

Slow Roller 2016

Objective

To create a device which will roll down a meter stick ramp in the longest time.

Materials

The device may be made only from the following materials: wood, string, thread, cardboard, cork, tape, glue, rubber bands, and paper. The allowed paper includes common plain paper (cardstock to thin paper) and tissue/toilet paper.

Plastic, metal (including metallic tape), sandpaper, and/or cloth may **NOT** be used. The sticky side of tape and other adhesives may only be used for assembly. They cannot contact the meter stick ramp at any time during the trials.

Construction

- 1) The mass of the entire device must be greater than 100 grams and less than 400 grams.
- 2) The device must have dimensions which allow it to fit into a 30 cm x 30 cm x 30 cm cube at all times.
- 3) The ramp will consist of a one meter long (100 cm) wooden stick (set on top of a piece of wood for support--the piece of wood is approximately 2.0 cm thick) inclined at **20 degrees** from the horizontal with one printed side facing up.

Elementary/Lower Middle School Divisions (Grades 5-7)

The ramp will be two meter sticks wide;
hence, approximately 0.7 cm thick x 5.0 cm wide

Upper Middle School/High School Divisions (Grades 8-12)

The ramp will be one meter stick wide;
hence approximately 0.7 cm thick x 2.5 cm wide

- 4) The device should be constructed to roll down on the printed side of the meter stick for 80 cm. The device must be rolling for the entire 80 cm in contact with the meter stick without slipping.

- 5) One alternative: The device may be constructed in a dumbbell shape with the central bar rolling in contact with the meter stick ramp. The weights of the dumbbell balanced on either side of the ramp. (Imagine rolling a weight lifter's barbell down an inclined 2" x 4" piece of wood. It will require some balancing to remain in contact with the ramp.
- 6) All parts of the device must move together as a unit and progress down the ramp. The entire unit must roll down the ramp. Every external part of the device must have the same rotational motion (velocity). (Differential internal rotation is allowed.) **Devices like a car that has wheels that roll but a body that does not roll will be disqualified.**
- 7) The meter stick will be mounted on a long piece of wood that is narrower (by only a few millimeters on each side) than the meter stick to avoid obstructing the motion of the device.
- 8) A wooden dowel or round pencil or wooden spool may be used as the axle of the slow roller.
- 9) The intent of the rules is that nothing should be used in the construction of the Slow Roller that was manufactured for that purpose. For example, a student should not use a large yo-yo (Chinese or otherwise) and simply place it on the stick. The yo-yo is made to roll about its axis so this would not be allowed. All materials should be available at local grocery, department, or discount stores.

Competition

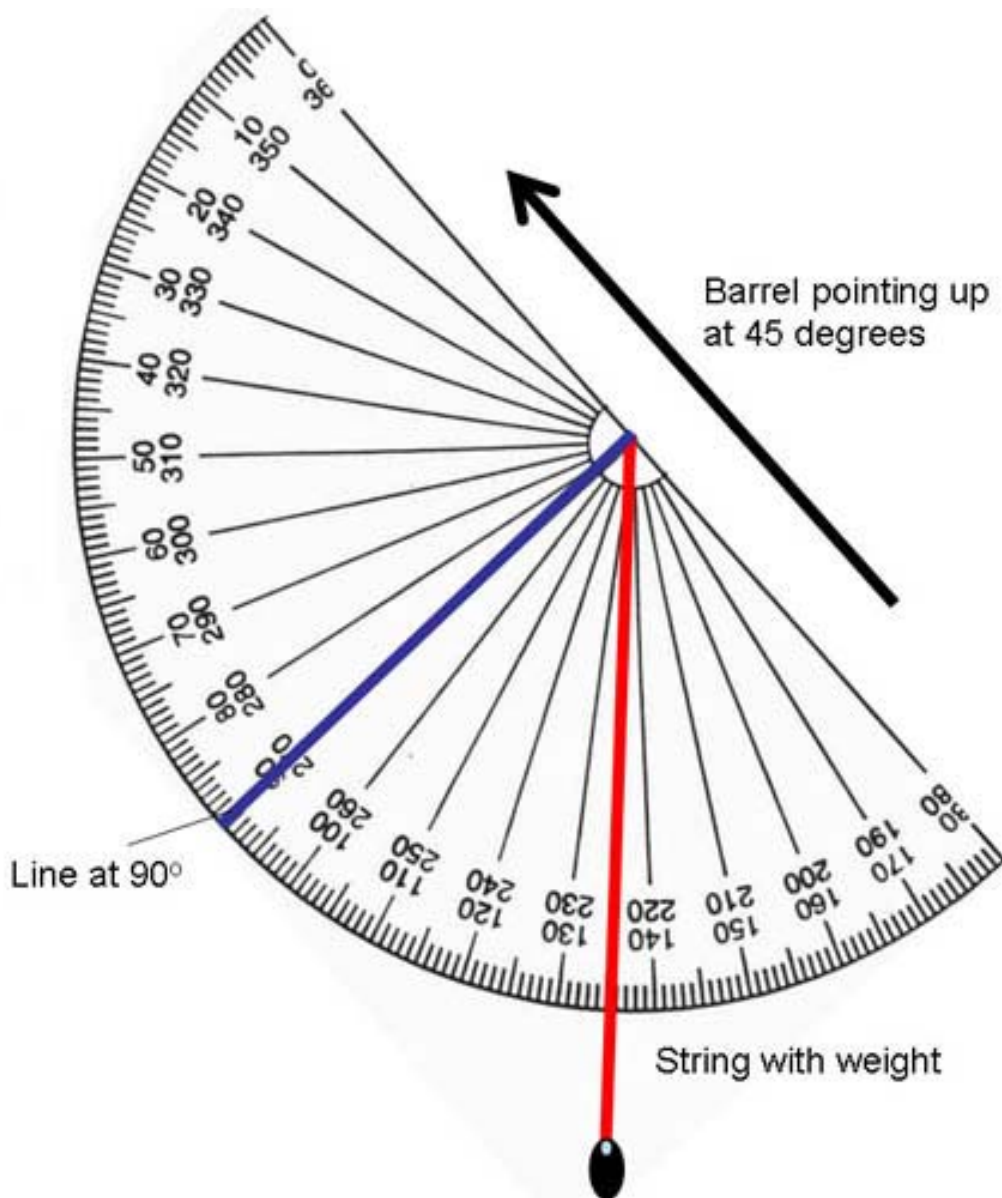
- 1) The center of the device will be placed on the start line and be timed while traveling 80 cm.
- 2) One participant will release the device at the start line and catch the device at the finish line.
- 3) No one may touch or supply force to the device in any way while it is rolling. The device may only use mechanical energy.
- 4) The device is released from rest at 10 cm on the meter stick and timed until 90 cm. Alternatively, the participant may start the device in motion UP THE RAMP (toward 0 cm) or DOWN THE RAMP anywhere between 0 and 8 cm.
- 5) The device must make continuous measurable progress at all times in the opinion of the judges. Wet glue and the sticky side of the tape may not come in contact with meter stick. Any other listed materials may come in contact with the ramp.
- 6) If, in the opinion of the judges, the device will complete the run successfully but the time would be too long to wait, the judges may stop the trial and calculate its projected time for 80 cm.

