

PINEWOOD DERBY

PACK 98

Official District Rules and Tips

Dear Parents,

Welcome to the world of Pinewood Derby. Your scout and you should make the car together as a project! It is not the intent that the parent show your Scout the garage door then walk away; nor is it the intent that your scout play video games while you cut and sand. Parents should shape with the power tools and then direct the rest of the action while showing your scout each step in building a car.

Pinewood Derby is meant to be a Parent/Scout project, with your scout doing as much work as is age appropriate.

Before building your car, please follow the rules and safety guidelines. Here are a few simple safety guidelines:

- Wear protective goggles, gloves and a dust mask to protect your eyes, hands and lungs
- Don't melt lead. It is not only a very dangerous operation, it is toxic.
- Scouts are not allowed to use power tools at workshops. Period!

Design your Pinewood Derby Car

First step is to have fun thinking up a car design. Don't limit your imagination, but keep in mind that the more complicated the design, the harder it will be cut the pine block and shape the car.

If you are short on time, consider a very simple design that requires only one or two cuts. For example, the wedge shaped design only requires you to cut the block on a diagonal. Hold the block so you are looking at it from the side, then draw a line with a ruler from the bottom left to the top right. Voila, one cut. The half with the axle slots is the part you are going to use, while the other half can be used for firewood. You are basically going to cut the block in half starting from the top edge to the bottom edge.

From here you can easily see how your car design can be as simple or complex as you want. Adding weights to your Car

Why add weight? Well, since you cut all that wood away, the block is now very light. Your car accelerates down the track by the pull of gravity. More weight, the faster it goes. The rules say that your car can weigh no more than 5 ounces. Your goal should be to bring it as close to 5 ounces as you can.

The easiest way to add weight to your car is to purchase a little set of weights from a hobby shop or BSA (Hobby Town on College). These weights come in segments that snap off so you can add just the right amount of weight. The weights can be glued on.

There are many other ways to add weight to your car...you can drill holes in the car and fill it with lead Bibs or even glue a stack of pennies to the car. Just be sure that whatever you use, it is secured tightly so it doesn't pop off during the race.

Painting your Car

You are now ready for the final touches...painting, decals, and decorating. This part should be done entirely by the scout. Let them have fun picking the colors and designs that they want on their car.

The first coat of paint should be a wood primer because it will soak into the wood to create a base for the top coat. After the primer dries, sand it lightly with the very fine grade of sandpaper (200 or 400 grit). Next paint one or two finishing coats to get a clean, polished look.

If you are painting the car with a single color, use spray paint. If you want more than one color, brush it on. Masking tape works well to make straight, sharp lines. Just tape the part of the car that you don't want

painted, paint away, then peel off the masking tape. If you buy model paint and a small model paint brush, you can paint intricate designs on the car, like stars, numbers, happy face, scout symbols, etc. Most kids get into this part and really have fun painting their cars.

Finishing Touches

Aside from painting cool designs on your car, consider decals. Kids love them and they add a nice finished look to the car. Kids also like to glue on pieces of toys, like toy soldiers, car parts, lizards, fenders, exhaust pipes, bumpers, etc.

Wheels

The last step is axle preparation and putting the wheels on. The most important thing to remember is to deburr the nails that you received in your kit. What does that mean? There is a sharp burr on the underside of the nail head that must be removed. If you don't remove the burr, it will dig into the plastic wheels as the wheel turns, severely slowing down your car. The easiest way to remove this burr is to place the nail in a vice so the head is sticking up. Then gently file down the burr with a fine file until it is totally removed. You can also remove it with sandpaper, though this will take longer. Your objective is to make the axle as smooth as possible.

When all four axles have been deburred, insert them into the block. They should be inserted so the wheel is about 1/8" from the car. If the wheel is too tight, the wheels will bind, slowing the car down. If they are too loose, the car will wobble down the track.

How to build a fast Pinewood Derby car

Every scout likes to win. It's a great feeling. However, there are lessons learned in 'not-winning' too. We have a fairly competitive Pack as far as Pinewood Derby goes, and I've learned a little bit about building cars over the years (much to the chagrin of my son) that I'd like to share with you.

This is by no means a comprehensive list of speed secrets. There are several experts in this area that have published booklets, one written by an engineer, on the subject. I would consider these tips the basics but they are enough to get your car off to a good start. You may do as much or a little of these as possible. Bottom line is do it together and have fun!

General principles of speed

Your car goes down the track from the pull of gravity. Your car is slowed down from friction. Friction is the enemy of speed. Reduce friction and your car will go faster. Here are some ways to reduce friction and increase speed...

Axles

You want to make your axles as smooth as possible. Be absolutely sure that the burr under the nail head is filed or sanded off. Once that is sanded off, polish the nail head to a mirror like finish.

