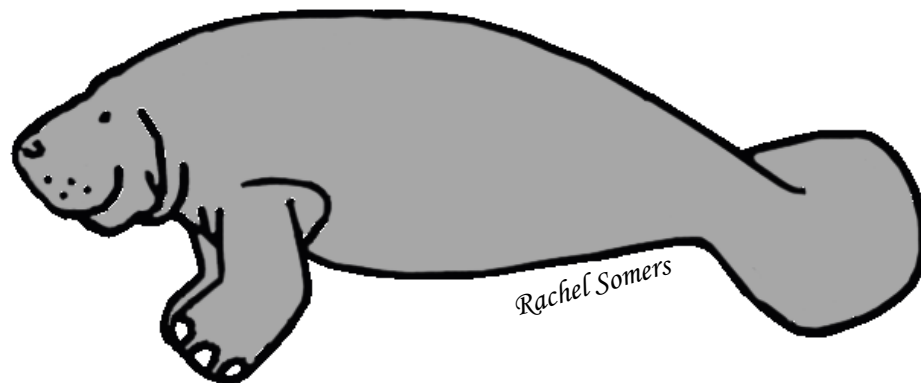


HOW TO BUILD A LIFE-SIZE MANATEE MODEL



Louisiana Sea Grant

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Purpose: Building a life-size model of a manatee will give students a better understanding of the size and shape of this endangered marine mammal while building teamwork in the class.

Time: 3 to 5 hours

Supplies

Markers

Scissors

Clear packing tape

Plastic sheeting 3 to 4mm thick (3 ft wide and at least 22 ft long)

Yardsticks

Butcher's paper

Duct tape

Plastic tubing or plastic edging (roughly 1- inch diameter) Available in gardening or plumbing sections of building supply stores.

Straight edge (to be used only by an adult)

Small electric fan

Overview of Procedure:

- Plastic sheeting will be cut into all of the appropriately sized square and rectangular pieces to make each separate body part before any assembly occurs.
- Pieces will be separated by size and shape into piles labeled BODY, HEAD, FLIPPERS, and FLUKE (tail).
- Each body part will be constructed separately. Each piece can be done simultaneously by different groups.
- Appropriately sized pieces of butcher paper will be used to make freehand patterns for flippers and flukes.
- Body parts will be connected with tape and plastic tubing.
- Opening for inflation will not be cut until the manatee is assembled.
- The finished manatee model can be collapsed into a flat 2.58ft. (diameter) circle for storage.

Procedure:

Step 1: Cut out plastic and butcher paper for all parts

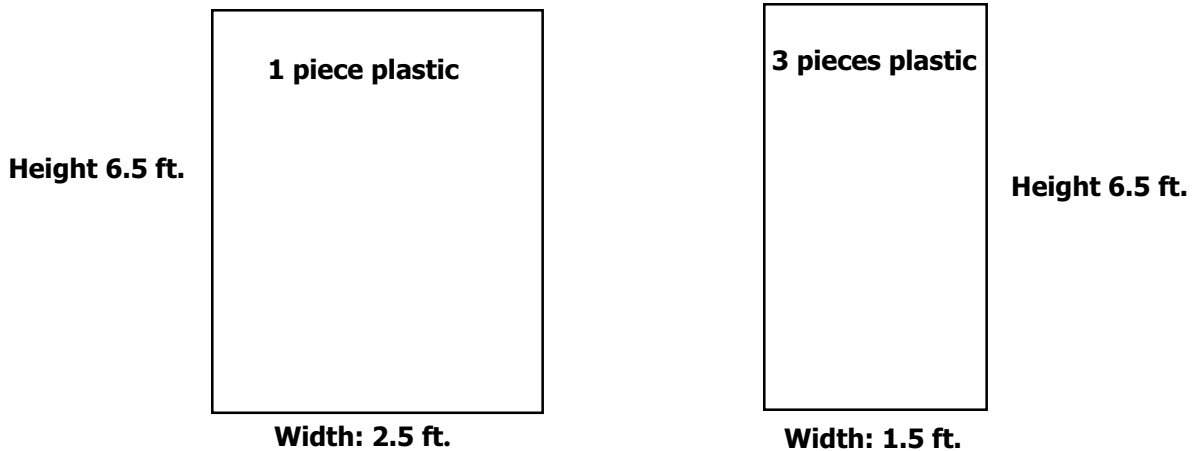
Supplies needed: plastic sheeting, marker, scissors, and yardstick

Helpful Hints:

- If you have tiled flooring, use the tiles as a ruler, most tiles come in sizes of 1 by 1 ft or 2 by 2 ft.
- When cutting plastic, taping it in a few spots onto the floor keeps it from moving.

