Rodger Carter's Top Eleven ways to make a fast Pine Wood Derby car……

1. The car must steer straight!
   After the car is complete, practice pushing the car across your kitchen floor. If it is turning right or left, then adjust the steering.

2. The axles must be very smooth.
   The axles need to have their ridges removed and be polished down. A drill, a small file, and emery paper all help.

3. The wheels must be lubed and stay lubed.
   Copious amounts of dry graphite should be applied to the wheels and axles. Putting a cover over the outside of the wheel (like a sticker) with a small pile of graphite on the wheel, gives the wheels a continuous supply of graphite for the many runs it must make in order to win.

4. The car must weigh the max weight.
   Since 5 ounces is the max allowed weight and since the scale only measures to tenths, then the car needs to weigh 5.099999 ounces.

5. The car must reach maximum velocity.
   Since the car gains speed from gravity, and a mass keeps accelerating until it reaches terminal velocity, then the car should be the heaviest in the rear and the lightest in the front. Making a large hole near the back of the car and pouring molten lead into it will help accomplish this.

6. Friction at wheel contact points should be minimized.
   The wheel axles should be slightly angled up (positive camber). This does two things: keeps the wheels away from the car (the friction of the wheel rubbing against the car is greater than the friction of the wheel rubbing on the axle head, and it allows the wheels to run on an edge instead of the flat part (which is more friction). Make sure the top of the wheel doesn't drag on the outside edge of the car (ie, if the car's shape at the wheels is thin, this problem is avoided).

7. Wheels should run smoothly.
   Not all of the kit wheels run true. Take a pile of wheels and spin them on an axle one at a time until you find four good ones.

8. Wheel-car friction needs to be reduced.
   The part of the car the rubs against the inside hub of the wheel should be extremely smooth and hard to reduce friction. Wood hardener, paint and multiple grades of steel wool work help.

10. Steering friction created needs to be reduced.
    Wheel axles should be as far apart as possible to increase the cars steering movement.

11. The axles must not come loose.
    Glue the axles to the car body. This keeps the axles from coming loose over the many heats the car must run.