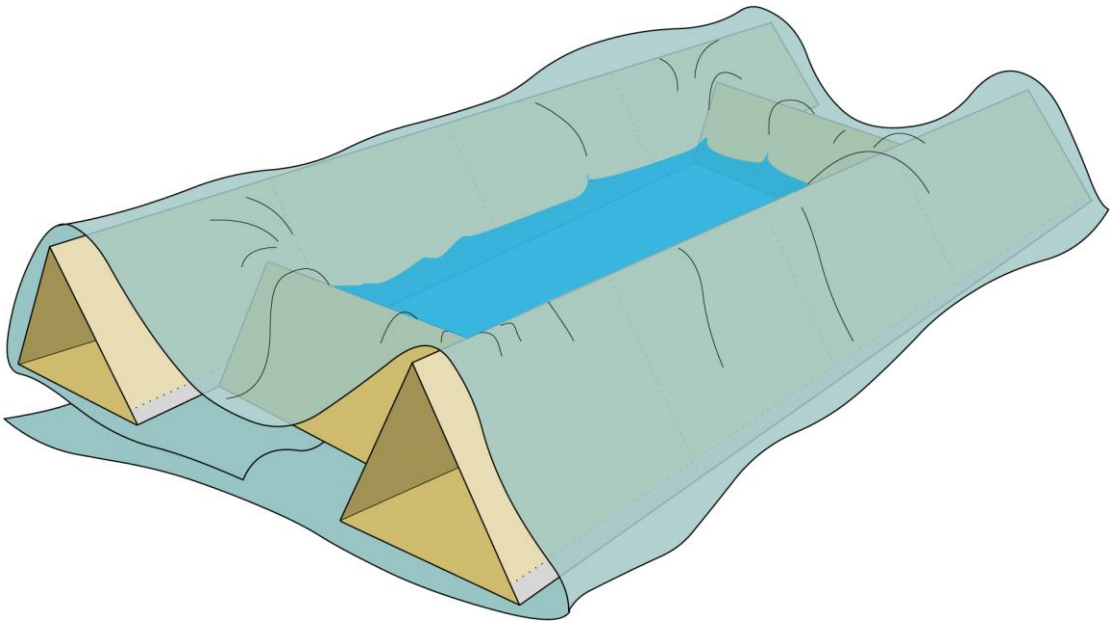
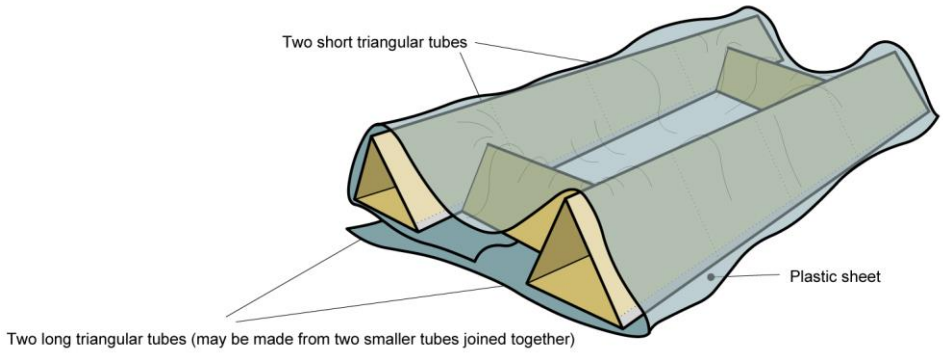
Constructing a water rig to race your solar powered model boat

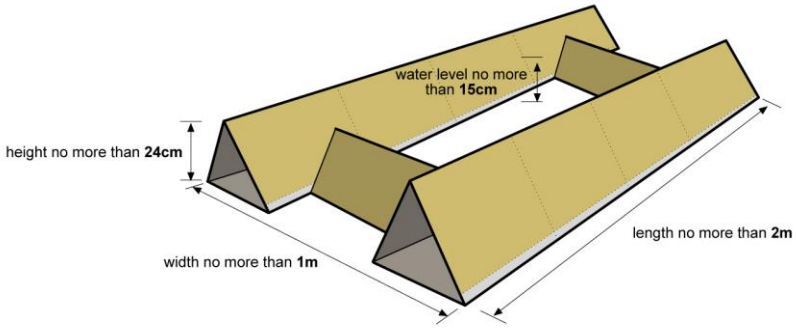


Constructing a water rig to race your solar powered model boat

To test your solar model boat you may need to construct a water rig. The number of boats you can use at one time in the rig will depend on the size of the boats and the rig.

