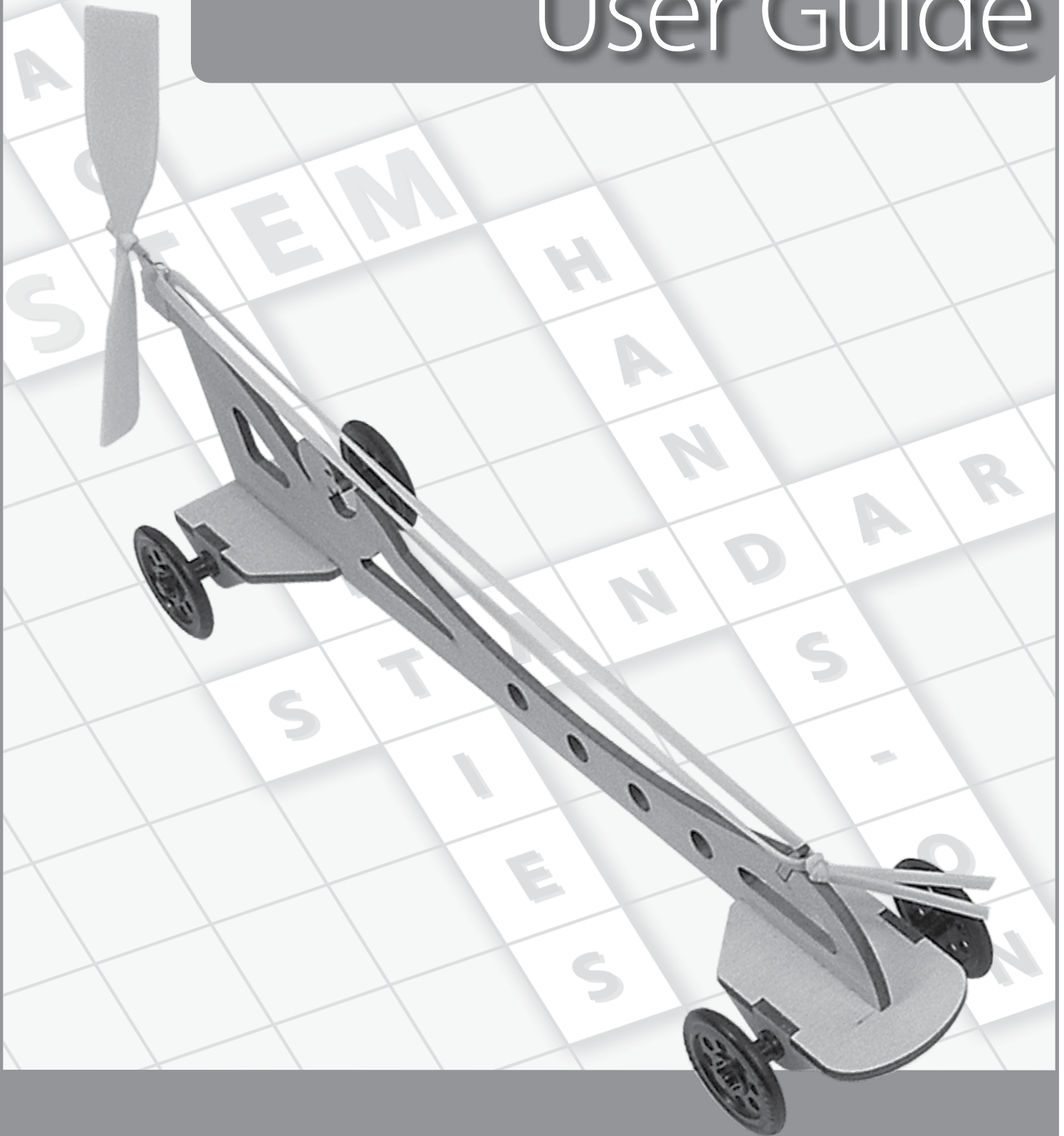


Prop Racer System User Guide



Introduction

The CO₂ dragster racing activity is popular with older students, but has eluded elementary students due to its complexity. Pitsco's latest race system brings the excitement and learning of racing into grade schools.

The Elementary Prop Racer System features race cars built from laser-cut wood parts – cars fueled by rubber bands and propellers instead of CO₂ cartridges. While this activity is fun and safe, it also provides the opportunity to teach science concepts such as energy, torsion, and much more.

