Reading

2. A light ray can change direction when going from one material into another. This phenomenon is known as

   A. reflection.
   B. absorption.
   C. refraction.
   D. scattering.

Answer

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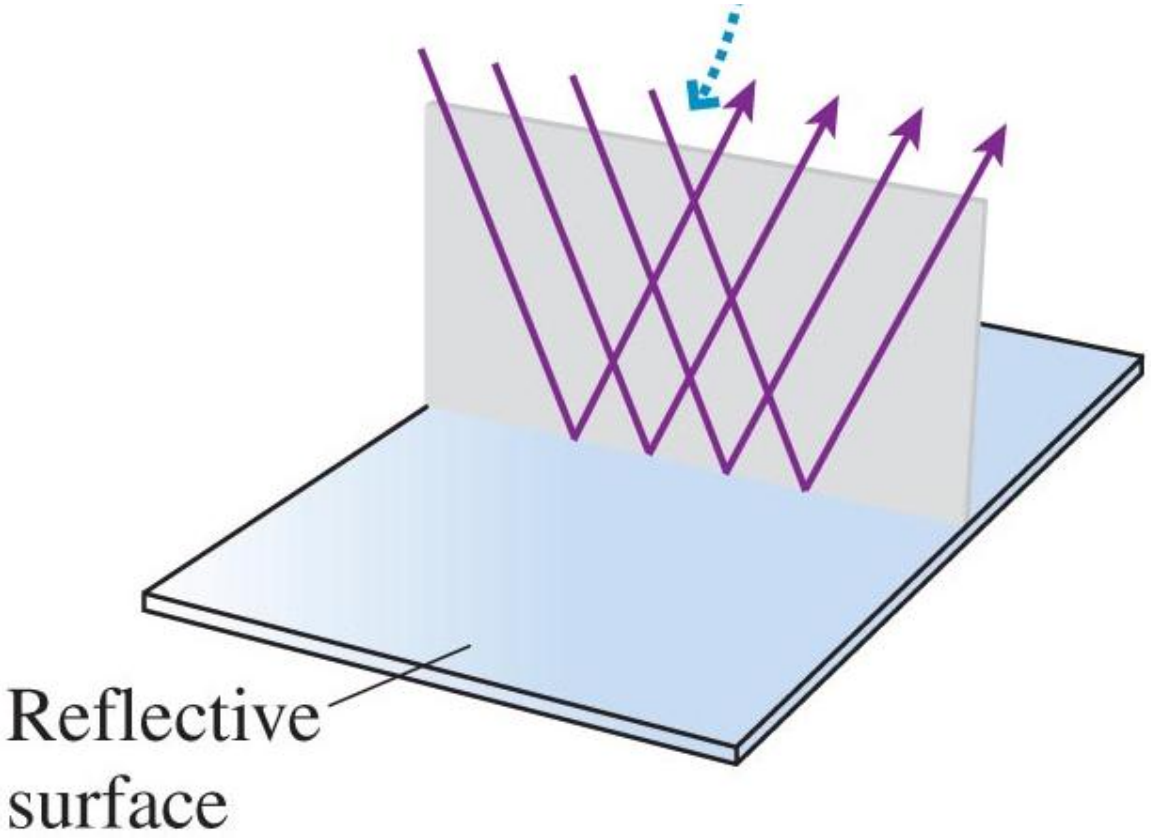
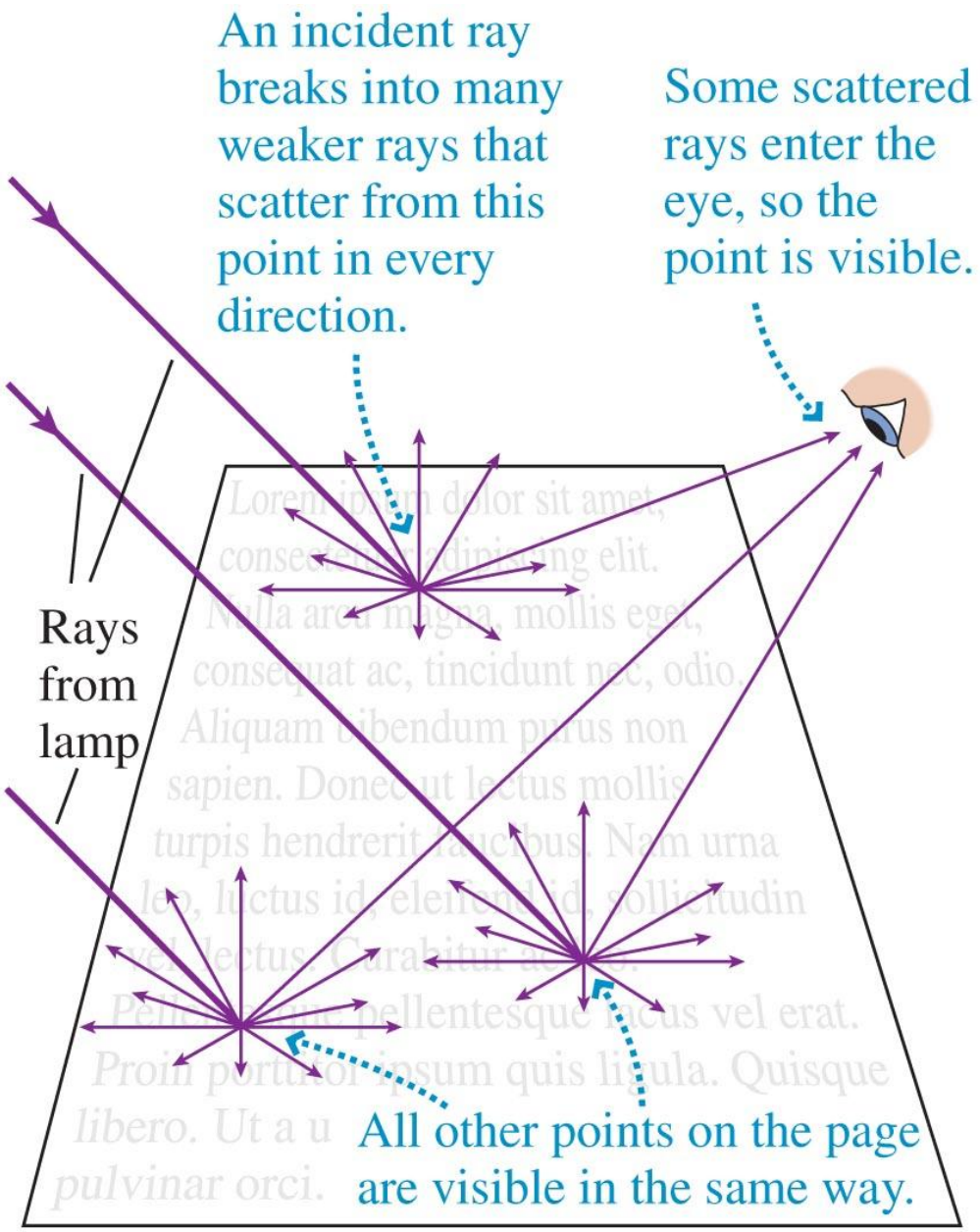
The Law of Reflection



$\theta_r = \theta_i$.