This is what the rig looks like:





What you need to make the rig

Materials	**Equipment**
A minimum of six recycled thick corrugated cardboard cases e.g. packing case from printer or computer. They should be approximately 1m when opened out.	Stanley knife
Masking tape at least 5cm wide	Pencils and felt-tip pens
Plastic sheet e.g. green/blue damp-proof membrane	Metre rule

There are four steps to making the rig:

1. Choosing the cardboard cases
2. Making the two long triangular tubes
3. Making the two short triangular tubes
4. Lining the rig

Assembly instructions

1. Choosing cardboard cases

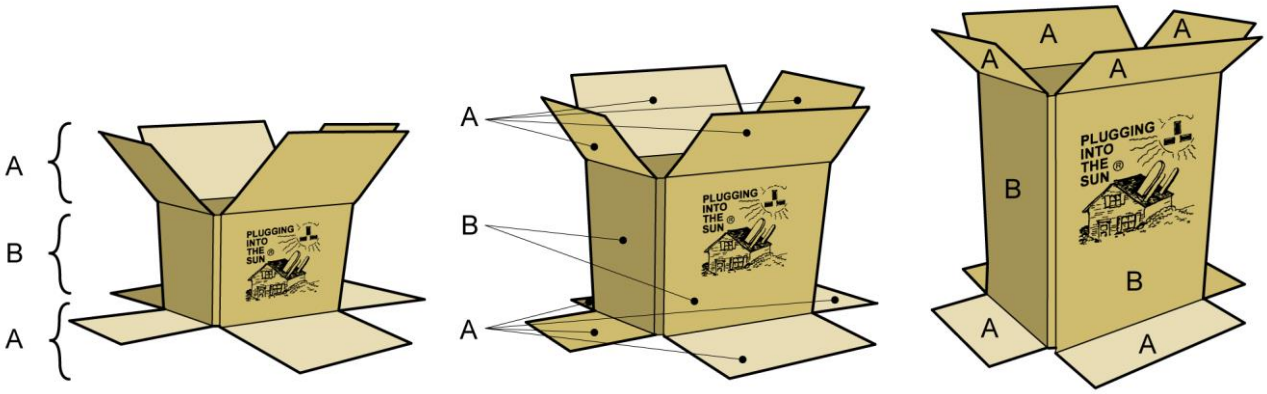
The exact size (length & width & depth) of the rig will be based on the size of cardboard cases you collect.

The depth of the water level in the rig needs to be no more than 10-15cm. This means the height of the sides of each of the triangle tubes should be a minimum of 24cm.

The final length of the rig needs to be no more than 2 metres and 1 metre in width. It may be necessary to connect lengths of triangular tube made from more than one case to create the length.

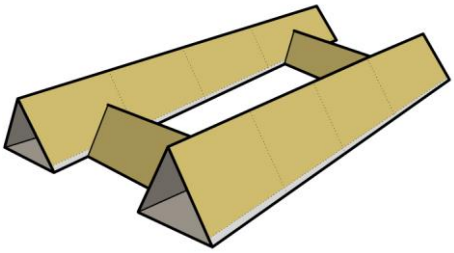
Your case will probably look like one of these three options below:

Option1	Option 2	Options 3
Sections A, B and C are the same height. This should be a minimum of 24cm.	**Section B is twice the height of A and C**	**Sections A and C are much smaller than B**

