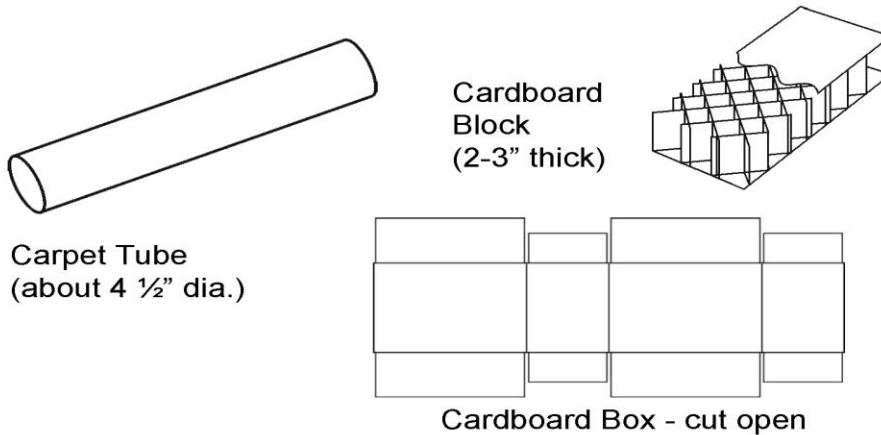


# Cardboard Boat Design

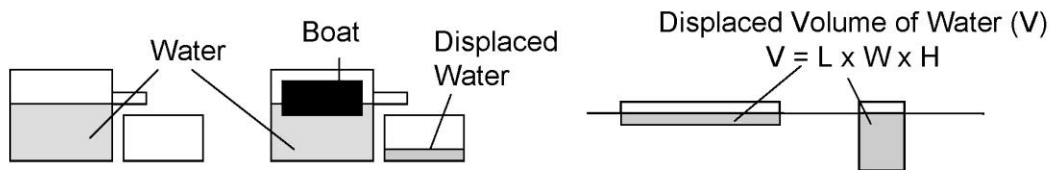
- Consider its size - building & transporting to the water
  - Big enough to hold crew, small enough to carry
  - Wider is better, but still be able to paddle
- No surfboard style designs are allowed
- Rafts are allowed
  - Consider total weight of all materials when wet
  - EVERYTHING must be removed from the water

## Construction Materials (examples)



## Cardboard Boat 'Physics'

- "How much will you sink?" - Displacement



Weight of Water =  
62.4 pounds/cubic-foot

$$\text{Water Displaced(ft}^3\text{)} = \frac{\text{Weight-of-boat-}\&\text{-people-lbs}}{62.4 \text{ lbs/ft}^3\text{-H}_2\text{O}}$$

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

### Example:

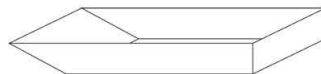
Box boat, 3 ft X 6 ft, 1ft tall (high)  
 Boat volume = 3' X 6' X 1' = 18 ft<sup>3</sup>  
 Boat displacement = 18 ft<sup>3</sup> X 62.4 lbs/ft<sup>3</sup> = 1123.2 lbs  
 Which equates to 93.6 lbs per inch of boat height

# Cardboard Boat Design Suggestions

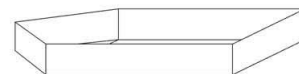
- Set the Design Goal: Fun, Speed and Appearance
- Sketch out your design
- estimate materials or plan how to use what you have
- plan out what construction techniques will be used
- 1'x1'x3' box: will float 187 lbs.
  - if it'll hold you, it's big enough to float
- Flat bottom, sit-to-paddle & canoe styles - 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 (<8') - 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
- Cover all edges of cardboard - acts like siphon
- Cardboard Tubes make great frames
  - Cut for joining & bending
  - Fasten tubes together
- Cardboard Hull
  - 1-2 layers, fasten & cover the seams
- Reinforce the area where you sit, kneel or stand



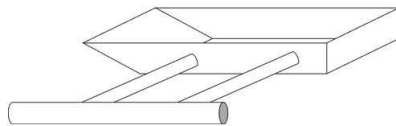
Simple  
Box



Slanted  
Box



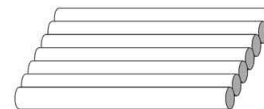
V-Shaped  
Bow



Outrigger  
Design



Pontoon  
Design



Raft  
Design