Physics: Refraction Project

Individual Project – No pairing or Grouping

This project is based on the video https://www.youtube.com/watch?v=NKo__zjMqOQ

500 ml water bottles are the regular medium sized water bottles in our daily use.

You have been given a rectangular container, which you could use to do the experiments.

You are required to find the refractive index of 1, 2, 3 or 4, three of 5 to 7, and any one from 8 and 9

1. Water (bottled water or distilled water) – control experiment - Mandatory
2. Tap water
3. Apple Juice
4. 100% Crane berry Juice (with no sugar)
5. 3% salt solution
6. 6% salt
7. 12% salt solution
8. Canola oil
9. Almond oil

Learn How to prepare the Salt solutions:

Note: ONE teaspoon (tsp) of salt weighs 6 gram

Dissolve 5 tsp of salt in 500 ml bottle of water (make sure to shake well) to get 12% solution.

Take exactly half of it for the first experiment and add water to the same 500 ml bottle and shake well to get 6% solution.

Take half of it for the second experiment and add water to the same 500 ml bottle and shake well to get 3% solution.

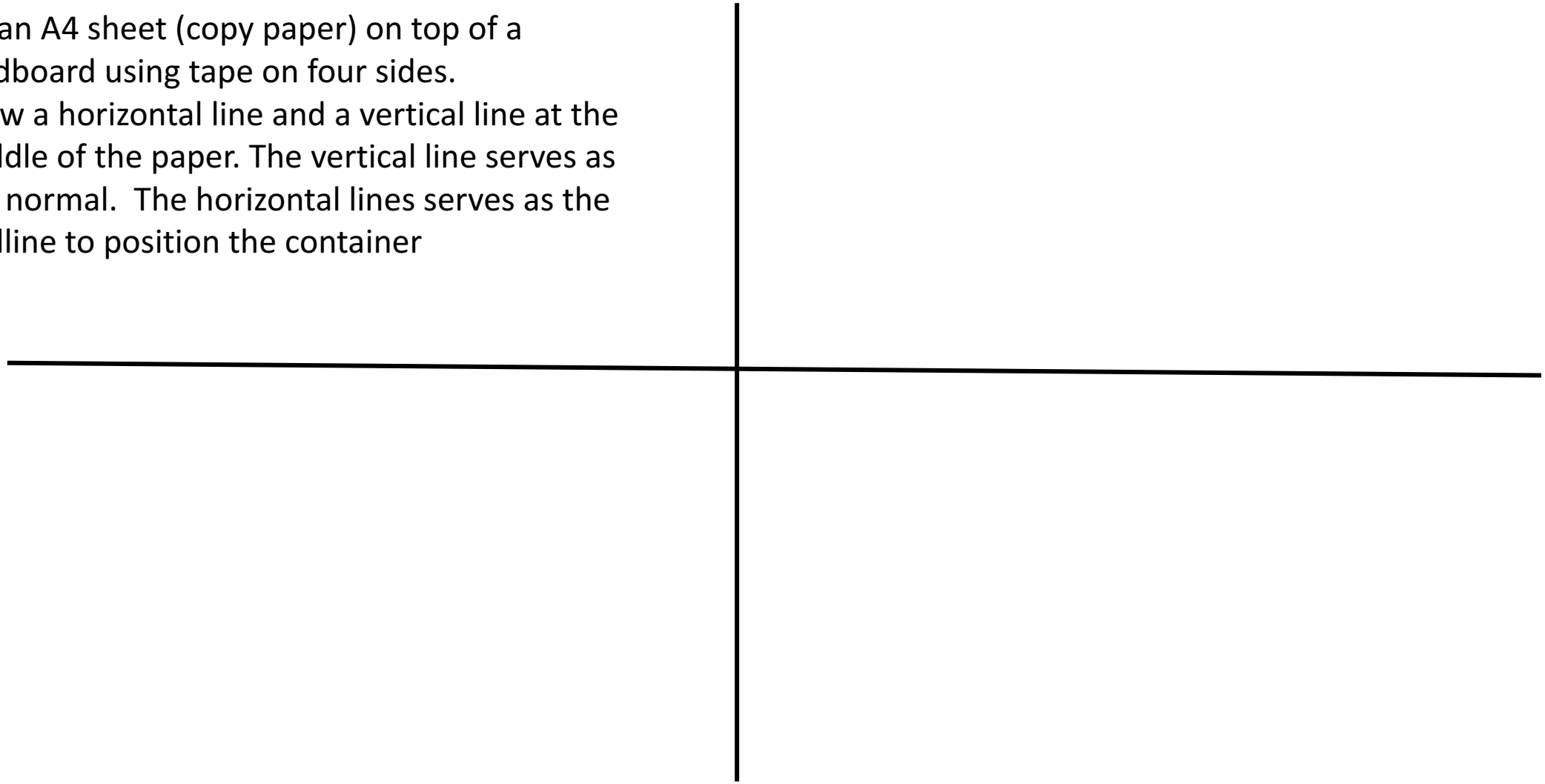
Each experiment needs to be repeated three time and each experiment needs to have a separate chart and calculation of refractive index.