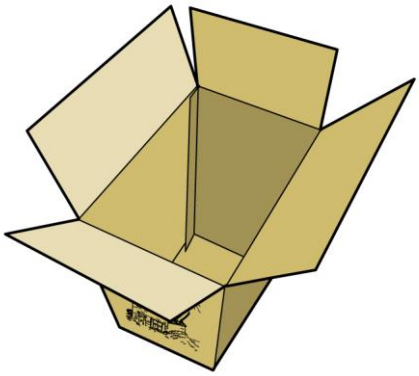
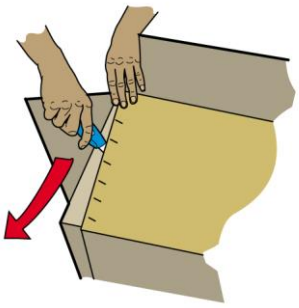
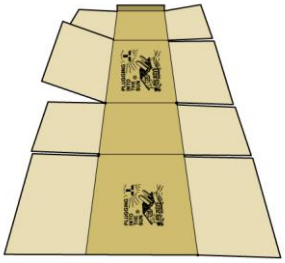
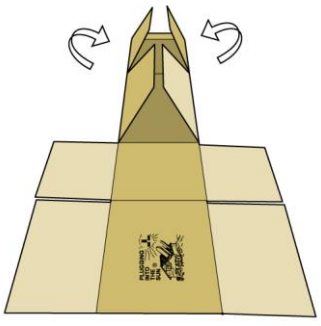


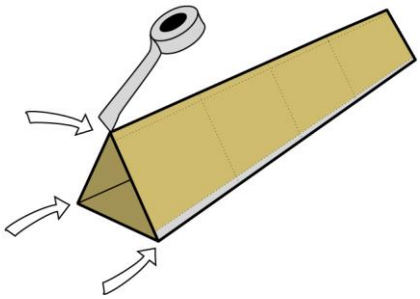
Choose the case that is most like yours, Option 1, Option 2 or Option 3, then follow the appropriate instructions given below.

2. Making the long tubes

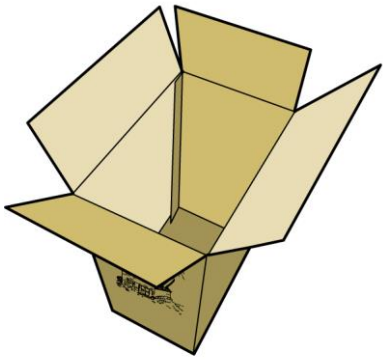
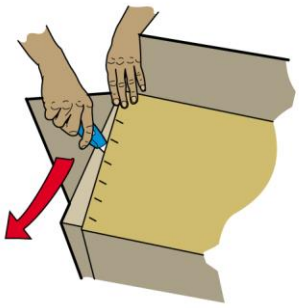
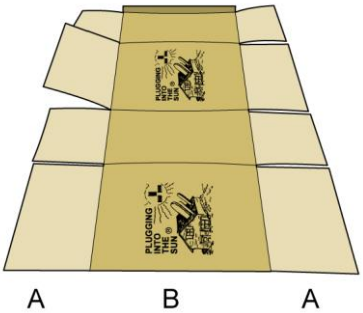


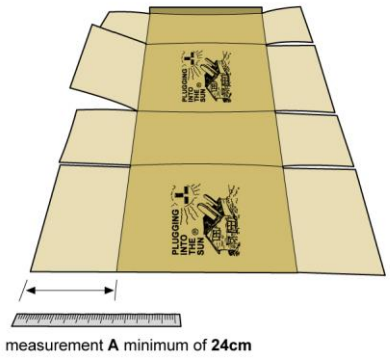
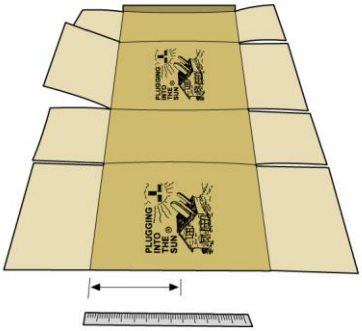
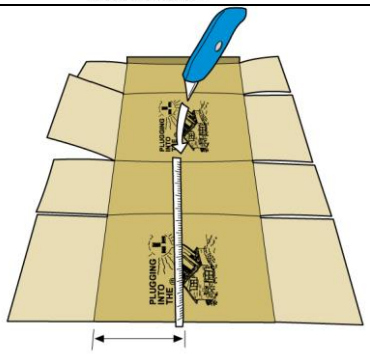
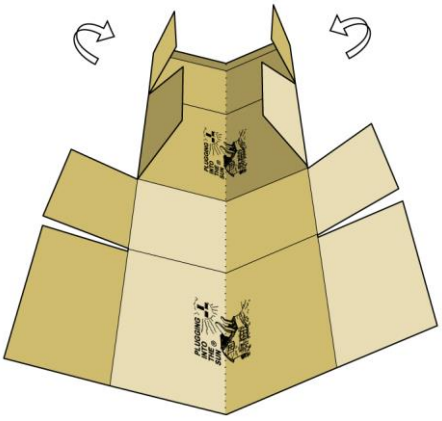
Option 1 – Sections A, B and C are the same height