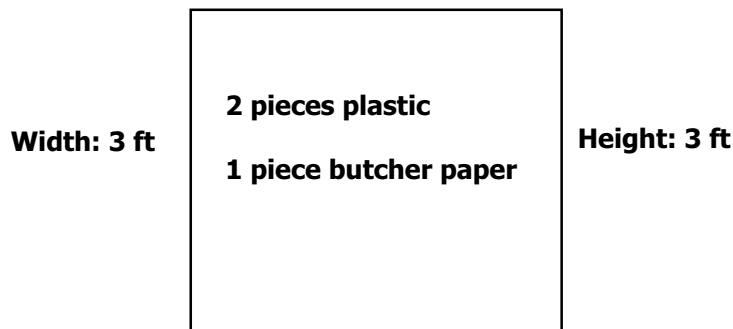
BODY

- Unroll the plastic and cut out 4 rectangular pieces to make the body.
- Cut one piece 6.5 ft by 2.5 ft.
- Cut 3 other pieces 6.5 ft by 1.5 ft.
- Place these 4 pieces off to the side in a pile.
- Label the pile: Body.



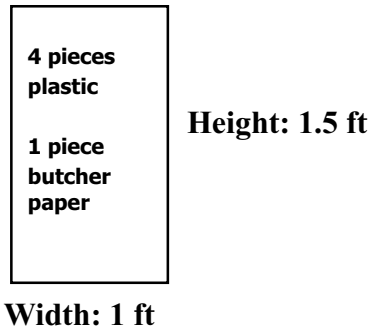
FLUKE

- Unroll plastic and cut out 2 rectangular pieces to make the fluke (tail).
- Cut the pieces 3 ft by 3 ft.
- Cut out a 3 ft by 3 ft piece of butcher paper, which will later be used for the fluke pattern.
- Place these pieces aside in a pile labeled Fluke.



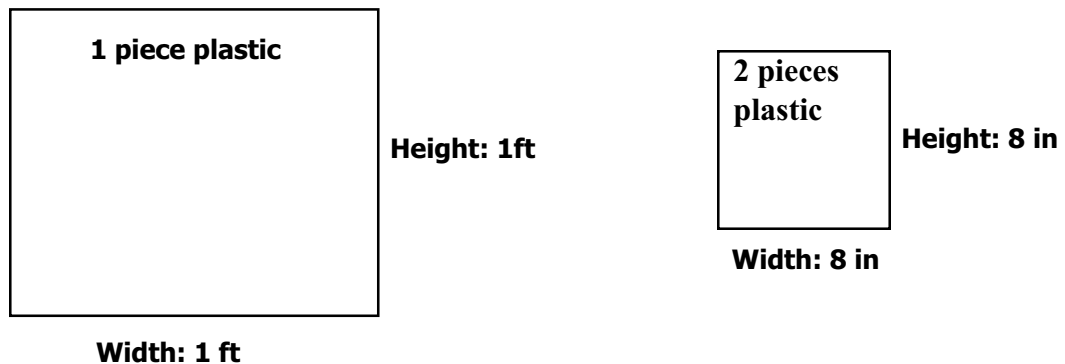
FLIPPERS

- Cut out 4 rectangular shapes to make the flippers.
- Cut them 1ft by 1.5 ft
- Cut out a piece of butcher paper 1 ft by 1.5 ft for a pattern of the flipper.
- Place these pieces aside in a pile labeled Flipper.



HEAD

- Cut out three pieces of plastic to make the head.
- Cut one piece 1ft by 1 ft.
- Cut two pieces 8 in by 8 in.
- Place these aside in a pile labeled Head.



Step 2: Assemble Body (Cutting, Drawing and Taping)

Supplies needed: Body pieces, scissors, yardstick, markers, clear packing tape, plastic tubing/edging, and straight edge

The fusiform body is tapered at both ends to assure that it will be aerodynamic in the water.