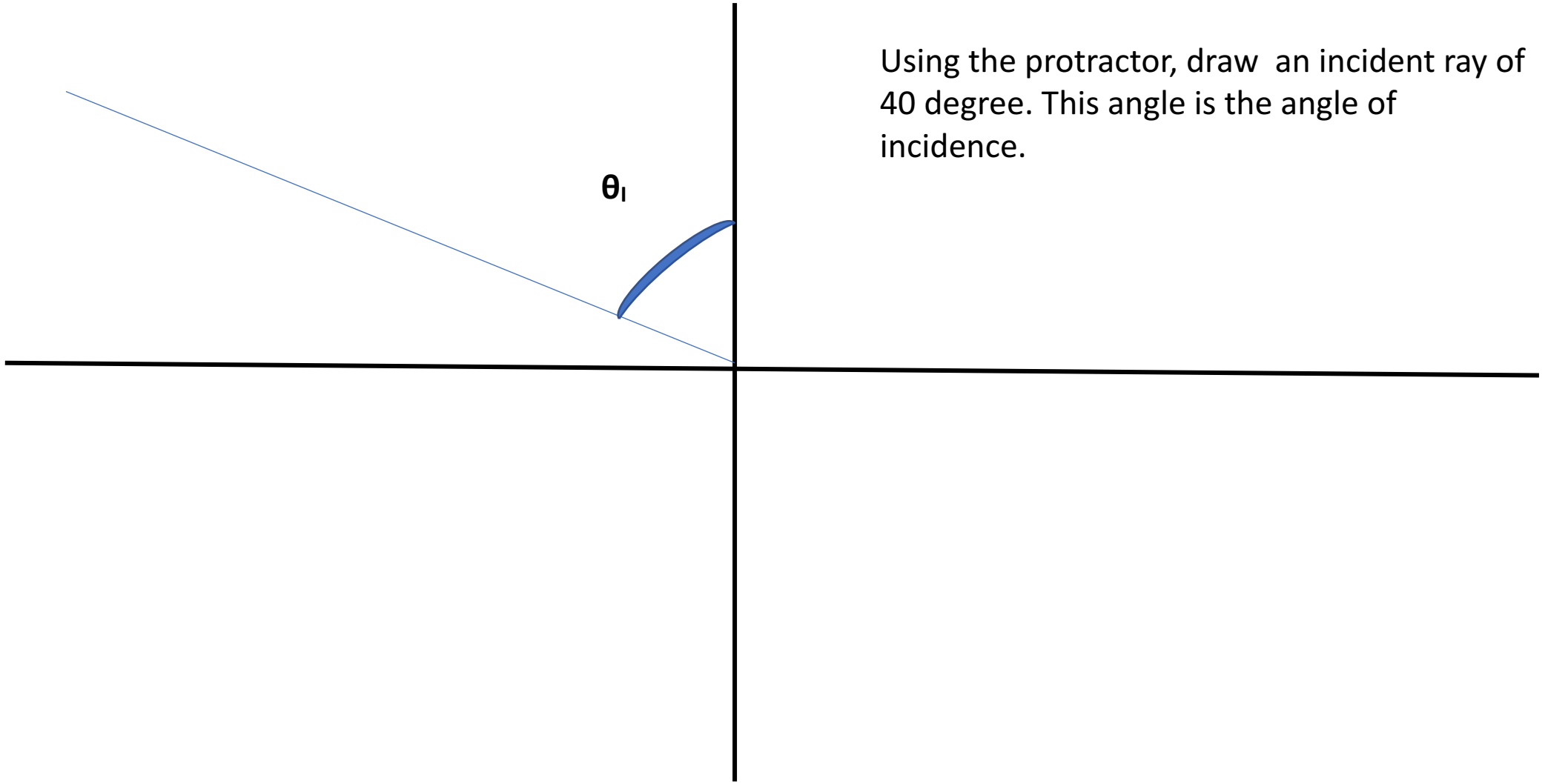
Your entire experimentation and chart making needs to be videotaped. The video needs to be uploaded to youtube or google drive and the link needs to be emailed to me. Charts need to be additionally physically turned in.

