Two Point Source Interference Problems

Consider an extremely large ripple tank where the distance between two point sources is 10 cm. A point (**P**) on the third anti-nodal line is selected and the perpendicular distance from the central antinodal line to point **P** is 1 meter. The distance from the midpoint between sources to point **P** is about 20 meters.

1. In the space at the right, sketch the situation. Show and label the sources $\mathbf{S_1}$ and $\mathbf{S_2}$, the central antinodal line, the third antinodal line, point **P** and the given values listed above. In the space below, identify values of **y**, **d**, **L**, and **m**.

   y = _____ d = _____

   L = _____ m = _____

2. Determine the value of the wavelength. **PSYW**

3. Detemine the perpendicular distance from the central antinodal line to a point on the fifth anti-nodal line. **PSYW**

4. Detemine the perpendicular distance from the central antinodal line to a point on the third nodal line. **PSYW**

5. Detemine the perpendicular distance from a point on the first anti-nodal to a point on the fourth anti-nodal line if measured through point **P**. **PSYW**

6. If the wavelength of the waves in the same ripple tank is doubled and the **d** and the **L** values remain constant, then what will be the perpendicular distance from the central anti-nodal line to a point on the ...
   a. third anti-nodal line.

   b. fifth anti-nodal line.

   c. third nodal line.

7. Complete the following statements generalizing the conceptual relationship among quantities:

   As the distance between sources is decreased, the antinodal lines move _____ (closer together, farther apart) and the value of y _____ (increases, decreases).

   As the wavelength is decreased, the antinodal lines move _____ (closer together, farther apart) and the value of y _____ (increases, decreases).

Use the two-point source interference equations to solve the following problems.

8. Two point sources, 3.0 cm apart, are generating periodic waves in phase. A point on the third anti-nodal line of the wave pattern is 10 cm from one source and 8.0 cm from the other source. Construct a sketch of the physical situation and determine the wavelength of the waves. **PSYW**

9. Two point sources are generating periodic waves in phase. The wavelength is 4.0 cm. A point on the second anti-nodal line is 30.0 cm from the nearest source. How far is this point from the farthest source? Begin by constructing a sketch of the physical situation. **PSYW**

10. A point on the third nodal line of an interference pattern is 8 cm from the central antinodal line and 48 cm from the sources. The sources are 1 cm apart. Determine the wavelength of the waves. Begin by constructing a sketch of the physical situation. **PSYW**

11. Two point sources are generating periodic waves in phase. The wavelength of the waves is 3.0 cm. A point on a nodal line is 25 cm from one source and 20.5 cm from the other source. Construct a sketch of the physical situation and determine the nodal line number. **PSYW**

12. Two point sources are generating periodic waves in phase. A point on the fourth nodal line is 25.0 cm from one source and 39.0 cm from the farthest source. Construct a sketch of the physical situation and determine the wavelength. **PSYW**

13. Water waves with a wavelength of 10 cm emanate from two point sources which are vibrating in phase. If a point on the fourth antinodal line is 7.2 cm from the central antinodal line and 32.8 cm from the sources, then determine the separation distance between sources. Begin by constructing a sketch of the physical situation. **PSYW**