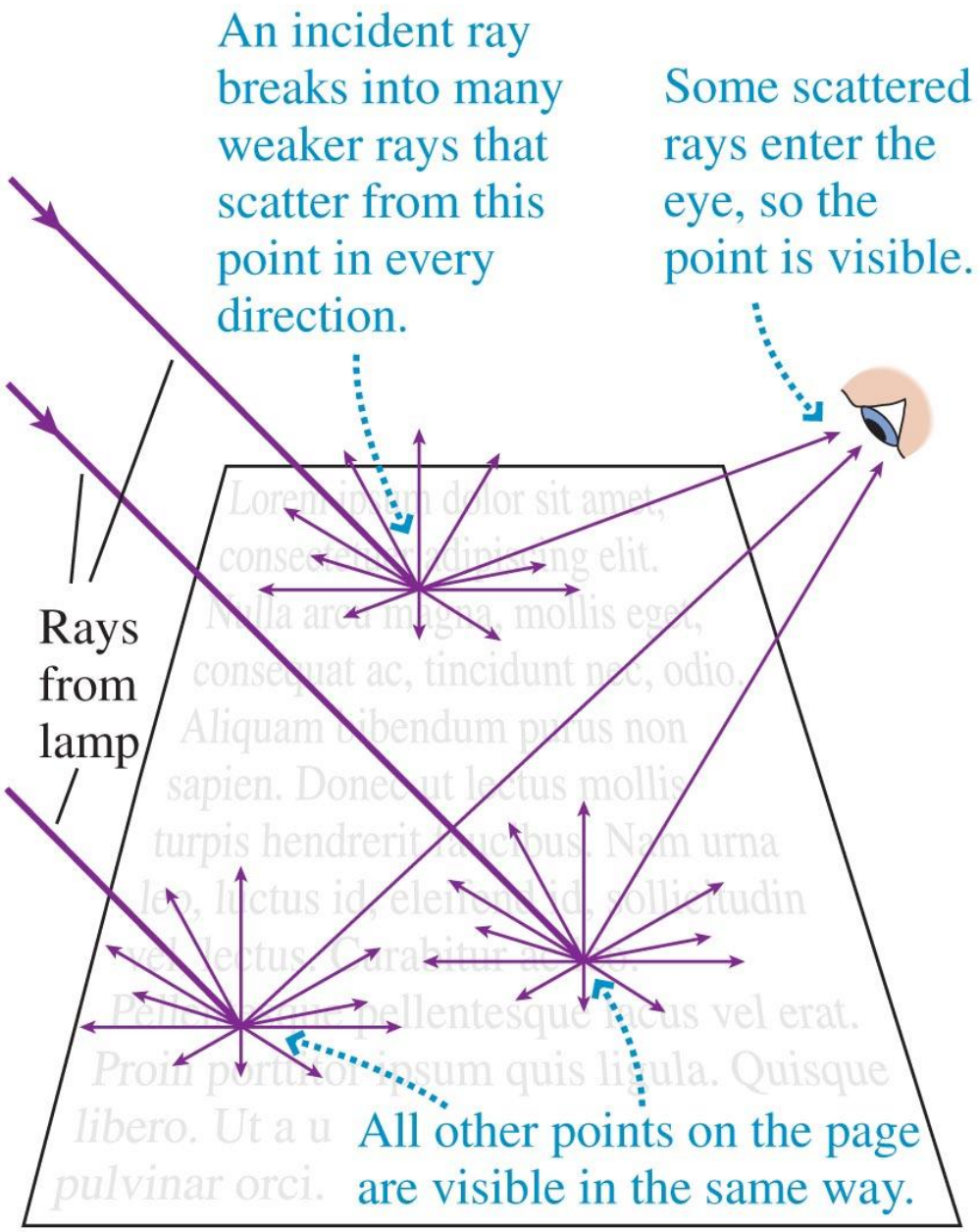
A. This isn't a shiny surface so $\theta_r = \theta_i$ does not apply

B. The surface is bumpy and $\theta_r = \theta_i$ does apply

C. This is not an example of reflection

D. Other

_____



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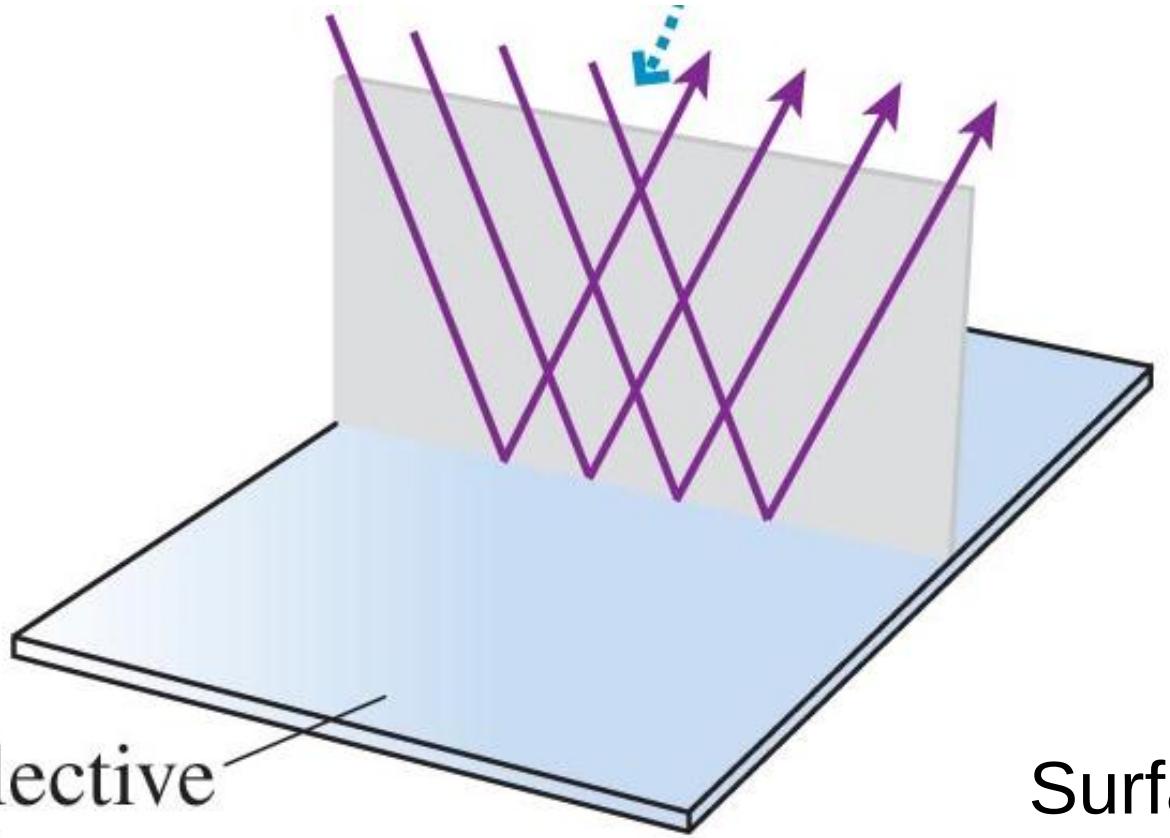
Specular Reflection



