

Pinewood Derby Building Basics

January 2016 edition (v1.1)

Pack 242 - Phoenix, AZ

Pinewood Derby

- Boys learn to take a plain block of wood, nails, and wheels...
- and turn it into an excellent racing machine

Pinewood Derby

- Boys learn how to:
- design
- use tools
- to persevere
- and that little things you can't see can make a big difference

Rules

- Box rules - 13 simple rules
 - but a lot of "gray area" and wiggle room
- District and Pack Rules
 - Much more detailed
 - No "gray areas" or room for argument
 - Focuses on what can be measured
 - Discourages "bought speed"

The Basics

- Wooden car, plastic wheels, metal axles
- 7" max length
- 2 3/4" max width
- 5 ounces max weight

What Makes The Car Go?

- A sloping Pinewood Derby track turns...
 - potential (stored) energy
 - into
 - kinetic (moving) energy
- Simply: height becomes speed!

Going Faster

- If a weight is placed higher, it'll have more potential energy
 - but the car can only be 7" long...
- Weight in back = greater initial speed
 - But too much weight in back can be unstable

Weight

- Almost all cars need added weight to reach 5 ounces
- Different weight types:
 - **Zinc / steel:** not expensive, but not heavy
 - **Tungsten:** very heavy, very hard, very expensive
 - **Lead:** heavy, inexpensive, easy to use
 - Lead can be harmful without precautions

Be Careful With Lead

- Lead can be dangerous if ingested
 - Don't sand areas with exposed lead
 - Wash hands after handling or use gloves
- Best to place lead inside car
 - if exposed, cover with paint or tape

