

Homework #1 (due Sept. 2)

Each problem is 10 points

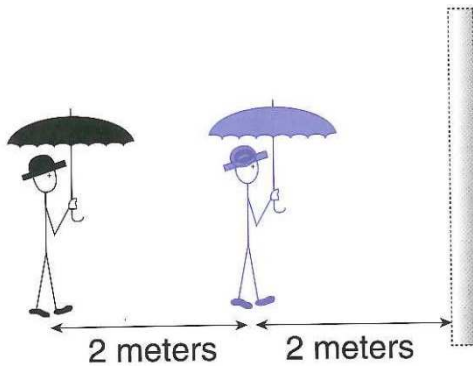
Textbook problems: 1.9, 1.10, 2.3

Problem 1.9: Microwave ranges operate at 2.45GHz. What is the corresponding wavelength?

Problem 1.10: A beam of light of wavelength 500nm falls perpendicularly on the screen with two holes. One beam travels in glass, the other in air. How long will the glass need to be to cause a delay of 1ns between the beam in glass relative to that in air? Take the refractive indices of air and glass to be 1.0 and 1.5 respectively.

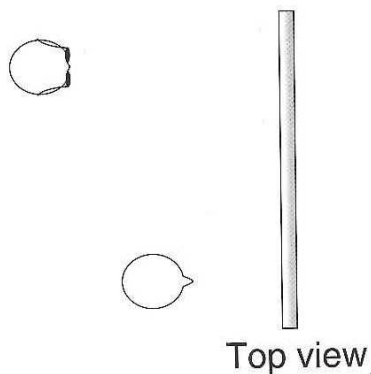
Problem 2.3: What is the critical angle for a diamond/air interface, and for a diamond/water interface? The refractive indices of water and diamond are 1.33 and 2.47 respectively.

A1. You stand 4 meters from the mirror. Your friend stands 2 meters from the mirror. To you, where does the image of your friend appear to be?



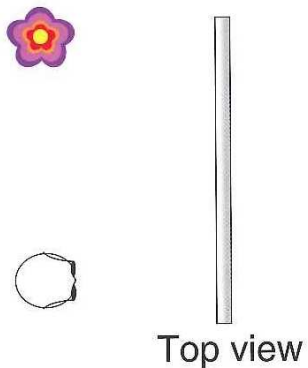
Side view

A2. In the top view diagram below, you are the person with sunglasses, looking in the mirror at the image of your friend. Carefully draw the path of the light rays from the tip of your friend's nose to your left eye and to your right eye. Extend the two rays that go to your eyes to illustrate where they seem to come from.



Top view

A3. Show by rays reflected from a mirror where the mirror image of the flower appears to be



Bonus question (extra credit): If you are 6 feet tall, how tall a mirror do you need to see yourself head to toe? Where on the wall should the mirror be mounted? Show a diagram to explain your answer.