The driving question for this project was “How can we test the Pythagorean theorem and the law of reflection. To answer the driving question we had to look back at all the stepping stones and milestones to explain how we tested the two ideas and come to a conclusion and answer them.

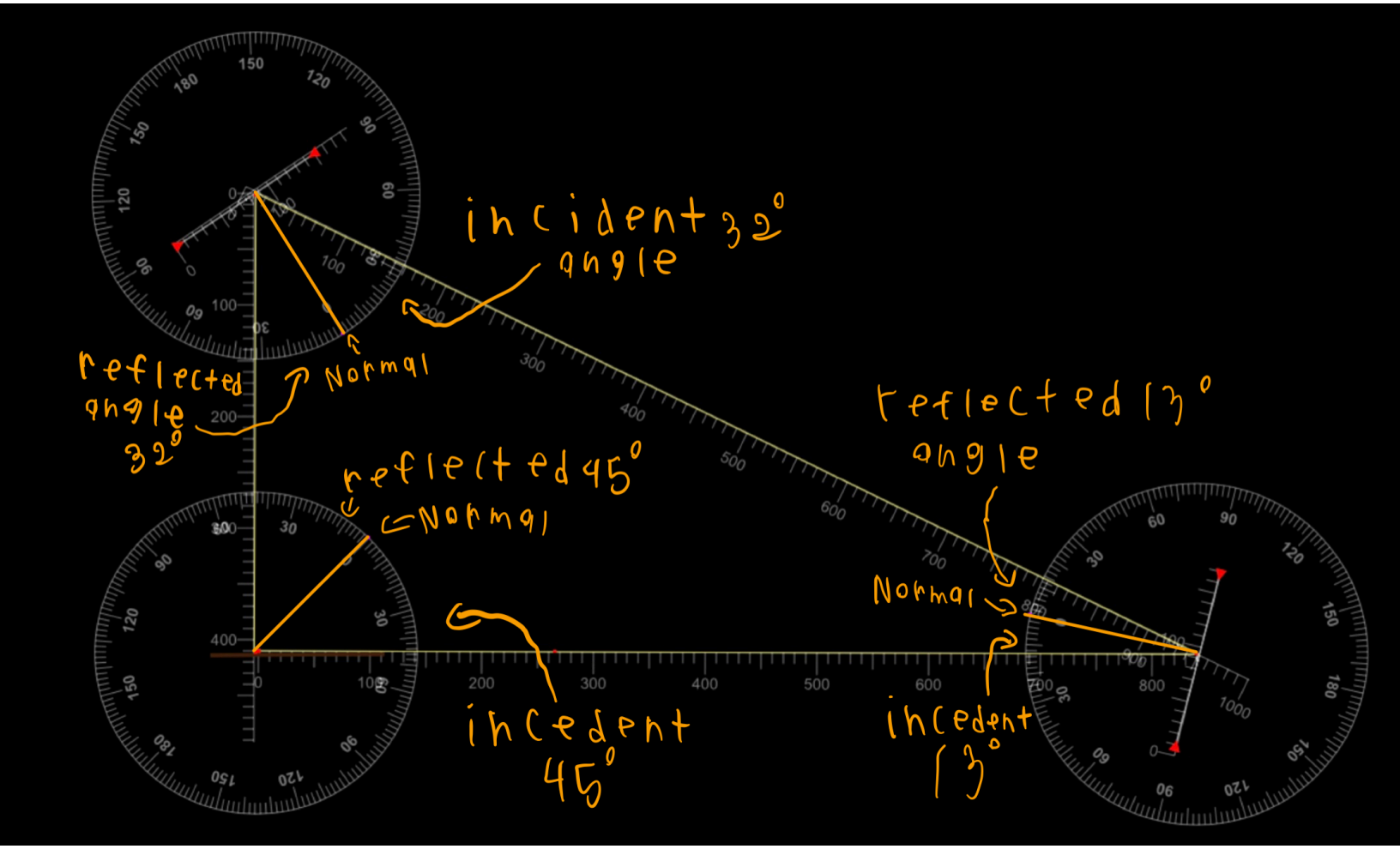
Hypothesis: for my hypothesis I predict that the tests in the simulator will prove that the Pythagorean Theorem only works on right triangles and the law of reflection will prove that the incident angle will be opposite to the reflected angle.