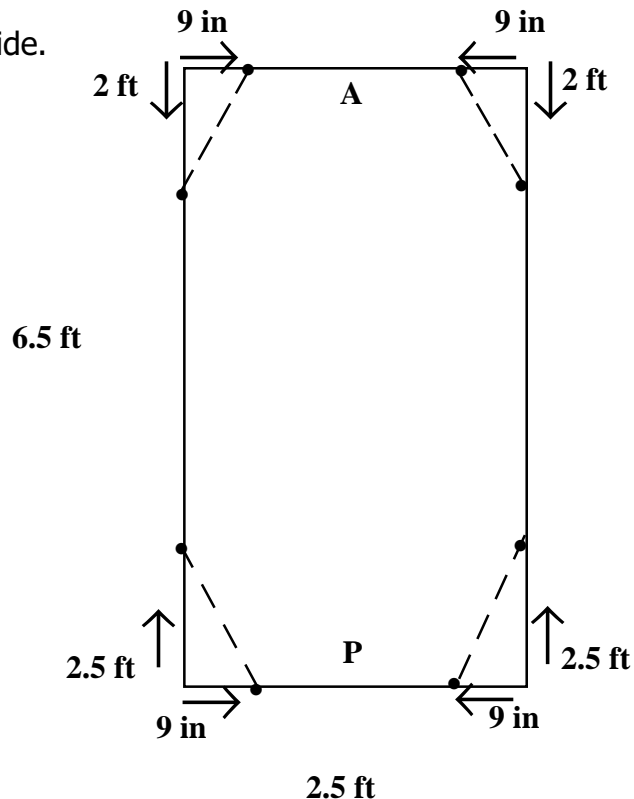
Shaping the Pieces

- S1**
- Lay out the 2.5 by 6.5 ft piece for the body.
 - Lay the yardstick across a 2.5-ft end and measure 9 inches towards the middle from each side.
 - Mark this end of the plastic with the letter "A" for the anterior end.
 - Repeat process at the opposite end and mark with the letter "P" for posterior end.
- S2**
- From the posterior end measure 2.5 ft along the edge.
 - Repeat for the other side.
 - Draw a line from the 2.5 ft mark on the left side to the 9 in mark on the left side of the posterior end.
 - Repeat steps for the right side.
- S3**
- From the anterior end mark along the 6.5 ft edge at 2 ft.
 - Repeat for the other side.
 - Draw a line from the 2 ft mark on the left side to the 9 in mark on the left side anterior end.
 - Repeat for the right side.

- Cut along the lines.

1 PIECE
(2.5 ft x 6.5 ft)

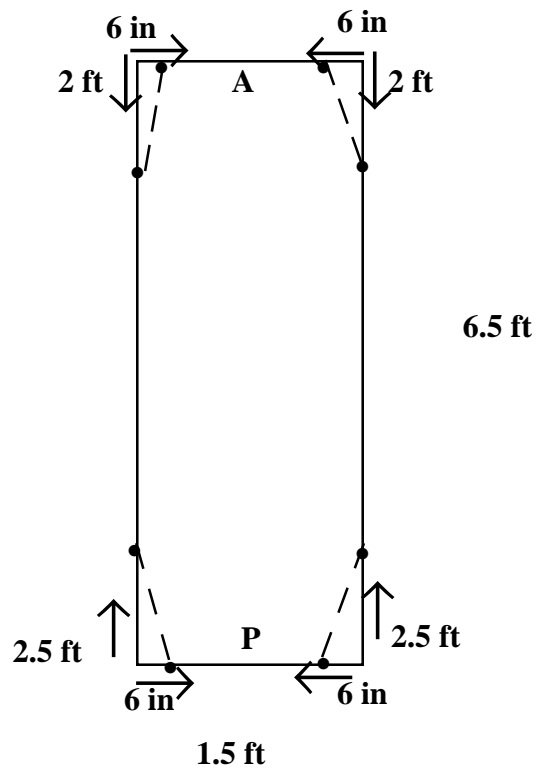
BODY



- S4** A. Lay out one of the 1.5 ft by 6.5 ft pieces.
 B. Lay the yardstick across a 1.5-ft end.
 C. Measure 6 inches from each side towards the middle and mark the spot.
 D. Mark this end with the letter "A" for the anterior end.
 E. Repeat at opposite end and mark with the letter "P" for posterior end.
 F. Repeat for the remaining two 1.5 ft by 6.5 ft pieces.
- S5** A. From the posterior end, make a mark at 2.5 ft along one of the 6.5 ft sides.
 B. Repeat for the other side.
 C. Draw a line from the 2.5 ft mark on the left side to the 6 in mark on the left side of the posterior end.
 D. Repeat steps for the right side.
 E. Repeat for remaining two 1.5 ft by 6.5 ft pieces.
- S6** A. From the anterior end, make a mark along one of the 6.5 ft sides at 2 ft.
 B. Repeat for the other side.
 C. Draw a line from the 2 ft mark on the left side to the 6 inch mark on the left side anterior end.
 D. Repeat for the right side.
 E. Repeat for the remaining two 1.5 ft by 6.5 ft pieces.

