets fun! Get creative, and sketch out a design for your car. Be sure to pick a design that you can feasibly create though, and be sure to read the rules of your particular race to ensure that you are staying within the requirements. If your race limits length, be sure to measure your design before you start!

DRAW IT OUT

- We recommend perfecting your design with pencil and paper before you ever start working on the wood itself.
- One great suggestion is to draw a rectangle that takes into account the maximum height and maximum length or use the template at the end of this book.
- From there, you can add marks for axles, wheels, weights, and other components, while ensuring you're not breaking any race rules. Add your unique flair to the car at this point.

SPEED TIP. Don't give your car a pointed nose. While this looks cool, it doesn't work out well at the beginning of the race when the car is resting against the starting pin. It can also send the car off crooked when the race begins.

SPEED TIP. Keep in mind that whatever you design, it has to be carved out of the wood. If your design is too difficult and curvy, simplify it just a bit. If you don't have a lot of detailed tools, the simpler design will be best.

SPEED TIP. Don't cut yourself too short in the back of the car. By leaving some extra wood there, you have space to add weights to the rear end of the car.

SPEED TIP. Aerodynamics are important! You don't want your car to be a rectangular block barreling down the racetrack. Select a design that moves air around and over the car. A wedge shape is a good example, but there are many other options that decrease wind resistance and increase speed.

SPEED TIP. Avoid the following: rough edges across the car (slow it down), unfilled holes (catch air and slow the car down), larger surface in front to smaller surface in rear (do it the other way around and achieve more speed).

SPEED TIP. Leave plenty of space between the front and rear wheels.

CUT IT OUT *(Do not do this without an adult helping you.)*

- If you drew out your design on paper, cut it out and tape it to your block so you have a clear template for cutting the wood.
- Cut your design into your block of wood. Most likely, parents will need to do this-- especially for the younger Scouts. Cub Scouts are not allowed to use any type of power tool. Depending on your design and your child's ability and maturity, they may be able to cut out the design using a hand saw such a coping saw.
- Once you have cut the initial design out, you can add more intricate details using a wood rasp.

SPEED TIP. Using a coarse grit of sandpaper, sand your car smooth. The smoother the car, the easier it will be to paint and the less wind resistance it will pick up on the track.

SPEED TIP. Sounds obvious, but be sure that the front and the back of the car are different enough for an official to notice the difference. You don't want the official to put your car on the ramp backwards.

ADD WEIGHTS

The next step to designing your car is adding weights. While the design and the individual components are important for the car to work properly, the weight is what makes the car go faster.

SPEED TIP. You want your car as heavy as the race allows; this will make it go faster! The limit for most races is 5 oz., and you want your car to hit that limit exactly.

- You want to add your weights to the rear end of the car, situated 1 inch in front of the back axle. The positioning of the weight is a strategic move that could win you the race.
- You can use a variety of items for weight, including coins, metal pieces, and more.
- After you place the weights inside the car, fill the holes you used with wood putty or glue from a glue gun.
- As you're weighing your car, make sure you put the axels and the wheels on the scale too. And don't forget that your paint and other decorations will add a bit of weight, so make sure you account for that.
- Be sure to confirm the exact weight of your car prior to the race. If you haven't hit 5 oz., add another weight!

PAINT AND DECORATE

- Once your car is sanded, smooth and free of any wood dust, use a water-based paint on it.
- The first coat has a tendency to soak into the block itself. Sand lightly after the first coat, and the following coats will not sink into the wood.
- After the final coat has dried, feel free to add decals, stickers, designs, and any objects that give your car some personality.

Chapter 4: Axles and Wheels

Add the axles and wheels

You're almost ready to race, but this portion of the process is very important. There are a number of important steps to adding the wheels and the axles.

LUBRICATE

In order to hit top speeds, we need to reduce friction between the car and the wheels. We do this by lubricating the wheels and the axles with graphite. Be very careful with the graphite. It is a fine black powder that is difficult to clean up. Most facilities won't allow you to add it to your car while you're inside, so set up a "graphite station" outside.

- First, sand the axle slots with medium grit sandpaper. Then add a small amount of graphite to each axle slot with a Q-tip or the tip of your finger. Do this until the slot is covered.
- Next, add graphite to the wheel hub in the same manner until there is a ring around the hub. Put graphite into the bore of each wheel itself.
- Now, shake the wheels to dust off any loose graphite.

Now that the wheels are well lubricated, it's time to add the axles.

AXLE INSTALLATION

- Install the axle into the wheel, while pouring bits of graphite into the bore. This way, the connection between the two is well lubricated.
- Push it all the way through, and add more graphite while spinning the axle in the hole.

MOUNTING

- Place the wheels on the car, pushing the axles as high into the axle slot as they can go.

SPEED TIP. Make sure the axles are perfectly perpendicular to the block.

- With all four wheels in place and locked into the axle slots, roll the car forward as a test run. Pay attention to how the wheels spin, and if the car goes in a straight line.

RACE AWAY!

With your car rolling straight, it's time to race!

Resources

[Pinewood Derby Resources & Information](#)

This [page on my site](#) lists everything I've written about the [Pinewood Derby](#). Click on over and enjoy!

[Pinewood Derby Music Playlist](#)

Add to the excitement of your race by playing some of these fun car-related songs.

[Pinewood Derby-Themed Treats](#)

Serve some snacks to keep everyone from getting too hungry at your Derby.

[Pinewood Derby Award Ideas](#)

From Best Movie Theme to Best Use of Legos to Sportiest Car, you'll find lots of award ideas in this post.

Make sure you check out this post to see some [incredible Pinewood Derby trophies made out of discarded car parts](#).

[Pinewood Derby Books](#)

If you need more help with your car, check out this list of 10 helpful books.

[Pinewood Derby Raisin Racers](#)

Make "Raisin Racers" at your Derby. This combo activity & snack is sure to be a hit.

[Pinewood Derby Parts & Supplies](#)

Grab all the parts and supplies you need to build an epic Pinewood Derby car in the [Cub Scout Ideas Amazon shop](#).

Pinewood Derby Grid

Draw your design on one of these template. Then tape it to your block of wood, so you'll know exactly where to cut!

