

Pack 374 Pinewood Derby 2009



Weigh-in and Registration: Friday, January 30th, 5:30pm to 7:00pm at Oster School

Race Day: Saturday, January 31st at Oster School
2nd Chance Registration 9:30am – 10:30am
Racing 11:00am – 3:30pm

Car Building Clinic: Saturday, January 10th, 10:00am to 2:00pm in Wright Hall

Car Building Rules

Intent

The purpose of this event is for the scout to build and race a wooden car. The scout should do as much of the work as is appropriate for his age. It is expected that a Tiger Cub will have quite a bit of help, but a Webelos 2 should be doing almost all of the work himself. Buying premade parts is NOT the goal of this event! Each scout is expected to build a new car each year.

The Kit

The car shall be built from the official "Cub Scout Grand Prix Pinewood Derby Kit." The Kit is a one piece wood block for the car body with plated nails for wheel axles and wide-tread plastic wheels. Only official BSA wheels and axles may be used as replacements. Unofficial kits, bodies, wheels or axles will not be accepted. The "PineCar" or any other pre-cut bodies WILL NOT be allowed to enter the Pack Race or the District Race.

The Car Body

You must start with the wood block provided in the kit and, as a minimum, the axle slots and some amount of continuous wood between the slots must remain from the original block. THE AXLES MUST BE INSERTED IN THE PRE-CUT GROOVES THAT ARE ALREADY CUT IN THE CAR BODY. The wheel-base (distance between the axles) must not be changed. You may add weights and other decorations if you wish. Decorative parts may be from any source.

Wheels

All cars must have four (4) wheels. You must use official BSA wheels THE SHAPE AND FORM OF THE WHEELS CANNOT BE MODIFIED OR RESHAPED, however wheels may be cleaned up to remove molding burrs. Only a minimal amount of material may be removed. The embossed "tread" marks on the outer rim must still be visible. You may not remove material from the inside of the wheel. The molded lettering on the inside and outside of the wheel must be intact and visible to the judges. The wheels may be polished if desired. All

four wheels MUST be in contact with a flat surface when the car is placed on it. (Roll the car on a flat surface and all 4 wheels MUST turn)

Axles

The official kit provides nails for the axles, and you must use the official BSA axles. Wheel bearings, washers, bushings, axle sleeves, and wheel covers are prohibited. The axles may be smoothed and polished if desired. The axles may be glued or clamped to hold them in place in the slots.

Physical Dimensions

Overall dimensions cannot exceed: 3" wide by 7" long by 3" high. Some kits come with blocks longer than 7" and must be trimmed. Note that these rules allow a 3" width vs. the 2 ¾" width specified in the kits. The width between the wheels must be greater than 1-¾", inside measurement. No part of the car can extend forward of the starting post.

Track Clearance

Track clearance is specified at 3/8" even though the lane strips are only 1/4" high.

Weight

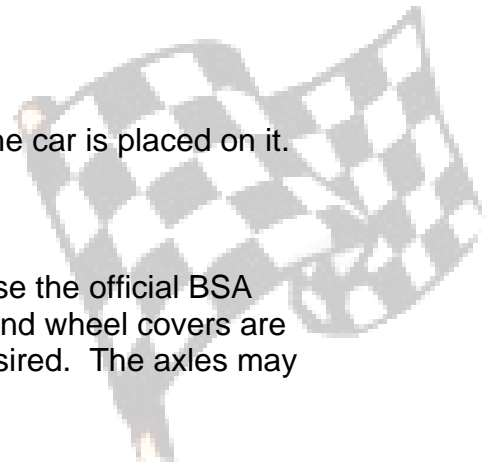
The car weight shall not exceed 5.000 ounces (141.75 grams). No loose material of any kind is permitted in or on the car. The car may be hollowed out and built up to the maximum weight by the addition of solid materials such as wood or metal provided it is securely attached or built into the body chassis. The weight MUST NOT be taped on. No liquid weights are permitted inside or attached to the outside of the car body. Lead weights should be avoided due to the toxicity of lead. The pre-made metal weights, or steel, brass or tungsten should be used instead. If lead is used, it must be under the surface, sealed from touch. Note that many low cost scales and most post office scales are not very accurate and your car may be overweight if you rely on them. At the district race, an official BSA 5 oz weight is used as the reference, and all cars must not weigh more than it does.

