Trail Life USA

Pinewood Derby

Rules, Building Tips & Racing Guidelines

*Ready, Set, Race!*

# Introduction

The Pinewood Derby is one of Trail Life's most anticipated events! This exciting race combines creativity, engineering, craftsmanship, and friendly competition. Fathers and sons work together to design, build, and race miniature wooden cars, creating memories that last a lifetime.

This guide provides the official rules, helpful building tips, and strategies to help your Trailman create a competitive car while having fun in the process. Remember: the goal is to do your best, learn new skills, and enjoy the experience together!

Whether you're aiming for the fastest car or the most creative design, this guide will help you navigate the building process from start to finish.

# Car Dimension Rules

**Your car must meet ALL of the following dimensional requirements to pass inspection:**

* **Maximum Length:** The overall length of the car shall not exceed 7 inches.
* **Maximum Width:** The overall width of the car shall not exceed 2¾ inches.
* **Wheel Clearance:** The car must have 1¾ inches clearance between the wheels (inside measurement).
* **Ground Clearance:** The car must have 3/8 inch clearance underneath the body so it does not rub on the track.
* **Starting Gate:** No part of the car may extend past the starting gate.

**PRO TIP:** *Build your car slightly under these maximum dimensions to ensure it passes inspection. Leave a small safety margin!*

# Weight Rules

Weight is critically important for speed. Heavier cars (up to the limit) typically perform better.

* **Maximum Weight:** The car shall not exceed 5.0 ounces.
* **Official Scale:** The official race scale used at car check-in shall be considered final.

**WEIGHT STRATEGY:** *Always aim for exactly 5.0 ounces. Use a digital kitchen scale at home, but expect slight variations. Bring extra weight materials to the race for last-minute adjustments!*

# Materials and Construction Rules

These rules ensure fair competition and safety for all racers.

## Required Materials

* **Official Block:** The official pinewood block provided by the troop must be used. The block may be shaped, painted, and added to in any way desired within weight, length, and other tolerances.
* **Kit Wheels:** The wheels supplied with the kit must be used. The wheels may be cut, drilled, beveled, or rounded. You may remove seams and imperfections from the wheels.
* **Kit Axles:** The axles supplied with the kit must be used. They may be polished or lubricated with dry graphite powder only - no wet lubricants.
* **Current Year Only:** The car must be made from materials distributed by the troop this year. Previous years' cars are not allowed to race.

## Prohibited Items

* **NO** wheel bearings, washers, or bushings
* **NO** springs of any type
* **NO** starting devices (car must be freewheeling)
* **NO** wet lubricants (oil, WD-40, grease, etc.)

## Required Identification

* **Name Label:** All cars must have the Trailman's name clearly written on the bottom of the car.

# Inspection and Race Day Rules

## Inspection Process

* Each car must pass inspection by the official inspection committee before competing.
* The Inspection Committee has the authority to disqualify cars that do not meet specifications.
* Once the car is impounded after inspection, only Pinewood Derby race officials may handle the cars.
* Arrive early for inspection - cars cannot race until they pass!

## Damage and Repairs

* If a car loses a wheel or is otherwise damaged during racing, the racer shall have 5 minutes to make repairs.
* Bring a small repair kit to the race: extra graphite, super glue, small pliers, and the original kit parts.

# Building Your Car: Step-by-Step Guide

Building a Pinewood Derby car is a journey of design, craftsmanship, and problem-solving. Here's how to create a competitive car while having fun!

## Step 1: Design Your Car

1. **Research designs:** Look at templates online, but encourage your Trailman to add their own creative touches.
2. **Sketch your design:** Draw the car from multiple angles. Consider aerodynamics and weight placement.
3. **Plan weight placement:** Most speed comes from having weight toward the rear of the car (more on this below).
4. **Consider creativity:** Many derbies have awards for design. Balance speed with creative appearance.

