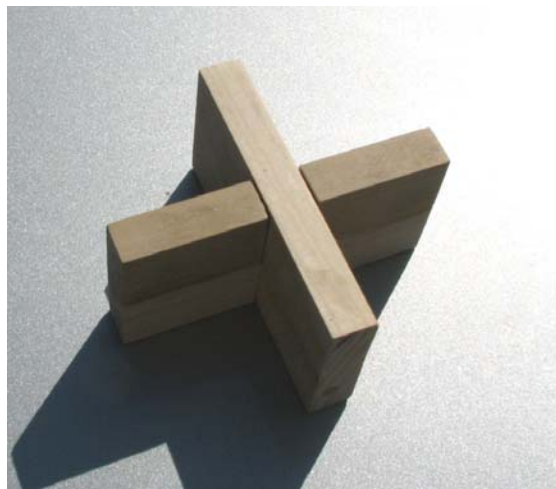
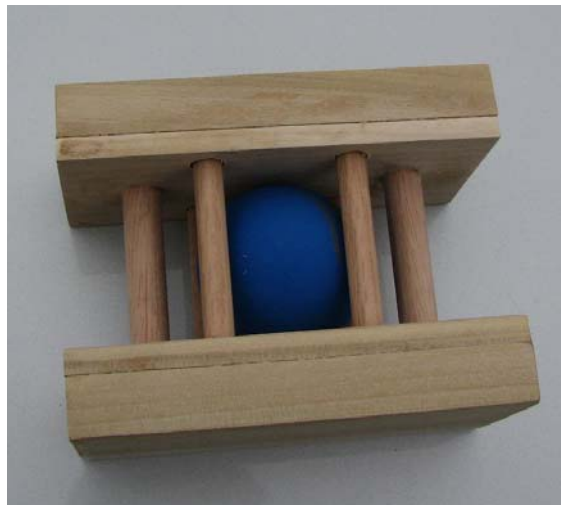


“Easy to Do” Build it Yourself Brain Teasing Puzzles



Mind Twister



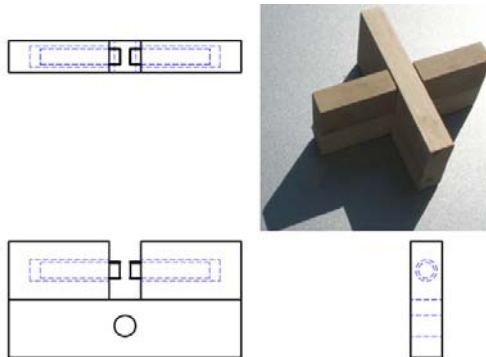
Mind Trapper

**By John M. F. Berner
04/01/07**

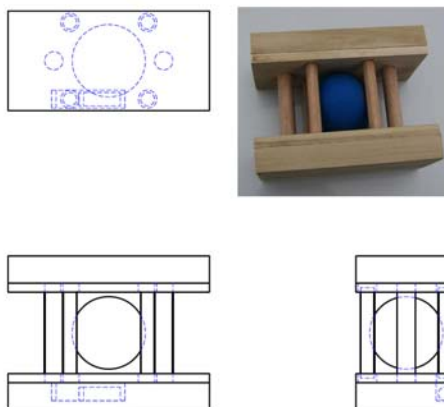
Introduction:

This instructional booklet is a guided tool used to aid you in the building of fun puzzles which will amaze your friends and encourage their problem solving skills. Before you begin to build these puzzles, you will need to understand the problem and solution to each.

The Mind Twister puzzle is a combination of two boards that are locked together with sliding pins. The problem is to get the two boards separated. The reason it is so difficult to get them apart is that there are four pins that could be holding the boards together. Each time the puzzle is turned, another pin slides into locking position due to gravity. The solution to the problem is centripetal force. To get the boards apart, you will need to place the puzzle on a flat smooth surface and give it a spin forcing all four pins to slide outward. You should then be able to separate the boards.



The Mind Trapper puzzle is a wooden cage with a ball that is trapped inside. The problem is to remove the ball from the cage without forcing or damaging the ball or the cage. The solution is hidden in the base of the cage. There is a pin which is held in place by a couple of magnets preventing one of the four cage bars from being able to back out of its place to set the ball free. In order to get the cage bar out, you need to get the pin to shift inside the base with a quick rap of the cage on the palm of your hand in the correct direction. The bar should then be able to slide into the base and then be pulled out and away from the cage.



No one really knows who invented the centripetal force puzzle, but they were found in novelty stores in China. The ball in the cage puzzle was invented by a magician whose original was made out of brass. He called it the Alcatraz puzzle. Now they are selling miniature versions using plastic injected molds for the base, brass bars, and a steel ball. The name, materials, and dimensions were changed to protect their patent.