Surface is smooth
Mirror, polished metal, glass

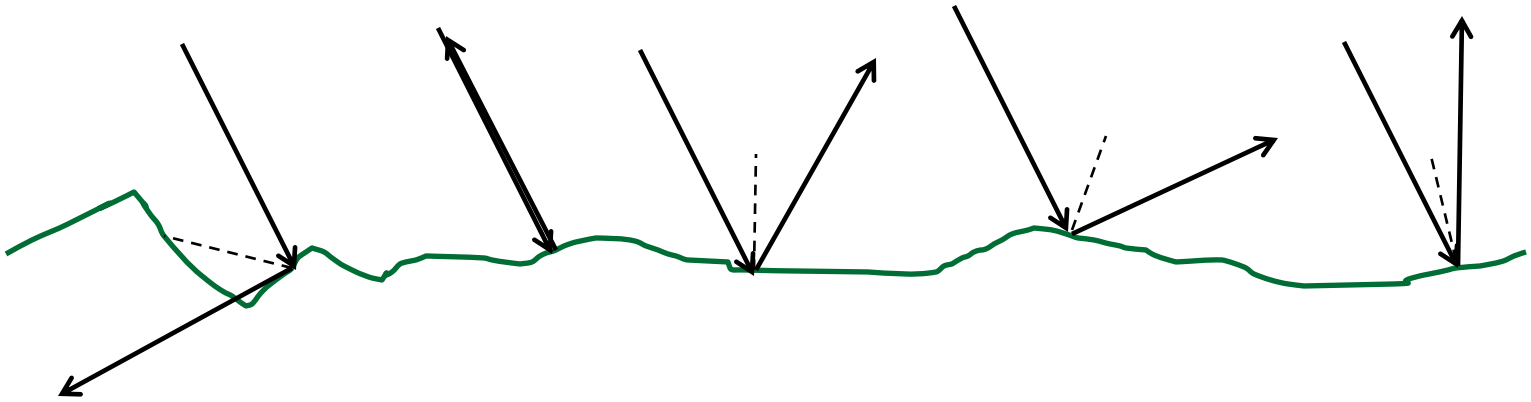
Rough Surface

Make a random looking rough surface.

Now draw 10 incident rays coming from a parallel source

Draw reflected light rays

Don’t forget your normal first!



Would dry pavement undergo specular or diffuse reflection?

A. Specular

B. Diffuse

C. Something else

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A. Specular

B. Diffuse

C. Something else

Would wet pavement undergo specular or diffuse reflection?

A. Specular

B. Diffuse

C. Something else

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A. Specular

B. Diffuse

C. Something else

Why is it hard to see at night when the road is wet?

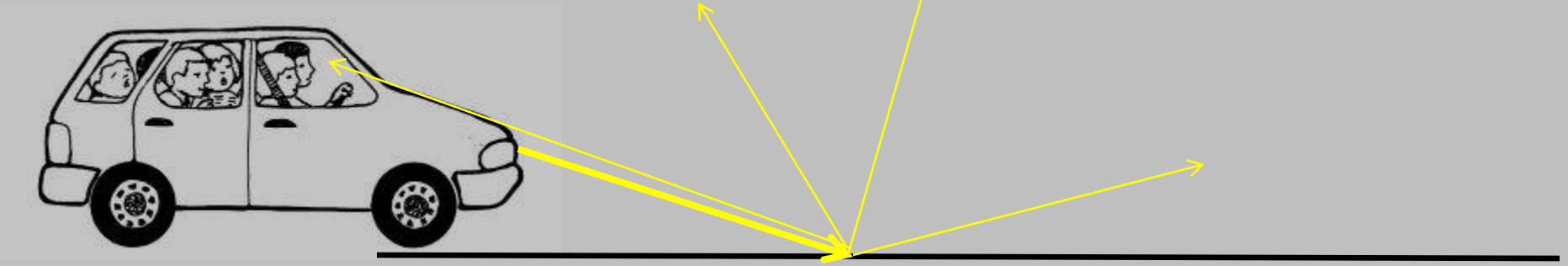
A. It’s typically darker out because it’s stormy

B. Your headlights are not shining into your eyes

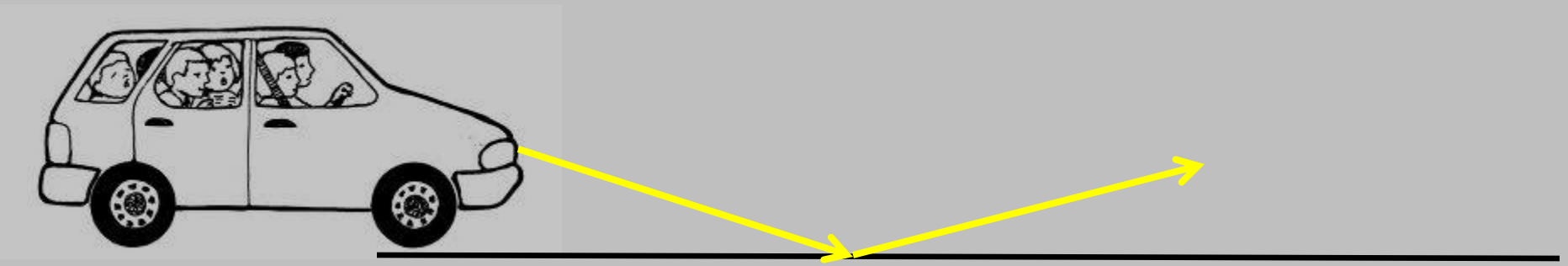
C. On coming vehicle lights are too bright and your eyes adjust

