

## Tractor Pull

Robert P. Adams (Dr. Bob)

This event is gaining in popularity because it is a unique form of racing that differs from all others such as the Pinewood Derby, Dragsters, Catamarans, etc, in which the object is speed. For tractor pulls, the object is distance. In addition, the boys have a very sturdy toy to take home (see Tractor Pull in Crafts section). The best track is to use 3 sections of a pinewood derby track, lying flat on the floor (or on three 8' folding tables). If necessary, you can run the tractors on the floor and use 2 x 4"s to make the lanes.

### Running the event:

Use the three flat sections of a pinewood derby track on top of three 8' folding tables. Tape four strips of rubberized material to the track at the start to give traction for the first 10 inches; else the tractor's wheels will slip when you set the tractor on the track. Attach the sled to the tractor and hold onto the sled when you set the tractor on the track, then pull the sled back just a little so the front tires of the tractor lift off the track (boys really like this!). The starter says "Ready, set, go!" Of course it is not important if both tractors are released at the same time, because they are racing only for distance.



Write all the boys' names in a club on pieces of masking tape (3-4" long). Use a small square to get the position of the front of the sled, thence over to the side of the track. Then stick the boy's tape (name) on the side of the track (sticking up in the air). If he gets a further distance on another trial, move his tape to the new position. If it is not as far, just leave his tape where it is. When the competition is completed for this club, you merely have to record the 3 furthestmost tapes (names) for 1, 2, & 3rd places.

After the boys check in their tractors and a number for the racing order is attached, don't let the boys touch their tractors until the competition is finished. This saves lots of time and prevents lots of accidents to the tractors.

Note: If you were to have 2 tractors that both pull their sleds to the end of the track (~24 ft), then have an elimination round at the end. Just tape a quarter (or 2 or 3) on each sled and have them race for the grand championship. The greatest distance that I have seen is about 18 ft. using the regular balsa sleds. Be sure and try out this competition the day (or week) before the real competition to see how far your model tractor will pull (and that the track is ok). Saves a lot of embarrassment before all the parents!



**Propulsion:** Wound up rubber band. The fairest way we have found is for an adult leader to roll the tractor backwards 5 ft. on a table, A greater distance may wind the rubber band too much, and it may become lodged between the axle and the plastic housing.

### Tractor specifications

A. Width - Maximum of 4", minimum of 1 1/2" between wheels (to straddle track rail):

**Note: you need to check your track to be sure this width is right for your track!**

B. Length - 13 inches.

C. Height - 5 inches.

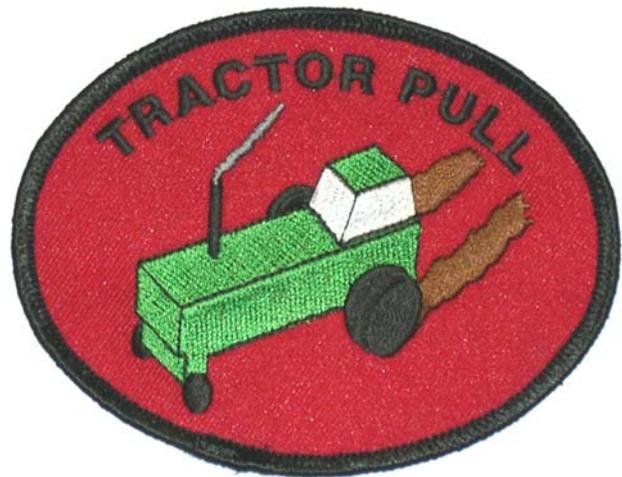
D. Weight - no limits.

E. Details - additional wood, plastic, string, etc. may be added for decorating as long as the above limits are not violated.

F. Attachments - no device may be added that will offer additional propulsion (except the rubber band provided).

G. Inspection - all tractors will be inspected before the race and those tractors not meeting the specifications above will not be allowed to participate until the tractor is brought into compliance.

**Awards:** Trophies for distance (1st, 2nd, 3rd in each division). Plus, trophies for the best tractor model. (Use the same judging criteria as for the Pinewood Derby above) and Tractor Pull patches.