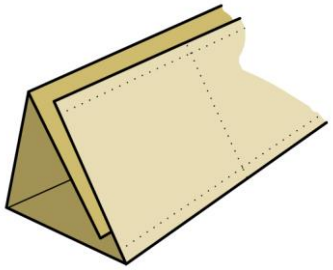
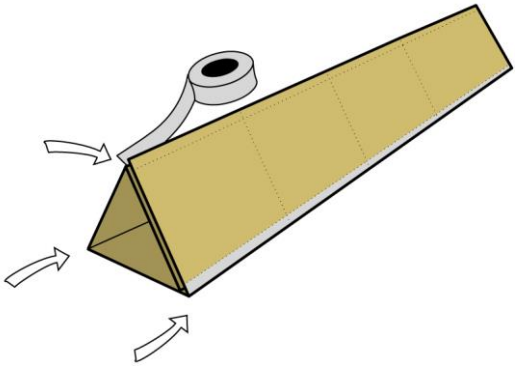
1.1	Start by opening the case. One edge of the case has a join where two sides of the case overlap. This edge may have staple(s) that join two overlapping sides of the case. First remove the staples. Separate the join by hand or use a Stanley knife to cut down this edge.	
Warning icon	Ensure that you remove any staples carefully before using the Stanley knife. Be careful when using the Stanley knife. Always cut away from yourself.	
1.2	Lay the opened out case flat on the floor.	
1.3	Fold the flaps A and C into a triangular tube. You may need two people to do the folding.	

1.4	Tape the tube along the join. Apply tape around all three sides of the tube especially where sections of the case will need to join.	
1.5	Repeat steps 1.1 to 1.4 to make another long tube.	

Option 2 – Section B is twice the height of A and C

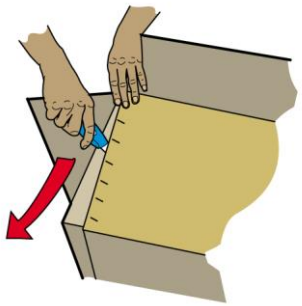
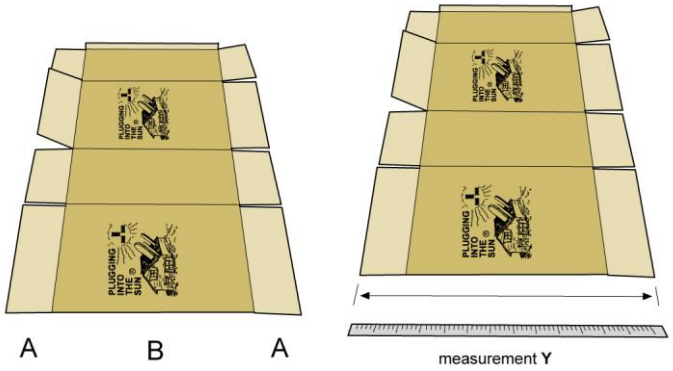
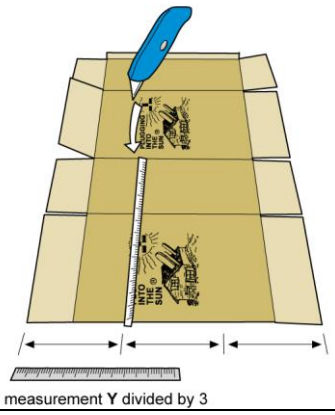
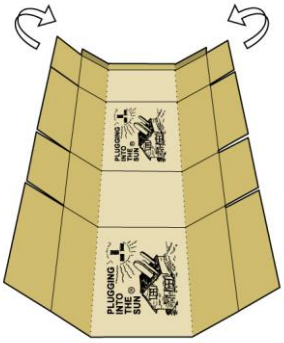
2.1	Start by opening the case. One edge of the case has a join where two sides of the case overlap. This edge may have staple(s) that join two overlapping sides of the case. First remove the staples. Separate the join by hand or use a Stanley knife to cut down this edge.	
Warning icon	Ensure that you remove any staples carefully before using the Stanley knife. Be careful when using the Stanley knife. Always cut away from yourself.	
2.2	Lay the opened out case flat on the floor.	

