Rules Continued

Permitted Materials:

- Corrugated Cardboard
- Cardboard "blocks"
- Cardboard Tubes
- Fastening material (Duct tape, Paint, and Glues.)

Materials NOT Allowed (Judges will decide.):

- Wood, Styrofoam
- Plastic sheathing
- Fiberglass
- Sona-Tubes, coated cardboard
- Silicon, Wax, Tar
- Caulking compounds
- Metals
- Staples, clamps, screws

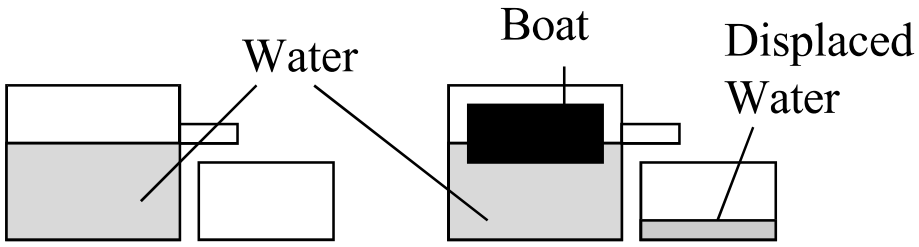
Things to Keep in Mind

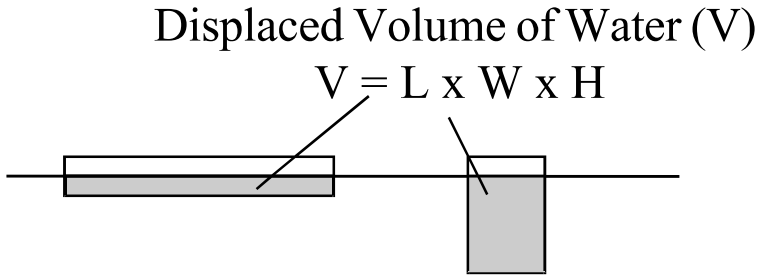
Consider its Size - building & transporting.

- Big enough to hold crew, small enough to carry.
- Wider is better, but still be able to paddle.
- no surfboard style designs are allowed.
- Rafts are allowed.
- Consider total weight of all materials when wet.
- Team must remove all materials from the Fox River.
- Best decorated boat and best dressed crew will receive prizes.

Speaking 'Physics' – Part 1

- "How much will you sink? - Displacement





Weight of Water =
62.4 pounds/cubic foot

$$\text{Water Displaced}(ft^3) = \frac{\text{Weight-of-boat-\&-people-lbs}}{62.4\ lbs/ft^3\text{-H20}}$$

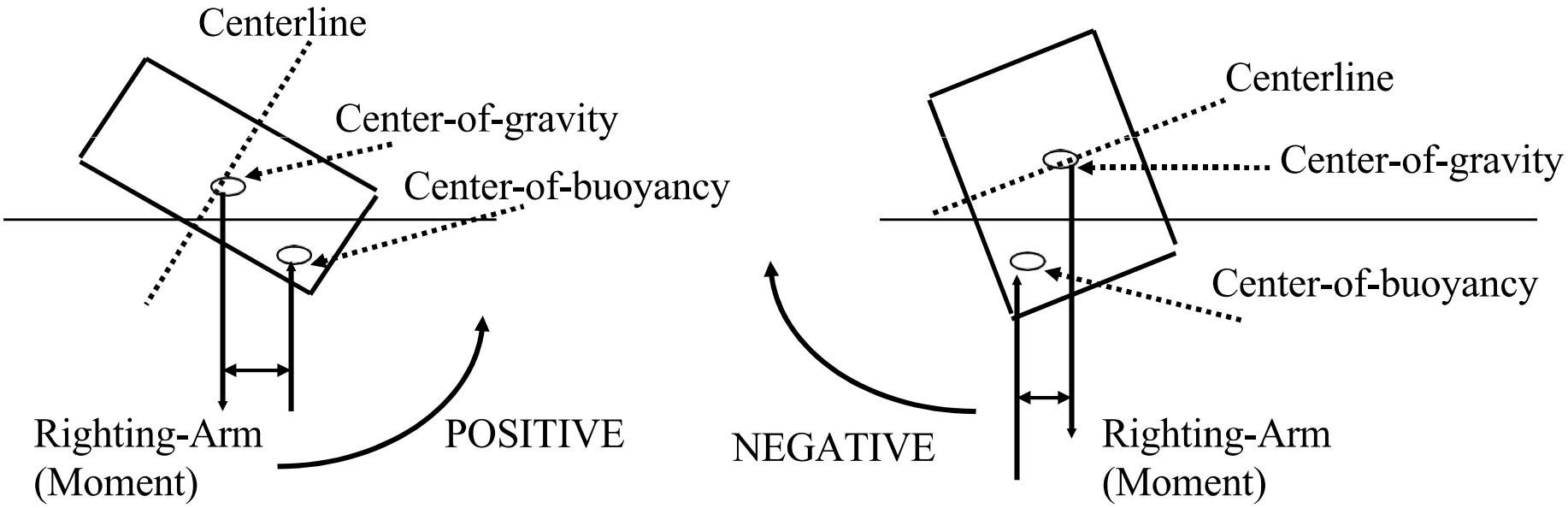
$$\text{Depth(ft) boat sinks} = \frac{\text{Water Displaced}(ft^3)}{\text{Length X Width of boat}\ (ft^2)}$$