Gravity / weight

This one is simple. Be sure your car weighs as close to 5 oz. as possible. The heavier your car, the faster it will go. Find someone with a scale, purchase an inexpensive scale or weigh your car at the post office. Add weights until the car with the wheels and axles is up to 5 oz. Don't wait until check-in night to get this right. At the end of it all though, it's the 'official' scale you have to appease.

Balance

Add weight towards the rear of the car. Tests show that best performance is achieved on most tracks when the weight is added towards the rear of the car. This can be overdone, but a simple test to make sure the car is properly weighted is to balance the finished car on a pencil. The car should balance somewhere between 1 and 1-1/2 inches in front of the rear axle.

Making the car go straight

This can be tricky. Roll your car along the kitchen floor. If it veers to the right or left too much, the axles are crooked. Just like steering a car, you need to adjust the steering on your Pinewood Derby Car. To do this, you must adjust one or more of the axles so the car rolls straight. You can do this by re-drilling the axle holes and re-inserting the axles, or just use pliers to slightly bend the axle(s).

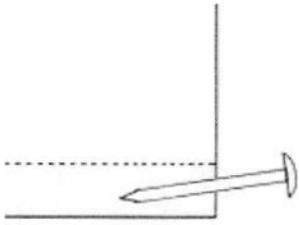
Lubrication

This is essential. Purchase a tube of graphite and sprinkle a little on the axles near the wheel. Spin the wheel so the graphite works in. You will notice a significant improvement in the speed of the wheel as it turns.

If you are serious about speed, spend a few hours some night on the internet researching tips & secrets from the experts or start the process of trial and error like I did. Either way, have fun and happy racing.

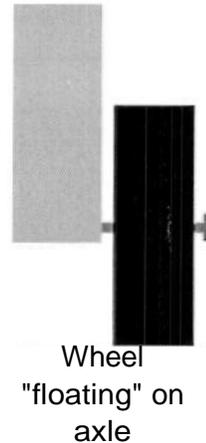
AXLES

Standard blocks have grooves in the bottom of the car for the axles guides. Grooves have two problems. The first is that the groove is often not at a perfect right angle with the block and the second is that it is very difficult to insert the axle in the groove so that the axle is level. The result is that your car will not go straight down the track causing the wheels to rub on the center guide and/or the wheels will constantly rub on either the car body or the axle head. Both of these conditions will slow your car down.



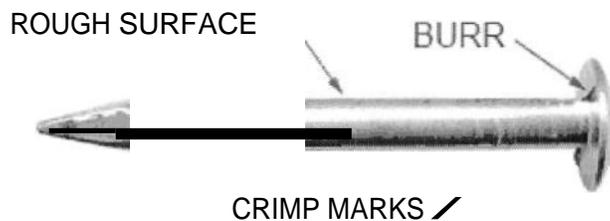
Axle in grooved block

- I use a drill press to drill precision drilled holes so the car will run straight and fast every time.
- No need to spend hours aligning your wheels. Just insert the axles in our block and you are ready to go.
- Level axles allow the wheel to "float" between the block and the axle head for the fastest possible speed.
- Axles won't drift out of alignment like they can in grooved blocks.
- No shims or other adjustments needed.
- Raised wheel (optional) for a 25% friction reduction.



The end result? You will save hours adjusting the axles and your car will consistently run straight and fast.

Don't let your axles keep your Pinewood Derby car from winning!



The axles that come in your kit have several flaws.

Besides burrs and crimp marks, the axle shaft may have a slight curve and the axle head may not be at a right angle to the shaft.

