GEOMETRIC OPTICS DAY 6: LAB L13.2: MEASURING INDEX WITH SNELL'S LAW

CED 13.3 · Skills 3.A/2.D · FRQ: ED · bounded investigation

RETRIEVAL

Write Snell's law and circle the quantities that should be graphed to obtain a straight line.

QUESTION AND SAFETY

Question: What refractive index is supported by angle measurements through the acrylic block?

Safety: Keep the laser below eye level, terminate the beam, and rotate the block rather than the laser whenever possible.

METHOD

1. Direct the ray from air into the center of the block's flat face. The transmitted ray then reaches the curved face approximately along a radius, so that boundary adds little refraction.
2. At the flat face, measure θ_1 in air and θ_2 in acrylic, both from the normal.
3. Repeat for at least five air-side incident angles.

NOTES / REASONING

RAW ANGLE DATA

trial	θ_1 in air (deg)	θ_2 in acrylic (deg)	notes
1			
2			
3			
4			
5			

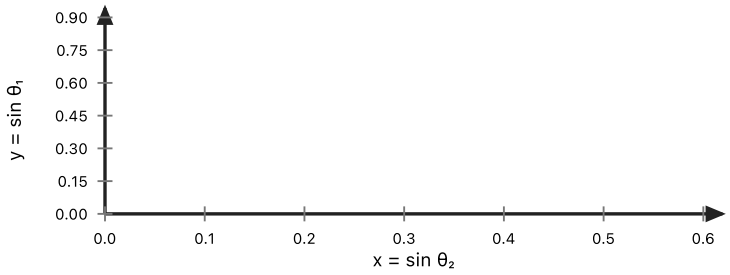
Method check: Explain why the transmitted ray should reach the curved face along a radius.

Read the protractor at eye level. Record angles to the instrument's justified precision before calculating sines.

LINEARIZED DATA

trial	$x = \sin\theta_2$	$y = \sin\theta_1$	residual from fit
1			
2			
3			
4			
5			

PLOT Y = SIN THETA1 AGAINST X = SIN THETA2



Fit: draw one best-fit line and calculate its slope with units, if any.

ANALYSIS AND CONCLUSION

1. Starting with Snell's law and $n_{\text{air}} = 1.00$, show why the graph slope equals n_{block}.

2. Report the measured index with an uncertainty supported by the graph or repeated trials.

3. Identify one measurement choice that could change the slope systematically.

4. State whether an angle-angle graph would have the same linear interpretation.