Included Materials

- 2 line anchors
- 1 roll of duct tape
- 1 roll of monofilament line
- 5:1 rubber band winder
- 4 clothespins
- 1 towel
- Package of competition rubber, 16'
- Basswood sheet with winding station parts
- Materials for four racer kits:
 - Basswood sheets with laser-cut parts for four racers
 - 16 wheels
 - 4 fonts with four bushings each
 - 8 axles
 - 8 screw eyes
 - 4 propellers

Also Required (not included)

- White glue or CA glue
- Scissors
- Tape measure

Gluing Tip

With these racers, you will glue notched ends into holes cut for the notches. When you do this, make sure to place glue on all the edges that will touch the other part.

System Preparation

1. Divide the kit materials into four kits. Add one clothespin to each racer kit.
2. Cut four 24-inch pieces of competition rubber and place one with each racer kit.
3. Build the winding station:
 - a. Pop out the laser-cut parts from the basswood sheet.
 - b. Lay Part 1 flat on your work surface; the part number should be facing up.
 - c. Glue Parts 2 into the holes on the sides of Part 1 as shown in Figure 1. The slot on top of the Part 2 pieces should be facing away from the part number on Part 1.
 - d. Let the winding station dry.

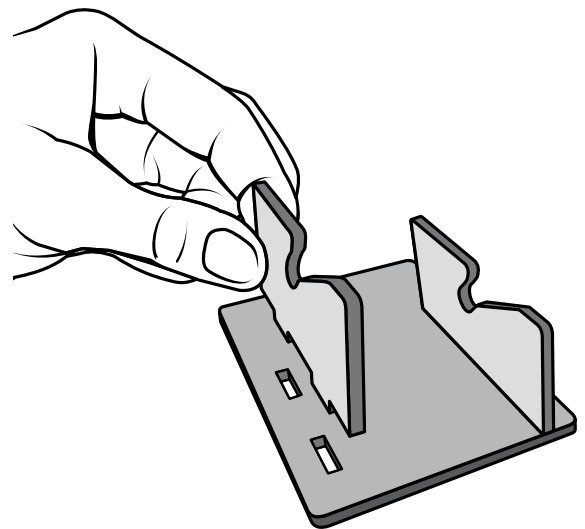


Figure 1

Directions to Build One Racer

Note: Each racer kit has a slightly different design. Three of the four designs have five laser-cut parts. The fourth design has seven parts. There is an extra step for this fourth design, but all four racers work the same.

1. Carefully, pop out the laser-cut parts from the basswood sheet of the racer you are building. Be sure not to lose or break any parts, or you might not be able to finish the car.
2. In each Part 4, push in one of the bushings in the part's hole (Figure 2). Be careful not to break the wood parts when you do this.
3. Glue two of the Part 4 pieces onto Part 2 as shown (Figure 3). Make sure the flanged ends (the wide end) of the bushings face out from the middle of Part 2. Let the part dry completely.
4. Glue the last two Part 4 pieces onto Part 3 as shown (Figure 4). Make sure the flanged ends (the wide end) of the bushings face away from the middle of Part 3. Let it dry.
5. Glue the Part 2 and Part 3 pieces – with the Part 4 pieces on them – onto Part 1 as shown (Figures 5 and 6 on following page). Let it dry.