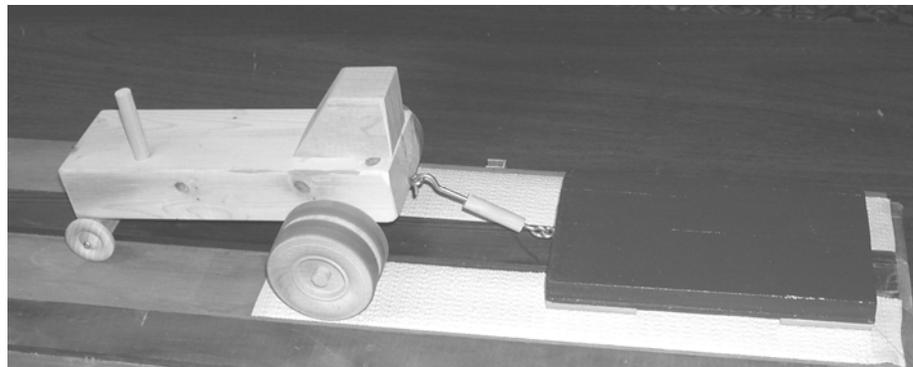


## Building the Tractors

This is a great project for a Special Event. Building and racing a rubber band powered tractor is one of the most popular activities for boys (and their dads). Invite the families to cheer the boys on to victory. The Tractor Pull is comparable to the pinewood derby in getting boys interested and for use as a monthly Father-Son activity. Building Tractors is a great way to involve fathers (parents).

### Materials:

1. 1 - 8" x 1 1/2" x 2 1/2" spruce/fir (cut from 2" x 4" stock) for tractor body.
2. 1 - 3/4" x 3/4" x 2 1/2" spruce/fir for front axle.
3. 1 - 1 1/2" x 1 1/2" x 3" spruce/fir block for making the tractor cab.



4. 4 large (2 1/2") rear wheels (cherrytree toys.com, #69).
5. 2 small wooden (1 1/4") front wheels (Guillows Inc. or cherrytree toys.com).
6. 1 - 5 5/8" x 3/8" dowel for rear axle.
7. 1 - 2 1/4" x 3/8" dowel for exhaust pipe.
8. 2 screw eyes (#10) for holding the rear axle (3/8" dowel fits nicely in #10 screw eyes).
9. 2 #4 x 1" wood screws, round, Phillips head (boltdepot.com, stock #11581) for front axles.
10. 2 - small (#6) washers for the front wheels.
11. 1 - 3/4" x 18 brad to drive into the hole in the 3/8" rear axle to hold the rubber band.
12. 2 - 3p box nails (for rear rubber band holder and to secure end of rubber band).
13. 12 - 3/8" nylon washers (for rear axle)
14. 1 - #4 x 1" wood screw, round, Phillips head for attaching Nylon Pulley.
15. 1 Nylon Pulley (G12943, Electronic Goldmine, goldmine-elec.com)
16. 1 - screw eye, size #212, for attaching sled to rear of tractor.
17. 1 - 7" rubber band.
18. 8 - size 64 rubbers bands for rear wheels (traction) (cf. Office Max, etc.) plus Phillips screwdrivers, hammers, sandpaper (120 - 150 grit), white glue.

#### **Before the meeting:**

1. Cut and sand all parts (body, front axle, tractor cab, rear axle, exhaust pipe).
2. Drill 3/8" hole, 1/2" deep for exhaust pipe (see photo).
3. Pre-drill two (7/64") pilot holes for the #10 screw eyes to prevent splitting the wood during assembly.
4. Drill two 3/32" holes about 1/2" deep into front axle block ends to prevent it from splitting when the #4 x 1 screws are used in during assembly.
5. Glue front axle to front part of tractor body. Make sure the front axle block is flush with the front of the tractor body.
6. Check if 3/8" rear axle (dowel) will go into rear wheels; ream out the wheel holes with a knife if needed.

#### **Assembly at the meeting:**

1. Screw in the #10 screw eyes down to about 1/4". Insert 3/8" dowel to see it is level to the tractor body. Adjust screw eyes until it is level. You may need to bend one of the screw eyes forward/backward to square the axle to the axis of the tractor. Put some 3/8" nylon washers on each side to see if there is sufficient room between the axle and body (you need 1/4").  
Note: If you are painting the body, **DON'T PUT ON THE WHEELS** until you are finished painting (and the paint is well dried).
2. Place a drop of Elmer's glue inside 2 wheels and push the axle into each of the 2 wheels on one side. Add 6 of the 3/8" nylon washers to the axle, insert axle with 1 set of dual wheels into the screw eyes.
3. Put 6 nylon washers onto the axle, then glue on the remaining 2 wheels. Check to see that they turn freely. You may need more or less of the 3/8" nylon washers to be sure the wheels do not rub the sides of the tractor body.
4. The hole for the brad should now be centered between the screw eyes.

