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Form N Race Derby, Pinewood Derby, Cube Car Rally-as you call it, Derby is a lot of fun and it's a great opportunity to learn and create memories. This is a set of plans for the four-lane derby track. The track is designed for disassembly for easy storage. Take a closer look at these plans to see the different parts and the construction process. The design is quite simple, and the track can be built with home workshop tools. However, accuracy is important; Sloppy work will produce a track with noticeably faster/slower bands, with a section of joints that derail cars, or with other defects that will reduce the derby fun of everyone. Be sure to drill the pilot holes for all screws to avoid splitting wood. Use carpentry glue on all permanent wooden-to-wood joints, in addition to any mechanical fastenings used. Review One reader said he was able to buy all the materials needed for about \$100. Lumber Part #Qty.Item Description L14 @ 1/2 x 14 x 8' plywood (base sections) L216 @ 1/4 x 1 3/8 x 8' lattice strip (lane guides) L31 @ 1 x 4 x 72 pine (brace) L41 @ 1 x 4 x 38 pine (stabilizer) L52 @ 1 x 4 x 43 pine (long legs) L63 @ 1 x 4 x 14 pine (leg cleats) L72 @ 1 x 4 x 12 pine (short legs) L81 @ 1 x 4 x 4 pine (brace block) L93 @ 1 x 2 x 88 pine (base supports) L106 @ 1 x 2 x 16 pine (section cleats) L111 @ 1 x 2 x 20 pine (starting bar) L121 @ 1 x 2 x 14 pine (end cleat) L134 @ 1/4 dowel x 4 (starting posts) L141 @ 1/2 dowel x 6 (starting bar handle) L154 @ 1/2 x 1 3/8 x 1 3/8 pine (guide risers) You should be able to cut Parts L3 through L8 from three 8' lengths of 1 x 4 pine. You should be able to cut parts of the L9 and L10 from four 8' lengths 1 x 2 pines. You should be able to cut parts of the L11 and L12 from one 3' length 1 x 2 pines. Hardware Part #Qty.Item Description H13 @ 6 x 14 x 1/8 sheet metal (section connectors) H224 @ 1/4 x 2 flat-head stove bolts (with washers and wing nuts) H32 @ 1/4 x 2 round-head stove bolts (with washers and wing nuts) H45 @ 21/2 x 21/2 hinges (with screws) H51 @ 21/2 x 21/2 loose-pin hinge (with screws) H62 @ 11/2 x 11/2 loose-pin hinges (with screws) H71 @ 1/8 inside-diameter screw eye H836 @ 11/4 #10 flat-head wood screws Other Supplies carpenter's glue a small box of 1/2 brads hard-surface enamel paint (red, yellow, green, and blue for the lane guides, and white* for the base) clear gloss polyurethane fine steel wool a supply of heavy rubber bands three sandbags (optional) Lay Out Base Sections Label the four plywood base pieces (Part L1) Section 2, Section 3 and Section 4. Section 1 will be the end of the starting gate, and Section 4 will be the end of the finishing gate. Safe Lane Guide to Base Sections 1, 2 and 3 Key to Fair Track (piste without faster/slower lanes) is a proper alignment of lanes and track sections. Don't rush with it Check, double check and check three times the alignment of the guide lanes in front of them in place. Figure 2.1 - Distance between the guide paths (view from above) Apply carpentry glue to the guide lanes (Part L2). Carefully spread the lane guides to the track base sections (Part L1) at 31/2 centers. (See Figure 2.1) Clamp the lane guides in place. Safe lanes with 1/2brads. Allow the glue to dry completely. The centers of lane guides will be 13/4, 51/4, 83/4, and 121/4 from both edges of the base track. Figure 2.2 - Friction brake (side view) Section 4 is different from other sections because the last 3 foot strip guides are raised to form friction brakes. The lower part of the cars will drag on the raised lane guides, slowing the cars down after they cross the finish line. (See Figure 2.2) Figure 2.3 - Section 4 (top view) Align and provide lane guides for Section 4 just like you did for other sections, but don't provide the last 3' of the lane guides (three feet near the end of the cleat). (See Figure 2.3.) Figure 2.4 - end of the cleat position (bottom view) Apply carpenter glue to the end of the cleat (Part L12). Spread the final key on the underside of Section 4 along one end. Clip the end of the cleat in place, and fasten it with two 11/4 #10 flat-headed wooden screws (part H8), one at each end. (See Figure 2.4.) Figure 2.5 - Friction brake design (face view) After the glue dries, create a friction brake by maintaining the loose ends of the guide lanes with directional stands (Part L15). Apply the carpenter's glue to one strut guide, then place it under the