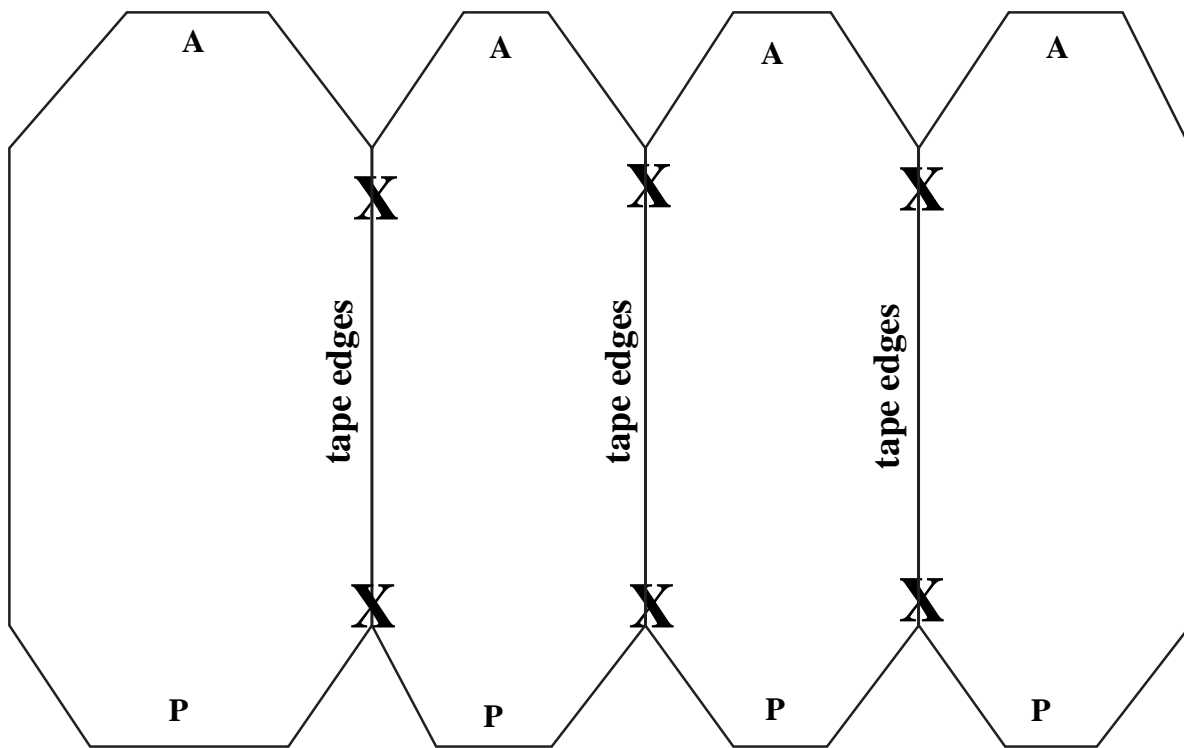
- Cut along the lines.

3 PIECES
 (1.5 ft x 6.5 ft)



Connecting the Pieces

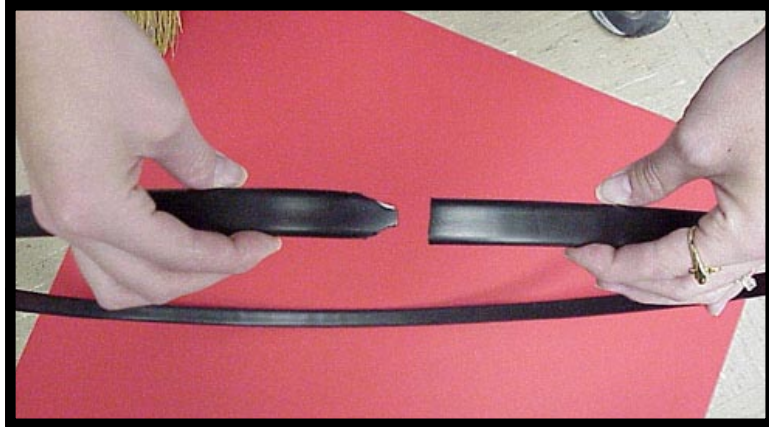
- Lay the pieces next to each other, all with the anterior end facing the same direction.



- A. Begin taping. By roughly 0.5 inches, overlap the middle section of one body piece to another one and tape them together.
B. Repeat by attaching a third piece, and the final piece.
- Flip the attached pieces over and tape along the seams on the other side. (This double-sided seal will prevent air from seeping out of the manatee once assembled.)
- Mark a small "x" at the end of each of the seams. (This will later be used as your guide to line up and attach the plastic tubing/edging.)
- A. Flip one section over another and line up the diagonal edges on one side.
B. Tape them together with some overlap.
C. Repeat for the other diagonal edged side on the same section.
D. Repeat this step for the remaining untaped diagonal sections.
E. Flip the plastic over and tape the other side to make a tight seal.