**Step 2. Shape, sand and paint the body, wheels, etc., before putting it all together! (of course it can be completed and un-assembled for painting at home).**

**Step 3.**

1. Hammer in the rear rubber band keeper nail (3p BOX nail).
2. Hammer in the 3p box nail for rubber band keeper.
3. Use a Phillips screwdriver to screw in the #6 x 1 1/2" sheet metal screw with its #6 washer (on top) and the 1/2" Teflon tube covering the exposed threads. Do not over tighten. The Teflon tube will be a low-friction pole for the rubber band to slip over when the rear wheels are wound.
4. Attach front wheels and #6 washers using #4 x 1 wood screws.
5. Screw in screw eye into rear of tractor body.
6. Glue in exhaust pipe in hole near front of tractor body (top). Glue on tractor cab.

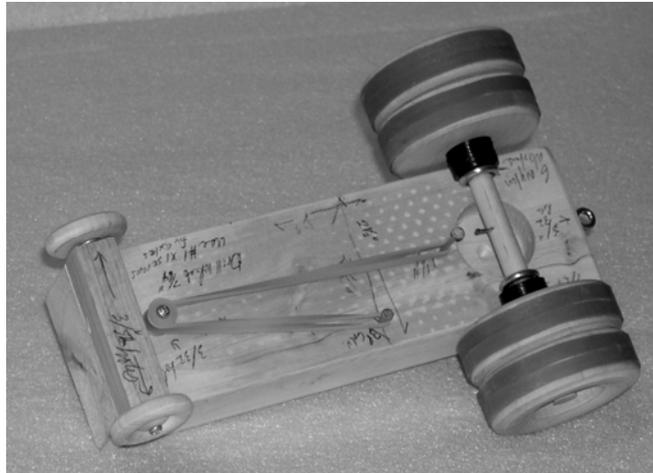
If needed: Attach the rear wheels and axle.

7. Glue two size 64 rubber bands on each rear wheel for traction (4 wheels x 2 bands each = 8 rubber bands).

Leaders need to provide to each boy: Sand paper, steel wool, spackling, etc. Boys will provide their own paint, extra parts, etc. to customize their tractor.