You should have a great time building these puzzles and when you are finished you will have a couple of hand made tricks to be proud of; but first, you will need to gather a small list of supplies and follow some easy step-by-step instructions.

The Building Supplies You Will Need:

6 Basswood Craft Boards - 5 ½" Length x 2 ¾" Width x ¾" Height
1 Craft Dowel - ½" Diameter
1 Craft Dowel - 3/8" Diameter
1 Racket Ball - 2" Diameter
2 Thin "Easy to Cut" Magnets

The Tools You Will Need:

Ruler
Square
Pencil
Center Punch
Hammer
Clamps
Wooden Hand Guides
Wood Glue
Drill Press
Dremel Tool with Sanding Band Bit
Table Saw
Electric Sander or Sand Paper
Scrap 2 x 4

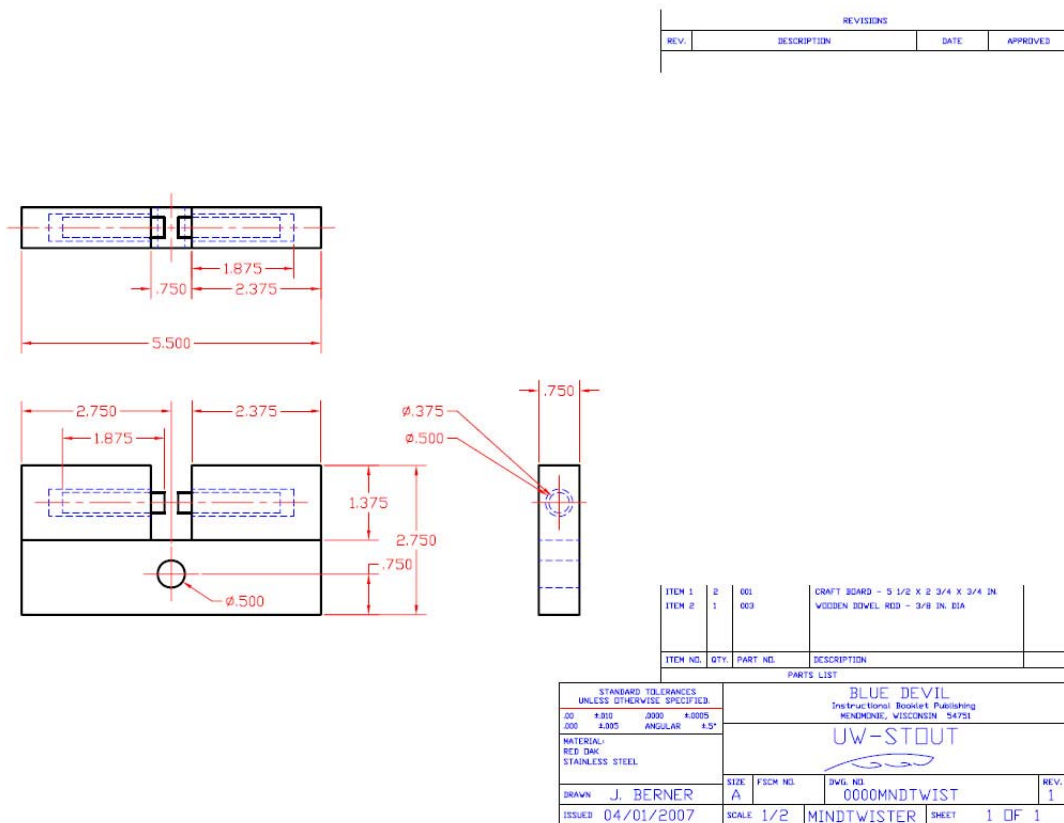
Important Safety Rules:

- projects are recommended for 9th thru 12th grade students
- make sure you work under adult supervision
- wear safety glasses
- remove all jewelry
- don't wear loose clothes
- clear all clutter from your work area
- make sure others are a safe distance from you when working with power tools
- ask for instruction on tools that you are unfamiliar with

Mind Twister

Step 1: Read all instructions before getting started and get familiarized with the following drawing:

(this drawing is a copy of the original and is not shown in half scale)



Step 2: Measure and draw a line at a parallel distance $1 \frac{3}{8}$ in. from either long edge of your two craft boards as it is half the distance. Draw another two lines at a parallel distance $2 \frac{3}{8}$ in. from each end.

Step 3: Set your table saw at a 90 degree angle at a height $\frac{1}{4}$ in. above the width of the board. Individually and with the power off, place the board up against the fence so that the blade is in line with the line you just drew. Tighten the lock on the fence. Turn the power on and rip each board **using wooden hand guides instead of your fingers.**

Step 4: Individually, place a half of each cut craft board along the fence in your compound miter saw. Adjust the blade so that it is at a 90 degree angle. Two cuts will be made, so with the power off, choose your first line to cut and slide each piece down so that the blade lines up with a it. Turn the power on and make a cross-cut. Repeat these steps for the next line on each board.