loose end of the lane guide and clamp it in place. Protect the lane guide to guide the risers with a 1/2 brad. Protect the lane guide to base with one 11/4 #10 flat-headed wooden screw (part H8), driving the screw through the strut guide. Position (see Figure 2.5.) Repeat the process for the other three struts. (a) Closed (b) Open Drawing 2.6 - The beginning of the gate action (side view) Section 1 is different from other sections because it has a slot in the center of each lane so that the starting poles swing downwards. (See Figure 2.6.) a) Drill holes (b) to connect the holes Figure 2.7 - cutting slots for the starting poles (top view) Start by marking the center of each lane. Next, move to place each lane 8' from the starting end. Next, not to drop each lane again 3' for it. This gives you two points in the center of each lane, one 8' from the starting end and the other 11' from the starting end. Drill 1/2 of the hardening into the center of each of these dots. (See Figure 2.7(a).) Then use a keyhole saw, a jig saw or a similar saw to cut out a slot connecting the two holes in each lane. This will create a 1/2 wide slot down the center of each lane. (See Figure 2.7 (b).) Preparing Section Connectors and Cleats Figure 3.1 - Part H1 Construction (Top Drill four 1/4 holes in the cones section (Part H1), one in each corner. Find the center of each hole 13/4 with a 6-length side and 11/2 with a 14-length side. (See Figure 3.1.) Figure 3.2 - Part of the L10 design (top view) Mark the middle points of the cleats section L10. Drill four 1/4 holes in each section of the cleat. Find the center of the holes 11/2 on each side of the middle point and 61/2 on each side of the middle point. (See Figure 3.2.) Figure 3.3 - Basic Support Positioning (lower view) Applying carpenter glue to one base support (Part L9). Carefully center the basic support on the bottom of Section 2 and clamp it in place. (See Figure 3.3.) Credit basic support with five evenly marked 11/4 #10 flat-headed wooden screws (Part H8). In the same way, ensure the remaining base supports sections 3 and 4. Allow the glue to dry completely. The key to a fair track (a track without faster/slower lanes) is the proper alignment of lanes and sections of the track. Don't rush into this step. Check, double check and check the alignment of section connections three times while you work. Gently align the ends of sections 1 and 2, then clamp them face down to the work surface. It is a good idea to place a scrap of wood between sections of the track and the work surface to protect the work surface from the drill bits. Carefully align the section connector (Part H1) over the ends of the two sections of the track. Squeeze the section connector in place. Using the holes in the section connector as a guide, drill two 1/4 holes in each section of the track. The holes should be located 11/2 from the end of the section, and centered in the outer bands (13/4 from the edge of the base), but the exact positions are less important than the fact that the holes exactly correspond to those in the connector section. Figure 3.4 - Section Connection (top view) Carefully unscrew two sectional slyks with average holes above the holes that you have just drilled in sections of the route. Use 1/4 of the chats (part H2) to check the cleats section alignment and then clamp the cleats section in place. Using the outer holes in the cleats section as a guide, drill another two 1/4 holes in each section of the track. The holes should be located 61/2 from the end of the section, and centered in the outer lanes (13/4 from the edge of the base), but the exact positions are less important than the fact that the holes correspond to those in the appropriate section of cleat accurately. Unclamp everything. Countersink holes in the alley guides. Figure 3.5 - Link section (side view) Assemble this connector section with eight 1/4 x 2 flat-headed oven bolts, eight washers, and eight wing nuts (part H2). Section connectors should be sandwiched between the bottom of the track sections and the cleats section. Wing nuts should be on the underside of the track. The heads of the furnace bolts should be flush with the surface of the guide lanes. (See Figure 3.4 and Figure 3.5.) Mark the ends of these sections of the track, the section connector and sectional snaps with red paint. Break this section connection. Repeat the connection process between sections 2 and 3 (yellow or green