Due Date: on or before March 15. This is a Course Work Project. Those who turn in before the deadline get the incentive of earning 20% of their final exam credit. Those who turn in late will take a separate final exam.

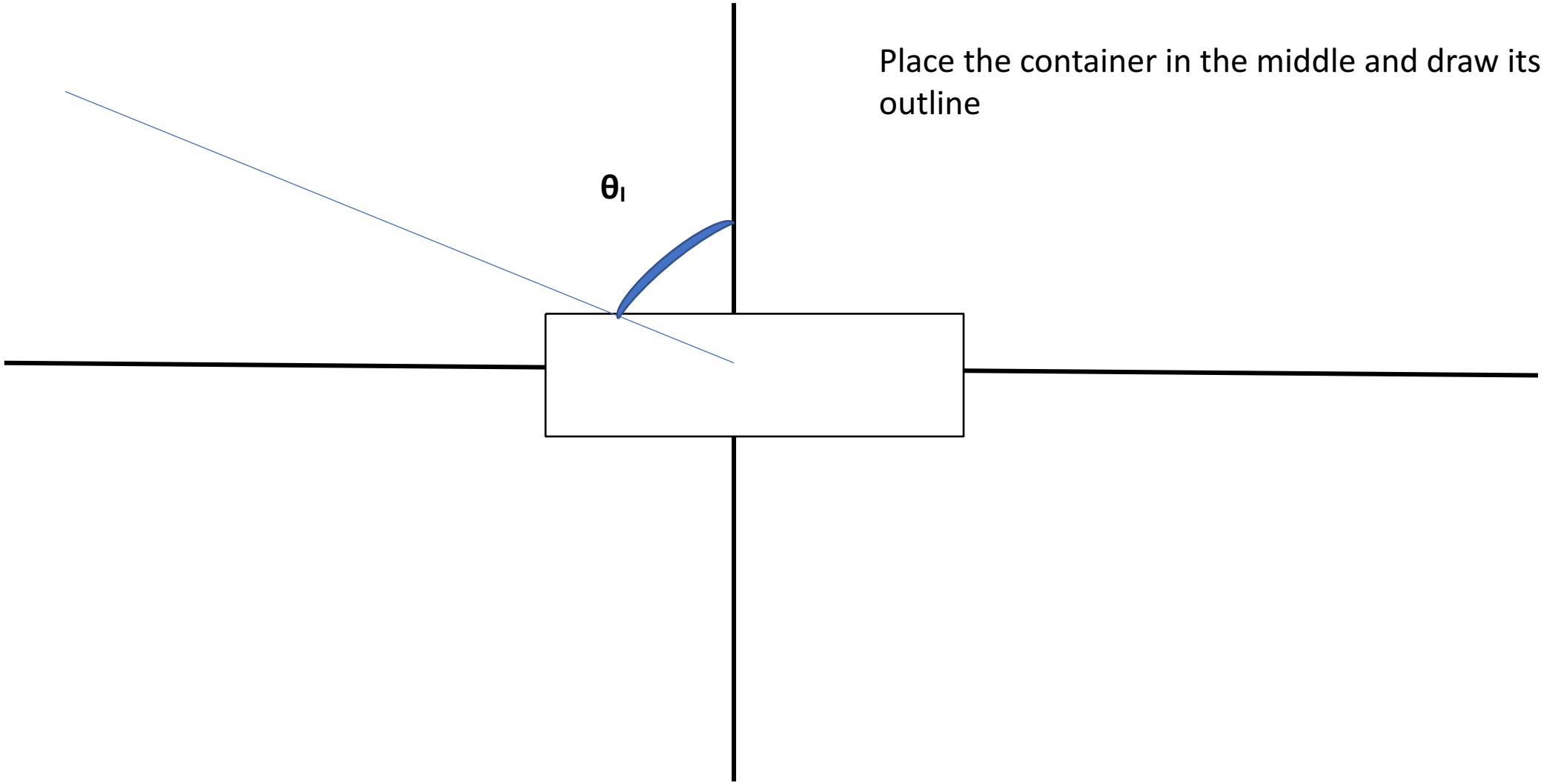
Consult the following slide as needed in the experimentation Part. Chart template is provided on the last but one slide.

