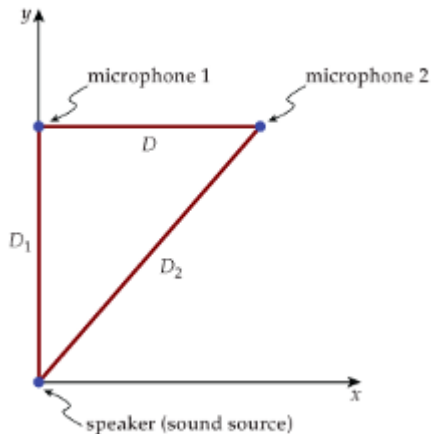


Question #78090, Physics / Other

A speaker (sound source) is located at the origin, one pickup microphone is located at distance D_1 away and along the positive y-axis and a second pickup microphone is located a distance $d=2.47\text{m}$ to the right of the first microphone at a distance D_2 from the speaker. If a sound from the speaker reaches the second microphone 2.54 ms after it reaches the first microphone and the speed of sound is 343 m/s , determine the distances D_1 and D_2 to the microphone

Solution



1)

$$\frac{D_2}{v} - \frac{D_1}{v} = \frac{D_2 - D_1}{v} = t$$

$$D_2 - D_1 = vt$$

2)

$$D^2 = D_2^2 - D_1^2 = (D_2 - D_1)(D_2 + D_1) = vt(D_2 + D_1)$$

$$\frac{D^2}{vt} = D_2 + D_1 = D_1 + vt + D_1$$

$$D_1 = \frac{1}{2} \left(\frac{D^2}{vt} - vt \right) = \frac{1}{2} \left(\frac{2.47^2}{(343 \cdot 0.00254)} - (343 \cdot 0.00254) \right) = 3.07 \text{ m.}$$

$$D_2 = \frac{1}{2} \left(\frac{D^2}{vt} - vt \right) + vt = \frac{1}{2} \left(\frac{D^2}{vt} + vt \right) = \frac{1}{2} \left(\frac{2.47^2}{(343 \cdot 0.00254)} + (343 \cdot 0.00254) \right) = 3.94 \text{ m.}$$

Answer provided by <https://www.AssignmentExpert.com>