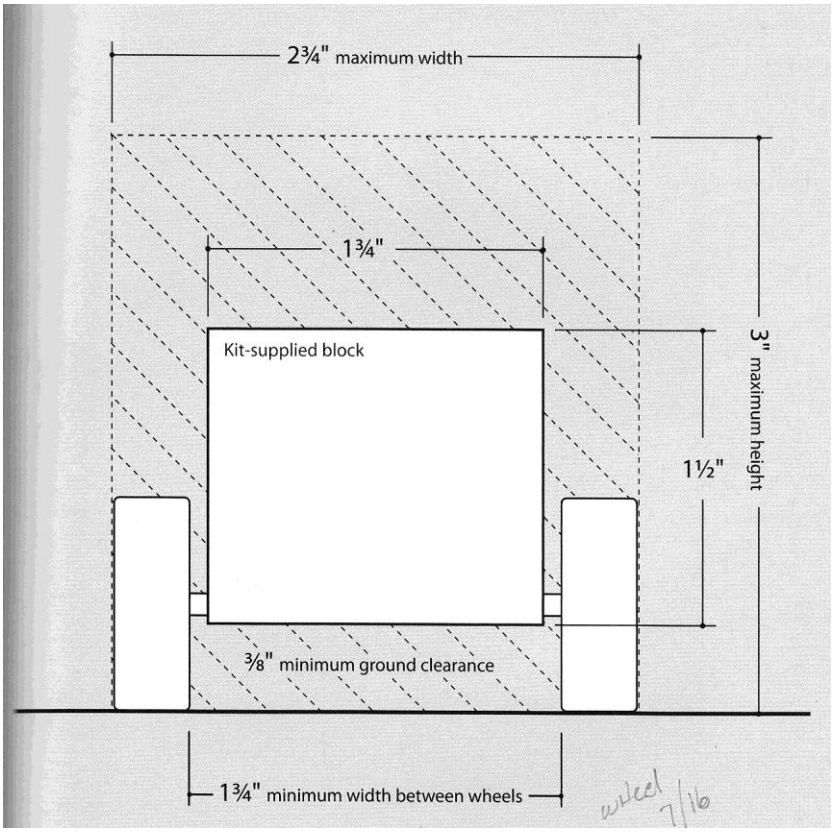
Pinewood Derby Building Steps

1) **PLAN A DESIGN:** I recommend keeping it fairly simple for the first year. There are many designs on the internet and I have a few books that can be looked at for additional ideas. Keep these things in mind when designing.
    a. Length 7 inches (this is the size of the wood blank in the kit)
    b. Width 2 3/4 inches. This is the outside of wheel to outside of wheel dimensions. The wood block supplied in the kit is 1 3/4 inches wide. When designing your car be sure and keep the width where the wheels touch the body 1 3/4 inches. The race track is constructed with multiple lanes. Each lane has a 1 5/8 inch wide strip the length of the track which is 1/4 inches high. The wheels of the cars must straddle this track so make sure to keep the body width 1 3/4 where the wheel and axels will attach.
    c. Minimum ground clearance should be 3/8 inch. The car will race over a 1/4 inch high guide rail so it is important to maintain a minimum 3/8 inch clearance on the bottom of the car.
    d. Weight: The car must weigh 5 oz or less. In most cased weight will need to be added to get the car up to 5 oz. The heavier the car the faster it will go so target close to 5 oz. If you don't have a scale someone suggested going the post office and using the mail it yourself scales in the lobby. (Hint 1: From what I have read it appears that keeping as much of the cars weight as possible to the rear of the car will help with speed. There is a bunch of physics behind this but basically the higher you can move the weight of the car on the starting track the more inertia it will have when it hits the flat part of the track.)

e. Here is a diagram I copied from “Pinewood Derby Designs and patterns” by Troy Thorne. It shows the dimensions from the end view.



2) **CHECK WHEEL GROOVES:** The instructions that come in the box dedicate about 1/5 of the page to this so I can only assume it must either be very important or a common problem. Before shaping the body, use a square, protractor or piece of paper to make sure the grooves for the wheels are 90 degrees to the body. Grooves that are not 90 degrees to the body will cause the car to steer to one side and rub against the lane strip, slowing down the car.

According to the directions that come with the car can be redressed if they are not square by holding two hacksaw blades together and using a square as guide. Be very careful not to cut too deep so that the bottom clearance will be maintained at 3/8 inch.

As an alternative there is a jig that is made for drilling holes for the wheels. This jig fits over the outside of the body and comes with its own #44 drill bit. I know these are available on the internet and I believe I saw them at Tammies Hobbies in Beaverton.

3) **TRANSFER DESIGN TO WOOD BLOCK:** We will first draw our design on two pieces of grid paper. One for the side view and one for the top view. We will then use some graphite paper to trace the design onto the wood body.

   Alternatively, you can draw the design directly on the car. If you have mostly straight line such as the simple wedge shape, this may be easier.

4) **FIRST ATTACHMENT OF AXELS:** It will be much easier to get the wheels attached correctly later if you test assembly the axel (without wheel) now. Lay the block on its side. Gently drive the axles in to with in 1/4 inch of the head. Keep the axel as straight as possible. Gently remove the axels on the first side with a pair of pliers and repeat the process on the opposite side. Axels should fit snug.