paint) and the links between sections 3 and 4 (note blue paint). Safe brace figure - Section 1 with brackets View) On the underside of section 1, mark line 9 from the end, which joins section 2. Apply carpentry glue to one side of the bracket block (Part L8). The center brackets the block at the bottom of Section 1 with one end on the mark and clip it in place. (See Figure 4.1.) Protect the bracket block with three 11/4 #10 flat-headed wooden screws (part H8). Allow the glue to dry completely. Attach one end of the bracket (Part L3) to the 21/2 hinge bracket block x 21/2 (Part H4). Figure 4.2 - Long legs (rear view) Mark each long leg (Parts L5) 12 from its bottom end, and 8 from its upper end. Position two leg cleats (Part L6) through long legs, with the top edge of each leg cleat along the respective marks on long legs. The legs of cleats should be perpendicular to long legs, with the outer edges of long legs even with the ends of the legs cleats. (See Figure 4.2.) Apply carpentry glue to the joints, restore the correct position and alignment of parts, and clamp the parts in position. Fasten the legs of cleats to long legs with 2 11/4 #10 flat-headed wooden screws (part H8) at each junction. Let the glue dry. Figure 4.3 - long legs with stabilizer (rear view) Stabilizer position (L4 part) in the center through the lower ends of long legs with the ends of long legs even from the bottom edge of the stabilizer. The stabilizer clip is in position. Drill one hole 1/4 through each joint. Unclamp stabilizer and fasten it with two 1/4 x 2 round-head oven bolts, four pucks, and two wing nuts (parts H3). (See Figure 4.3.) Remove the stabilizer and store the bolts in the holes. Figure 4.4 - Section 1 with long legs (bottom view) On the underside of section 1, mark line 12 from the end with slots for starting posts. Spread the top end of the long leg unit on this line. (See Figure 4.4.) Attach the top ends of the long leg blocks to the bottom of Section 1 with a pair of 21/2 x 21/2 loops (Part H4). Figure 4.5 - Short legs (front view) Position of the remaining cleat leg (Part L6) through the lower ends of short legs (Part L7) with the ends of short legs even with the lower edge of the cleat leg. The leg should be perpendicular to the short legs, with the outer edges of the short legs even with the ends of the cleat leg. (See Figure 4.5.) Apply carpentry glue to the joints, restore the correct position and alignment of parts, and clamp the parts in position. Fasten your leg to the short legs with two 11/4 #10 flat-headed wooden screws (Part H8) in each joint. Let the glue dry. Figure 4.6 - Section 1 with short legs (bottom view) On the underside of section 1, find line 9 from the end that joins section 2. You drew this line during the previous Safe Bracket step. Spread the top end of a short leg block on this line. (See Figure 4.6.) Attach the top ends of the short leg blocks to the bottom of Section 1 with a pair of 21/2 x 21/2 loops (Part H4). Note that loops should open more than 90 degrees short legs be vertical when the track is set up. If the loops are flush with the ends of the short legs, they will only be able to open 90. Here are some ways to do it. Allow the loops to extend a little behind the ends of the short legs. Cut the top ends of short legs at an angle rather than a square one. Turn the front legs forward so they swing forward to Section 2 rather than back to the starting gate. You should move the mounting space for the front legs (and for the brace and bracket unit) to 12 from the end of section 1, rather than 9 from the end of section 1 as stated earlier. In addition, the brackets (part L3) can be about 3 shorter. Figure 4.7 - Section 1 with legs and braces (side view) Turn section 1 right side up and stand upright on extended leg units. Position brace so that the loose end of the brace lies on the lower leg of the cleat long leg unit. (See Figure 4.7.) Attach the loose end of the brace to the lower leg of the cleat long leg unit with 21/2 x 21/2 free-pin hinge (Part H5). The loose hinge allows long leg units and braces to be separated from each other and folded flat for storage. Attach the starting poles and pen Figure 5.1 - Part L11 construction (top view) Mark the line along the length of the starting bar (Part L11). Find this line 1 from the back edge of the starting bar. Drill a hole 1/2 through the starting bar. Find the center of this hole along the marked line and center