

Go Far Cars Ramp

A Basic Ramp With Four Height Settings



A Basic Ramp With Four Height Settings

Background

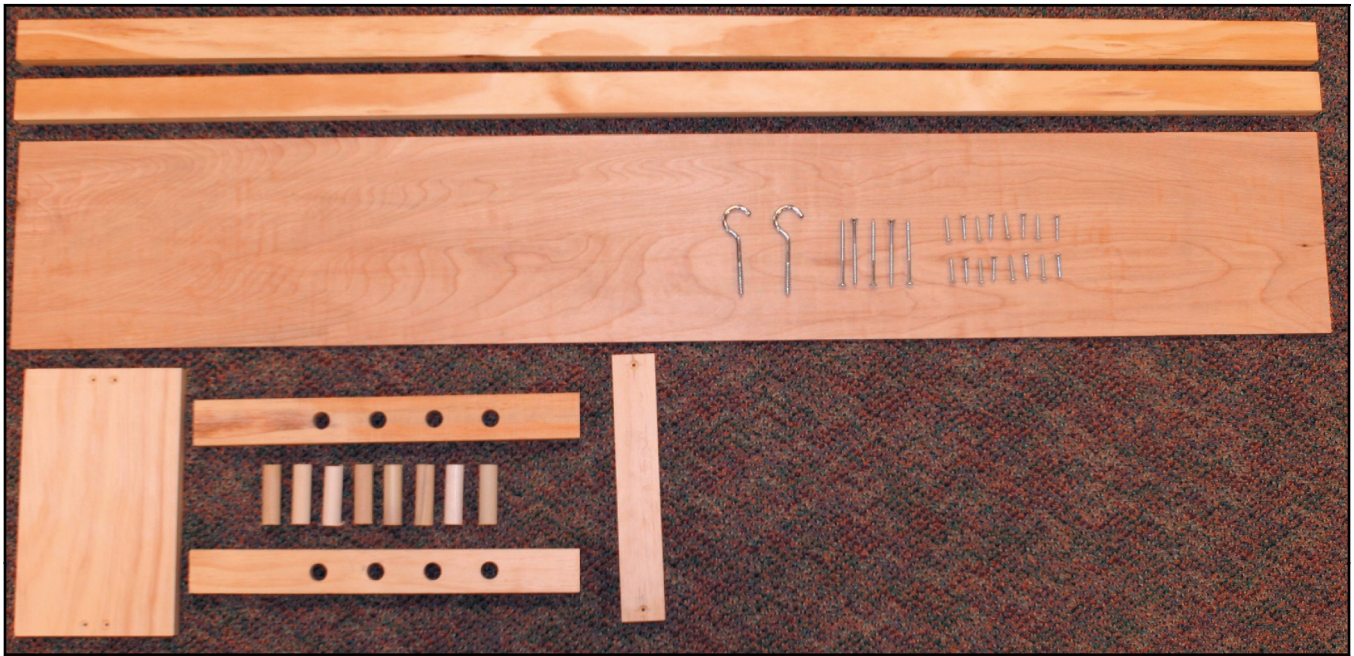
Developed for use with Jefferson Lab's *Go Far Cars* experiment, this simple ramp can easily be set to four different height settings. The ramp settings are uniformly spaced, so the amount of gravitational potential energy given to an object at the top of the ramp increases by a constant amount as the ramp is placed at higher settings.

Overview

The ramp is elevated by a support framework made from strips of 1 × 2 pine board which is attached to a 1 × 6 pine base. The different settings are made by attaching 5/8" diameter wood dowels to the support framework. In this particular ramp, the dowels are spaced 10 centimeters apart. The ramp itself is made from a 4 foot long sheet of oak or poplar plywood. The smoothness of the plywood is the primary consideration when choosing a sheet from the hardware store. Two additional 1 × 2 pine boards are attached to the plywood ramp surface. These boards prevent the plywood from bowing as well act as barriers that prevents whatever object is travelling down the ramp from falling off the side. The ramp attaches to the support framework by means of two #6 screw hooks which are inserted into the ends of the ramp's 1 × 2 pine boards.

Component List

- 5/8" diameter wood dowel (roughly 2 feet needed)
- 1 × 2 × 4' pine board (2 needed)
- 1 × 2 pine board (roughly 3 feet needed)
- 1 × 6 pine board (roughly 1 foot needed)
- 1/4" thick oak or poplar plywood (a section 4 feet long and 7 5/8" wide needed)
- #6 × 3 3/8" screw hook (2 needed)
- #6 × 1" wood screw (18 needed)
- #8 × 2 1/2" wood screws (6 needed)



All of the components are gathered. All of the wood has been cut and all of the holes have been drilled.

Ramp Construction

1. Cut a 4 foot long by $7\frac{5}{8}$ inch wide strip from the quarter inch plywood.
2. Define the nicest side of plywood as the top.
3. Attach a 4 foot length of 1×2 pine board along one of the top edges of the plywood strip with 9 of the one inch long wood screws and some wood glue.
4. Attach a second 4 foot length of 1×2 pine board along the other edge of the plywood strip with the remaining one inch long wood screws and some wood glue.