Judging

- 1) The judges will time two trials for each team. The team may use a second device for the second trial. However, only two trials are allowed in total for each school at each competition level.
- 2) The longest trial time will be used for scoring.

Judge: Lee Hirsch Lee_M_Hirsch@mcpsmd.org / Thomas S. Wootton High School

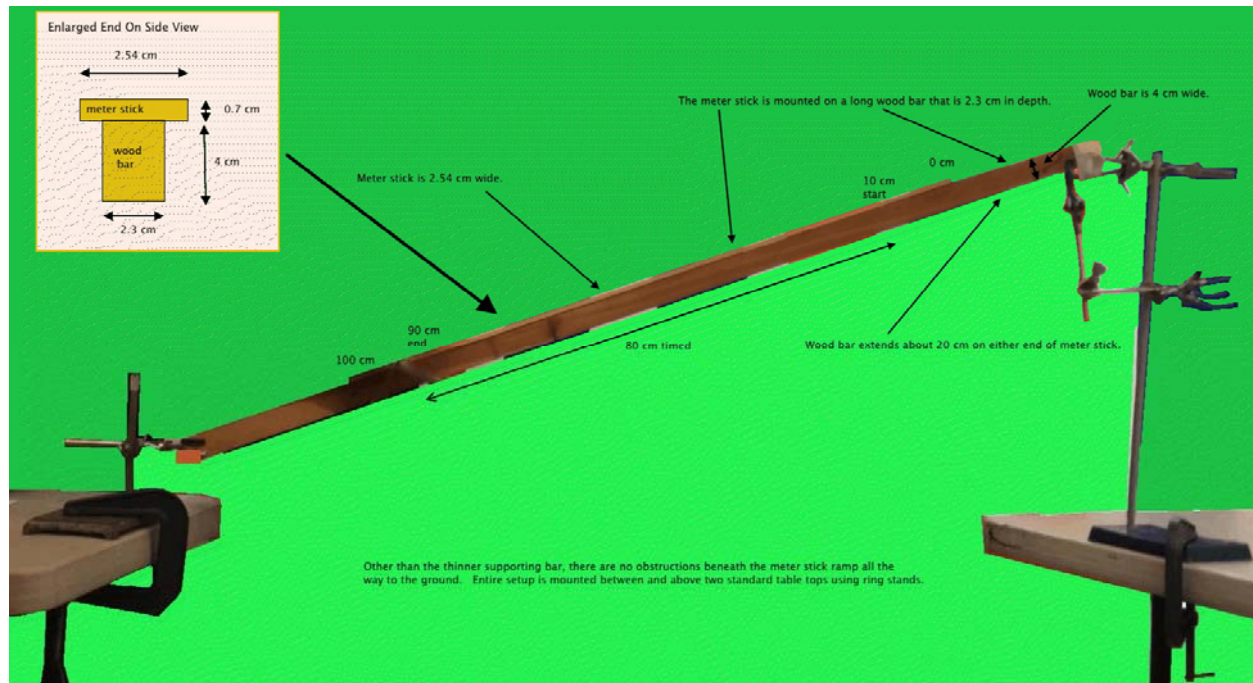
Simple method for getting angle: Take a protractor and hang a mass from the center. Align the edge of the protractor with the bottom of the meter stick and tilt until you obtain our angle of 20 degrees.



Schematic of our test track (zoom in to see key details):

Upper Middle School/High School Divisions (Grades 8-12)

Ramp will be one meter stick wide;
hence approximately 0.7 cm thick x 2.5 cm wide



Elementary/Lower Middle School Divisions (Grades 5-7)

The ramp will be two meter sticks wide;
hence, approximately 0.7 cm thick 5.2 cm wide