D. Other _____

Draw the light from the headlights onto a **dry** road



Draw the light from the headlights onto a **wet** road



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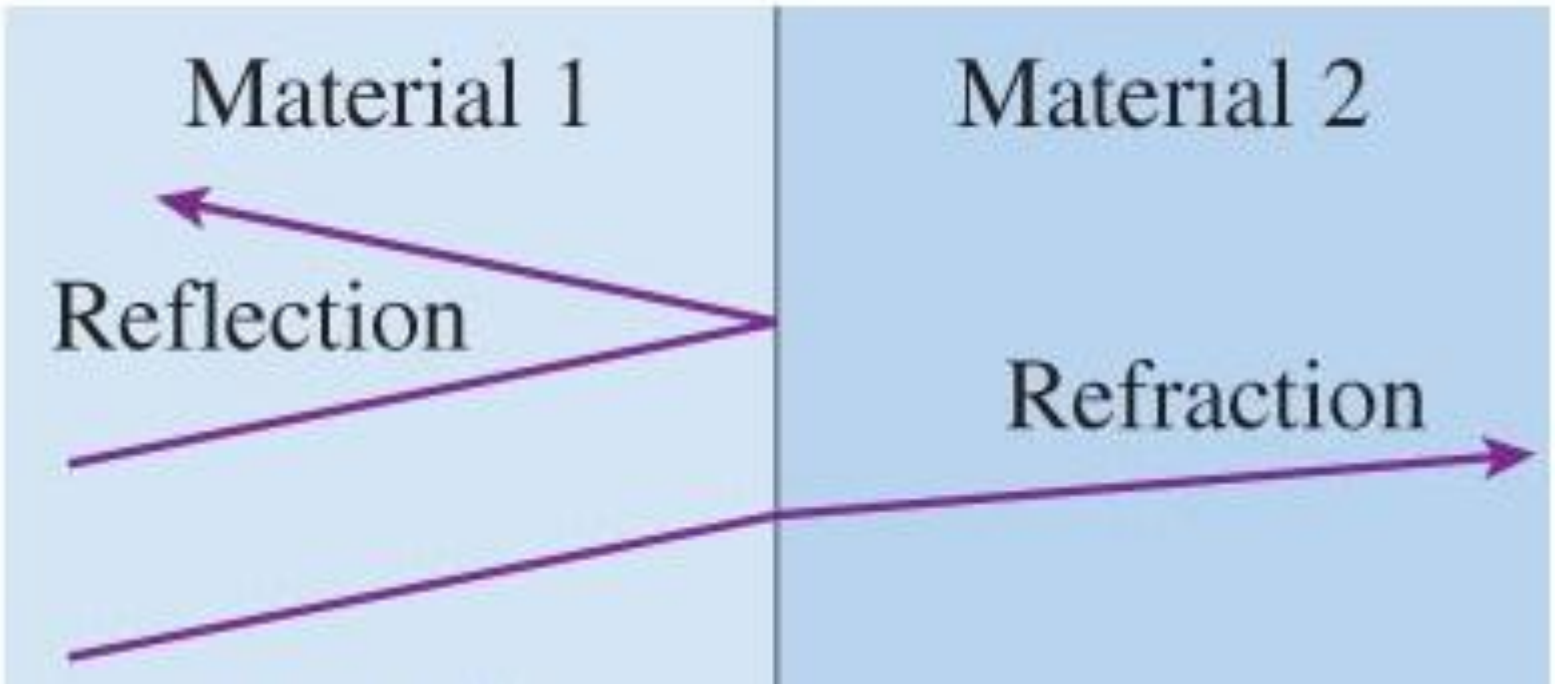
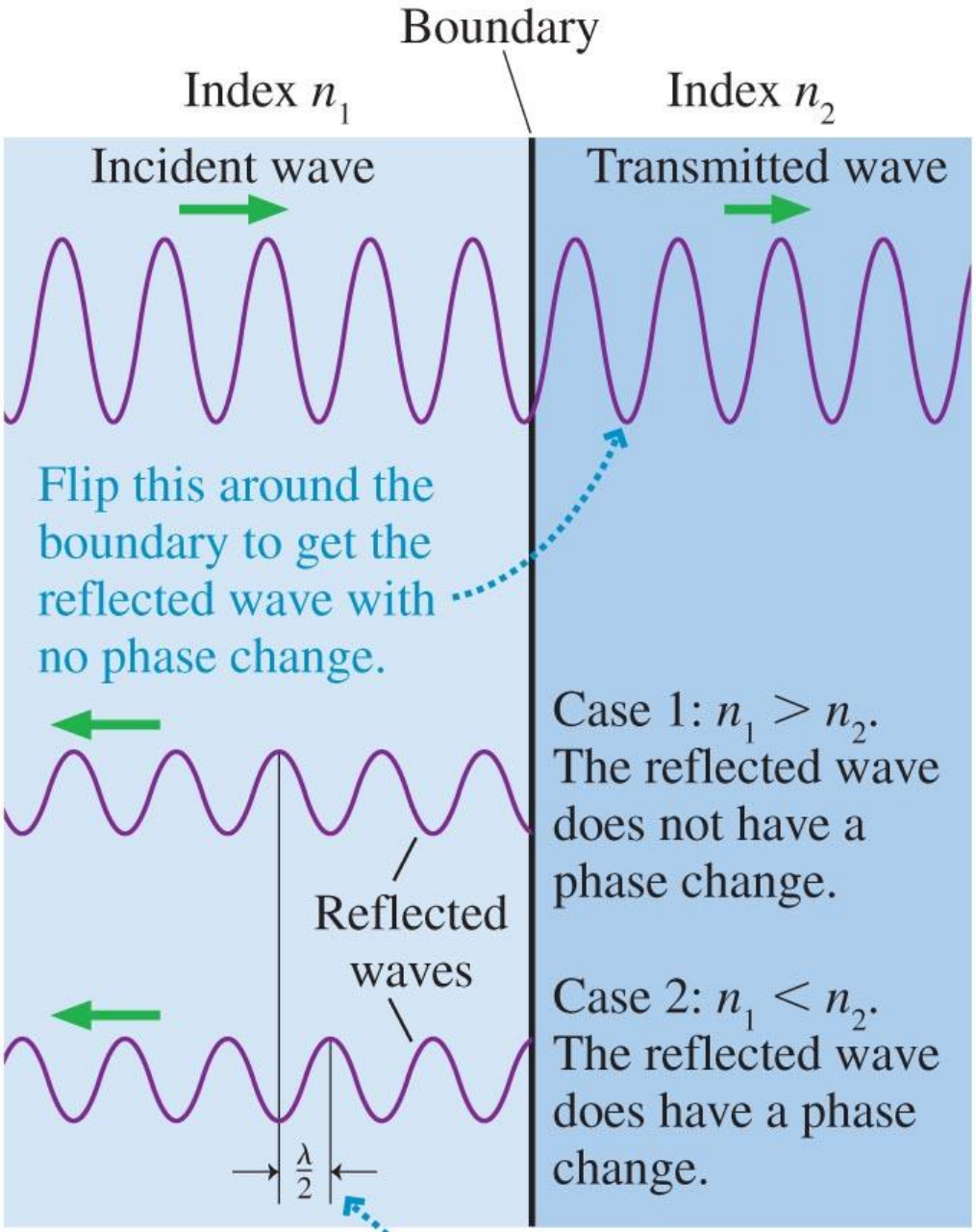
The Ray Model of Light