Example:

Box boat, 3 ft X 6 ft, 1ft tall (high)
Boat volume = 3' X 6' X 1' = 18 ft^3
Boat displacement = 18 ft^3 X 62.4 lbs/ft^3 = 1123.2 lbs
Which equates to 93.6 lbs per inch of boat height

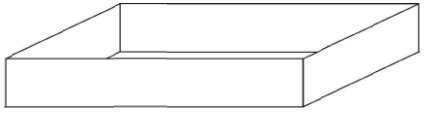
Speaking ‘Physics’ - Part 2

“Wider is Better” - Center of Buoyancy:

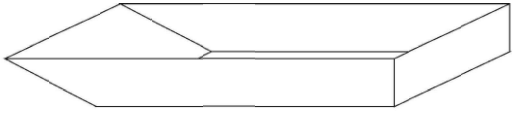


Speaking 'Physics' - Part 3

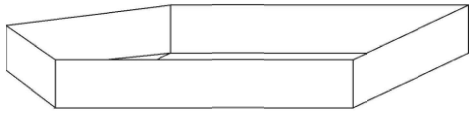
Moving Through the Water:



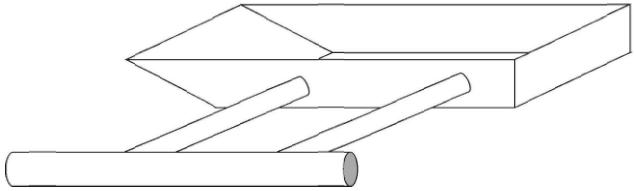
Simple Box



Slanted Box

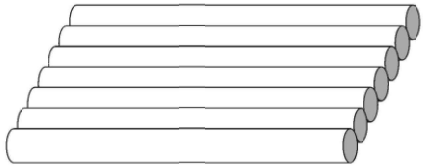


V-Shaped Bow



Outrigger Design

Pontoon Design



Raft Design

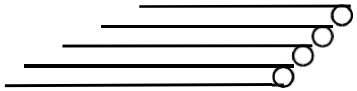
Design Suggestions!

- Set the Design Goal (Fun, Speed, Design, a little of each.)
- Sketch out your design.
  - build a scale model from manila paper:
    - estimate materials or plan how to use what you have.
    - plan out what construction techniques will be used.
- 1'x1'x3' box: will float 187 lbs.
  - if it'll hold you, it's big enough to float.
- Flat bottoms, sit-to-paddle - are the best/easiest.
- Rudders help keep you straight but make turning difficult and adds complexity to your design.
- Long boats go fast - but are harder to turn.
- Short boats (<10') - are difficult to keep straight.
- Best Length: 8-12 feet
- Best Height: 18 inches
  - allows room to sit/kneel & still paddle over the edge
- Best Width:
  - 18"-30"(max) for 1 person
  - 48" wide for 2 people side by side
- Kneeling is a "power" position but sitting is more comfortable.

