# PINE WOOD DERBY TIPS (Extracted from the "Ultimate Pine Wood Derby" website)

## HISTORY

The first Pinewood Derby was held in 1953 by Cub Scout Pack 280C of Manhatten Beach, California. The first reference to the Pinewood Derby in a Scout publication was in the October, 1954 issue of Boy's Life. The June, 1955 Program Helps listed "Wheels, Wings, and Things" as a theme. The Cub Scout Program Quarterly gave instructions for running the Pack Meeting Derby. The Supply Division's catalogs had kits available for $2.75 for a package of eight. Over 15 million kits were sold during the next 20 years. Today, over 80 million car kits have been sold.

## MOST IMPORTANT TIPS

1. The boys and adult should make the car together as a project! It is not the intent that the parent shows the Scout the garage door then walk away; nor is it the intent that the boy plays video games while the adult cuts and sands. Parents should shape with the power tools and then direct the rest of the action while showing the boy each step in building a car.
2. Have fun! After all, this is what it is all about.
3. Know the rules. Being disqualified can be very embarrassing.
4. Safety first. Let's not lose any fingers.

## DESIGN TIPS

1. Have your son draw a design on paper then cut it out and use it as a template. I use the paper with the little squares on it to make it easier for him. Draw a side and top view on the paper by tracing around the block of wood.
2. Keep the car a full seven inches. It has to do with the physics of velocity and length of travel of the weights.
3. Use the full 2 3/4 inches (outside wheel to outside wheel) that the rules give you. This will allow the wheels to travel farther before hitting the center strip.
4. Leave a lot of wood in the back to put in the weights.
5. Use the groove closest to the end of the block of wood as the rear axle. Trust me, it helps. If you are interested in discussing the physics, please e-mail me.
6. Do not make the front of the car pointed. It is hard to set up against the starting dowels.
7. Be aware of how sensitive your electronic timers are. You want the car to set them off at the end of the race and not before.
8. Use your imagination. Be creative. Shape has the least to do with winning. A beaver driving a log or even a pickup truck is more interesting than a wedge and will be just as fast. The aerodynamics of a small block of wood doesn't mean much in thirty feet.

| | | | |
|---|---|---|---|
| Hot Dog | Banana | Shark | Watermelon Wedge |
| Dragster Rocket Car | Ice Cream Bar | Batmobile | Police Car |
| Pencil | Tow Truck | Giant Lego Car | Fire Truck |
| Train Engine | Ambulance with Lights | | |

## FRICTION IS YOUR ENEMY

1. Debur the wheels. Take off the flashing and seam that was produced when the wheel was molded with a 600 grit or better sandpaper, inside as well as out. Sand any bumps off the wheel the sandpaper. Metal polish will restore the gloss. Be careful not to break any rules your race has regarding wheel modification. (Narrower wheels have less

friction and are better, but often disallowed). Don't sand too much or you'll create a flat spot. Sand by hand, not in the drill. Heat from the high speed of a drill will damage the plastic wheel.
2. Polish the axles. First with a 400 grit if you have a really bad spot. Then a 600 grit, and then a jeweler's rouge. Finish off with a chrome/metal polish.
3. Have only three wheels touching the track. Raise a front one slightly. There is less friction with 3 wheels rolling than 4.
4. The head of the axle should be tapered about 15 degrees so it rubs against the wheel less.
5. Wax the wheels with furniture polish. Make sure the polish does not contain a solvent of any sort.

**LUBE JOB**
1. Use graphite only. Oil damages the paint and collects dust. I'm told that the graphite works better than the new white teflon.
2. Break in the wheels by spinning them with lots of graphite.
3. Right before check-in, fill the wheels wells with graphite and cover with stickers like a hub cap. You can paint the 1 inch stickers in a contrasting color. It looks great!
4. Put a small drop of white glue where the axle goes into the car body and put powdered graphite on it there. That causes less friction if the wheel should rub against the car body.
5. Other than the good polishing of the axles, dump the axles and wheels in a ziplock bag with some graphite and shake them for a few days prior to the race. That way the wheel and the axles are as slick as can be.

**IT'S TIME TO GO STRAIGHT**
1. Put the axle in at a downward (5-10 degrees) angle. This provides two benefits. The first is the only the inside edge of the wheel is in contact with the track. This seems to make the car go straighter with less wobble. The second benefit is that the wheel rides to the outside of the axle and doesn't come in contact with the body. This tip is for experts only. First timers have trouble getting this right. If you have to email me to ask about it, you shouldn't do it.
2. Axles must be in straight front to back. That is square to the body. True the axles, don't trust the slots! If you have one, use a drill press to ensure all axles are straight. One of the front and two of the back should be measured to be the same height.
3. After pressing in the axles, test the car for crooked wheels...roll it on the floor. If the wheels are on straight, the car should roll 8-10 feet in a fairly straight line. Should the car turn left or right, you need to tinker with the axle placement without removing them from the car body, until it rolls straight.
4. Do not put the axles in at the top of the groove. Put them in at the middle. This lifts the car of the track a bit more and reduces the chance of rubbing on the center strip.
5. Glue the axles in place. Nothing is worse than having the wheel fall off as you cross the finish line.
6. Once you match a wheel and axle together with graphite, keep them together. They wear into each other as a matched set.

**WEIGH IN**
1. Get the weight as close to the 5 ounce limit as possible. Add the last little bit of weight with lead tape from the golf shop. This can be trimmed with scissors at the last minute. Remember, the official scale may not weigh the same as yours.

2. Everyone has an opinion on where to put the weight. My belief is that the weight needs to be predominantly in the rear so that gravity can act upon the weight further up the incline and for a longer period of time A car with more weight to the rear generally grabs more speed down the slope. Many suggest having the center of gravity at 1 to 11/2 inches in front of the rear wheels. But be careful not to put too much in the rear or you'll pop a wheelie.
3. What kind of weight? I think the melted lead is dangerous and unnecessary. Tubular weights can be sunk in the sides; flat weights, like those sold at hobby & council stores can be attached to the car bottom if it is carved in a bit. Incremental weights (with pre-marked grooves) are easier to snap off into the size you need. Some folks just use BB's, nuts & bolts, etc., but these must be glued so that they can not move. No movable weights or mercury are allowed.
4. We use the round weights found at the hobby shops and craft stores. This allows us to stick the weights out the back of the car. We paint them and tell everyone that they are jet engines or tail pipes. What they really do is allow us to get the weights as far back as possible.
4. Keep the weight low on the car and in the center (Left/Right of the car). Put the weight just in front or behind the rear wheels for less wheel chatter.

**THE FINISH**
1. Buy a gloss finish for the car. It’s worth it. After all that work, this is the final touch. The more coats that you put on...the shinier your car will be. Be sure the paint is dry before putting on the gloss coat. Some gloss products may be incompatible with the paint.
2. Sand in the direction of the grain when smoothing and against the grain when shaping.
3. Use a sandable primer or wood sealer. White is for light colors and grey for dark colors.
4. Water based paints dry quicker (1 hour) than oil based paints (24 Hours).
5. Children LOVE decals. The more.....the better.

**RACE DAY, BE PREPARED**
1. Have extra axles and wheels on hand. You never know when your car may be the one dropped by your son as he shows off his handiwork.
2. Have a derby tool kit handy. It should include superglue, sandpaper, a drill, extra screws for your weights, extra weights, and a small screwdriver. You may not use it, but it will make you the most popular person at the event.
3. Transport your car in a shoebox. Dropped cars are unfortunately a too common experience.
4. Add LOTS of graphite right before check in.
5. Explain to your son that running the car along the floor prior to the race will cause it to lose!