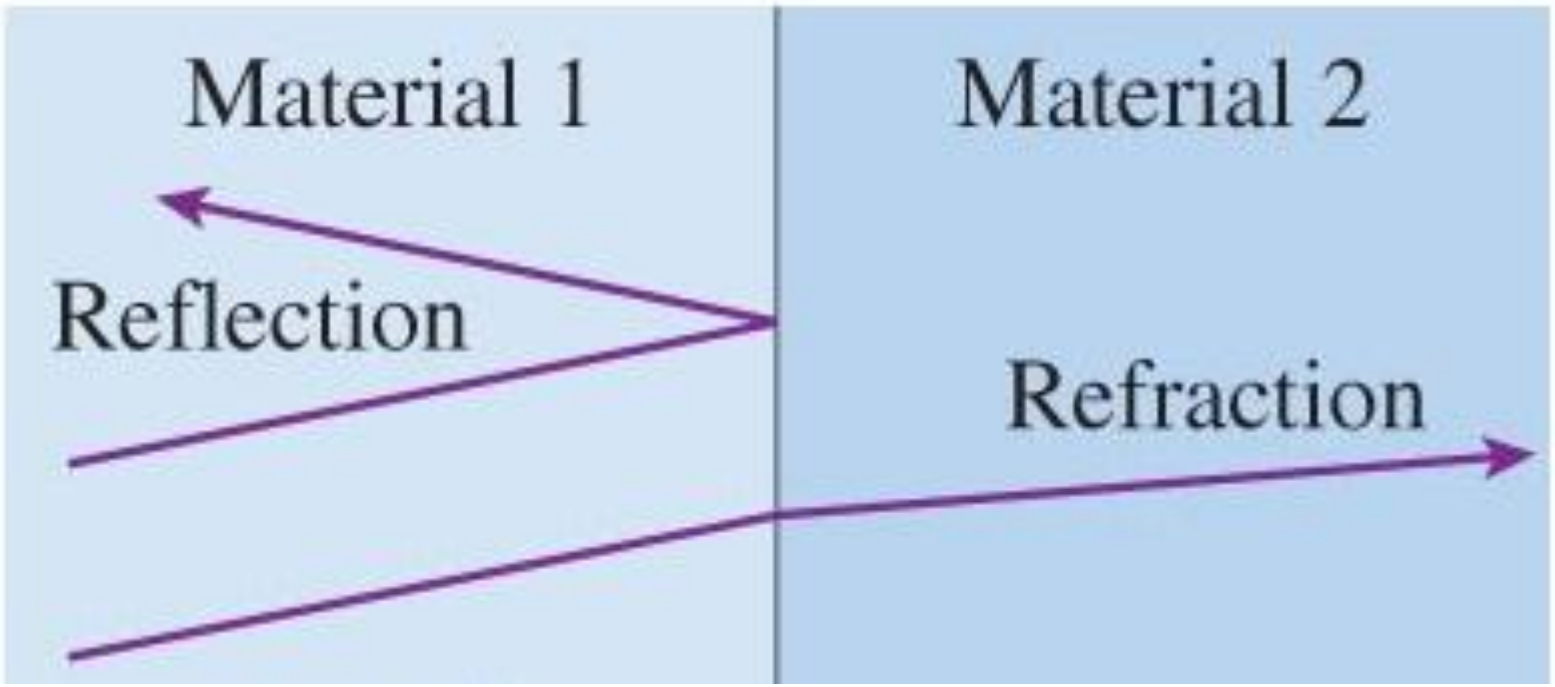


Light reflects off of a surface with two different indices of refraction

Phase Changes Due to Reflection



The Ray Model of Light

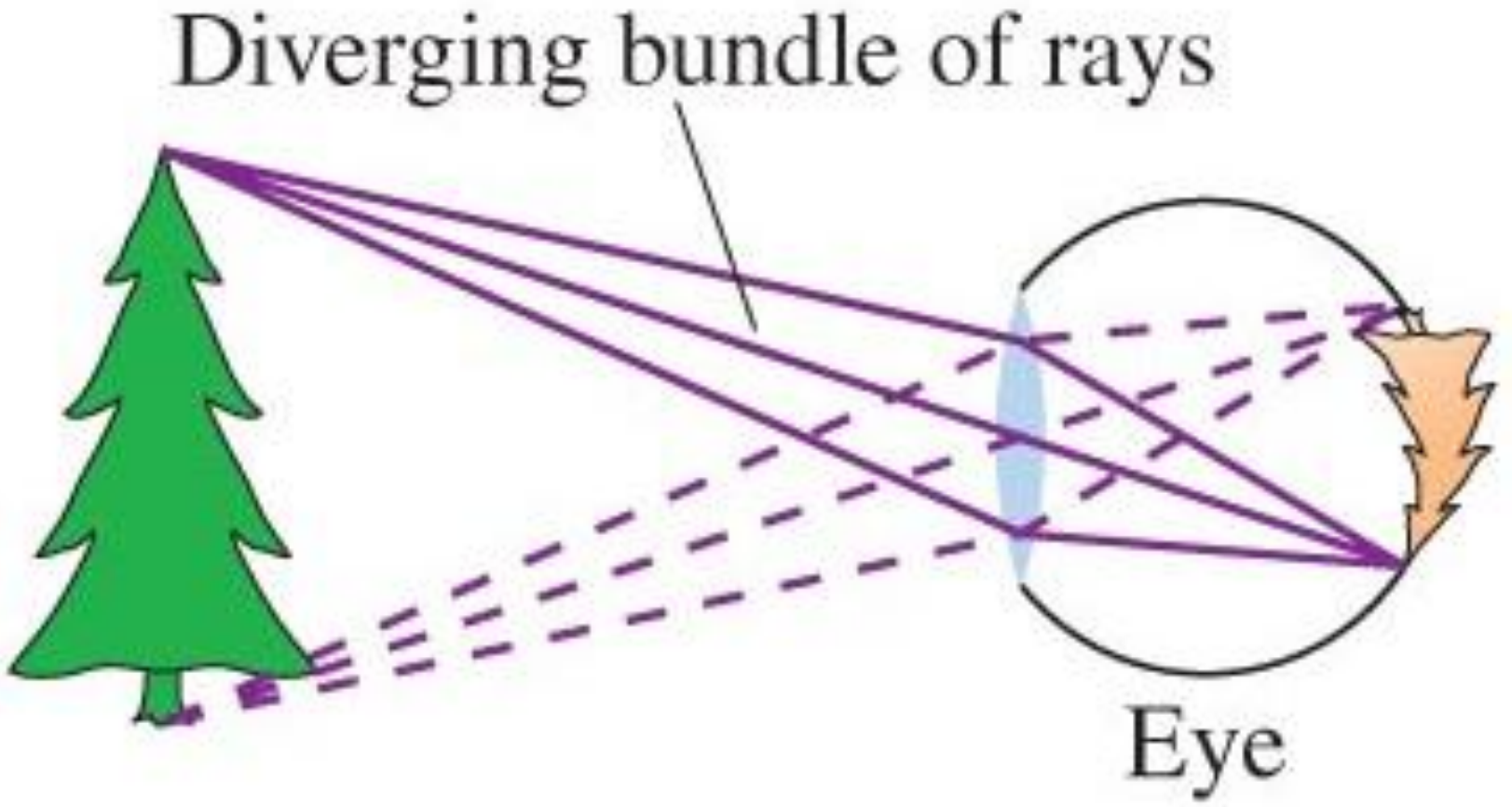


Light reflects off of a surface with two different indices of refraction