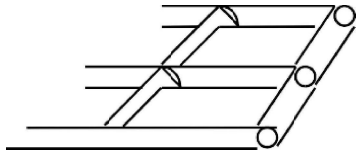
Construction Tips & Techniques – Part 1

- Cover edges of cardboard - acts like siphon
- Cardboard Tubes make great frames.
  - Cutting for joining & bending
  - Fastening tubes together
- Cardboard Hull
  - 1-2 layers, fasten & cover the seams.
  - With 2 layers, overlap the seams.
  - Decorate, paint & varnish.
- Reinforce the area where you sit, kneel or stand.
- Carpenter's glue works well, liquid nails
  - hot-melt glues melts in the sun
- Duct tape only non-painted surfaces (tubes or frame that will be covered)
  - Duct tape shrinks when painted.
  - Duct tape can be covered with masking tape if you need to paint it.
  - No Clear tape - it melts when painted.
  - Masking tape for glued edges & seams
  - Kraft paper with spray adhesive also

Construction Tips & Techniques – Part 2



Solid Tube
Frame

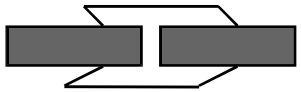


Center/Cross
Beam
Frame

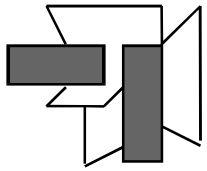