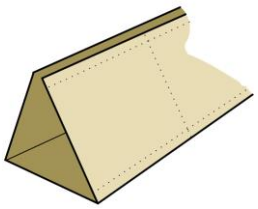
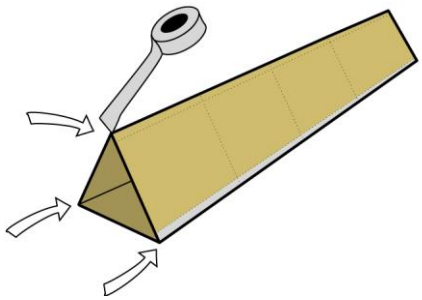
2.3	Measure height of flaps A and C from fold to edge and make a note of this measurement. [It needs to be a minimum of 24cm. If not, use this case but follow Option 3 instructions.]	 measurement **A** minimum of **24cm**
2.4	Use the metre rule to measure this distance from the join between section A and B. Repeat this at least once on each panel of the case. Use the metre rule to join these points up.	 measurement **A**
2.5	Score this line using the Stanley knife and the metre rule.	 measurement **A**
2.6	Fold along the scored edge to create the triangular tube. Notice that one side of the triangle will be made up of the overlap of two flaps A and C. You may need two people to do the folding.	

		
2.7	Tape the tube along the join. Apply tape around all three sides of the tube especially where sections of the case will need to join.	
2.8	Repeat steps 2.1 to 2.7 to make another long tube.	

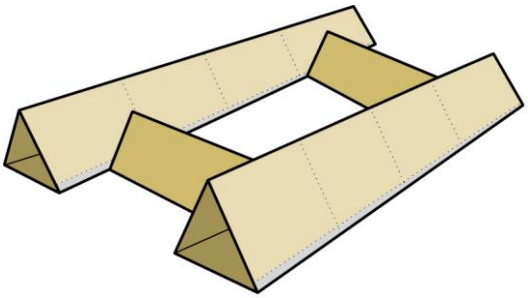
Options 3 - Sections A and C are much smaller than B

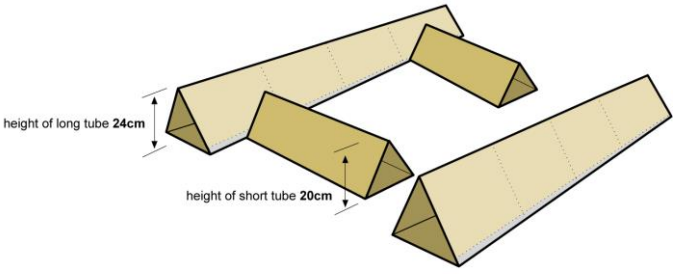
3.1	Start by opening the case. One edge of the case has a join where two sides of the case overlap. This edge may have staple(s) that join two overlapping sides of the case. First remove the staples. Separate the join by hand or use a Stanley knife to cut down this edge.	