$$n = \frac{\text{speed of light in a vacuum}}{\text{speed of light in the material}} = \frac{c}{v}$$

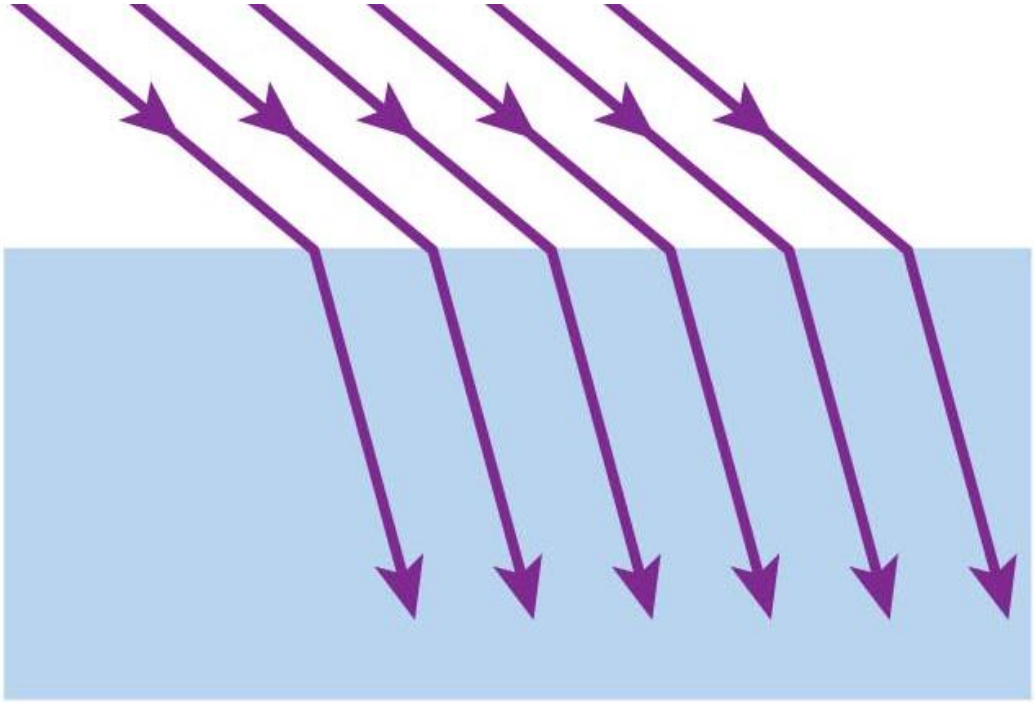
Demonstration

The Ray Model of Light



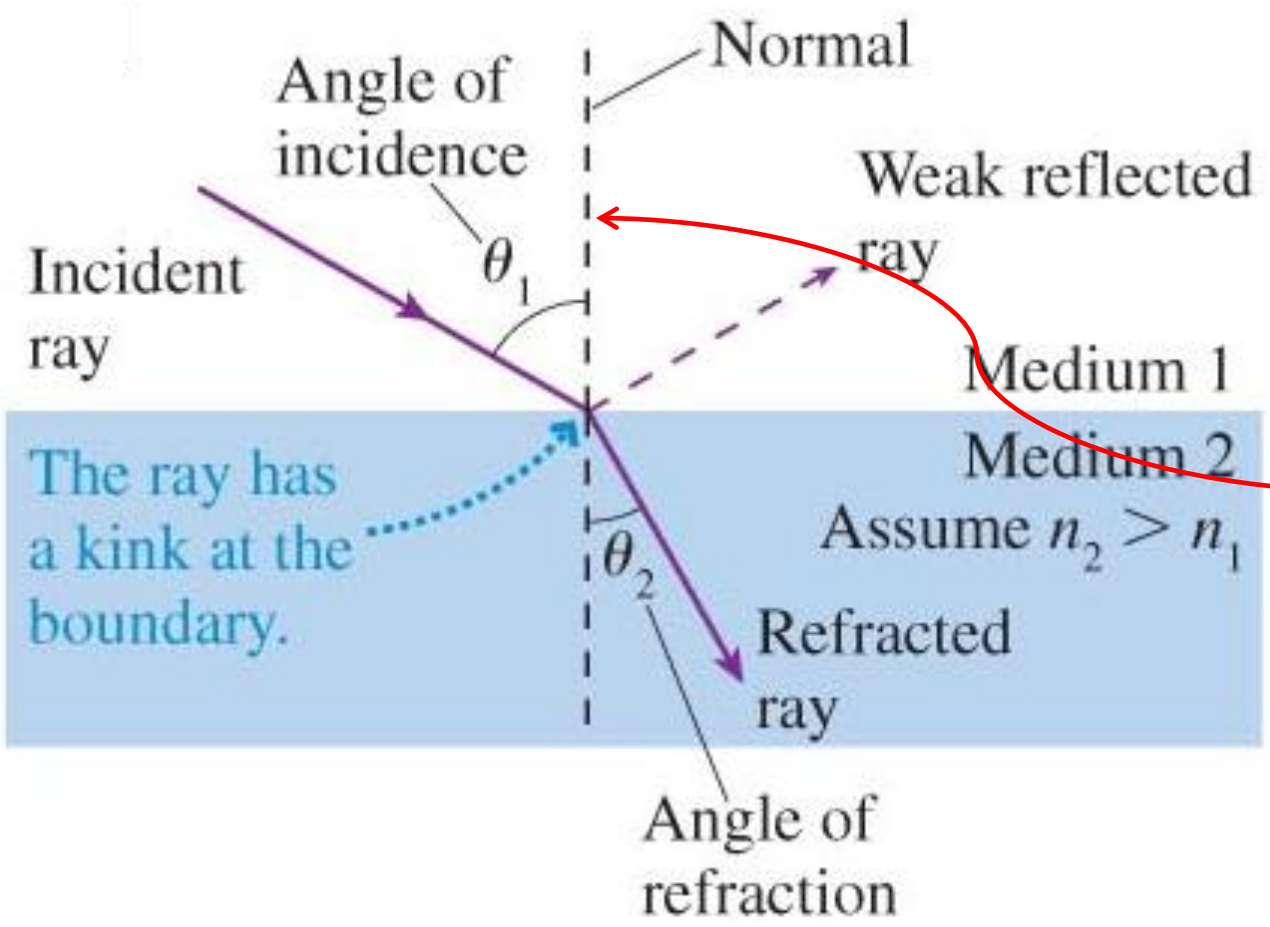
The eye sees by focusing a bundle of rays.