Polished Axles



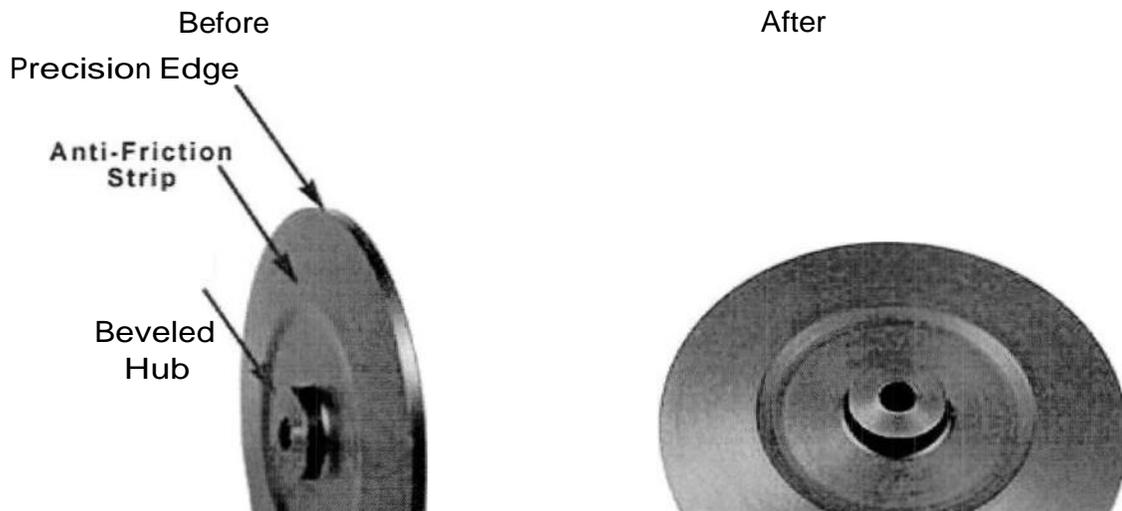
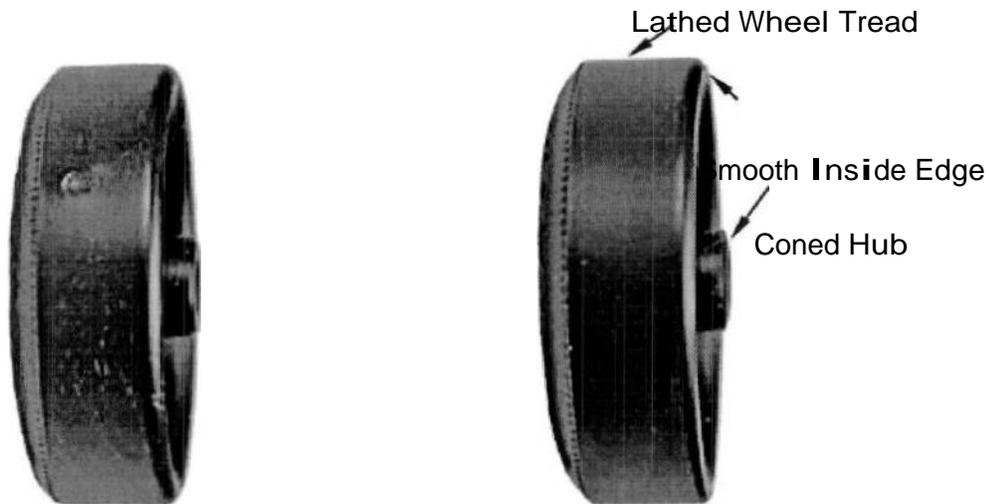
1. Straighten the axle.
2. True the axle head so that it is at a 90 degree angle to the axle shaft.
3. Remove Crimp marks
4. Remove Burrs.
5. Taper the head slightly to reduce contact area with the wheel.
6. Cut a shallow groove in the axle shaft to act as a lubricant reservoir.
7. Polish the axle shaft.

WHEELS

The wheels that come in your kit are not perfectly round and the tread surface is not even. In addition, several different molds are used to make the wheels. The wheels from each mold have different characteristics and imperfections. The result is that your car will vibrate or bounce slightly as it goes down the track slowing your car down.

- Smooth the inside edge of the wheel -This edge can rub on the center guide as the car moves down the track. If the rim is uneven, the wheel can "catch" on the guide as the wheel rotates slowing the car down.
- Cone the wheel hub- One of the largest factors that limit the speed of your car is the friction caused by the wheel hub rubbing on the car body. By coning the hub, you reduce the wheel/body contact area by 95%, minimizing friction.
- Also, consider narrowing the wheel's width. Remember, friction is the enemy.
- Finally, approach these wheel tips with caution as you have only four wheels to start with, and you need all four to race with. Mistakes are costly.

The result is wheels are much faster!.



LUBRICANTS

Lubricants can make the critical difference between winning or losing a race. Only dry lubricants, such as graphite, are allowed.

How to apply graphite:

1. Insert a wheel into an axle.
2. Hold the wheel down. Shake the graphite tube then squeeze out several puffs of graphite into the gap between the wheel and the axle.
3. Tap the wheel several times with your finger to move the graphite throughout the wheel.
4. Hold the axle horizontal and spin the wheel with your finger several times.
5. Repeat steps 2 through 4 several times.
6. Attach the wheel and axle to your car.

WEIGHT

The more your car weighs, the faster it will go on a downhill ramp. District rules specify a 5 oz. maximum weight. Most Pinewood Derby cars weigh between 1.5 oz. and 3.5 oz. (depending on design) without weights so a car may need 3.5 oz. or more of additional weight.

Weights are available at Hobby Town on College

Stick-On Weights



Incremental Tapered Weights

Caution: You should handle lead weight with gloves. Children should not handle lead weights