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Summary

Start With A Plan

So let's get ready to race! Before we go over the car construction, there are a few things to go over first.



BE SAFE

- ❖ Always follow safety rules when using tools.
- ❖ Safety glasses and gloves should be worn when using all tools.
- ❖ Make sure you use hand tools and power tools under adult supervision.
- ❖ DO NOT use lead car weights! Lead can be toxic. Use the weights sold for pine wood derby racing.
- ❖ Make sure you know the rules that your pack follows when racing. You can't race if you do not follow the rules. It's very hard to get another car ready if your car is kicked out on race day.
- ❖ Show good sportsmanship towards all participants.

And have fun!

The directions here follow the rules that come with the pine wood derby car kit but your pack may have different rules.

Follow the rules of your pack when you build your car or you may not be allowed to race. You can't win if you can't race.

You'll probably come up with several ideas on your own, so we suggest you read this entire guide first, and then make your own plan for building your car.

Material Needed

Here's the minimum things you'll need to begin.

- ✓ One pinewood derby car kit
- ✓ Graphite lubricant
- ✓ Small water color paint brush
- ✓ Epoxy
- ✓ Car weights
- ✓ Pliers
- ✓ Small Hammer
- ✓ Small wire or nails or tacks
- ✓ 100 grit sand paper
- ✓ Paint and decals for the car

If you want a better chance of winning, you'll want to consider these things as well.

- ✓ Hobby drill and drill press
- ✓ #44 drill bit
- ✓ ¼ inch drill bit
- ✓ sand paper in 400, and 600 grit
- ✓ metal file
- ✓ tooth paste or jewelers polish
- ✓ an extra set of 4 wheels and 4 axel nails
- ✓ ruler for measurement



We used this hobby drill to carve out a spot for weights, grind and polish the axels, and drill holes for the axel. *You can do most of the items in this guide without one except you will have to use the pre-cut slots for the axels and will not be able to use our preferred method to glue in the axels.*

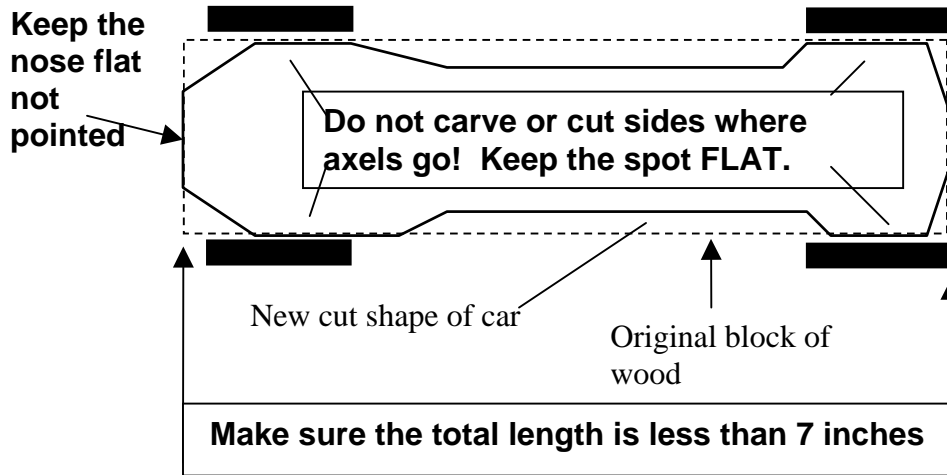
If you search the internet, you'll find a great deal written about the science of how to make a fast pinewood derby racer. The best information I found is by Dr. Cory Young at www.pack146.nova.org/pinewood/ the web site for Cub Scout Pack 146 in Chantilly Virginia. Dr. Young did 29 experiments and found some things that made cars go faster and some things that did not. He did not examine some things that we found make cars go faster. We use his results as well as our experience in making our recommendations but here's the simple science behind a high performing racer.

1. **Get the car to go as straight as possible**
2. **Get the friction between the axels and wheels as low as possible.**
3. **Use to maximum amount of weight permitted by your rules**



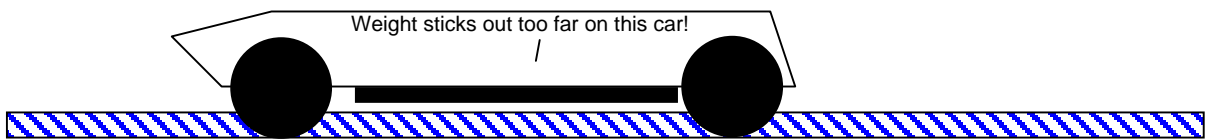
Shape

No matter what shape you choose, DO NOT cut or carve around where the axels and wheels will go. Also, keep the edge of the nose flat. A rounded or pointed nose is harder to set up at the starting line to go straight. Make sure the total length, including the wheels, is less than 7 inches.



Weight Placement

If you put weight on the bottom of the car, make sure you carve out a hole deep enough so the weights do not rub on the track. Most tracks have a raised center to guide the cars. If you just screw the weights on the flat bottom, the weights will rub on the center of the track and your car will stop a few inches down the track and you'll be dead last!



The drawing above shows weight that sticks out too far below the car. This weight will rub the track center and your car will be dead last! Even if the weight does not rub on a flat part of the track, it will rub when the track curves. My dad lost the dads race because of this. I tried to tell him.



SAFETY NOTE!

Cutting out a hole for your weights is best done with a router tool or chisel. These tools should ONLY be used under adult supervision!

Add weight at the final weigh in

Build your car so that weight is added at your pack weigh in. This is the last time you can adjust anything. It is usually easier to add weight even by gluing small pieces to the top of the car. I've seen scouts grinding off weight to meet the weight limit. When you do that at the last minute you can mess up your alignment or get sawdust in the wheels and cause the car to go slower. It will also mess up your paint job too.



SAFETY NOTE!

DO NOT use lead weights. Lead can be very toxic. Use coins, washers, or weights made for pinewood cars.

Color

One thing I never tried but think might help with tracks that use photo electric timing systems is to paint the car black to make sure the light gets cut off as soon as the car crosses the finish line.

So before we go any farther, you should know the following:

- ✓ The shape of your car, a simple sketch is fine.
- ✓ Where your weights will go, under or on top.
- ✓ If you will be able to extend your wheel base



Friction, the enemy of fast cars.

We'll reduce friction greatly by getting the axels ready.

I like to experiment with different wheels and axels to get the best combination of wheels that will spin the longest to give me the fastest car possible. That's why I get additional wheel sets. I test different wheel and axel combinations by spinning the wheel by hand and seeing which combination spins the longest with the least vibration. These are the pairs that we will prepare for the car. Make sure you remember which axel goes with which wheel.

The axels are just small nails. They are not made very precisely and have burrs on the underside of the nail head.

We need to get rid of the burrs so the wheels spin with less friction.

We also need to file the underside of the head so the wheel does not rub against it as much as if it was flat. We call this a beveled edge.

We'll also file and polish the axels to make them smooth and also let the wheels spin with less friction.

