## Waves Worksheet #8

1. When the waves from two point sources meet on the surface of the water, what must there be to produce

   a) constructive interference?
   b) destructive interference?
   c) an antinode?
   d) a node?

2. On the pattern for two point sources given below, label source 1 as S_1 on the left side of the pattern and label source 2 as S_2 on the right side of the pattern. Draw in a horizontal line through the two sources. Find the midpoint of the line segment S_1S_2 and draw in the perpendicular bisector of this line segment. This is called the center line. Mark in all of the nodes with an open circle and all of the antinodes with a shaded circle.
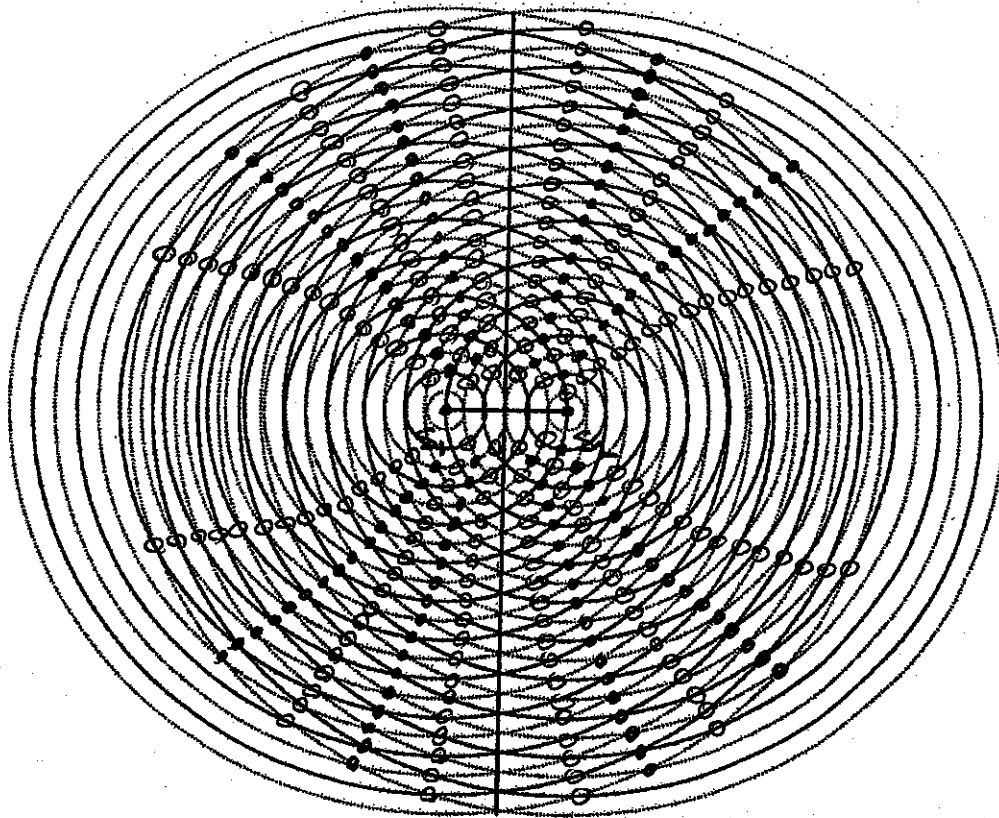
3. Two point sources are generating waves at the same frequency and phase. The pattern is shown below. The solid lines represent the crests and the dashed lines represent the troughs.
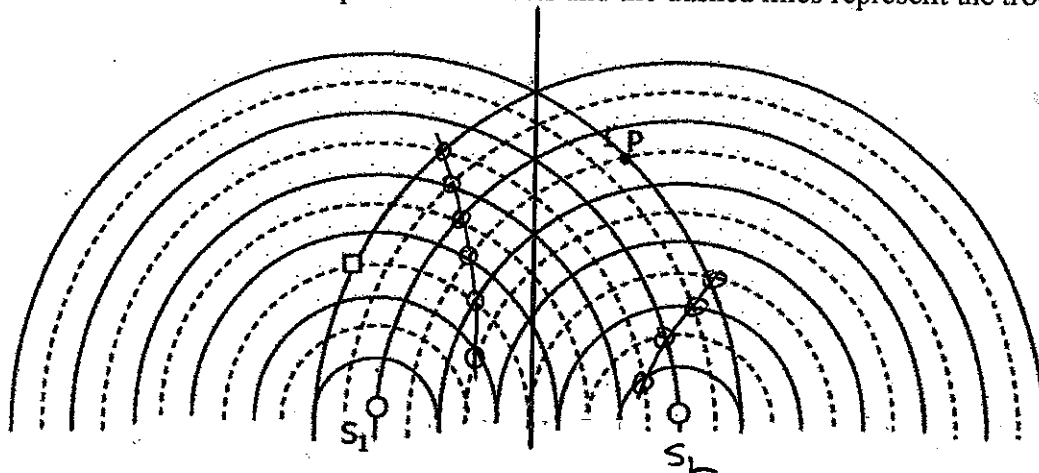
Draw in the perpendicular bisector of $S_1 S_2$.

a) Draw the **second nodal line to the left** and the **fourth nodal line to the right** of the perpendicular bisector.

b) What kind of interference, constructive or destructive, is occurring at the location of the square?

c) On which nodal line would the square be located? 4th

d) What would be the distance between the square and the source S_2 if the wavelength of the waves is 4.0 cm? 6λ or 24 cm

e) On which nodal line is point P? What is the path length difference to point P?

f) What is the path length difference to the square?

4. Two point sources are generating waves in a ripple tank, causing the waves to interfere. The two point sources are 10.0 cm apart, and the frequency of the waves is 4.0 Hz. A point on the first nodal line is located 16.0 cm away from one source and 15.0 cm away from the other.

a) What is the wavelength of the waves?

b) What is the speed of the waves?

5. State the effect on the interference pattern for two point sources if

a) the wavelength of the waves was increased.

b) the two sources were moved closer together.

c) the frequency of the waves was increased.

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① a) 2 crests overlapping

   or

   2 troughs overlapping

   b) 1 crest + 1 trough overlapping

   c) a point of constructive interference

   d) a point of destructive interference

② See attachment

③ a) see attachment

   b) destructive (crest + trough overlapping)

   c) 4th

   d) $6\lambda = 24$ cm

   e) 2nd nodal line

   $$PLD = \left(n - \frac{1}{2}\right)\lambda$$

   $$= \left(2 - \frac{1}{2}\right)(4)$$

   $$PLD = 6 \text{ cm}$$

3 f) $PLD = \left(n - \frac{1}{2}\right)\lambda$

$$= \left(4 - \frac{1}{2}\right)4$$

$PLD = 14 \text{ cm}$

④ a) $PLD = |16 - 15| = 1 \text{ cm}$

$PLD = \left(n - \frac{1}{2}\right)\lambda$

$1 = \left(1 - \frac{1}{2}\right)\lambda$

$\lambda = 2 \text{ cm}$

b) $v = f\lambda$

$$= (4)(2)$$

$v = 8 \text{ cm/s}$

⑤ a) inc. $\lambda \rightarrow$ less nodal lines

b) dec. distance $\rightarrow$ less nodal lines

c) inc. $f \rightarrow$ more nodal lines