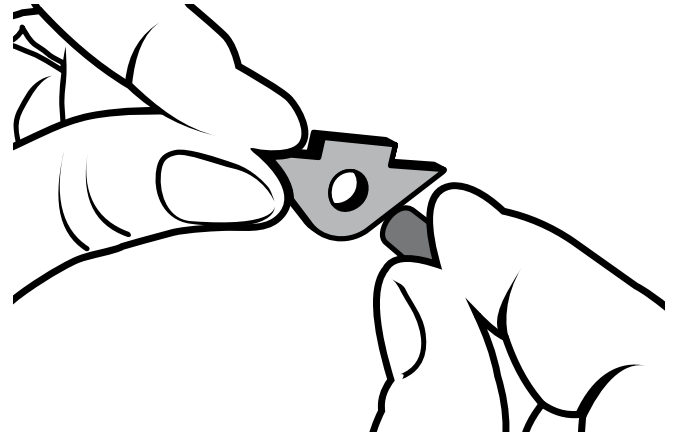


Figure 2

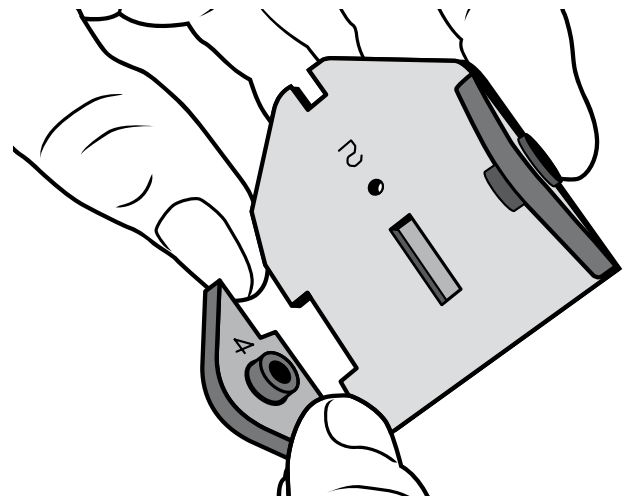


Figure 3

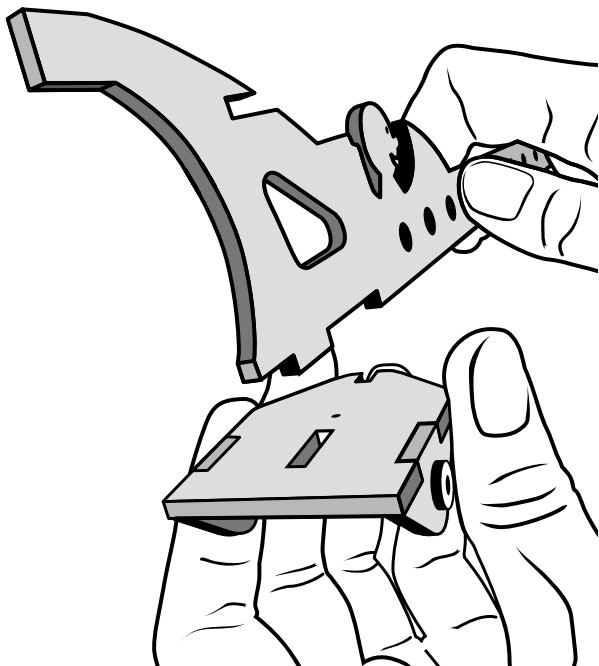


Figure 5

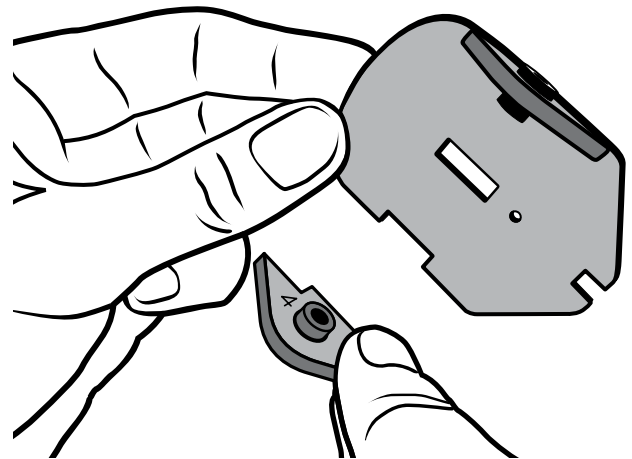


Figure 4

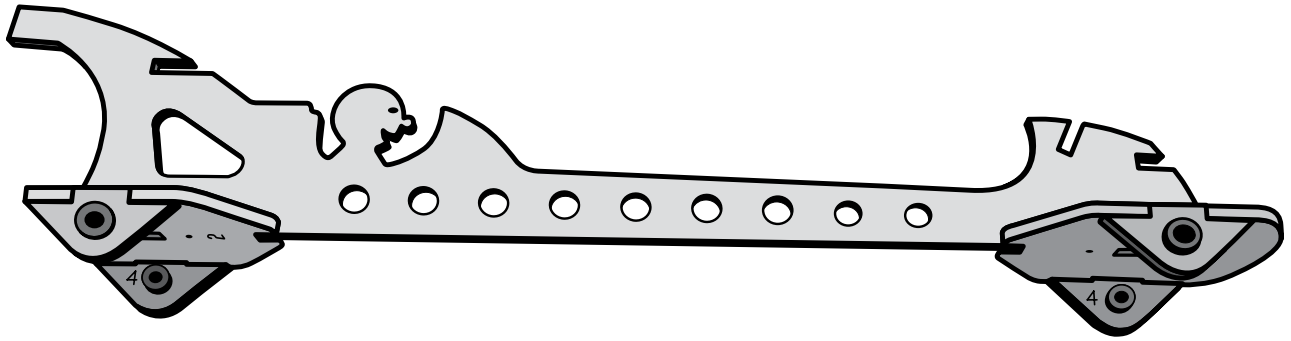


Figure 6

6. Glue Part 5, which is very small, into the notch that is on top of the racer as shown (Figure 7).
7. If you are building the racer with the two extra parts, glue them in now. Glue Part 6 in the notch in front of the racer as shown (Figure 8). Make sure the pointed end of Part 6 is toward the front of the car.

Glue Part 7 in the notch on the tall point rising at the back of the racer as shown (Figure 8). Again, make sure the pointed end of the part is facing the front of the car.

8. Let your racer dry completely.
9. Insert the axles through the bushings at each end of the racer as shown (right side of Figure 9).