Tubing

- A. Prepare the plastic tubing/edging by cutting 2 pieces of plastic tubing/edging 7 ft in length. Use the straight edge to cut the tubing.
- B. At one end, trim the tubing so the end angles come to a point.
(This end will fit inside of the other end of tubing to make a ring, after the tubing has been attached to the plastic.)



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- A. Lay tubing across the body segments so it lines up along one set of your "X" marks.
- B. Attach it with about an inch of overlap to one end.
- C. While holding the sheeting so it is taut tape at each "x". Then, at the other end, tape 1 inch back from the end.
- D. Repeat step with the other piece of tubing.



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- A. Now that the tubing/edging is attached to the main body, it is time to make it look like a long cylinder.
- B. First stick the pointed end of the tubing into the non-pointed end and check to see that the plastic sheeting can overlap a little.
- C. If the sheeting doesn't overlap or touch, you will need to trim the tubing until it can.
- D. If the plastic sheeting can overlap, wrap a piece of duct tape around the tubing, forming a ring.
- E. Repeat step for other piece of tubing.



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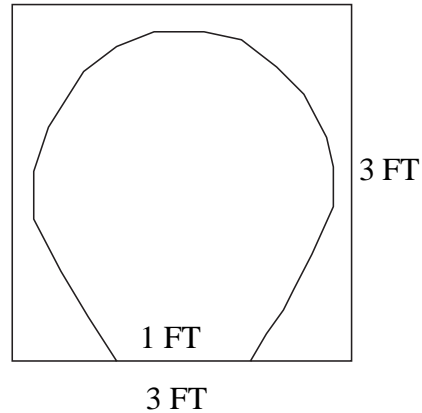


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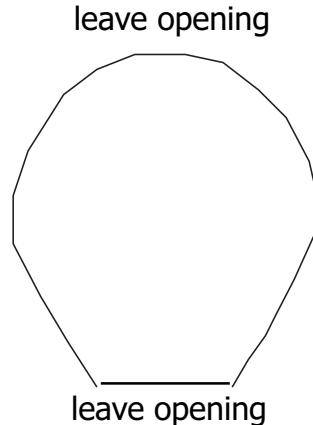
- A. To tape, take clear packing tape, and get 2 to 3 sets of extra hands.
 - B. Start from one plastic tubing/edging and tape towards the other.
(Make sure that the plastic doesn't bunch, and overlap to make a tight seal on the seam.)
-
- A. Tape from the tubing out to the end.
 - B. Repeat for the other side.
-
- A. At the posterior end of the manatee another piece of plastic tubing will be added.
 - B. Measure the opening and cut a piece of tubing to fit in it like a ring.
 - C. Bend the tubing in half so it makes a flattened oval and tape the ends together.
-
- Attach this oval ring about an inch inside of the posterior end of the plastic.
 - Set the body aside.

Step 3: Fluke Assembly

2 PIECES:



- A. Draw the fluke pattern on the piece of butcher paper. Use the one pictured as a guide, or look at some manatee pictures for a sense of the shape of the fluke.
- B. Cut out the pattern.