between the ends of the starting bar. Drill four 1/4 holes through the starting bar. Find the centers of these holes along the marked line and at 31/2 centers. (See Figure 5.1.) Double check the distance between the four 1/4 holes by setting the starting bar under the starting slots for the starting posts in section 1. Figure 5.2 - starting gate (rear view) Apply carpentry glue on the hole 1/2 in the starting bar (L11) and until the end of the starting handle of the bar (L14). Insert the end of the bar's starting handle into the 1/2 hole. The starting handle of the bar will protrude from the bottom of the starting bar, and will flush at the top of the starting bar. Apply carpentry glue to 1/4 holes in the starting bar (L11) and to the ends of the starting poles (L13). Insert the ends of the starting pillars into the holes of L14. The starting poles will protrude from the top of the starting bar, and will be flush at the bottom of the starting bar. (See Figure 5.2.) (a) Closed (b) open drawing 5.3 - starting gate (side view) Starting gate position in accordance with section 1, with the starting poles sticking out through the slots. Break the starting gate as close to the end of Section 1 as slots allow. (See Figure 5.3.) Attach the starting gate to the bottom of Section 1 with a pair of 11/2 x 11/2 loose loop (part H6). Loose loops allow you to remove the starting gate from Section 1 for storage. Attach 1/8 inside the diameter of the screw eye (part H7) on the underside of section 1, down from gate and center between the left and right edges of Section 1. The distance between the starting gate handle and the eye screw should be a couple of inches longer than the length of your heavy gum. Loop the gum over the starting handle of the gate and then loop to secure the other end of the gum in the eye screw loop. (See Figure 5.3.) To open the starting gate, the operator of the starting gate reaches under the track and pulls the starting handle of the gate back quickly and smoothly. You may need more than one rubber band to keep the starting gate from opening when four cars are in place. Finishing track sand all surfaces and sharp corners. Remove the residual dust with a tack cloth. Paint the top and edge the track base sections with white enamel, and let dry. Mask lane guides for Lane 1 and paint them with red enamel. Repeat the process by masking alleys 2, 3 and 4 and painting them with yellow, green and blue enamel respectively. Allow all strips to dry out. Finally, cover all the surfaces of the track with a clear shine of polyurethane. Rub with thin steel wool between the coats. Three or four layers of polyurethane will give a durable, durable finish. If you prefer, you can paint the base in black, gray or some other neutral color instead of white. You can also leave the base (or even the entire track) unpainted, and just apply a clear polyurethane finish. Using the track Use red connectors and cleats to join sections 1 and 2. Use yellow or green section connectors and cleats to join sections 2 and 3. Use the blue section connectors and cleats to join sections 3 and 4. Extend the legs of section 1 and secure the loose end of the brace on a long loop of legs with a hinge with a loose pin. Attach the stabilizer to the long legs with bolts and wing nuts. You can help stabilize the track by placing one sandbag over the cleat of short legs, and one sandbag at each end of the long leg stabilizer. (a) Closed (b) open drawing 6.1 - starting gate (side view) Attach the starting gate with a free pin hinge. Loop the gum over the starting handle of the gate and then loop to secure the other end of the gum in the eye screw loop. (See Figure 6.1.) You may need more than one rubber band to keep the starting gate from opening when four cars are in place. To open the starting gate, the operator of the starting gate reaches under the track and pulls the starting handle of the gate back quickly and smoothly. It is important to open the starting gate quickly to avoid giving some car designs an edge over others. It is important to open the starting gate smoothly to avoid suddenly bumping the track. Improvements following improvements to the base track design will produce a track that is better overall. Replace the H2 part (bolts and wing nuts for cleats section and connectors) with 1/4 x 11/2 flat oven bolts and T nuts. This allows the track to lie on the floor rather than resting on the wing Apply a 1-wide