(your pieces should look like these when you are finished)

Step 5: Measure and draw a line at a parallel distance $\frac{3}{4}$ in. from the long edge of your two thin longest length craft boards. Measure and draw another line at a parallel distance $2\frac{3}{4}$ in. from the short edge of your two craft boards.

Step 6: With your center punch and a hammer, mark where the two lines meet on each of your two boards.

Step 7: Individually, clamp each board to the mounting surface on your drill press. Line the $\frac{1}{2}$ in. drill bit up with the center punch by adjusting the mount and lowering the bit with the power off. When your board is in place, turn the power on and drill each $\frac{1}{2}$ in. hole.

Step 8: On the ends of each small block, measure and draw a line at a parallel distance $\frac{3}{8}$ in. from the longest edge. Measure and draw another line at a parallel distance of $\frac{11}{16}$ in. from the shortest edge.

Step 9: Stand each block on end. With the center punch and a hammer, mark where the two lines cross on each block.

Step 10: Individually, clamp each block to a piece of scrap 2 x 4. Clamp the scrap 2 x 4 to the mount on your drill press. With the power off, adjust the mount so that the $\frac{1}{2}$ in. drill bit lines up with the center punch on each. Drill to a depth of $1\frac{3}{8}$ in.

Step 11: Insert the $\frac{3}{8}$ " wooden dowel rod into one of the $\frac{1}{2}$ in. diameter holes you just drilled. Mark the depth with a pencil on the dowel rod. With the compound miter saw set at a 90 degree angle and with the power off, line up the blade to the mark you just

made on the wooden dowel rod. Turn the power on and cross cut the dowel. Repeat this step on the three other blocks.



(your pieces should look like these when you are finished)

Step 12: With your finger, spread a layer of wood glue on each long narrow edge of the small blocks. With the dowel pins inserted, reattach the small blocks to the other half of the craft board. The dowel pins should be facing inward. Clamp the pieces tight and let dry.



(your pieces should look like these when you are finished)

Step 13: With an electric sander or sand paper, sand all of the faces so that the cut pieces blend back together in one smooth surface.

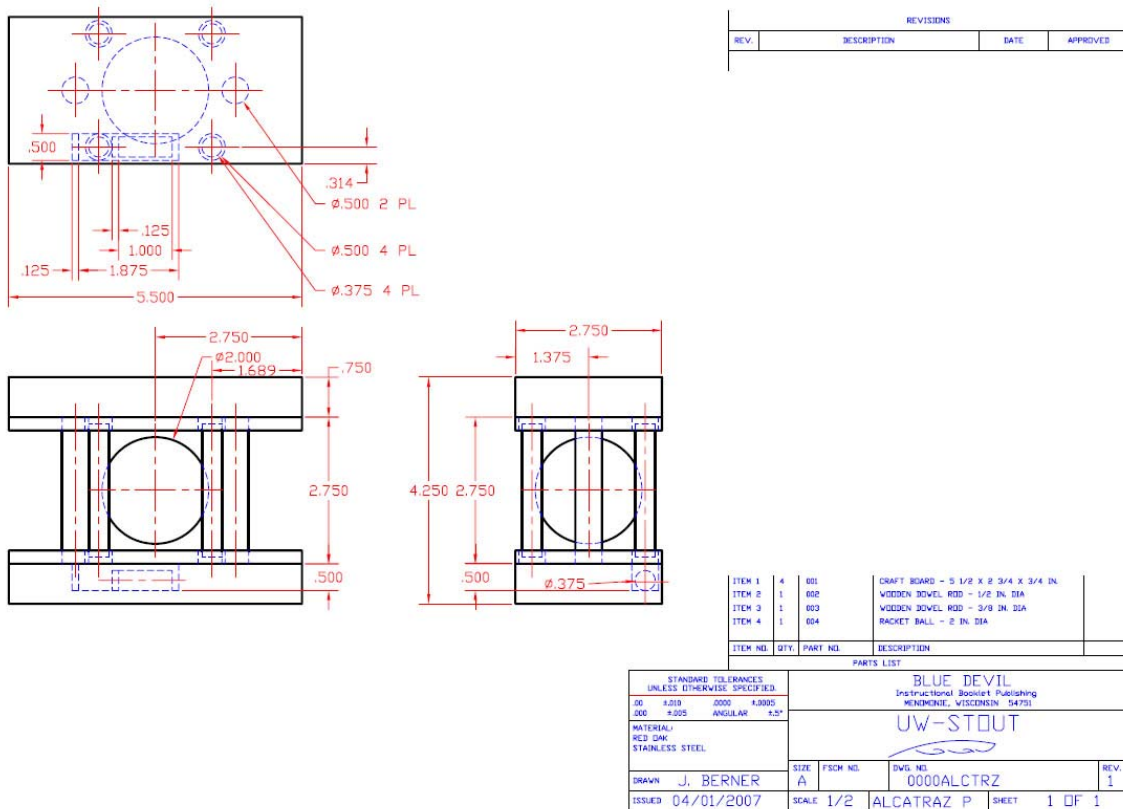
Step 14: Push each pin in so that they are hidden. With one piece upside down, slide the two pieces together so that they are perpendicular to one another. Shake and they will lock together. Spin on a smooth surface and the pins will unlock again.