Refraction



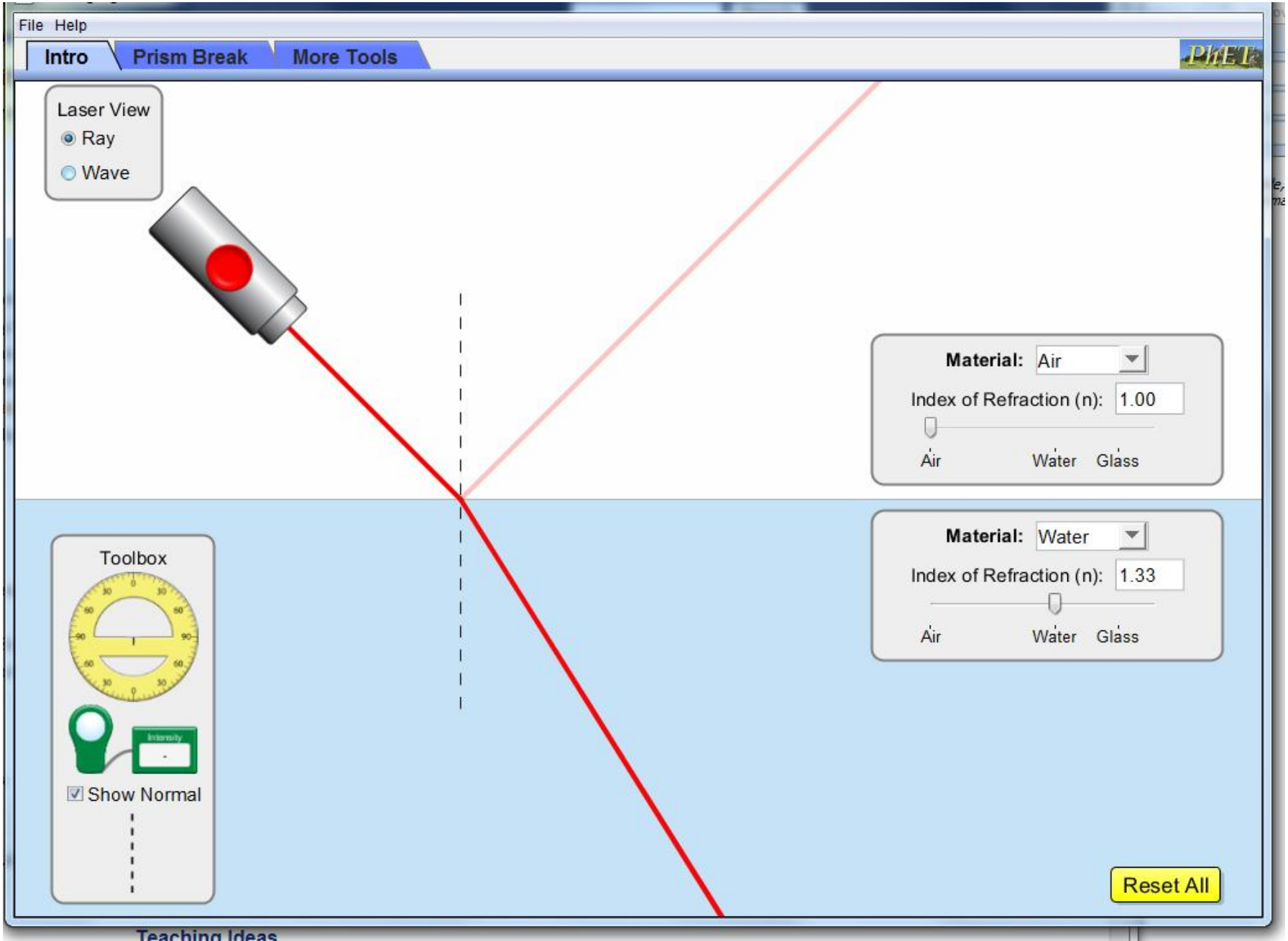
Refraction of a parallel beam of light

Snell's Law of Refraction



Must measure off the **normal** or math will NOT work!

$$n_1 \sin\theta_1 = n_2 \sin\theta_2$$


File Help
Intro
Prism Break
More Tools
PhET
Laser View
Ray
Wave
Material: Air
Index of Refraction (n): 1.00
Air
Water
Glass
Material: Water
Index of Refraction (n): 1.33
Air
Water
Glass
Toolbox
Show Normal
Reset All
Teaching Ideas