Warning icon	Ensure that you remove any staples carefully before using the Stanley knife. Be careful when using the Stanley knife. Always cut away from yourself.	
3.2	Lay the opened out case flat on the floor. Measure the entire the length of sections A, B and C.	
3.3	Divide this measurement by 3. Note this new value should be a minimum of 24cm.	
3.4	Use the metre rule to measure this distance from the edge of flap A to section B and again from section B to the edge of flap C. Repeat this at least once on each panel of the case. Use the metre rule to join these points up.	
3.5	Score this line using the Stanley knife.	
3.6	Fold along the scored edges to create the triangular tube. You may need two people to do the folding.	

3.7	Tape the tube along the join. Apply tape around all three sides of the tube especially where sections of the case will need to join.	 
3.8	Repeat steps 3.1 to 3.7 for the remaining cases. Remember the length of the rig should be no more than 2m.	

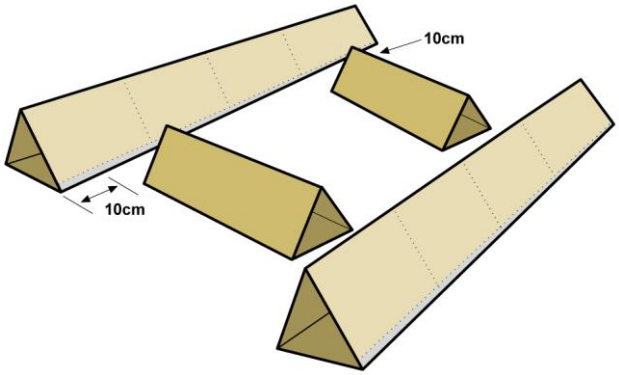
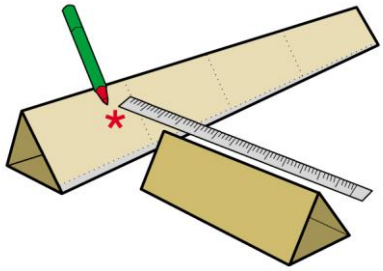
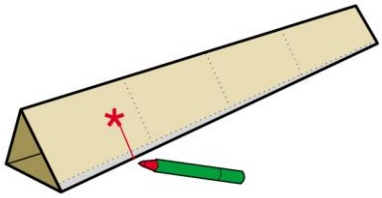
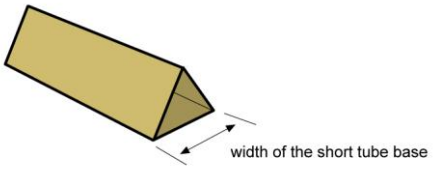
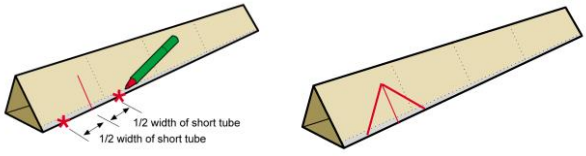
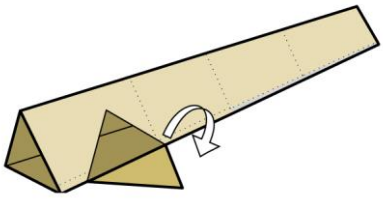
5. Making the short tubes

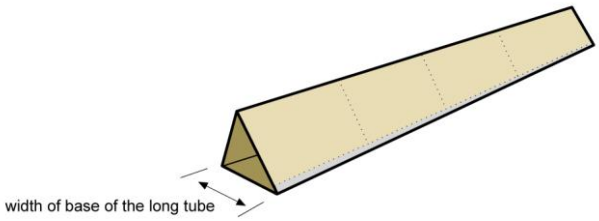
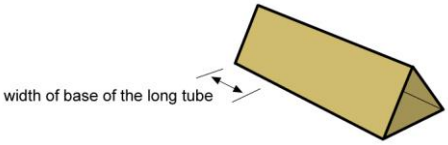
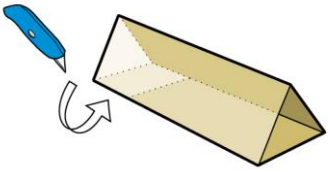
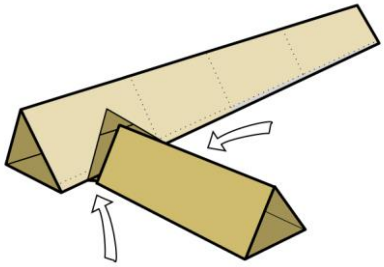