FRAMES

CONNECTING TUBES

Cardboard
Wrapper for Tubes
End-to-End

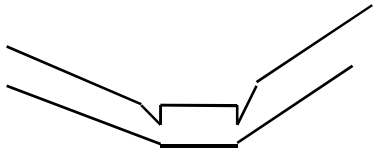


Cardboard
Wrapper for Tubes
At Right-Angles

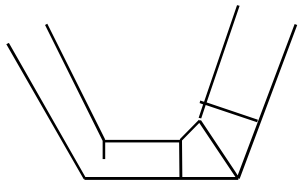


Construction Tips & Techniques – Part 3

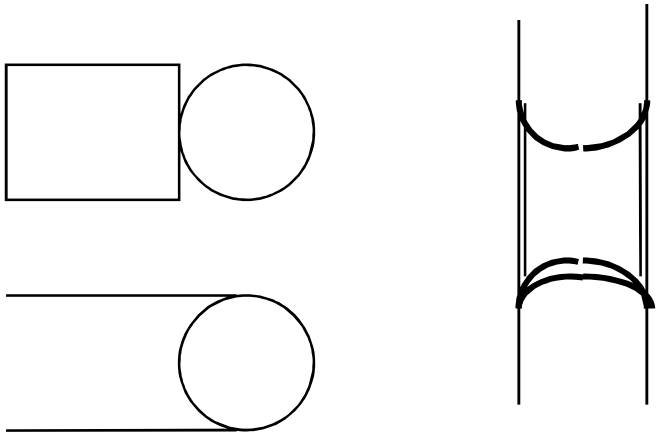
FRAME ANGLES



V-Shaped Cuts

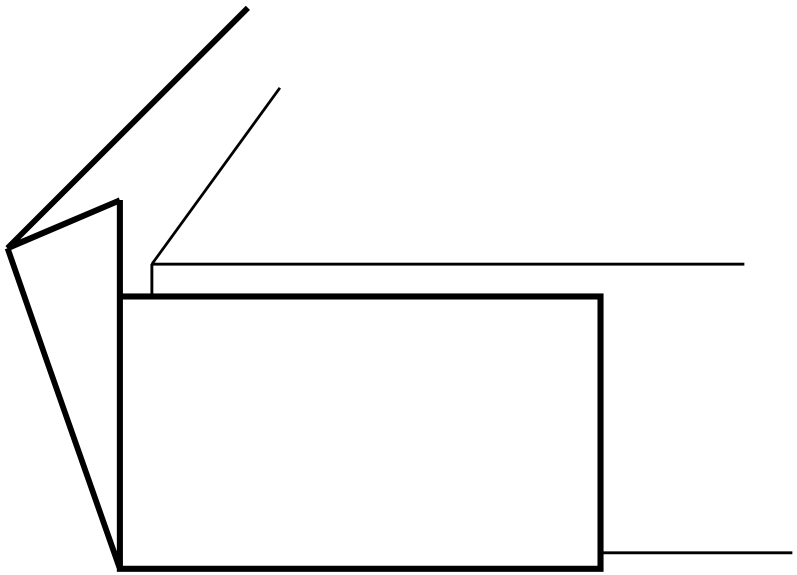


Multiple Cuts
for Sharper Angles



TUBE CUTTING TEMPLATE

Construction Tips & Techniques – Part 4

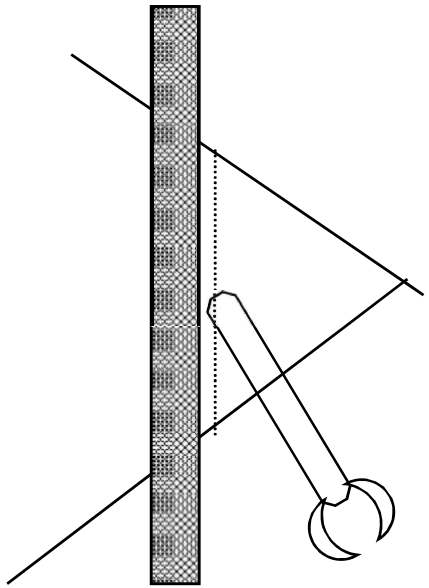


FOLD & OVERLAP
CARDBOARD
AROUND CORNERS

Construction Tips & Techniques – Part 5

Crease/Score a line for a nice

STRAIGHT FOLD



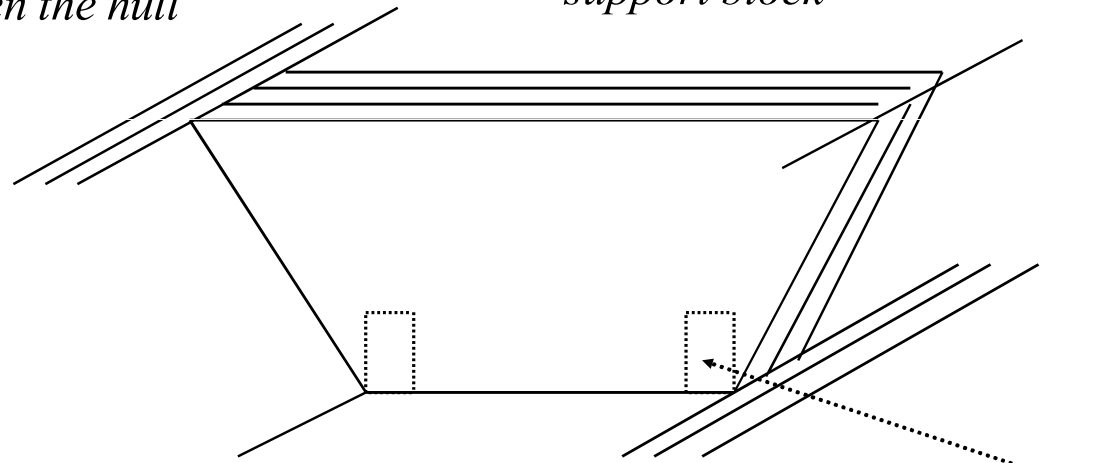
Construction Tips & Techniques – Part 6

Multiple cardboard layers
"glued" together on the sides

strengthen the hull

Multiple trapezoid-shaped pieces
"glued" together to form a

"*support block*"



A sheet of cardboard
could be folded &
"glued" together to
form *tubes/beams*