Procedure:

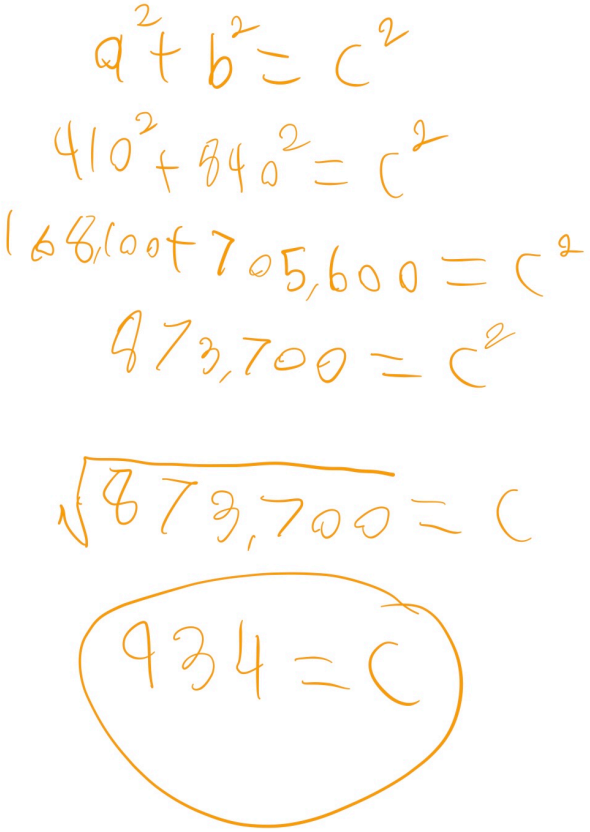
First I will open the simulation app and set up a basic beam of light, then I will get two ideal curved mirrors and angle them to a certain degree, then i'll reflect the beam of light off of the mirrors, the light will dance off of the mirrors forming a continuous triangle, as the light is reflecting off of the mirrors I will measure the beam length, the mirror length, and use a protractor to get the exact degree that my mirror is facing, after all is done I will extract all the data and use the Pythagorean Theorem to see if my triangle is a right triangle or is not a right triangle.

Data/Results/Analysis:

-Diagrams/pictures:



-equations:
This is my Pythagorean Theorem equation that I used to find out if my triangle is right or not.