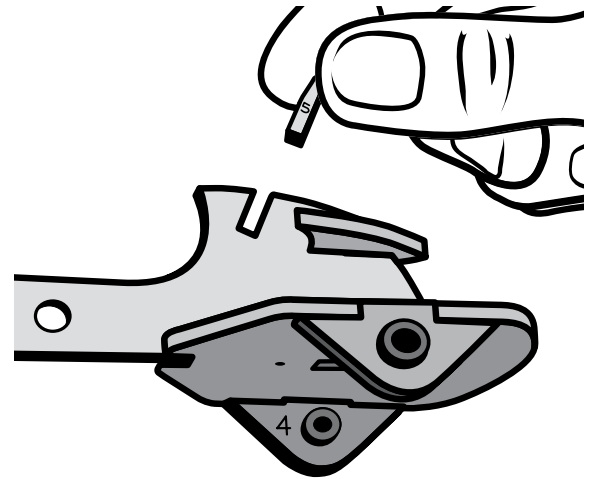


Figure 7

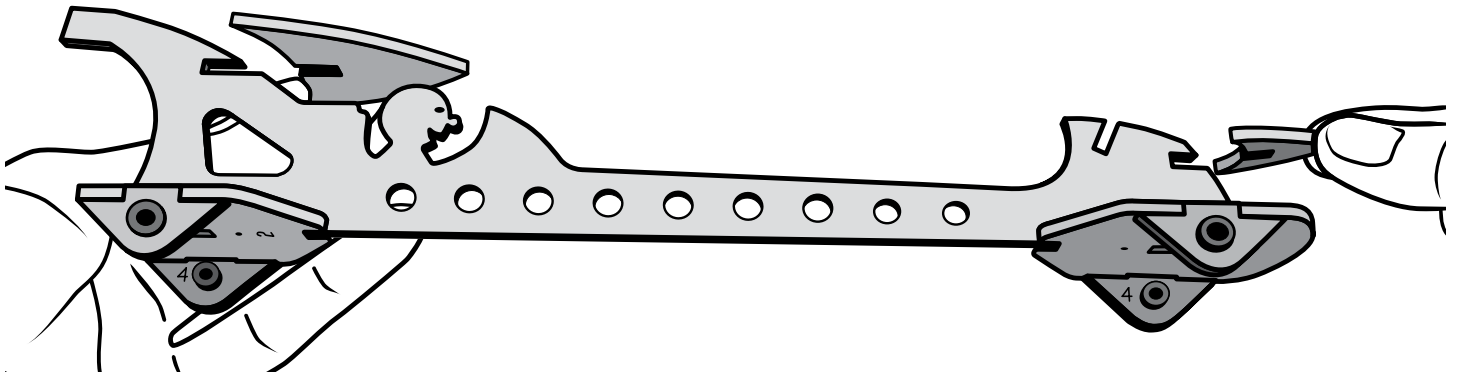


Figure 8

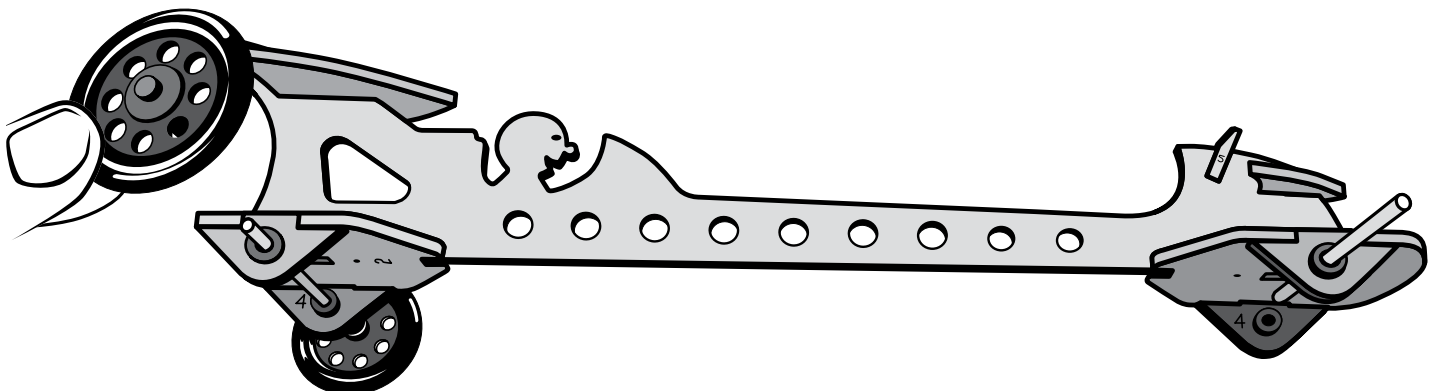


Figure 9

10. Firmly, press one wheel on each end of the axles as shown (left side of Figure 9). Make sure the wheels spin easily. If they do not, push them farther apart on the axle.
11. Push the propeller onto the back of the racer as shown (Figure 10).