5) **CUT AND SHAPE THE BODY:** There are many tools that can be used for shaping the block of wood into your scouts design. For Tiger Cubs this is an area that will require close supervision. Here are a few tools that can be used for shaping.

   a. Pocket knife or carving knives.
   b. Dermal tool.
   c. Coping saw (most designs can be cut with a hand coping saw)
   d. Files
   e. Jig saw
   f. Scroll saw
   g. Band saw
   h. Sand paper

6) **ADDING WEIGHT:** This is an optional step but will improve the speed of the car. To do this the car needs to be weighed and some kind of additional weight needs to be added to the car. When weighing the care include the tires, nails for the tires and any other accessories you may be planning to add to the car. When adding weight target just slightly less than 5 oz. There appears to be all kinds of commercial products available for this. The most common and easiest to obtain is lead used for fishing. But you can look on the internet for other options. If you select one of the weights that attaches to the bottom of the car be sure to allow for this in our design and maintain the 3/8 inch clearance under the car. For those coming to work at our house I will have plenty of lead available.
   a. To add the weight holes will need to be drilled into the body of the car. The recommended way to do this is to drill holes perpendicular to the body as close to the back as possible. Drill from one side and stop short

of going all the way through the car body. But be creative, you could add tail pipes, role bars or other decorative details that add weight.

b. Cut lead slightly shorter than the depth of the hole.
c. Insert the lead.
d. Fill the hole with wood putty.
e. Sand putty flush with body of car.
f. Weigh car again to make sure it is slightly under weight, it is easier to remove weight now than after it is painted.

CAUSION: Lead is toxic so it must be handled with care. Wash hands immediately after handling. Do not touch your face with your hands while working with lead. And do not sand lead so that it makes lead dust.

7) **PAINT THE CAR:** Use whatever paint method you wish. Model paints, Acrylic paints or Spray paints will all work good. Plan on at least two coats of paint so choose a fast drying paint.

Note: Before painting place a small piece of painters tape over axel hole area large enough so that when the wheel is attached it will not touch the paint. This will keep the axel hole from getting filled with paint and will provide a good surface for applying lubricant when wheels are attached.

8) **ADD DETAILS:** This step is Optional. If you are going to add details to your cars such as steering wheel, windshield, motors, drivers, tail pipes or decals should be added now. I noticed that Tammies Hobbies has a huge selection of decals for pinewood cars.

9) **WHEEL AND AXEL ASSEMBLY:** It appears volumes have been written on the proper preparation of wheels and axels. There is lots of good stuff on the internet. First I will cover the basic assembly then I will provide a few of the optional things that can be done to improve the performance of the car.

a. Assembly
    i. Remove painters tape from axel areas.
    ii. Lubricate the bare wood area with dry lubricant such as graphite. Be careful not to get any lubricant on the paint. Do not use liquid lubricant. Liquid lubricants tend to attract dust and lint and will eventually slow the car down. I also read on the internet that white Teflon dust is available but that the best is graphite.
    iii. Lubricate the axel with same lubricant.
    iv. Attach wheel and axle to body. The spacing needed between the wheel and the body is 1/32 inch. Find something that can be cut

and placed around the axel between the body and the inside of the wheel while driving the axel in. 1/32 is about the thickness of 2 – 3 business cards. Drive axel in so that it is just snug against the spacer. The axel head does go inside the wheel slightly so you may need to us something like a small dowel to pound it in with.

v. Make sure all 4 wheels are touching the ground. Make alignment if necessary.

b. Optional wheel and axel preparation
    i. The outside of the wheels have small spots left by molding. You may want to cut or sand these flat. If sanding use very fine 600 grit paper.
    ii. Check the axel hole. Trim and polish any mold residue.
    iii. Inside of wheel. Where the wheel touches the body of the car make sure there is no rough spots. This can be lightly sanded. For improve performance some racers even round this area slightly to minimize friction.
    iv. Check the inside rim of the wheel. This is the part of the wheel that will rub against the track guide. Make sure there are no rough spots on this part of the wheel.
    v. Polish the axel.. Straight out of the box the axel has some rough spots on it from the manufacturing process. These rough spots are found just below the head of the axel. To remove these put the axel in a drill chuck point end first leaving as much of the axel sticking out as possible. Turn on the drill and use a fine file to just remove these burrs from the axel. Then use a strip of 600 grit wet dry sand paper with water to polish the axel. Additional polishing can be done with polishing compounds if desired.
    vi. Test the car for proper wheel alignment. To do this, use a board 6 to 8 feet long and about 12 inch wide. Place two strips of masking tape on the board about 6 inches apart. These need to be straight as they will be used to check for alignment. Raise one end of the board about 6 inches, just enough to allow your car to roll. Align your car between the taped lines and let it role. If your car roles straight down the board your done. If not note which way it veers off and try to adjust. If your car does not go straight it will rub against the track guide and slow it down.
    vii. Once the wheels are perfectly aligned, you may want to apply a drop of super glue to the axel being very careful not to get any on the wheel or axel area where the wheel turns. This will help prevent accidental loss of wheels during races.

viii. For more ideas there is lots of information on the internet. A good book I found on www.scoutstuff.org is “Pinewood Derby Speed Secrets” by David Meade.

10) **FINAL WEIGHT AJUSTMENT:** Be sure and weigh your final car and make sure it is slightly under weight or that you have a way to remove weight at race day weigh in.
    a. You can remove weight by drilling holes in the bottom.
    b. One method I saw for adding weight at race day was to drill a 3/8 inch hole in the bottom about 1/4 inch deep. Then at weigh in you can add a couple of fishing split shots and glue them in with super glue.
    c. Another way I saw was to pound fishing sinkers flat so they are very thin. This makes them easy to cut with scissors to the right weight. During the building of the car make a shallow location for adding these weights and glue them in as needed on race day.