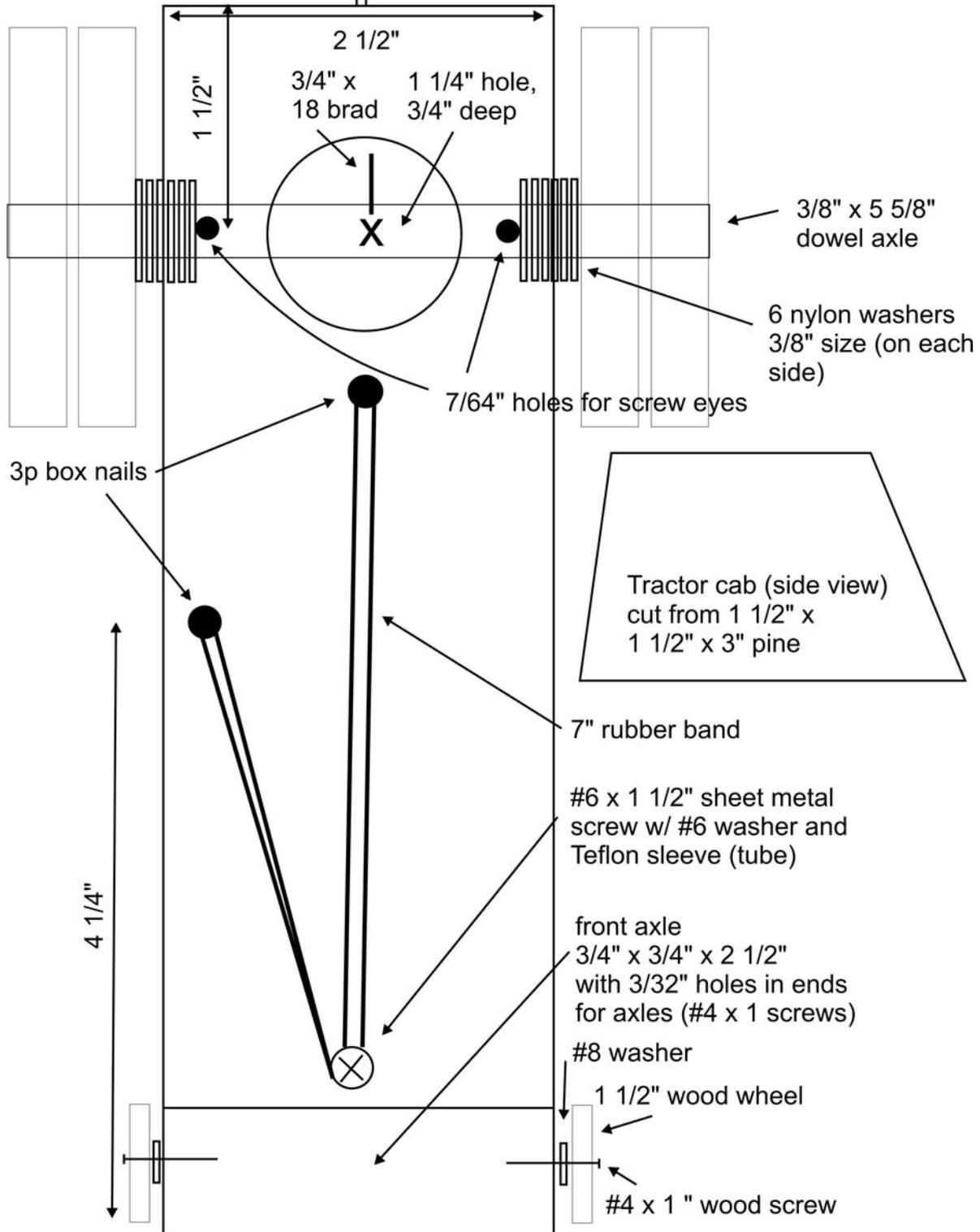
**Making the Two Pulling Sleds**

Make 2 pulling sleds from balsa. Sleds should be about 7" long, 4" wide and 3/4" or more tall (so they look heavy, but they are not (the tractors don't have much power, so using a very light sled makes the competition look more realistic). Put four 3/8" high x 1" long x 1/4" wide hardwood runners on the sleds so they won't drag on the track. Make the runners with a V bottom to minimize friction. The track is just a regular pinewood derby track, usually 3 - 8' sections laid flat. Attach a screen door hook to attach sled to tractor. Paint the sleds a bright color.



Tractor body: bottom view  
2 1/2" x 8" x (1 1/2" thick)

screw eye  
size # 212



## Competition:

Use the three flat sections of a pinewood derby track. Tape four strips of rubberized material (i.e., shelf lining) to the track at the start to give traction for the first 10 inches, otherwise the tractor's wheels will slip when you set it on the track. Wind up by pushing backwards 5ft (more or less, do a test to see what works best) on table. Attach the sled to the tractor and hold onto the sled when you set the tractor on the track, then pull the sled back just a little so the front tires of the tractor lift off the track (boys really like this!). The starter says "Ready, set, go!" Of course it is not important if both tractors are released at the same time, because they are racing only for distance.

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**Note:** If you were to have 2 tractors that both pull their sleds to the end of the track (~24 ft), then have an elimination round at the end of the club competition. Just tape a quarter (or 2, 3) on each sled and have them pull for the grand championship. The greatest distance that I have seen is about 18 ft. using the regular balsa sleds. Try out this event a few days before the competition to see how far your model tractor will pull, etc.

**Awards:** Trophies for distance (1st, 2nd, 3rd in each division, and trophies for the best tractor model (and most unusual if desired) (use same judging criteria as for the Pinewood derby). Also give each boys a Tractor Pull Patch (see Special Events Patches).

## Tractor specifications

A. Width - Maximum of 4", minimum of 1 1/2" between wheels (to straddle track rail):

**Note: You need to check your track to be sure this width is right for your track!**

B. Length - 10"; C. Height - 5 inches; D. Weight - no limits

E. Details - additional wood, plastic, etc. may be added for decorating as long as the above limits are not violated.

F. Attachments - no device may be added that will offer additional propulsion.



Best Model Tractors at a tractor pull.