MILESTONE 5: LASER TRIANGLE DISPLAY

Question:

Can we test and utilize both the pythagorean theorem and the law of reflection by using right angle triangles?

Hypothesis:

I hypothesize that we can test the Pythagorean theorem and the law of reflection by creating a laser right angle triangle that utilizes both concepts.

Materials:
- Pencil
- Glitter pen
- Mirrors x2
- 1 laser
- Feet {to hold up mirrors} x6
- jumbo batteries x4
- 1 large piece of paper
- I piece of cardboard (base)
- Star Wars spaceship figurines
- 1 resister

Procedure:

1. In pencil, create a sketch of a right angled triangle
2. Generate two measurements (the hypotenuse and leg a), and then find leg b through the Pythagorean theorem to make an accurate right angled triangle
3. Label the measurements onto the triangle
4. Then measure the right angle to double check the accuracy of the measurements
5. Prove the laws of reflection and find the normal in each mirror vertices
6. Place the mirrors following the measurements from the last step, and then place the laser in the correct spot
7. Test the triangle and record the data
8. And to finish it off we went with a shiny marker and added unnecessary stars/glitter and also ✨carl✨

Data/Analysis:

Pythagorean Theorem -

h = 30 cm
a = 25 cm
b = 16 cm

$h = a^2 + b^2$
$30 = 25^2 + b$
$900 = 625 + b$
$b = 900 - 625$
$b = 275$

Law of Reflection -

angle b, a - 45°
angle a, h - 60°-p

To **extend** our knowledge of the Pythagorean theorem and the laws of reflection, we decided to use Apple's "Measure" app to compare the measurements of the triangle. In this short experiment, we determined the percentage accuracy of this application through mathematical endeavours. In the end, we found that the app had around a 5% percent difference when compared to the measurements we found while using a ruler. To be honest, the app was pretty finicky and we believed that it would not be as reliable as a regular old ruler.
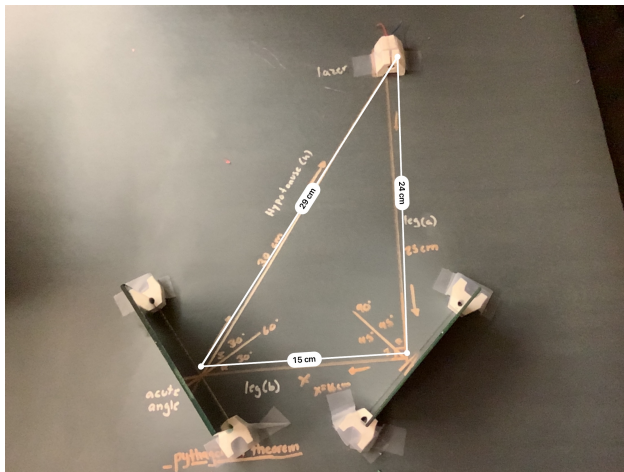
Proof of percent differences:

hypotenuse:
$$100 \times \frac{|30 - 29|}{\left(\frac{30 + 29}{2}\right)} = \frac{1}{29.5} \times 100 = 3.4\%$$

Leg A:
$$100 \times \frac{|25 - 24|}{\left(\frac{25 + 24}{2}\right)} = \frac{1}{24.5} \times 100 = 4.1\%$$

Leg B:
$$100 \times \frac{|16 - 15|}{\left(\frac{16 + 15}{2}\right)} = \frac{1}{15.5} \times 100 = 6.5\%$$

Conclusion:

In conclusion our project was a success (at least in our opinions.) Our hypothesis was correct, and we were able to create a laser triangle display while utilising both the Pythagorean theorem and the law of reflection. However, there were a couple of finicky obstacles along the way. One of them was that the laser would simply refuse to stay shining in the right direction, and the mirrors were hard to clamp down as well. Despite this, we managed to push through this, and accurately replicate a laser triangle.

Pythagorean theorem

$h = 30cm$
$a = 25cm$
$b = 16cm$

$h = a^2 + b^2$
$30 = 25^2 + b$
$900 = 625 + b$
$b = 900 - 625$
$b = 275$

$b = 16.6 -$
$b = 16$

Percent Differences

hypotenuse	leg a	leg b
$\frac{100 \times |30-21|}{(30+21)}$	$\frac{100 \times |25-24|}{(25+24)}$	$\frac{100 \times |16-15|}{(16+15)}$
$\frac{2}{}$	$\frac{2}{}$	$\frac{2}{}$
$= \frac{1}{29.5}$	$= \frac{1}{21.5}$	$= \frac{1}{15.5}$
$\times 100$	$\times 100$	$\times 100$
$= 3.4\%$	$= 4.1\%$	$= 6.4\%$