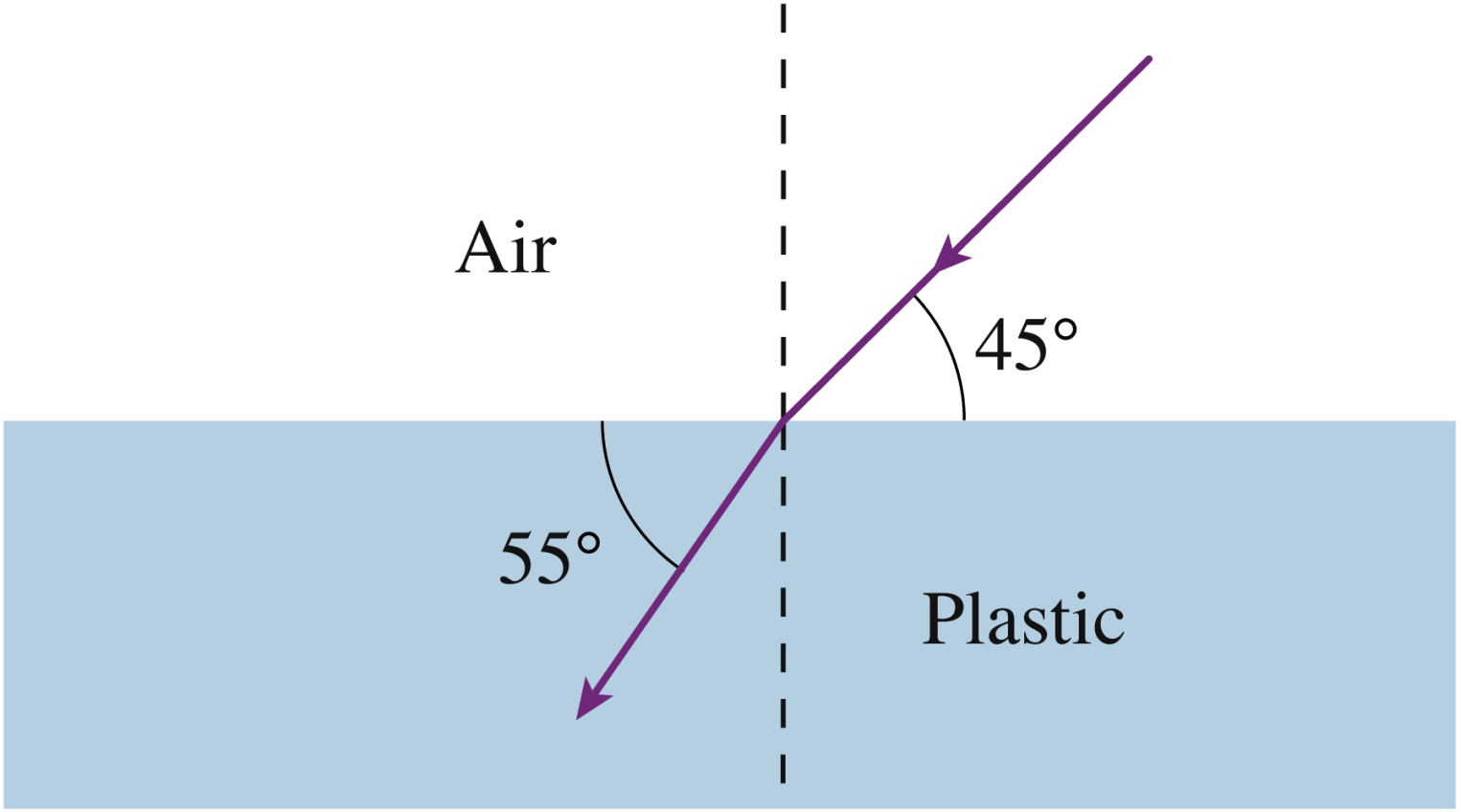
TACTICS BOX 18.1 Analyzing refraction

1. **Draw a ray diagram.** Represent the light beam with one ray.
2. **Draw a line normal (perpendicular) to the boundary.** Do this at each point where the ray intersects a boundary.
3. **Show the ray bending in the correct direction.** The angle is larger on the side with the smaller index of refraction. This is the qualitative application of Snell's law.
4. **Label angles of incidence and refraction.** Measure all angles from the normal.
5. **Use Snell's law.** Calculate the unknown angle or unknown index of refraction.

Exercises 10–13

Example Problem

What is the index of refraction of the plastic if a ray is refracted as in the figure?



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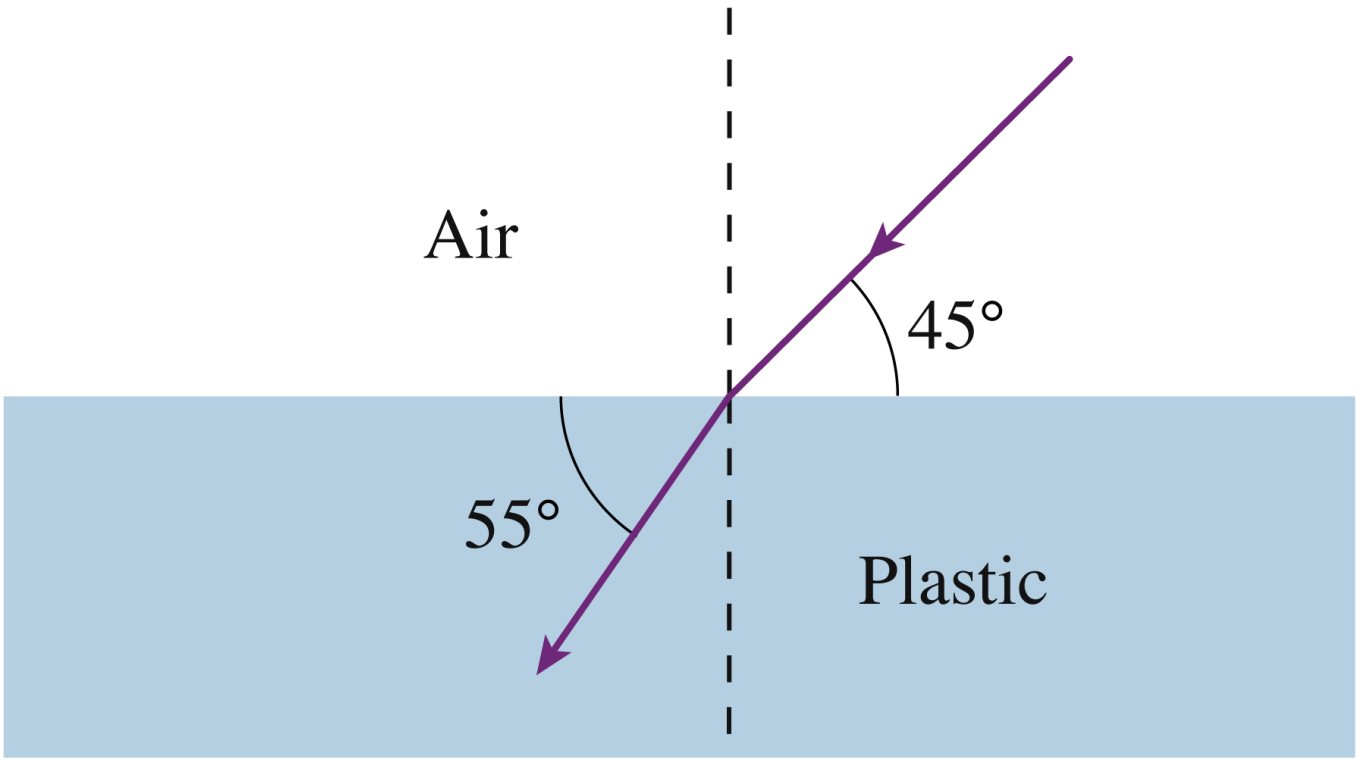
Example Problem



They're being tricky here
Must measure off the **normal**!!

$\theta_1 = 45^o$

$\theta_2 = 35^o$

$n_1 = 1.0$

$n_2 = ?$

$n_1 \sin \theta_1 / \sin \theta_2 = n_2$

$n_2 = 1.23$

$$n_1 \sin\theta_1 = n_2 \sin\theta_2$$