## Step 2: Shape the Car Body

1. **Mark your design:** Draw the outline on all sides of the block with pencil.
2. **Cut the basic shape:** Use a coping saw, band saw, or handsaw to cut the basic profile. Adult supervision required.
3. **Sand smooth:** Start with coarse sandpaper (80-100 grit), then medium (150 grit), and finish with fine (220 grit).
4. **Round edges:** Slightly round sharp edges for better aerodynamics and a professional look.
5. **Check dimensions:** Verify length (under 7"), width (under 2¾"), and ground clearance (at least 3/8") frequently.

## Step 3: Prepare the Wheels and Axles

*This is where many races are won or lost!*

**Wheel Preparation:**

* Remove mold seams and imperfections with fine sandpaper (400 grit)
* Lightly sand the inner hub where the wheel contacts the axle
* Some racers carefully bevel or round the outer edge for reduced friction
* Ensure wheels spin freely without wobbling

**Axle Preparation:**

* Polish axles with fine sandpaper or steel wool until smooth and shiny
* Remove any burrs or rough spots from the nail head and shaft
* Some experienced builders bend axles slightly for advanced alignment - research this technique

## Step 4: Add Weight

**CRITICAL:** Weight placement dramatically affects speed. Physics shows that placing weight toward the rear increases potential energy at the starting line.

1. **Target weight:** Aim for exactly 5.0 ounces.
2. **Weigh early and often:** Check weight after cutting, after painting, and before final assembly.
3. **Weight placement:** Most competitive cars have weight concentrated 1-2 inches in front of the rear axle.
4. **Weight options:** Tungsten weights (dense), lead-free fishing weights, zinc pennies, or metal rods drilled into the body.
5. **Secure weight:** Drill cavities and glue weights in permanently. Loose weights can shift or fall out.
6. **Final adjustment:** If slightly under weight, add putty, wood filler, or extra paint coats.

## Step 5: Paint and Decorate

1. **Prime first:** Apply primer for better paint adhesion and a professional finish.
2. **Multiple light coats:** Better than one heavy coat. Let each coat dry completely.
3. **Paint adds weight:** Weigh before painting so you know how much weight to add.
4. **Decorations:** Stickers, decals, painted details. Secure everything firmly - nothing should fall off during racing.
5. **Clear coat:** Protects paint and adds shine. Let dry 24+ hours before assembly.

## Step 6: Final Assembly

1. **Test fit:** Insert axles into slots WITHOUT glue first. Ensure wheels spin freely and car rolls straight.
2. **Alignment:** Wheels should be parallel and perpendicular to the car body. Adjust axle angles if needed.
3. **Install axles:** Apply a tiny amount of wood glue in the axle slot, then press axle in firmly.
4. **Let glue dry:** Wait at least 24 hours before handling or testing.
5. **Apply graphite:** Apply dry graphite powder to axles and wheel hubs. Spin wheels to distribute.
6. **Test roll:** Roll the car on a flat surface. It should roll straight and smoothly.

# Speed Secrets: Tips from Champions

## Weight and Balance

* **Maximum weight wins:** Always build to exactly 5.0 oz. Heavier cars convert more potential energy to kinetic energy.
* **Rear weight bias:** Place center of gravity 1-2" in front of rear axle for optimal performance.
* **Test the balance:** Balance car on a ruler at the center point. Rear should drop slightly.

## Friction Reduction

* **Polish everything:** Smooth axles and wheel hubs = less friction = more speed.
* **Graphite is your friend:** Apply liberally to axles and inside wheel hubs. Bring extra to race day.
* **Wheel alignment:** Perfectly aligned wheels reduce drag and keep car tracking straight.
* **Minimize contact:** Some builders space wheels to barely touch the track guide rail for minimum friction.

## Aerodynamics

* **Smooth surfaces:** Sand everything smooth. Rough surfaces create air resistance.
* **Streamlined shape:** Wedge or arrow designs typically perform better than boxy shapes.
* **Low profile:** Lower, sleeker cars have less wind resistance.
* **Round edges:** Sharp angles create turbulence. Gently round all edges.