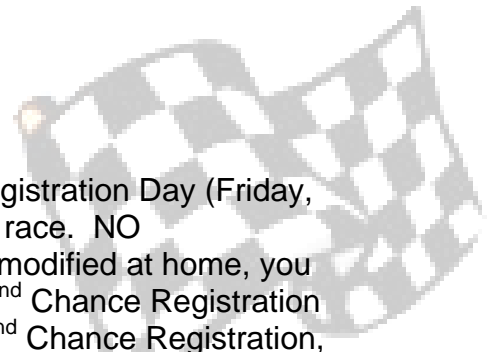
Springs

The car shall not run on any type of springs. The car must be free-wheeling with no starting devices.

Lubrication

The wheels and axles may be lubricated with any lubricant desired. However, a car that is dripping any oil or excessive amounts of graphite on the track will be disqualified. No additional lubricant may be added after the race starts. If wheel or axle repairs are necessary during the race, the replacement part may be lubricated under the supervision of a race official.





Registration Weigh-in and Inspection

All cars must be registered, inspected, and weighed on Registration Day (Friday, January 30th from 5:30pm to 7:00pm) in order to run in the race. NO EXCEPTIONS. If the car fails inspection and needs to be modified at home, you may make corrections to the car and bring it back for the 2nd Chance Registration (Saturday, January 31st from 9:30am to 10:30am). After 2nd Chance Registration, no more cars will be allowed to enter the race. After the cars have been registered and have passed inspection, they will be impounded until after the race. Unlike last year, we will not be adding lubrication to your car. So you should make sure that it is ready to race when you check it in.

District Race

Weigh-in and Registration:

Wednesday, February 4th, 2009 7:00pm to 9:00pm

Race Day:

Saturday, February 7th, 2009

Tiger Cub Check-in: 9:00am

Tiger Cub Race: 9:30am

Cub Scout/Webelos Check-in: 12:00 Noon

Cub Scout/Webelos Race: 12:30pm

Who:

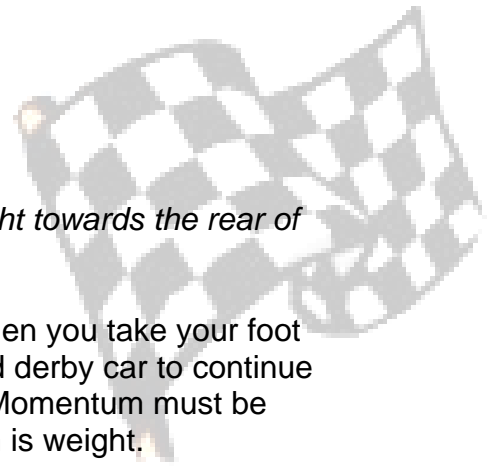
1st and 2nd place Tiger Cubs and 1st and 2nd place Cub Scout/Webelos Winners from each pack are eligible to enter the race.

Where:

Queen of Apostles, 4950 Mitty Way, San Jose. All Scouts and their families are invited to come and watch the representatives from their Pack.

A Pack Race Official is required to impound the cars at the completion of the Pack Race and bring them to the registration and inspection. This is to prevent any modification to the cars between the Pack and District races. The car drivers and their parents should be at the registration and inspection in case the car does not meet the physical dimension requirements or is too heavy and weight must be removed. They should also be present to make sure that the car is properly lubricated before the car is impounded for the District race. To minimize any issues with weight, we suggest adding weights in a manner that allow easy adjustment, addition or removal.

Car Building Hints - Five Keys to Performance



1. Maximize Momentum - *Maximize the weight; Add weight towards the rear of the car*

In an automobile, momentum helps the car keep rolling when you take your foot off the gas. In a similar way, momentum helps a pinewood derby car to continue rolling as fast as possible on the flat section of the track. Momentum must be maximized for top performance, and the key to momentum is weight.

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 the edge of a ruler. The car should balance somewhere between 1 and 1-1/4 inches in front of the rear axle (using the slot closest to the end of the block as the rear axle).

Does the type of weight matter? The maximum weight can be achieved with any type of weight; however, the type of weight does affect how easily the desired weight can be achieved. Denser weights (such as Lead or Tungsten) take up less space, so it is easier to reach the maximum weight. Also, since denser weights require a smaller volume of space, they allow creation of more aerodynamic cars (which is Key 2).