Fix an A4 sheet (copy paper) on top of a cardboard using tape on four sides.
Draw a horizontal line and a vertical line at the middle of the paper. The vertical line serves as the normal. The horizontal lines serves as the midline to position the container



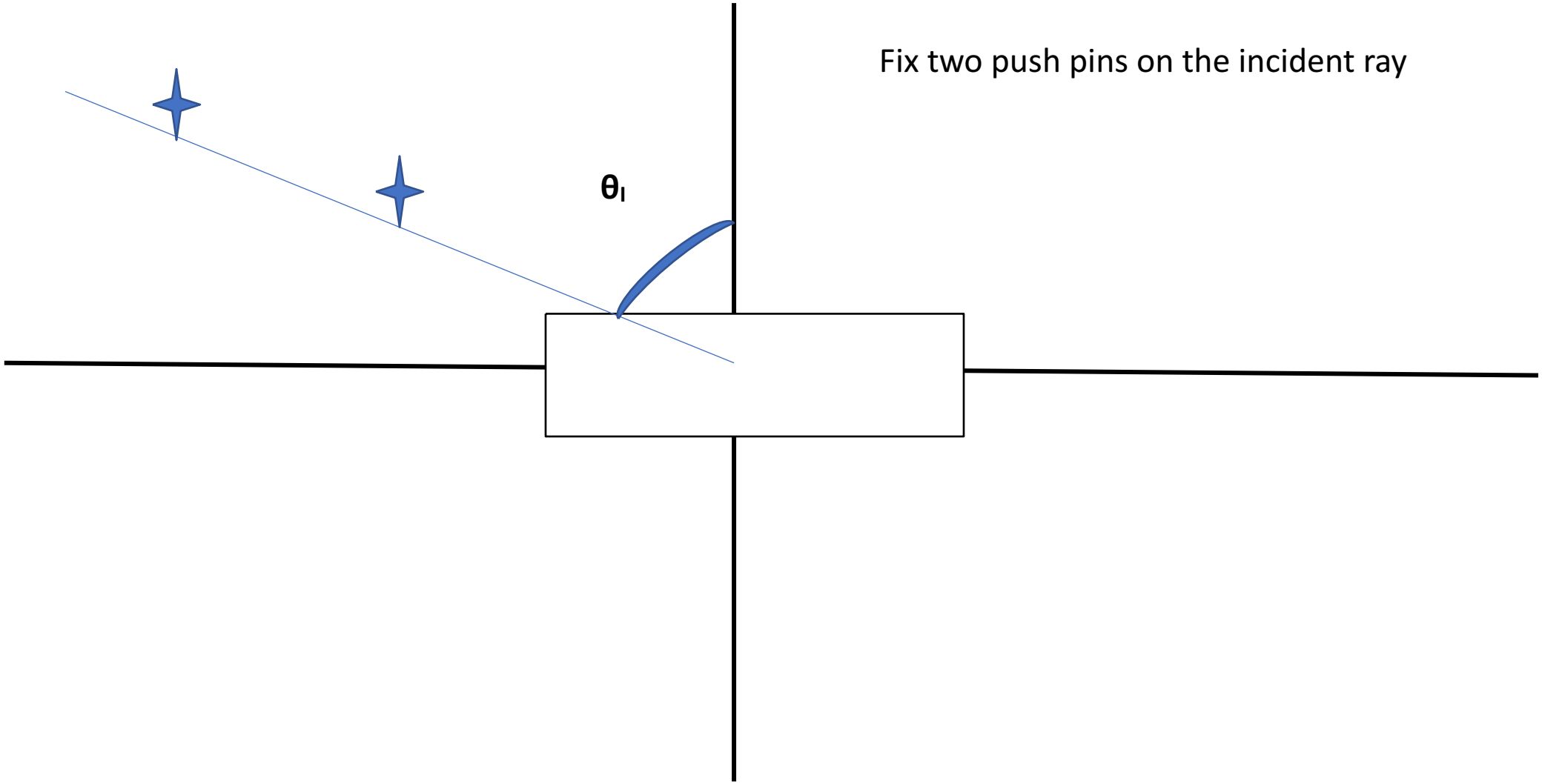


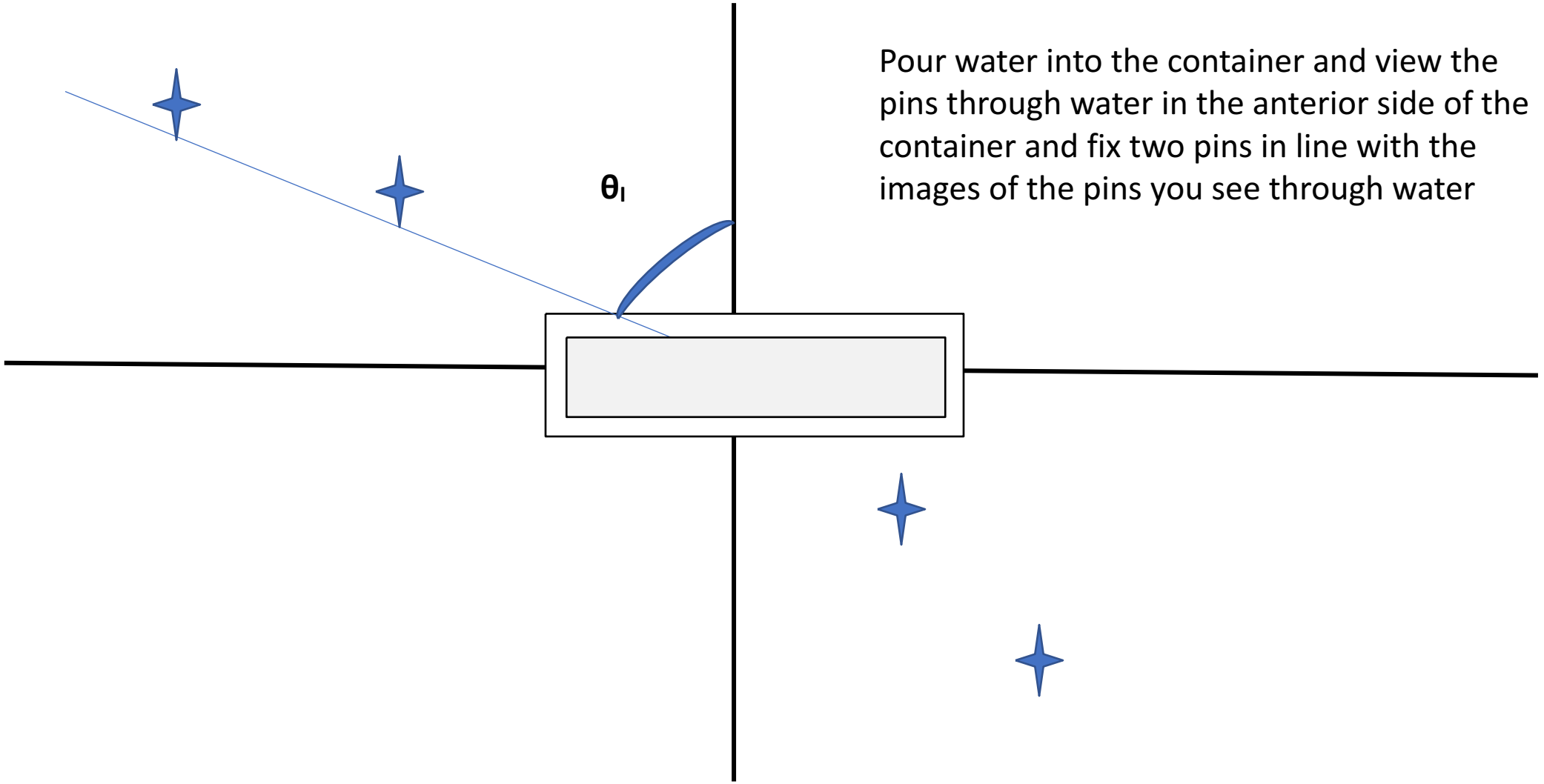
Using the protractor, draw an incident ray of 40 degree. This angle is the angle of incidence.



