WEEK 7

AIM TO DUNK

EXPERIMENT: DUNK BUCKET

OUTSIDE FUN!

Cool off on a hot summer day with this fun take on a carnival classic. Instead of dropping a person into a dunk tank, douse your friend from above with a bucket precariously perched on a tipping shelf. It's all about balance!

MATERIALS

24-inch piece of 1-by-6-inch board

Two 2-inch strap hinges

Four 2-inch corner braces (also called L brackets)

1-quart plastic container

Meter stick, cut down to 24 inches

Short wood screw (1/2 inch)

Washer

Pencil

Ruler

Duct tape

Pieces of pool noodle or other padding

Small plastic plate or cardboard circle

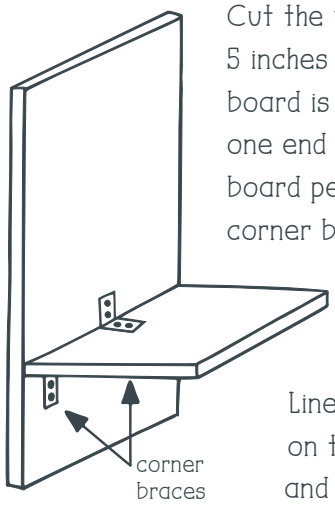
Wood saw

Screwdriver

Water

Bean Bag

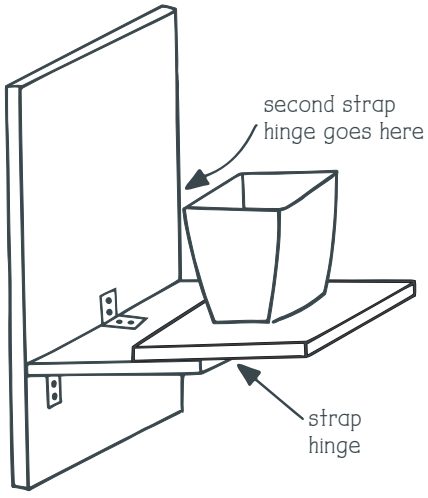
INSTRUCTIONS



Cut the wood into three pieces – two that are 5 inches long and one that's 14 inches. The 14-inch board is the backboard. Measure 3 inches from one end of the backboard and connect a 5-inch board perpendicular at that point, using the corner braces. Use two corner braces on the bottom of the shelf and one on the top in the middle.

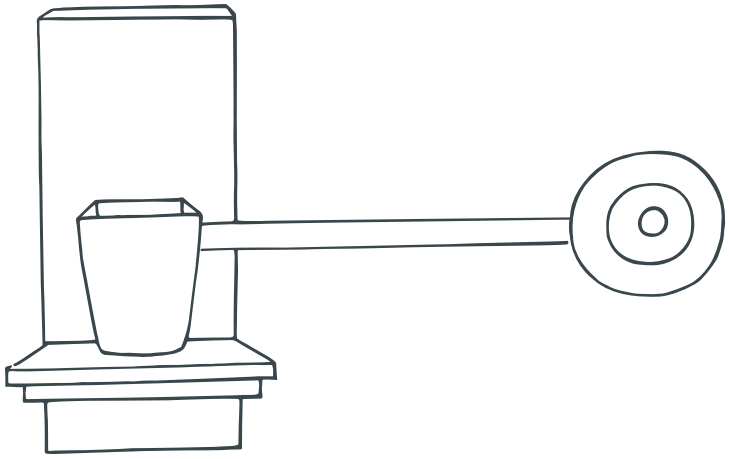
Line up the pivot part of the strap hinge on the top center edge of the 5-inch shelf and screw the hinge into the wood. On the unused 5-inch board, draw a line 2.5 inches from the end and attach the other half of the hinge along the center line. If done correctly, the small board should sit on top of the shelf in an offset position and should be able to tip forward.

Attach the plastic container to the tipping shelf. Line up the center of the container so it is a half-inch behind the pivot on the hinge. Attach the container with a short wood screw through a washer and into the board below. The washer helps distribute force and will keep the container from cracking.



Test the tipping shelf by holding the backboard vertical (such as against a wall) and filling the container with water. The container should tip with a gentle nudge. If it takes too much force to tip, reposition the container away from the backboard so that its center is right over the hinge. If the container won't stay put and always tips, reposition the container towards the backboard. The key is to have the center of mass just behind the hinge pivot.

Find the location for the lever arm by marking a line on the backboard that's just under the rim of the container. Screw the other strap hinge to the right edge of the backboard along this line so that the hinge opens out towards the container. The center of the hinge should be near, but not above, the top rim of the container. Close the hinge and use duct tape to attach the yardstick to the hinge so some of the stick is behind the container but the longer end extends out to the right. Tape the cardboard target to the far right end of the lever. Tape pieces of pool noodle or other padding to the lever arm that's behind the container so there is no gap between the lever arm and the container.



Now find a willing assistant to sit under the dunk bucket as you throw a bean bag at the target!

⚠ SAFETY FIRST:
Since throwers occasionally have less-than-perfect aim, bean bags provide plenty of force to trigger the water spill without fear of being hit by a wild pitch.

TIPS

The offset on the tip shelf is important. With the proper offset, the container of water will be on the verge of tipping and will require less force to push it over. Without this offset, the bucket would be difficult to tip over.

GAME ON

Challenge your friends to see who has a more accurate aim. How many times does it take you to hit the target before the water falls? What happens if you stand farther away, or closer?

MORE WAYS TO PLAY WITH BALANCE

Play tug of war with your friends – when forces on both sides are balanced, the rope doesn't move.

LIKE THIS ACTIVITY?

You could be a …

- Engineer
- Physicist
- Industrial designer
- Mechanic

WHAT'S HAPPENING?

The dunk bucket is a lesson about the center of mass (also called the center of gravity) and balance. When the container full of water is positioned over the pivot point, there should be an equal amount of mass on either side of the pivot. The water is balanced at the edge. That means it will take very little force to push the container over and tip the water on your friend!