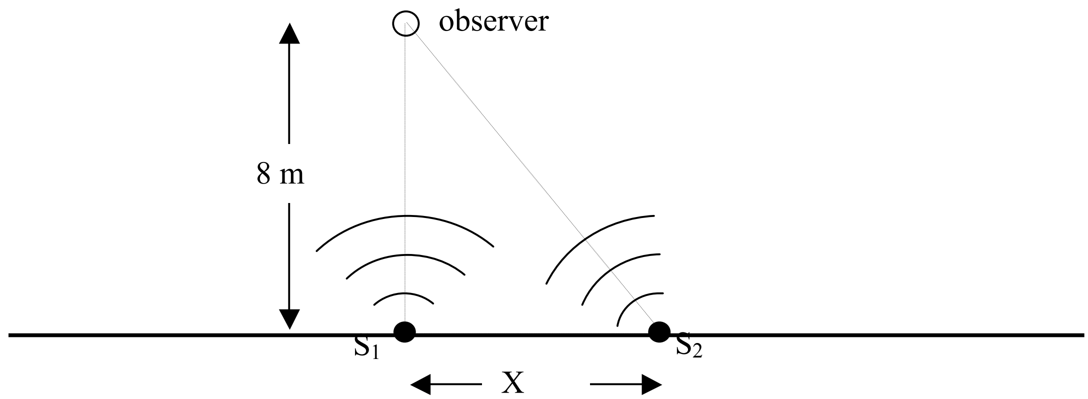
Physics 214 **Quiz 1-2 [20 points]** **Week 2**

The observer wants to adjust two speakers so to maximize the intensity heard. The speakers are coherent and in phase. Separately the intensity of each speaker is 2 W/m^2. Assume that the speed of sound is 340 m/s.



a) [3 points] What is the maximum possible intensity the observer can hear?
   - [3 points] 8 W/m^2

b) [7 poinst] Both speakers are on and broadcasting at a frequency of 20 Hz. Speaker 1 is fixed but speaker 2 can be moved anywhere along the solid line. Write an equation for the distances X where speaker 2 can be placed so the observer hears maximum intensity. Note, there may be multiple such distances.

   - [2 points] calculate λ = 17 m
   - [5 points] (X^2+h^2)^(1/2) – h = n λ where n = integer and h=8m
     Give full points for writing the equation that needs to be solved for X.

c) [5 points] Suppose the observer wants to set X=6 m but is willing to adjust the relative phase between speakers 1 and 2. What relative phase does the observer need to choose to hear maximum intensity?

   - [5 points] ϕ = -0.74 (the sign is somewhat ambiguous here given the wording of the problem, so don't take off marks for that)

d) [5 points] The observer discovered that the relative phase Φ in part (c) was accidentally set to -Φ. What intensity does the observer hear?
   - [3 points] The phase is not cancelled but added too. So
     ϕwrong = 2(–.74)
   - [2 points] I = 4 cos(ϕwrong/2)^2 * (2 W/m^2) = 4.4 W/m^2