2. Aerodynamics - *Profile and body features minimized to improve air flow*

There are many elaborate ways to improve aerodynamics, but to simplify matters, let's use the following principles:

- Low-profile cars (smaller surface area as viewed from the front of the car) will tend to outperform higher-profile cars.
- Cars should taper from a smaller surface area in the front to a (possibly) larger surface area in the rear.
- Edges running across the car should be rounded or tapered.
- Wings, sails, flags, pennants, etc. add to the surface area, thus they tend to decrease performance.
- Unfilled (major) holes can catch air and slow down a car.

Aerodynamics is not as important as the other four Keys, so I don't suggest that you sacrifice looks to achieve an aerodynamic shape. If your child wants to build a car that is not particularly aerodynamic, don't worry about it. Just make sure that the other four Keys are carefully followed.

3. Wheel/Axle Preparation - *Axles - no flaws, straight, polished; Wheels - no flaws, polished*

All of the frictional losses in a pinewood derby car come from the wheels and axles.

- Place the nail in the chuck of a drill and use a Mini-File to remove the flashing under the nail head and minimize the ridges on the shaft.
- Finally, polish the axles with successively finer grit sandpaper starting with 600 grit, or with some polishing compound (car polish, metal polish, jeweler's rouge, etc.) until they are bright and shiny.
- To prepare the wheels, place the wheel in a drill using a wheel mandrel (a tool sold at hobby stores), and then lightly polishing the smooth surface area of the wheel with fine (600+) grit sandpaper to remove the molding burrs. To make sure that this area is evenly polished, attach the sandpaper to a small flat piece of wood or metal, and then apply the sandpaper to the smooth area of the wheel. Continue polishing for about 10 seconds on each wheel. Remember that you cannot change the profile (shape) of the wheel.

4. Lubrication - *Quality lubricant; applied properly*

Lubrication is an extremely important key. The difference in time between a well-lubricated car and a car without lubrication can be one-half second or more (this translates into several feet on the track).

Most people use graphite for lubrication. Graphite is carbon that has been ground up into a fine powder. There are many varieties and qualities of graphite available at hobby and hardware stores, so make sure to get a good brand. The Tube-O-Lube brand is one brand many claim to have produced top results in pinewood derby racing.

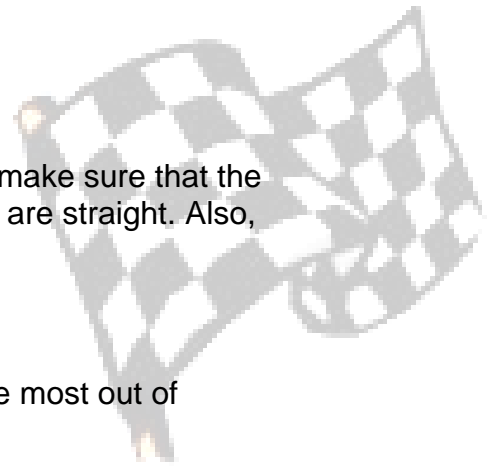
When lubricating with graphite, take the time to work it in thoroughly; a casual puff before the race is not sufficient. After lubricating, make a few test runs to break in the lubricant (or free spin the wheels several times). Since graphite works best after a break-in period, don't re-lubricate between race heats.

If you use a liquid lube (such as NyOil II), make sure to follow the recommended application procedure. With liquid lubes, less is best.

5. Alignment - *Car goes straight*

In order for the car to get to the finish line as quickly as possible, it needs to go straight. If it zigzags down the track, it will travel a longer distance, but worse it will continually lose speed as it bumps and rubs against the guide rail.

To minimize the amount of alignment adjustment needed, make sure that the axle slots are perfectly parallel to each other and the axles are straight. Also, make sure that the axles are inserted perfectly straight.



One simple method to ensure alignment is as follows:

1. Determine which of the front axles appears to be the most out of alignment.
2. Make a mark on that axle where it comes out of the car body.
3. Remove the axle from the car and remove the wheel.
4. Using a vise, pliers, etc. very slightly bend the front axle at the point marked in step 2.
5. Replace the wheel and re-insert the axle.
6. Roll the car on a smooth and level surface.
7. If it does not roll straight, slightly rotate the bent axle by grasping the axle head with a pair of pliers.
8. Repeat steps 6 and 7 until the car rolls straight.

After the axles are perfect, use two-part epoxy or hot glue gun to set the axles in position. The BSA axle clamps may also be used. Do NOT use a thin glue, such as super glue as this can run down the axles and into the wheels.