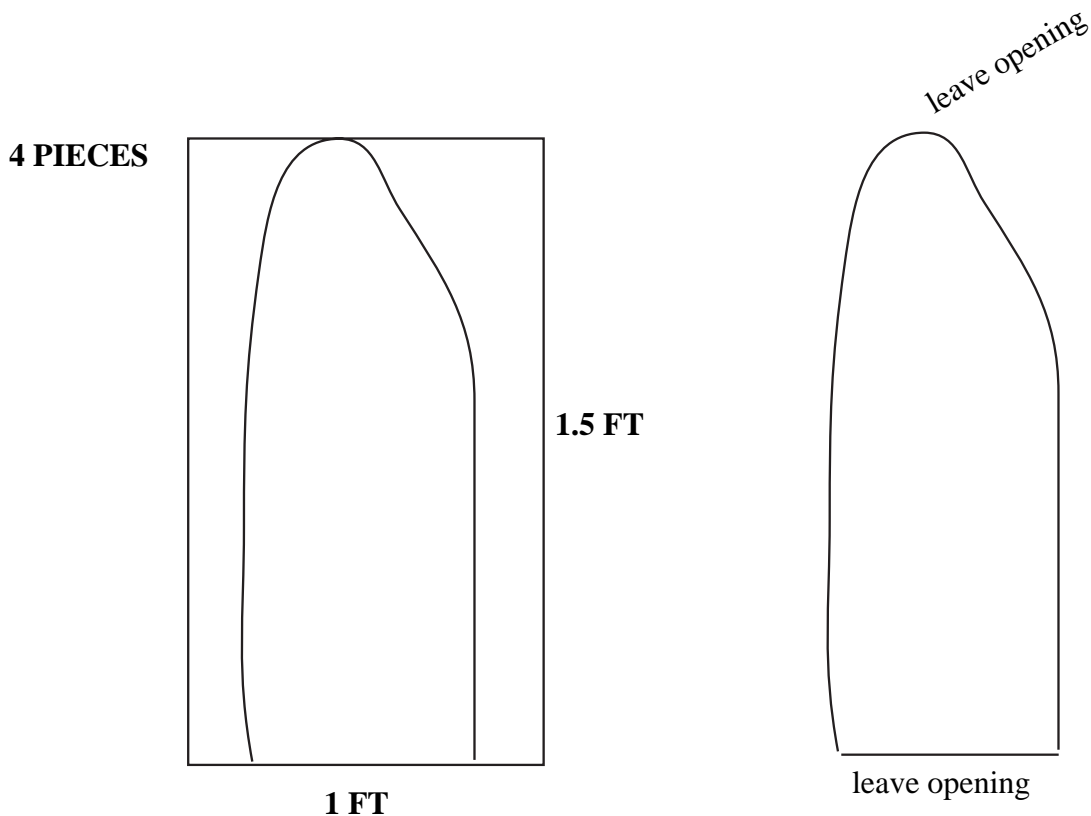
- A. Lay the fluke pattern on top of the plastic sheeting.
- B. Tape sheeting in a few spots to the floor so it doesn't move around when tracing the pattern, and tape the pattern in one or two places on the plastic sheeting.
- C. Trace the pattern and cut it out.
- D. Repeat with the other piece of plastic sheeting.

- A. Place one piece of the sheeting on top of the other.
- B. Tape along the curved edges, leaving an opening at the straight end, and an opening 6 - 8 inches wide at the opposite end.

- A. Attach the fluke onto the posterior end of the manatee.
- B. Stick the straight end of the fluke about an inch into the opening and tape the seam. (Stick your hand through the hole in the curved end to help attach the tape.)
- C. Once the fluke is attached tape up the hole at the end of the fluke.

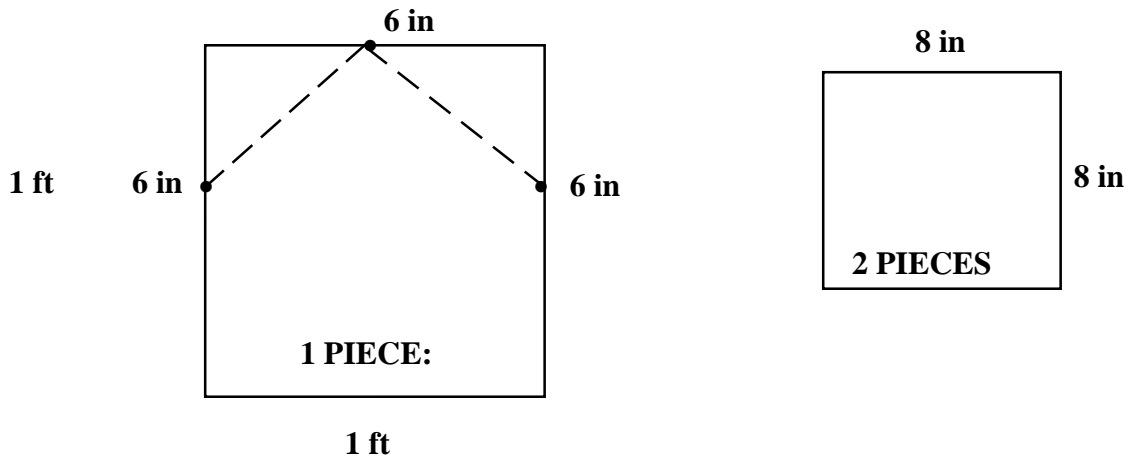
Step 4: Flipper Assembly

- A. Draw the flipper pattern on the already cut piece of butcher paper. Use the one pictured as a guide, or look at some manatee pictures for a sense of the shape of a manatee's flipper.
B. Cut out the pattern.
- A. Lay the flipper pattern on top of the plastic sheeting.
B. Tape the sheeting in a few spots to the floor so it doesn't move around when tracing the pattern, and tape the pattern in one or two places the plastic sheeting.
C. Trace the pattern and cut it out.
D. Repeat with the other 3 pieces of plastic sheeting.
- A. Place one piece of the cut-out sheeting on top of the other.
B. Tape along the curved edges, leaving an opening at the straight end, and an opening 6 - 8 inches wide at the opposite end.
- Repeat the above step for the other flipper.
- Set flippers aside.