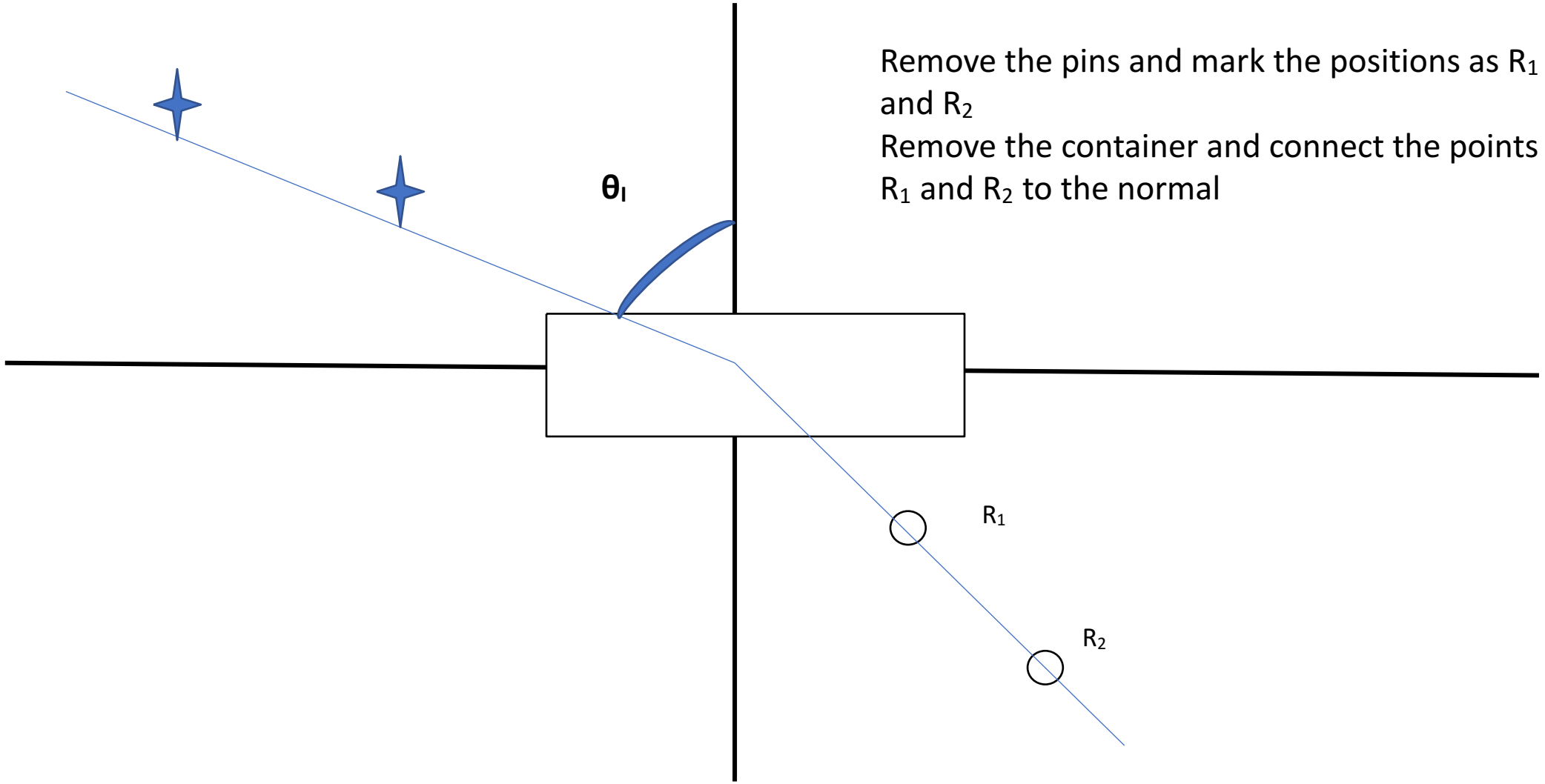
Place the container in the middle and draw its outline