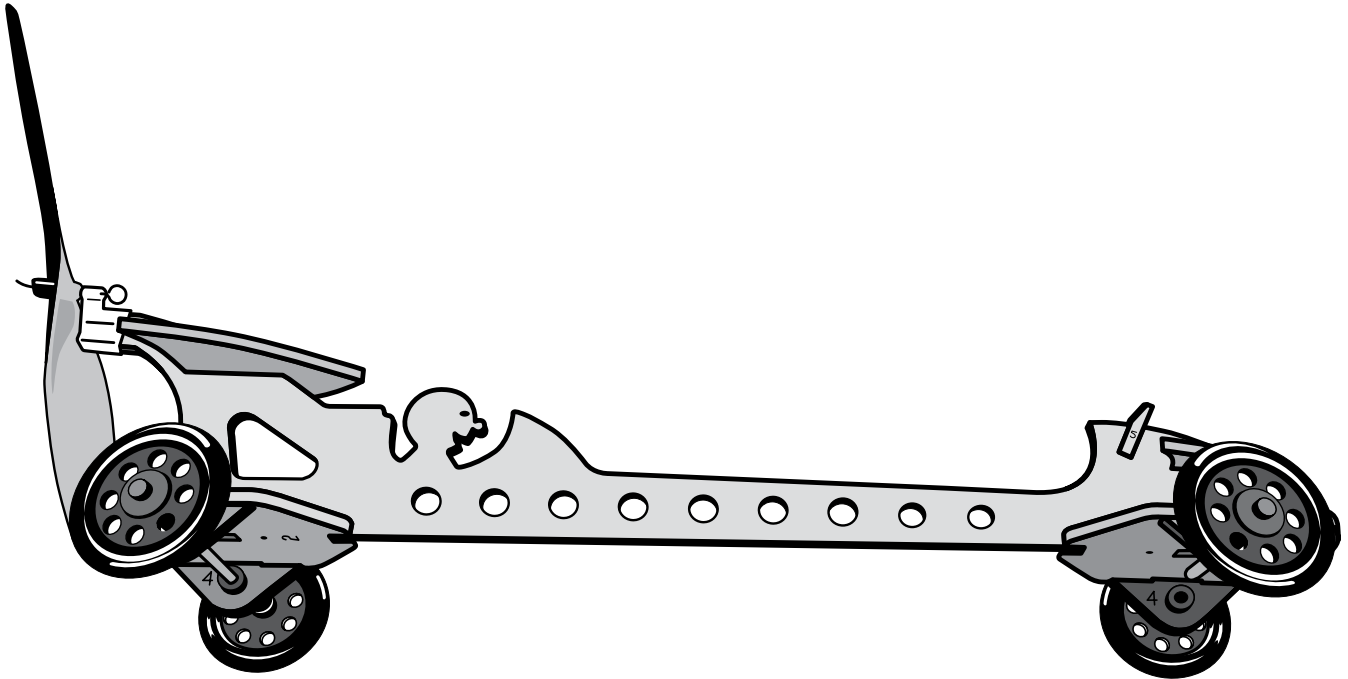


Figure 10

12. Hold your racer so the underside is facing toward you. There is one small starter hole on each end of the racer. One hole is on Part 2, and the other is on Part 3 (Figure 11). Find the two screw eyes.

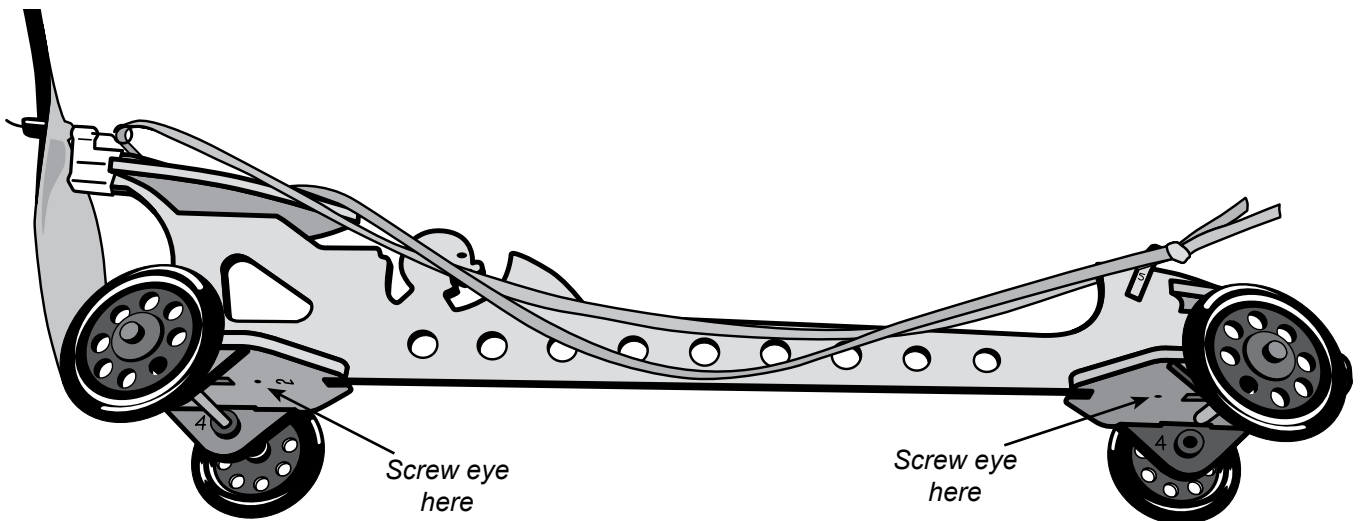


Figure 11

13. Keeping the screw eyes straight, screw them into these starter holes. Screw them in far enough so when the car is resting on its wheels, the screw eyes do not hit the ground. Make sure the screw eye holes face the ends of the racer so the race track line runs straight through the holes.
14. Tie the two ends of your piece of competition rubber in a tight knot. Hook the unknotted end on the small metal loop on the propeller. Hook the knotted end of the rubber over Part 5 as shown above (Figure 11).

Race Track Preparation

1. Gather the two line anchors, duct tape, monofilament line, towel, scissors, and tape measure.
2. Find a space with an even, hard surface to use as a race track. Hallways with tile floors or school gymnasiums are good places. Measure a space 30 to 60 feet long.
3. At the start and finish ends of this space, fasten the line anchors to the floor with duct tape (Figure 12).
4. Locate the spool of monofilament line. Tie a loop in the end of the line – use a knot such as the overhand or figure eight.
5. Hook the loop over one of the anchor screws on the line anchor.
6. Walk to the opposite end of the track; let the line unwind as you go. Bring the line just past the anchor and cut it.
7. Tie a loop at this end of the line using the overhand or figure eight knot. Tie the loop so it is approximately 24 inches short of reaching the anchor screw. For example, if the track is 60 feet long, tie a loop in the line so the length of the line plus the loop is 58 feet long. The line should be tightly stretched.
8. Cut off any excess line extending from the loop's knot.
9. Repeat Steps 4-8 for the other lane.
10. Fold the towel so it is several layers thick but still wide enough to cover the width of the track. Place the towel in front of and parallel to the finish line anchor. The towel will lie on top of the monofilament line. This towel prevents the racers from being damaged when they stop.