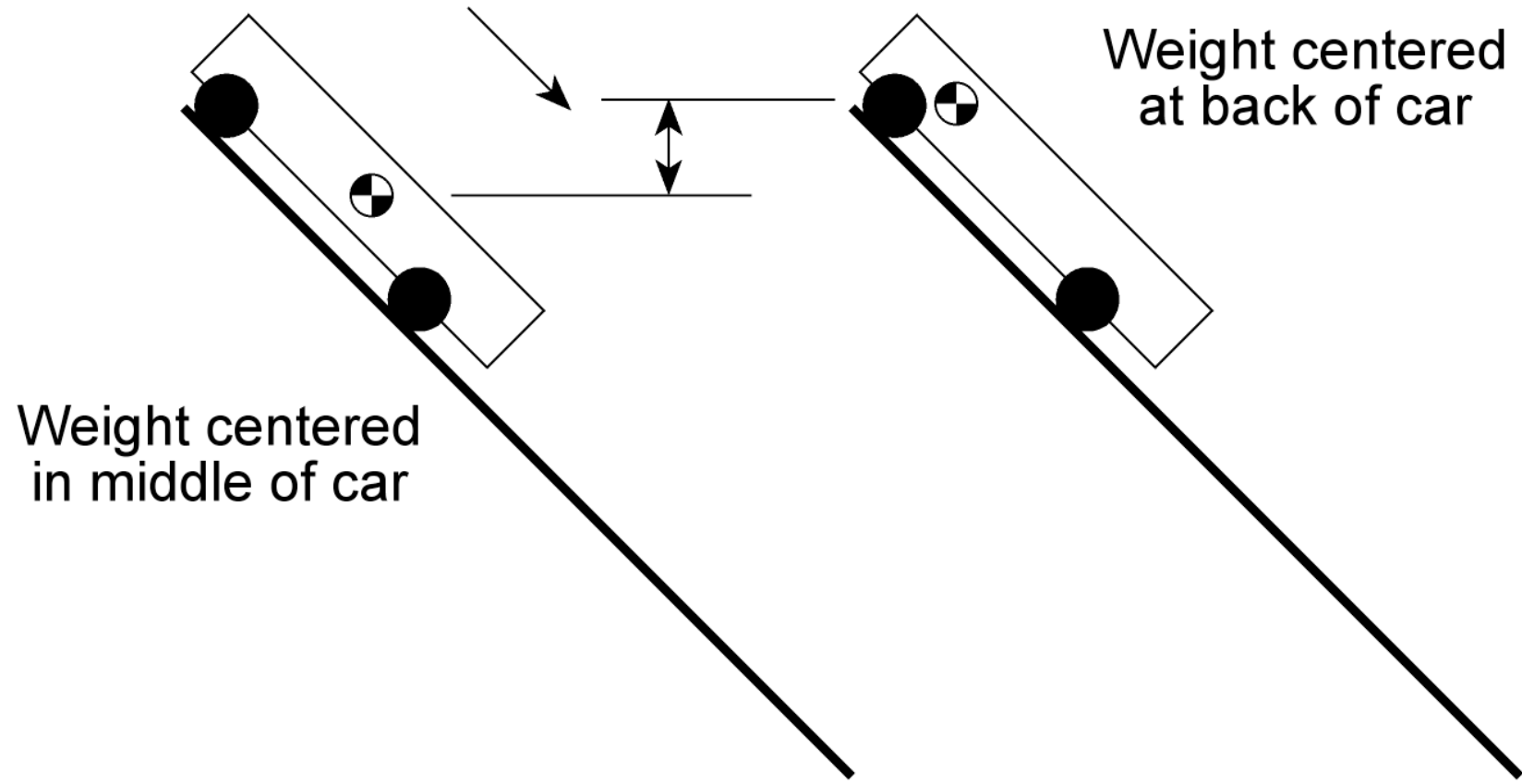
Weight Distribution

- More weight toward back is better
 - higher potential energy
- Too much weight in back = unstable
 - car "pops wheelies", might not stay in lane

Weight - where?

- More weight = more potential energy
 - up to 5.00 ounce limit
- Weight on back makes car too long, unless body is shortened
- Weight on bottom can hit track and slow car
- Best location: toward back of car, either on top or inside

Difference in potential energy



Weight centered
in middle of car

Weight centered
at back of car

Speed's Enemy: Drag

- Drag = things that work against continued movement
- Two major types of drag:
 - Air resistance (minor at PWD speeds)
 - Friction - biggest cause of slowing
 - Wheel vs axle (sliding in hub)
 - Wheel vs car (rubbing on body)
 - Wheel vs track (minor)

Wheels

- Most cars have 4 wheels
 - 3 wheels minimum
 - can have more than 4 wheels
- 4 5/8" maximum wheelbase
 - no minimum
- Longer wheelbase = less "wiggling" racing down track

Wheels

- Rules: use ONLY Official BSA Wheels
 - Official wheels have "BSA Pinewood Derby" molded on sides
- Scout Shop wheels: made in USA
- Hobby store wheels: made in China
 - Chinese wheels: usually heavier, not as fast
- Different colors available

Axles

- Out of box: rough common nails
 - protruding pieces of sharp metal rub on wheel hub and slow car down
 - If not worked on, car might not make it to finish, even with lubrication
- **Filing and polishing axles is #1 step to a faster car**

Axle Preparation

1. File off burrs and protrusions
2. Spin axle in drill and use wet sandpaper to smooth axle surface
 1. 500 grit, then 1000 grit
3. Spin axle in drill and use polishing compound to polish axle surface

Slots Or Not?

- Standard block has two slots for axles
- Slots can have problems
 - Wood around slot pops out
 - Axle may not go in straight
 - Axle can fall out during race

Drilled Axle Holes = Better

- Better option: drilled axle holes
- Pack has tool for drilling axle holes at workshops
- Greater strength & support
- But also need "inspection hole" for axle tip
 - See: <http://tinyurl.com/axleinsp>

Car Design

- In general: better to have more wood than less wood, especially toward rear
 - more room to place weight inside car
- Thin or delicate car sections can get damaged more easily

Car Design - Don't's

- **Don't** make front (or any other part) thinner than 1/4"
- **Don't** use a too-pointed front (makes it hard to place at start line)
- **Don't** shape front to allow car to extend past start pin (rules violation)
- **Don't** make car narrow at wheel locations
 - (need 1 3/4" between wheels on inside)

Car Design

- Draw car design on plan sheet
 - Side, top, front, rear
- Cut out car design and tape to block
- Trace car design onto block for cutting

Workshops

- Tools available for families to use
- Boys should only operate hand tools
- Adults on hand to help and answer questions
- Spare blocks, wheels, weights, paint available
- Stations for axle cleanup and polishing
- Everything you need to complete the car