self-gluing rubberized tape to the friction brake to slow the cars down faster. A sticky rubber surface will slow cars down faster than a solid rubber surface. Reverse gum on the starting gate so that it pulls the starting gate open. Add a simple latch to keep the starting gate in place until you place the cars on the track. When the latch is released, the gum will pull the starting gate open quickly and automatically. Prepare a lane guide along the entire length of the friction brake. The easiest way to do this would be to use a saw table to cut the triangular shell 3' long, 1 3/8 wide, and 1/2 thick at the end. Add soft bumper foam at the end of the track to stop fast cars that still have some momentum when they reach the end of the friction brake. Add your feet to the track to stand freely rather than leaning on the floor or on the table. To avoid the possibility of legs breaking the leveling of the track, fixed them within 1 x 4 lumber. Frames should have slats at regular intervals to support the base of the track. However, this structure requires that the curved section of the track (where the sloping ramp goes into the level at once) be fixed rather than follow a natural curve caused by the plywood base bending under its own weight. Cut a shallow notch in the cleats section (Part L10) for section connectors (part H1) to fit in. Variations of the following variations of the base track design can allow the track to better meet the needs of different groups. Change the number of lanes. Wider tracks should use additional base supports (Part L9) and sectional cleats (Part L10). The number of guide lanes and starting poles will vary, as will the size of many parts. Using standard 31/2 hubs for lane guides, the two-lane track will be at least 7 wide; A 3-band track with at least 101/2 wide (111/2 will use 4' x 8' sheet plywood effectively); and a 6-lane track, 21 wide. Increase the space between the directional movements and/or the space between the external directional movements and the edge of the track. This will require a wider base of the track, with a corresponding increase in the size of other parts. The wider lane distance allows you to allow wider car designs without worrying that neighboring cars are interfering with each other. The track is easier to store and transport if its sections are only 6 feet long and not 8 feet long. The track used by my CSB Stockade unit has five 6-foot sections, a shorter braking section friction beyond the finish line, and a shorter curved section to connect the 12-foot sloping ramp to the 18-foot level at once. However, shorter sections do not use plywood so effectively. If you prefer, you can paint the track base black, gray, or some other color instead of white. You can also leave the base (or even the entire track) unpainted, and just apply a clear polyurethane finish. If you prefer, you can make lane guides (Part L2) L2 synthetic materials that are more homogeneous than wood. Lane guides from these materials may be more uniform. From such materials it is possible to make a running surface of the track. Beware of buckles caused by different expansion rates between plywood base sections and any synthetic materials used. Use the lanes (Part L2) wider than the 1 3/8 these plans indicate. Kits usually have a unit that is 131/4 wide on axis slots, so the lane directs up to 1 5/8 wide can be successfully used. The wider guide lanes reduce the game from side to side, which keeps cars further apart and reduces the force with which cars are inserted into the guides. The downside is that cars hit the lane more often, and there's less room for error if any participants narrow down their game when forming/guiding the unit. This track plan was adapted for erasing (with permission) from derby track plans distributed by the Christian service brigade. I never built a derby track out of these plans (or from the original plans) and the original plans were a bit vague in the places. I am grateful to Derick S. and Carl L. Strickler, which has provided a valuable ViperZoom@aol.CivilFun@aol.CarlStrickler@upr.CarlStrickler@upr.com, has provided feedback based on the derby tracks of its units that were built using these plans. If you are using these plans to build a derby track, please let me know if you can offer any further improvement or clarification. See also the CarlStrickler@upr.CivilFun@aol.ViperZoom@aol.com

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