Enjoy!

Mind Trapper (more challenging)

Step 1: Read all instructions before getting started and get familiarized with the following drawing:

(this drawing is a copy of the original and is not shown in half scale)



Step 2: Using the table saw, you will need to rip two of your craft boards in order to make the width smaller. It starts out $\frac{3}{4}$ in. thick and it needs to be $\frac{1}{4}$ in. The blade should be $\frac{1}{4}$ in. higher than the board and $\frac{3}{4}$ in. from the fence. **Remember to use the wooden guides instead of your fingers.**

Step 3: Use the drawings to measure and draw out the locations of each of the holes needed to be drilled.

Step 4: Individually, clamp each thin board to the mount on the drill press. Using a $\frac{1}{2}$ in. drill bit, drill the holes.

Step 5: Measure and mark the ½ in. wooden dowel rod at 2 ¾ in. Cut two pieces using the compound miter saw. With the power off, line up the 90 degree blade with each measured mark. Turn the power on and crosscut your piece. Repeat this step for each piece.

Step 6: Measure and mark the 3/8 in. wooden dowel rod at 2 1/2 in. Cut four pieces using the compound miter saw. With the power off, line up the 90 degree blade with each measured mark. Turn the power on and crosscut your piece. Repeat this step for each piece.

Step 7: Measure and mark the 3/8 in. wooden dowel rod at 1 in. Cut one piece using the compound miter saw. With the power off, line up the 90 degree blade with each measured mark. Turn the power on and crosscut your piece. Repeat this step for each piece.

Step 7: Measure and draw the ½ in. x ½ in. x 2 in. slot on one of the full size craft boards. It will help if you use the thin craft board with its holes as a stencil. The slot should extend passed the hole ¼ in. toward the end and should run parallel to the longest edge toward the middle.

Step 8: Using a ruler and a Dremel tool. Carve out the slot slowly and carefully to dimension.

Step 9: Using an “easy to cut” magnet sheet, cut a ½ in. x ½ in. square and a 3/8 in. circle. Using wood glue, attach the square magnet to the outside end of the slot you just carved. Attach the circle magnet to the end of your 1 in. wooden dowel pin. Lay the pin in the slot so that the magnets are facing each other.

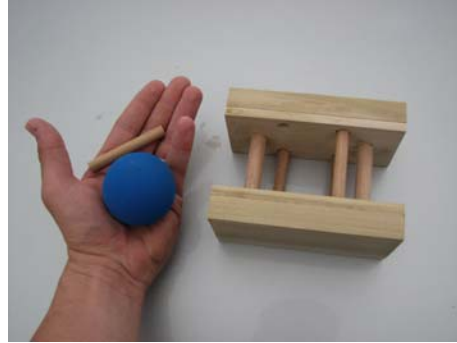
Step 10: Using the wood glue, attach each of the thin craft boards to each of the thick craft boards so that the edges line up. Clamp and let dry.

Step 11: Using a finger, spread some wood glue on each of the ends of your ½ in. diameter wooden dowel rods. Place the four 3/8 in. diameter wooden dowel rods into the four inner holes of one of the bases that you glued together. **Do not put glue on these as they are to remain loose.** Press the ½ in. diameter wooden dowel rods into the end holes in the base that is holding up the loose rods. Place the other base on top. Let dry.

Step 12: Sand all of the edges to make the bases appear as one block of wood using sand paper or an electric sander.

Step 13: In order to insert the ball into the cage, you will have to hit the cage on the palm of your hand to force the magnetic pin to separate. You may have to try hitting both ends to figure out which way the pin slides. The bar should then slide down between the square and circular magnet allowing the other end to angle out. (*cont.*)

Insert the racket ball. Slide the bar back down into the slot between the magnets and up into place. Shake the cage and you now have an imprisoned ball that needs someone else's attention to get it free.



Enjoy!

References:

Institute of Physics and IOP Publishing Limited

R Subramaniam and Toh Kok Aun, "Three-dimensional Puzzle Helps Teach Centripetal Force" Phys. Educ. 39 No 3

May 2004

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