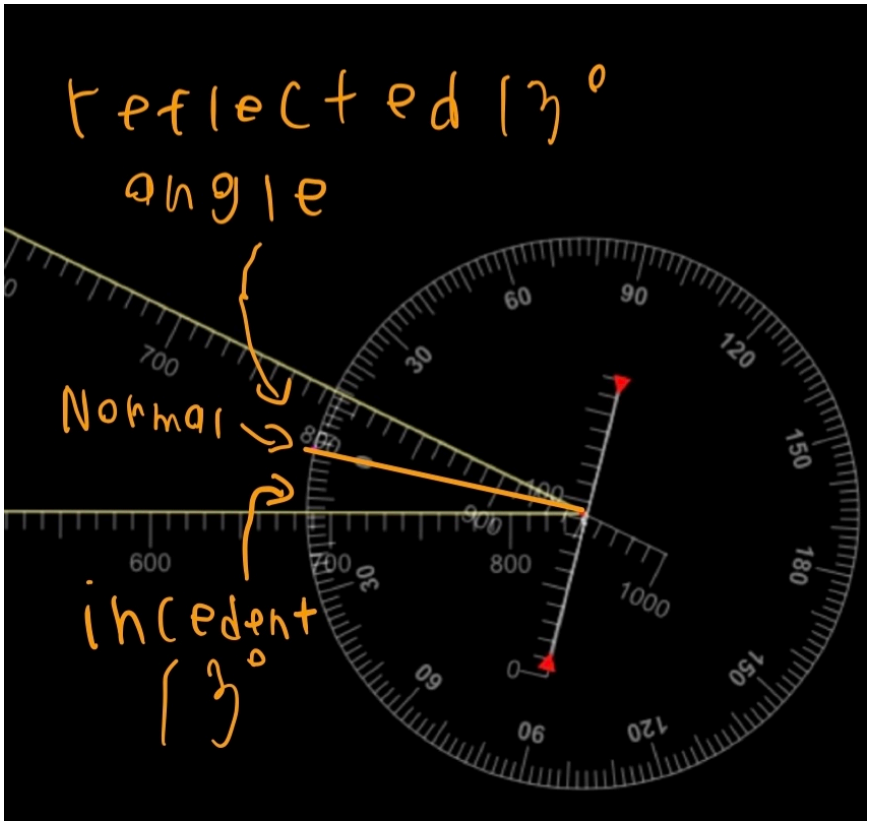


-Theoretical results: The Pythagorean Theorem equation predicted that the hypotenuse would be 934mm as shown in the Pythagorean Theorem equation above.

-Measurements: the bottom mirror is 160 degrees, the top mirror is approximately 120 degrees, the bottom mirror length is 140mm, the top mirror length is 150mm, the side beam length is 410mm, the top beam length is 934mm, and the bottom beam length is 840mm. The Pythagorean Theorem was correct and matched up perfectly with the hypotenuse being exactly 934mm.

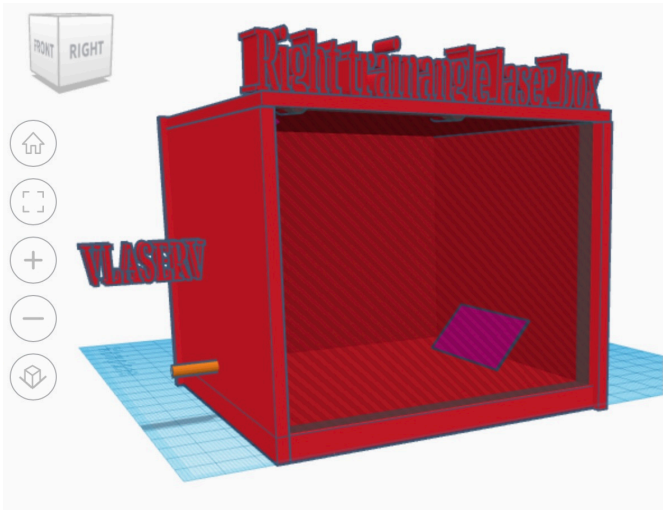
Conclusion:

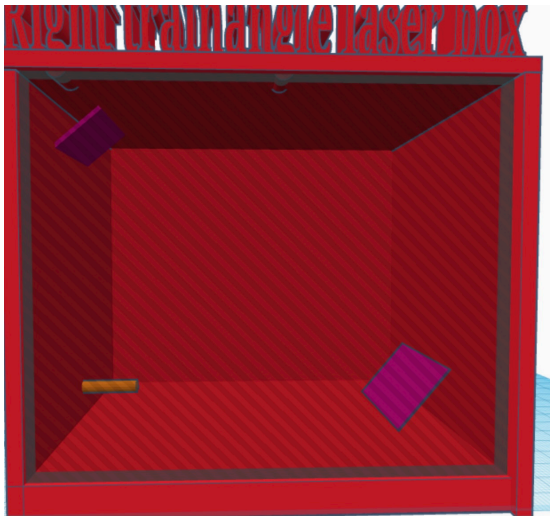
As it turned out, my question was answered correctly that the incident angle turned out to be the exact same because my indecent angle was at 13 degrees and my reflected angle was at 13 degrees as well, proving that the incident angle is the same as the reflected angle. I used a protractor to measure the incident ray and the reflected ray and is probably the easiest and most simple way to measure the incident and reflected ray, here is a picture of the protractor I used in the simulation app:



I have also proved that the Pythagorean Theorem only works on right triangles due to it predicting that the hypotenuse was 934mm which turned out to be the exact same, if I tried to use the Pythagorean Theorem on a different type of triangle it would prove null. One source of error I had was getting the exact measurement making it somewhat wrong and I thought that it was impossible for my triangle to not to be solved by using the Pythagorean Theorem but it turned out my measurement was just the slightest off. The first measurement for the hypotenuse was 940mm. After trying the Pythagorean Theorem to solve the hypotenuse it turned out to be 934mm which was the slightest bit off, but after remeasuring everything it turned out to be correct and exactly 934mm so measuring was definitely a source of error and could have ruined the whole thing if i didn't take the time to remeasure it. If I were to change something for next time it would be to get more precise measurements and probably redesign the whole laser set up due to me running into more problems probably to do with me positioning my lasers and mirrors in an odd way. So I would probably change that for next time to save a little bit of effort and drama.