Fix two push pins on the incident ray





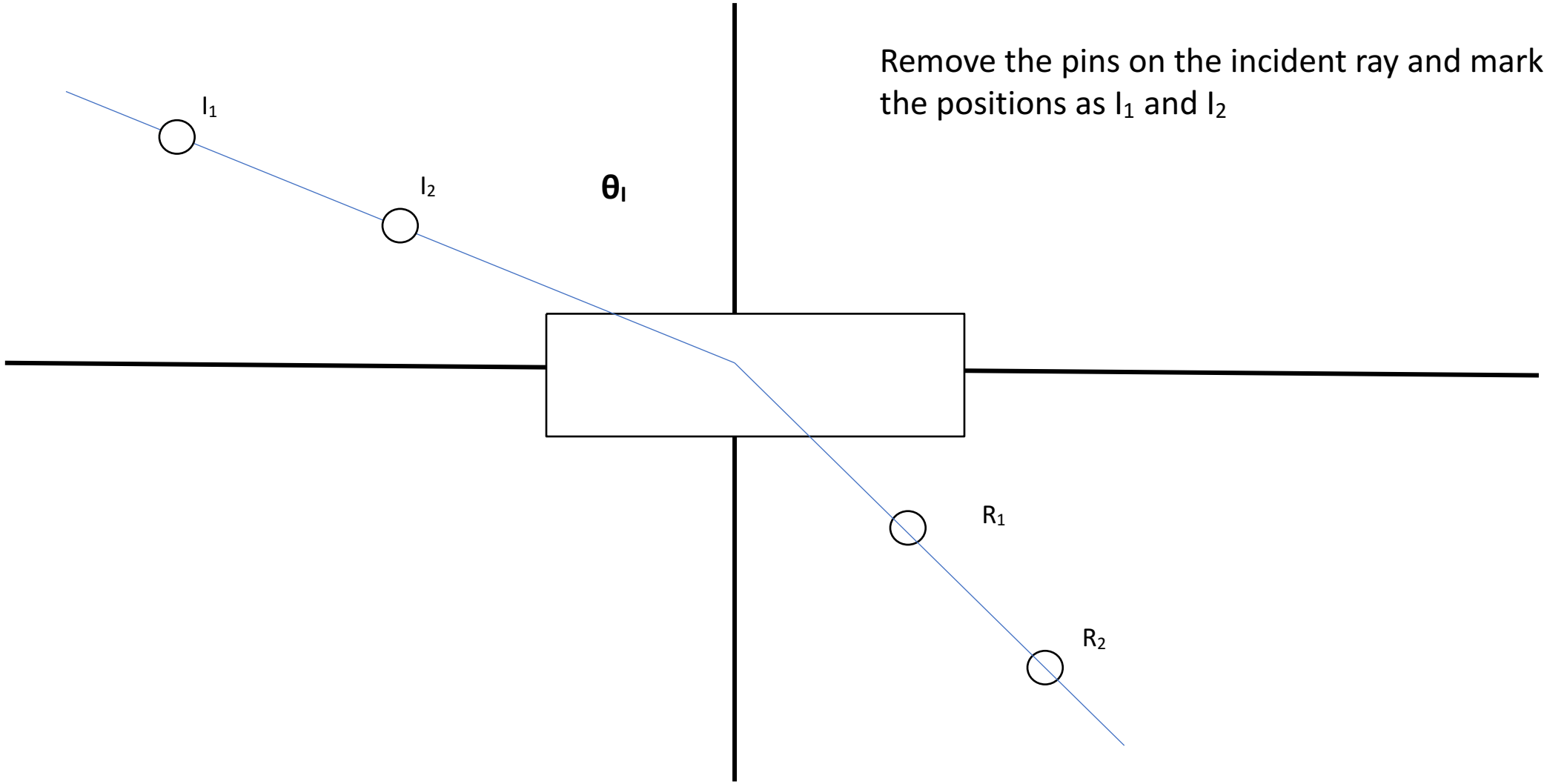
Pour water into the container and view the pins through water in the anterior side of the container and fix two pins in line with the images of the pins you see through water