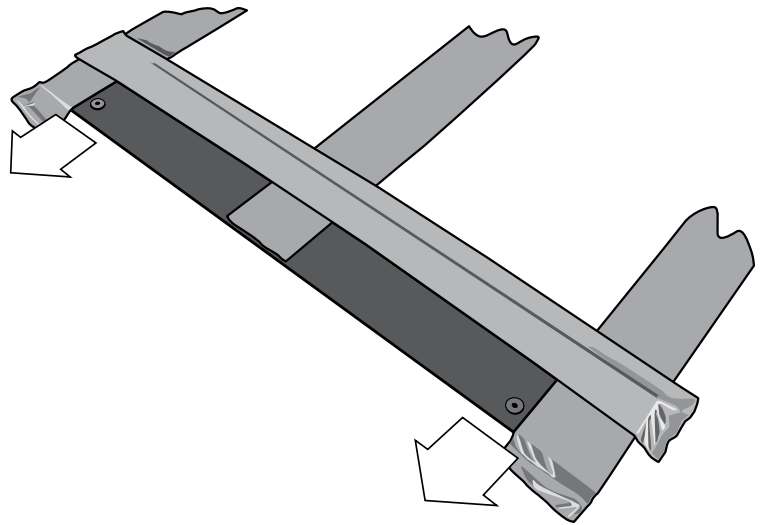
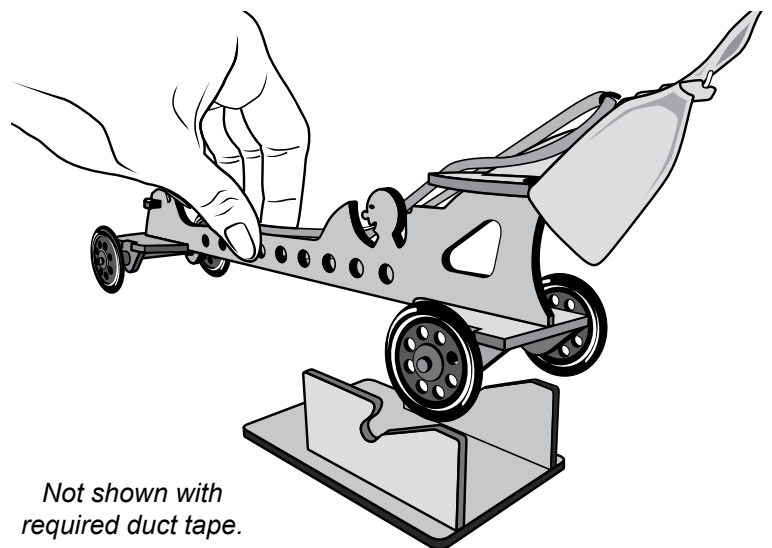


Figure 12

Running a Race

1. Gather the winding station, winder, and the two cars to race. Using the duct tape, tape down the winding station to a firm surface.
2. Place one racer in the winding station (Figure 13).
3. Place the clothespin on the back of the racer so it prevents the propeller from moving as you wind the car (Figure 14 on following page).



Not shown with required duct tape.

Figure 13

4. Lift up the end of the rubber that is hooked over Part 5. Attach it to the metal hook of the winder. Making sure to wind counterclockwise, turn the winder handle 40 to 60 times (Figure 15). Because it is a 5:1 winder, this will equal 200 to 300 rotations. Replace the rubber over Part 5.
5. Take the racer – without removing the clothespin – to the start line anchor. Remove the line from the anchor screw and run the line through the screw eyes under the racer. Be sure the front of the car is facing forward. Hook the line back over the anchor screw.
6. Repeat Steps 2-5 for the other racer.
7. With both racers backed up to the start line, remove the clothespins at the same time. Make sure there is someone at the finish line to determine the winner.