5.1	Open a case out using instructions 1.1. This should be a minimum of 1m when opened out. Lay it out open on the floor	
5.2	Follow instructions as in option 1, 2 or 3 depending on what type of case you have. Remember the short tubes should be 4cm in height shorter than the long tubes.	
5.3	Repeat steps 5.1 to 5.2 to make the second tube.	

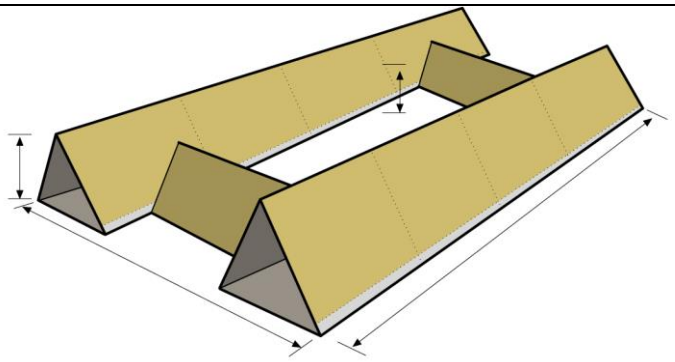
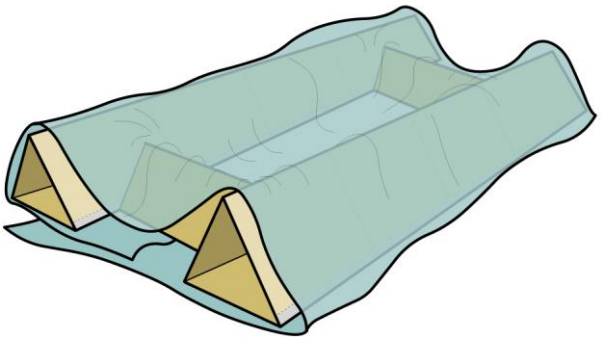
Once you have two short tubes (1m in length) and two long tubes (2m in length) you are ready to start assembling the rig.

6.0 Assembling the rig

6.1	Lay out the four tubes as follows: Place the two long tubes flat on the ground. Place the short tubes in between the two long ones 10cm away from the edge.	
6.2	Place the short tube 10cm from edge of the long one.	
6.3	Place the metre rule on the apex of the short tube and move it forward until it touches the long tube. Mark the spot where it touches the long tube with a pen.	
6.4	Draw a vertical line down from that spot.	
6.5	Measure the width of the base of the short tube and divide this measurement by 2. Now take this halved measurement and measure this distance either side of the vertical line making a mark each time on the long tube each time.	
6.6	Join up the three marks to make a triangle.	
6.7	Cut out the triangle using the Stanley knife, to form the socket.	
6.8	Repeat steps in 3.2 for the other three sockets.	

6.9	Measure the width of the base of the long tube.	
6.10	Take that measurement and measure it along the length of the **short** tube starting from the end. Do the same at the opposite side and mark out a square.	
6.11	Cut the square out.	
6.12	Slot the short tubes into the sockets.	

7. Lining the rig

7.1	You now need to line the rig with a sheet of plastic to provide area body of water for the boats to race. Use the following formula to work out how much plastic liner to cut: (Liner size = (4A +B+C) Take the plastic sheet and lay it out on the floor. Place the rig on it and fold the plastic sheet loosely around it. Tuck any excess sheet underneath the rig ensuring it is flat.	 

8. Adding and disposing of the water

8.1	Ideally, use rainwater that has been collecting in the water butt. Once you have run the races dispose of the water thoughtfully, for example, siphon it off to use in the garden or for indoor plants.