## Common Mistakes to Avoid

* **Too light:** Not reaching 5.0 oz wastes potential speed.
* **Front-heavy:** Weight too far forward reduces performance.
* **Rough axles:** Unpolished axles create excessive friction.
* **Wheel wobble:** Bent axles or uneven wheels slow the car significantly.
* **No graphite:** Dry axles have much more friction than lubricated ones.
* **Rushing:** Build over multiple days, allowing glue and paint to dry fully.

# Race Day Checklist

Arrive prepared for a successful race day! Bring these items:

* **Your completed car** (with name on bottom!)
* **Extra graphite powder** for last-minute lubrication
* **Small repair kit:** super glue, small pliers, spare wheels/axles
* **Weight adjustment materials:** clay, putty, or small weights in case you're under 5.0 oz
* **Sandpaper** (fine grit) for emergency sanding if over size limit
* **Camera** to capture the excitement!
* **Positive attitude** and good sportsmanship

# Sportsmanship and Values

The Pinewood Derby is about more than just winning. It's about the journey, the lessons learned, and the memories created. Here are the values we emphasize:

* **Do Your Best:** Focus on effort and improvement, not just the outcome.
* **Learn and Grow:** Every car teaches valuable lessons about design, physics, and problem-solving.
* **Encourage Others:** Cheer for all racers, not just yourself. Celebrate creativity and effort.
* **Handle Wins and Losses Graciously:** Be humble in victory, gracious in defeat.
* **Follow the Rules:** Integrity matters. Build within the rules and accept judges' decisions.
* **Value the Experience:** The time spent building together is more valuable than any trophy.

Remember: Fast cars are built with skill and knowledge. Championship character is built through sportsmanship and integrity. Aim for both!

# Awards and Recognition

Many Pinewood Derbies recognize multiple categories of achievement:

* **Speed Awards:** First, Second, and Third place for fastest cars
* **Design Awards:** Most Creative, Best Paint Job, Best Theme
* **Craftsmanship:** Best Workmanship, Most Original Design
* **Spirit Awards:** Outstanding Sportsmanship, Best Team Spirit

Your troop may have different or additional award categories. Check with your leaders!

# Timeline: When to Start Building

Plan ahead for best results! Here's a suggested timeline:

* **3-4 weeks before race:** Receive kit, research designs, sketch plans
* **3 weeks before:** Cut and shape car body, begin sanding
* **2.5 weeks before:** Final sanding, drill weight cavities, prepare wheels/axles
* **2 weeks before:** Prime and paint (multiple coats over several days)
* **1 week before:** Add weight, final paint/decals, clear coat
* **3-4 days before:** Final assembly, install axles and wheels
* **2 days before:** Apply graphite, test roll, make adjustments
* **Race day:** Arrive early for inspection, have fun!

# Helpful Resources

## Tools and Supplies

Most supplies are available at hardware stores, craft stores, or online. You may need:

* Saw (coping, band, or handsaw)
* Sandpaper (80, 150, 220, 400 grit)
* Drill and bits (for weight cavities)
* Paint (spray or brush-on)
* Primer and clear coat
* Wood glue or super glue
* Graphite powder (dry lubricant)
* Weights (tungsten, lead-free, or zinc)
* Digital scale (kitchen scale works)
* Ruler or calipers for measuring

## Safety First

* Adult supervision required for all power tools
* Wear safety glasses when cutting, drilling, or sanding
* Work in well-ventilated area when painting
* Keep work area clean and organized
* Follow all tool manufacturer safety guidelines

# Conclusion

The Pinewood Derby is an incredible opportunity for fathers and sons to work together, learn new skills, and create lasting memories. Whether your car crosses the finish line first or last, you've already won by spending quality time together and developing important skills.

Remember these key points: follow the rules, build to maximum weight, polish everything, place weight toward the rear, and use plenty of graphite. But most importantly, have fun, encourage others, and display good sportsmanship throughout the event.

The lessons learned while building a Pinewood Derby car - patience, precision, problem-solving, and perseverance - extend far beyond race day. These are skills and values that will serve your Trailman throughout life.

***"Worthy Is the Lamb"***

*May your car run fast and your memories run deep!*

**See you at the finish line!**