1. If the path-length difference between two identical and coherent light beams is 2.5 λ (2.5 wavelengths) when they arrive at a point on the screen, what do you expect to see there?

2. During a nighttime thunderstorm, the thunder arrives 8 seconds after you see the clouds light up. How far away was the lightning strike? (5280 ft = 1 mile)

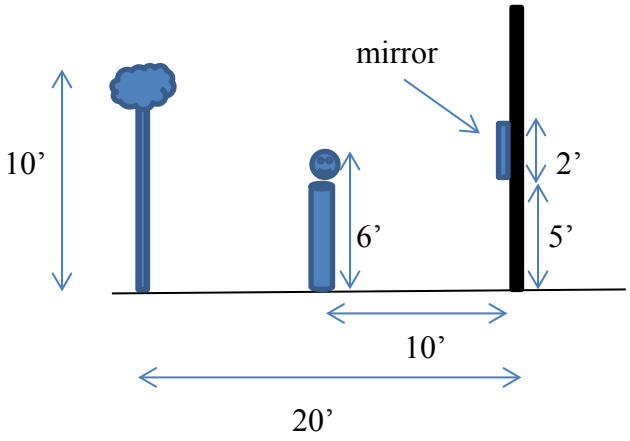
****

1. When you are bathing on a stony beach, why do the stones hurt you less when you get in deep water? (1/3 course point)

2. Once over the past winter, when the night had been particularly cold, I drove by the Bala Golf Course as I was coming in to school early in the morning. I noticed that exposed areas of the course were shrouded in mist. However, the areas under the trees that dotted the course were clear. What was the reason for that? (1/3 course point)

3. Blow on your palm with a wide open mouth and then with your lips slightly parted. The first feels hot, the other cold. Why? (1/3 course point)

4. You are standing 10 ft. in front of a plane mirror of length 2 ft. that is mounted on a wall so that the bottom edge of the mirror is 5 ft. above the floor. Another 10 ft. behind you is a potted plant that rises 10 ft. from the floor. Assuming that you are 6 ft. tall and that your eyes are at the top of your head, what can you see of yourself through the mirror and what can you see of the image of the plant? Now if you move 5 ft. towards the mirror, how are things changed? (1 course point)



5. You and a friend are watching a pool-shark showing off his prowess at billiards. In one demonstration, the pool-shark placed two billiard balls, one red and the other white, near each other on the table, then fires off the red ball so that it strikes one side of the table (A), then an adjacent second side (B), followed by the next adjacent third side (C) before

it collides with the white ball. Your friend says she knows how she can do the same trick, at least in theory. She picks up a piece of paper, and then sketches a rectangle to represent the billiard table. She asks you to insert two small circles to represent the balls anywhere on the table. Taking the paper back from you, she then draws the "complete trajectory of the red ball" as she would launch it so as to repeat the pool-shark's feat. If the drawing below is what you handed your friend, can you show what trajectory she drew? (You must use pencil/pen and ruler, and must be as accurate as you can be as you show the process for constructing the trajectory of the red ball. A good guess gets you no points at all. There is only one "path" that is allowable to your friend. You must show through your drawing how she found it.) (1/2 course point)

Having learned the "secret" behind how to solve this problem, show as many ways as you can that will allow you to fire the red ball so as to have it collide with the white ball after hitting four sides of the table (the red ball can hit any given side more than once). (1/2 course point)

Hint: Your friend used a concept in physics not related to mechanics to "solve" the problem, the law of reflection. Try to use it here.