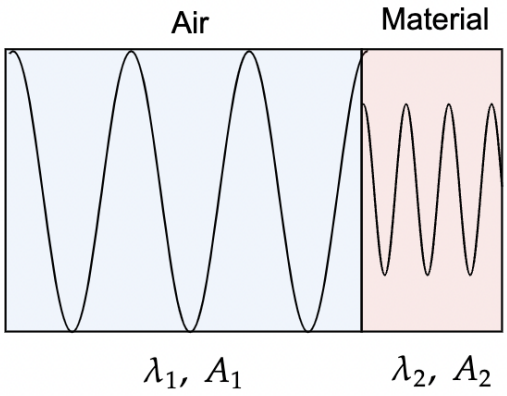
A100: The Index of Refraction

Name: _____

Part I: Do Now (10:23 - 10:28 | Individual)

The index of refraction, n, is a property of a medium or a material. The higher it is, the slower light travels in that medium (since $n = \frac{c}{v}$). Air has $n = 1$, which means light travels pretty fast through air. But water has $n = 1.33$, meaning water is almost like a traffic jam for light, slowing it down, forcing it to *bend*! Not only that, but since the speed of light changes, so does the wavelength (since $v = f\lambda$) and amplitude! But the frequency stays constant (think about why.)



1. Calculate λ_1 =_____ cm and λ_2 = _____ cm
   a. Hint: Use your ruler and measure crest-to-crest!
2. Calculate λ_1 =_____ cm and λ_2 = _____ cm (Use $\lambda = \frac{distance}{cycle}$)
   a. Hint: Your answers for 1 & 2 should match!
3. Calculate A_1 =_____ cm and A_2 = _____ cm

Part II: Big Idea (10:29 - 10:39 | Groups)

Now, you will figure out the mystery material by calculating its index of refraction n! In the space below, stand your block on edge and trace around the perimeter as seen on the video I sent you yesterday.

Here are some hints:

1. Construct and label a proper normal line
2. Construct the incident light beam at $\theta_i = 46^\circ$
3. Construct the refracted light beam
4. Use Snell's Law to calculate the refracted angle

Part III: Presentations (10:44-11 | Groups)

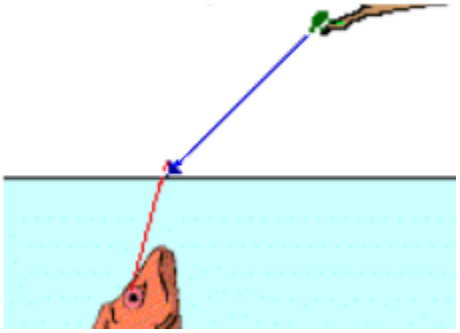
Each group will present one aspect of how they figured out what the mystery material was.

1. Group 1: Explain Normal Line (10:44 -10:46)
2. Group 2: Explain Incident Ray (10:46 -10:48)
3. Group 3: Explain Refracted Ray (10:48 -10:50)
4. Group 4: Explain how Snell's Law was used (10:50 -10:52)
5. Group 5: Explain how the index of refraction was calculated (10:52 -10:54)
6. Group 6: Explain how the material was identified (10:54 -10:56)
7. Group 7: Summarize (10:56 -10:58)

Vote: Who was the best presenter? _____

Part IV: Exit Slip (10:40 - 10:44 | Individual)

We just watched an amazing video of archer fish evolving to learn Snell's Law so that they could survive! The fish below is looking at an ant. The real location of the ant is shown. Your job is simple: where does the *fish* think the ant is? Draw the location of the ant from the fish's point of view. In other words, if you were the fish, which direction would you shoot water to catch the ant?



Part V: Homework

How far *d* does the archerfish aim from the actual location of the prey?