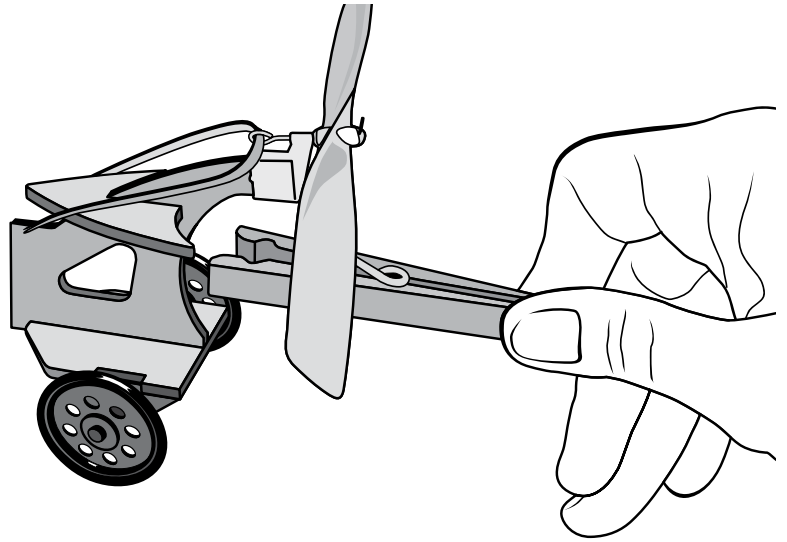


Figure 14

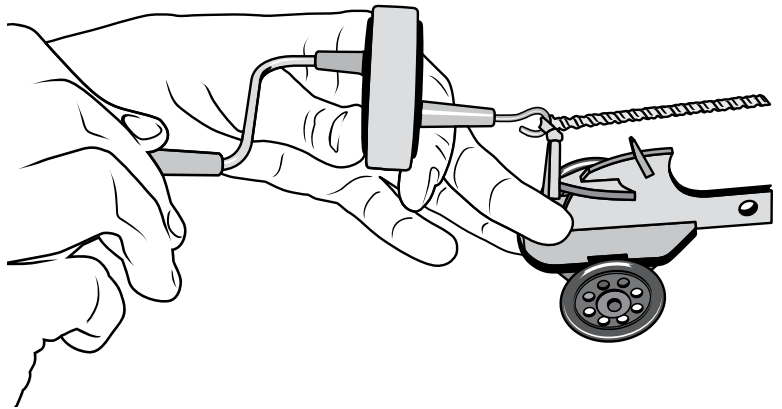
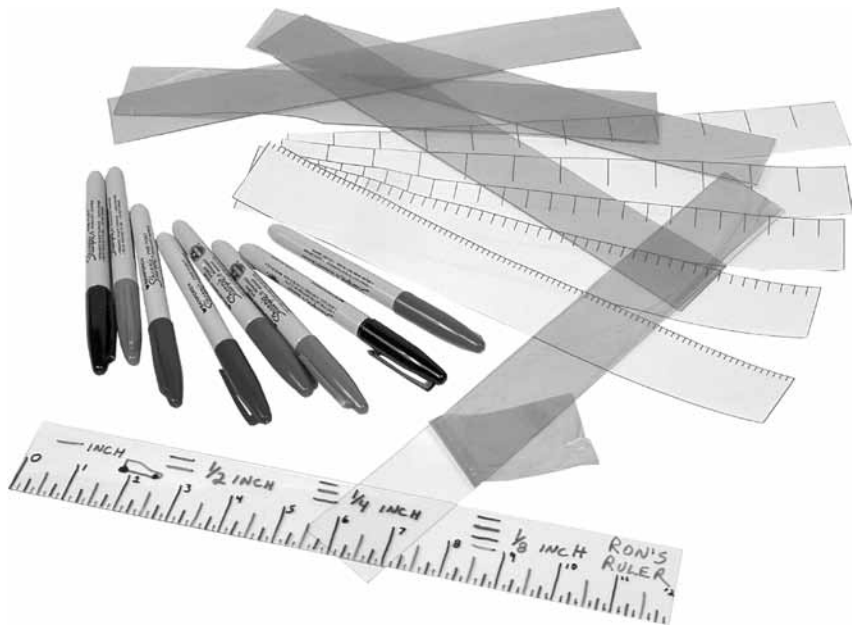


Figure 15



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