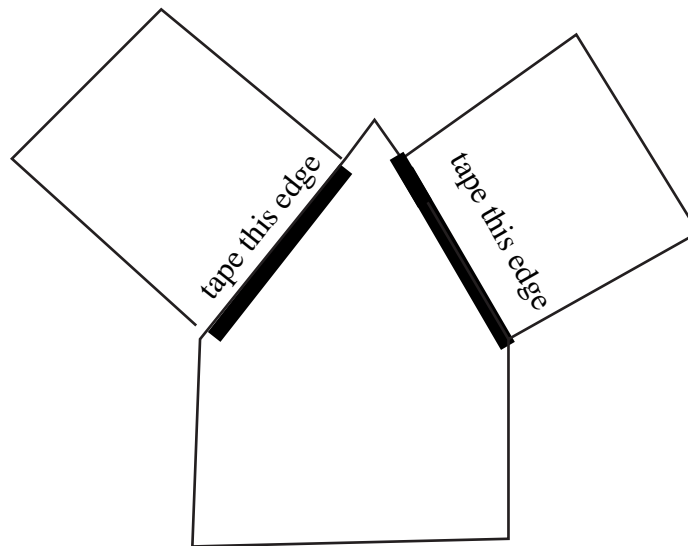


STEP 5: Head Assembly

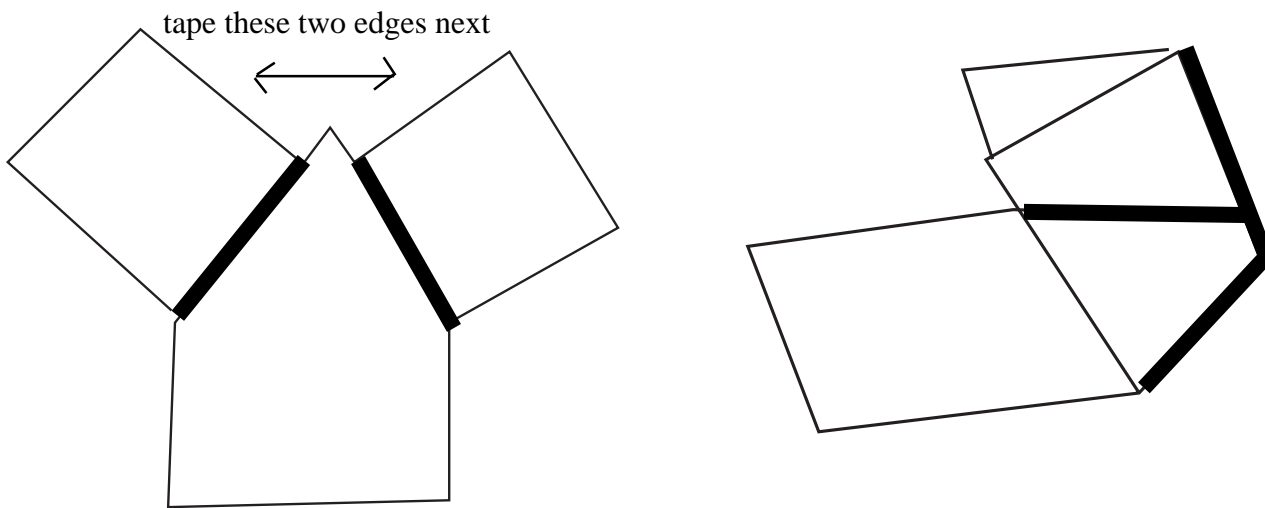
- A. On three edges of the 1 ft by 1 ft sheeting mark a dot at 6 inches.
- B. Draw two lines from the middle dot to the ones on either side of it, so that when it is cut, it will look like a house.



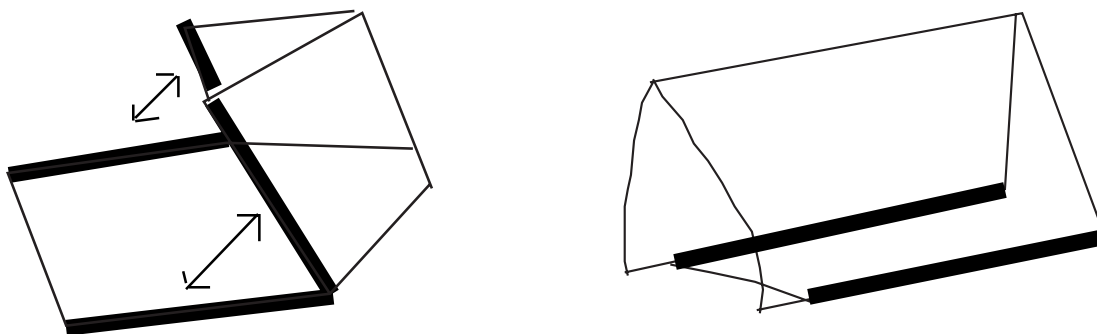
- A. Tape an 8 in square of sheeting to the diagonal edge of the 1 ft by 1 ft piece, starting from the end opposite the point.
- B. Repeat with the other 8 in square. (There will be a pointed flap in the middle that will be tucked under later.)