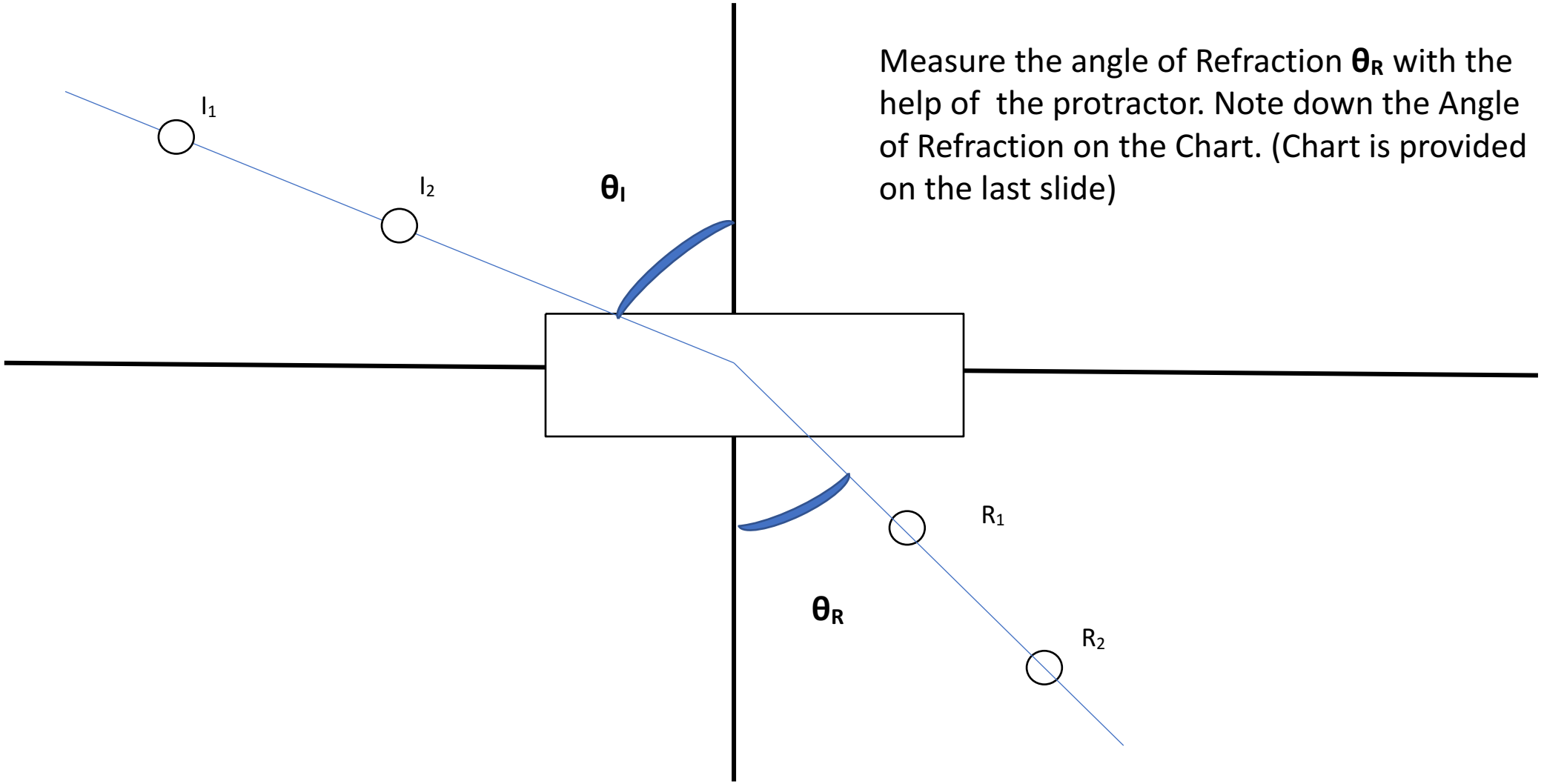


Remove the pins and mark the positions as R_1 and R_2

Remove the container and connect the points R_1 and R_2 to the normal

Remove the pins on the incident ray and mark the positions as I_1 and I_2





Measure the angle of Refraction θ_R with the help of the protractor. Note down the Angle of Refraction on the Chart. (Chart is provided on the last slide)

Repeat the Experiment 1 with a new sheet of paper, for an angle of incidence of 45°

Repeat the Experiment 1 again with a new sheet of paper for an angle of incidence of 50°

Experiment 1: Determination of Refractive Index of Water

#	Angle of Incidence, θ_I	Sine of Angle of Incidence, sine θ_I	Angle of Refraction, θ_R	Sine of Angle of Refraction, sine θ_R	Refractive Index = Sine θ_I / Sine θ_R
1	40°				
2	45°				
3	50°				

The Refractive Index of Water =

Change the content of the container and repeat the experiment for Experiments 2 to 6 (In all SEVEN Experiments and each experiment will be done for three incident angles.

Therefore, in all you will be preparing 7 charts, one each for the SEVEN experiments.
Download the same chart and edit accordingly for the new substance
You can use the same angle of incidence.
Or you may use other angles of incidence. But do not take too high or too low values.
If you are changing the angle of incidence, make sure that you edit the chart accordingly.