Concept of the laser box:
One thing I've wanted to do is expand this experiment and actually create this laser design in real life. But first you have to come up with a design and a plan for creating a real life right triangle. The first thing I did was go to a 3D designing website were I could come up with a model that would represent what it would look like in real life. Now you may ask "Why don't you just use the simulation app" Well, you cant really do much in the simulation because its meant just for testing the laws of reflection, not creating a model that you could create in real life. So to start my laser design I started to think small. I decided a rectangle would be the most ideal shape to put my mirrors and lasers in, mostly because its such an open space to place things in, but I decided for my first design I should go with a square. As I stated my design I realized there might be some things that are wrong with me design. First off my laser design was designed to make a triangle but I might think I put my laser in a place were it interferes with itself, but other wise I think my box and mirror design is just fine for what I'm trying to do. Here is a picture I took of my first design, remember every design starts off small and I'm probably going to have more designs that are much better in the future. The yellow small sphere is the laser and the pink rectangles represent the mirrors, here's some pictures:

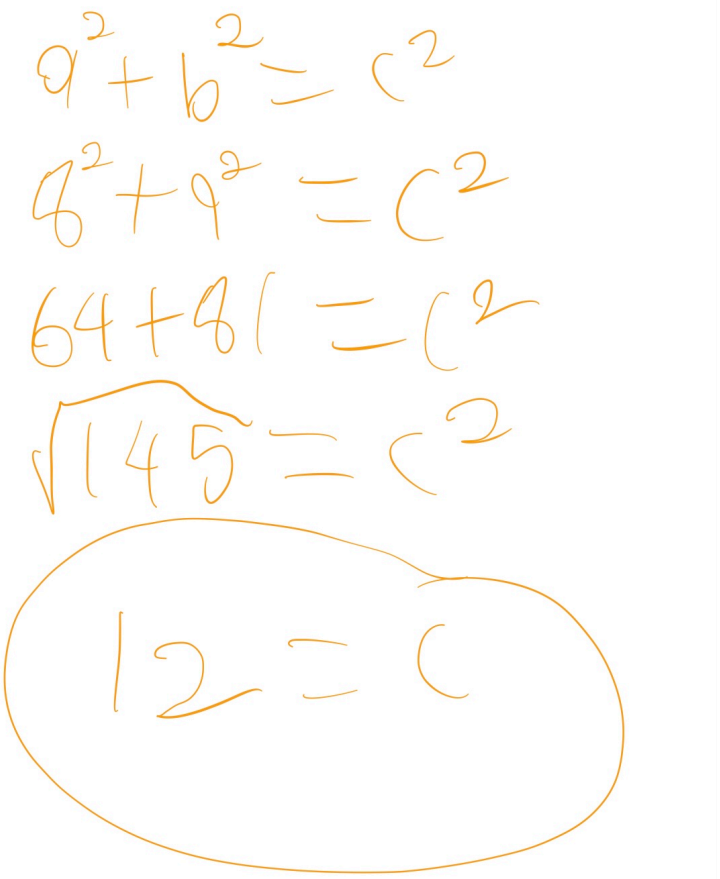




As you can see above these are very rough copy's of a design I'm thinking of doing, obviously I'm going to have to angle the mirrors the exact way they are in the simulation, and for the laser I'll cut a hole out in the side wall to the exact diameter of the laser, the front will be made of plexiglass and the cube will most likely be made of wood, sense I have experience with wood working. This would be a very fun thing to design and even after this project is over I'm still probably going to make this laser box to study the effects of light. This 3D model was very fun to make and the software I used to make this model is called TinkerCad which is a 3D design app. This was an awesome project and I cant wait to come up with more designs and make a real life version of this.

Measurements for the box:
I measured the box and the bottom laser length would be 9 the hypotenuse would be 12 and the side laser length would be 8, now after measuring and after doing the equation, I've figured out that my triangle is indeed a right triangle proving that this model would work in real life.

Here is a picture of the equation I did to figure out if my triangle was right or not:



So now after figuring out if my triangle was right or not I will now try to create this in real life!