- A. Tape the facing edges of the 8 in squares together.
- B. Tuck the pointed flap under the new seam.
- C. From the underside, tape it in place.



- A. Tape the edge of the 8 in square facing the larger piece to it. (These pieces will not fit exactly, line them up the way you like it best.)
- B. Repeat for the other side.
- C. There should now be a round open end.



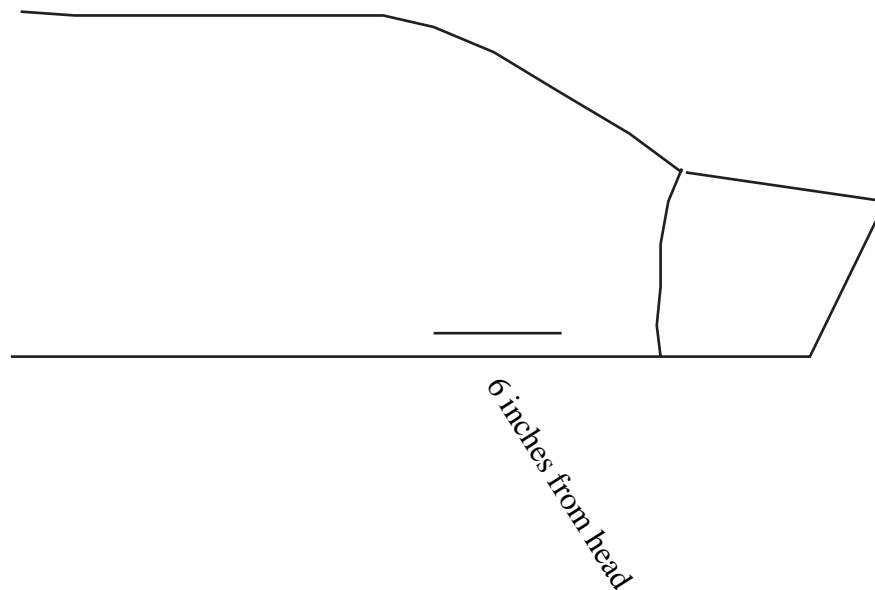
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- A. To add a ring of plastic tubing to the open end, measure out a piece of tubing/edging that fits the head opening.
- B. Tape the tubing together so it forms a ring.
- C. Tape the ring an inch in from the opening of the head so that it is secure.

- A. Stick the head onto the anterior end of the manatee.
- B. Tape it in a few spots.

- On either side of the head, cut a 10-inch slit parallel to the ground about 6 inches away from the head. (These are the slits where the flippers will be attached.) Use a straight edge or scissors to cut the slits.

- Use the holes for the flippers to securely attach the head.



STEP 6: Attaching the flippers to the body

- Check to see if the opening of the slit is wide enough to fit the flipper. If not cut it wider.

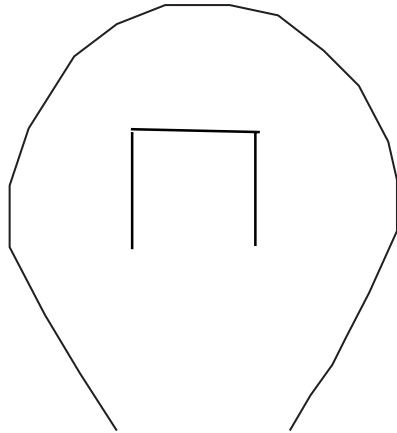
- A. Stick the flipper into the hole with about an inch of overlap.
- B. Use the hole at the other end to securely attach the flipper.

- Once the flipper is attached, tape up the hole.

- Repeat with other flipper.

STEP 7: Cutting Flap for Fan

- On the bottom side of the fluke, cut a three-sided flap.
- Tape along the edges of the flap and along the cut opening. (This will prevent the plastic sheeting from ripping after many uses.)



- Attach a fan and watch the manatee fill.
- Leave the flap open to compress the manatee for storage.

Congratulations! You have a life size manatee!!!!!!!!!!



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