Two 4 foot lengths of pine board have been attached to the top of the plywood strip.

5. Define one end of the ramp assembly as the back.
6. Mark the center of the back face of each of the two 1×2 pine boards. Drill $\frac{11}{64}$ inch diameter pilot holes at those locations.
7. Screw a screw hook into the back end of each of the two 1×2 pine boards. When completed, the open end of the hook should be pointing downward and the two hooks should each extend an equal distance from the back of the ramp.

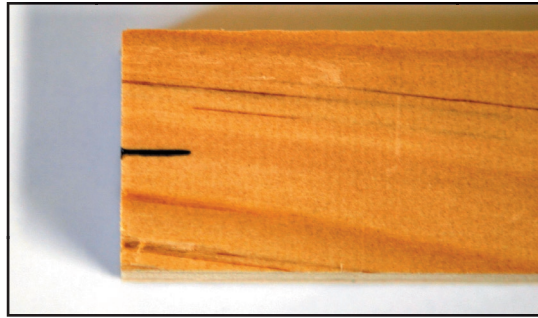


A screw hook has been inserted into the end of one of the 1×2 pine boards.

8. Congratulations! Ramp assembly is now complete!

Support Arm Preparation

1. Cut two 13¹/₂ inch long sections from the 1 × 2 pine board. These two pieces will become the left and right support arms.
2. Take one of the pieces and mark its center line along one of the ends. This end will become the bottom of the support arm. The center line mark will help align the piece with the base board as well as help locate the locations of the support dowel holes.



The center line has been marked at the end of one support arm.

3. Make a second center line mark about 10 inches away from the first end.
4. Use the drill pattern found in **Appendix A** to mark the locations of the support dowel holes. Align the bottom of the drill pattern with the bottom of the support arm. Match the center line marks on the support arm with the center line marks on the drill pattern.
5. Use a ⁵/₈" diameter drill bit to cut the four holes needed in the support arm.
6. Repeat steps 2 through 5 with the second support arm.
7. Cut eight 2 inch long sections from the ⁵/₈" diameter wood dowel.
8. Flip the two support arms so that the centerline marks are facing down.
9. Apply a little wood glue in each of the support dowel holes and insert the dowels. You may need to use a rubber mallet to fully position the dowels. They should end up being flush with the marked side of the support arm.
10. The support arms are now ready! We just need something to attach them to...

Base Board Preparation

1. Cut a 9¹/₄ inch long section from the 1 × 6 pine board. This piece will become the base of the support frame.
2. Turn the base board so that its long edge runs from right to left.
3. Make two center line marks, one on the right side of the piece and one on the left side of the piece. This marks where the support arms will join with the base board.
4. Draw a line parallel to the right edge of the base board that is as far away from the right edge as half the thickness of your 1 × 2 pine board. Although a reasonable person may think that a piece of 1 × 2 pine board would be one inch thick and two inches wide, it typically is not. You can expect your 1 × 2 pine board to be roughly ³/₄ inches thick and 1¹/₂ inches wide. Make certain that this line intersects the center line and extends about an inch above and below it.
5. Mark two points on the line that is parallel to the right edge of the base board, one that is ³/₈ inch above the center line and one that is ³/₈ inch below the center line. Drill ⁹/₆₄ inch diameter pilot

holes at these two points.

6. Repeat steps 4 and 5 with the left edge of the base board.
7. That's it! The base board is now ready!



Pilot holes have been drilled in the base board.

Top Board Preparation

1. Cut a $9\frac{1}{4}$ inch long section from the 1×2 pine board. This piece will become the top of the support frame.
2. Turn the top board so that its long edge runs from right to left.
3. Mark the center line along the right and left edges.
4. Much like you did with the base board, draw lines which are perpendicular to the center lines and at a distance from the edge equal to one half the thickness of the 1×2 pine board. Drill $\frac{9}{64}$ inch diameter pilot holes at these locations.



Pilot holes have been drilled in the top board.

5. The top board is now ready! Time to put everything together!

Support Frame Assembly

1. Take one of the support arms and align its center line with one of the edges of the base board. The outer face of the support arm should be flush with the edge of the base board and the support dowels should point towards the center of the base board. Secure the support arm to the base board with two #8 \times 2 1/2" wood screws. To prevent the support arm from splitting, it may be wise to extend the pilot holes into the support arm. Here is a trick for marking their locations on the end of the support arm: Remove the support arm and screw the screws into the baseboard to a point where their tips are just extending past the base board. Align the support arm and press it down onto the screw points. This will leave an impression in the end of the support arm that will show you where to drill the new pilot holes.
2. Attach the second support arm just like you did the first.
3. Attach the top board to the support arms with #8 \times 2 1/2" wood screws. The faces of the support arms should be flush with the ends of the top boards. Again, it may be wise to drill pilot holes into the support arms.
4. Oddly enough, that's it! Hang the end of the ramp on the support dowels and you are good to go!



A completed support frame.

Appendix A - Support Arm Drill Pattern

