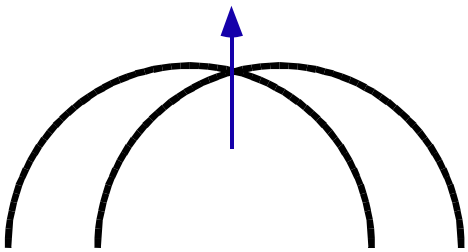
PhyzSpringboard: Intro to Interference in 2-D

DOUBLE CRESTS

1. Consider two ripple tank wave sources side-by-side as shown in *P:CC* D-11. If both sources make a pulse at the same time, the two resulting ripples will interfere as shown to the right.



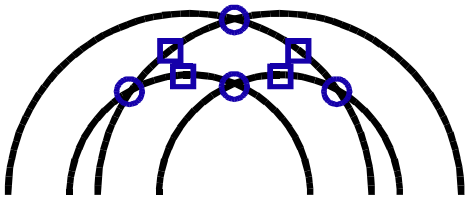
   a. Circle and label the location of the **double crest**, where the crests of the two ripples add to each other.

   b. The double crest is an example of _√_ constructive ___ destructive interference.

   c. Observe the motion of the double crest. How does it move relative to the line that connects the two sources? (Draw an arrow showing the path of the motion of the double crest.)

Perpendicular, away.

2. Suppose the two sources make a series of two pulses.



   a. Circle and label the location(s) of the double crest(s) on the diagram to the right.

   b. Consider the two double crests along the perpendicular bisector between the two sources.

      i. What lies halfway between the two double crests? A double trough.

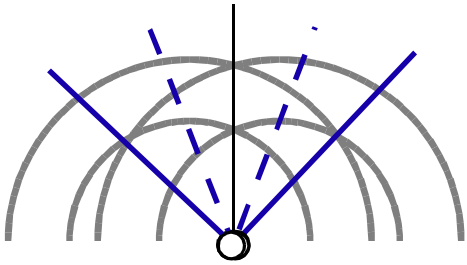
      ii. This is an example of _√_ constructive ___ destructive interference.

   c. Find four locations where the crest of one wave coincides with the trough of another.

      i. Mark them with small squares.

      ii. These are examples of ___ constructive _√_ destructive interference.

3. Examine the diagram to the right. It shows the two sets of ripples from the two sources. A line has been added along the central region of _____constructive_____ interference.



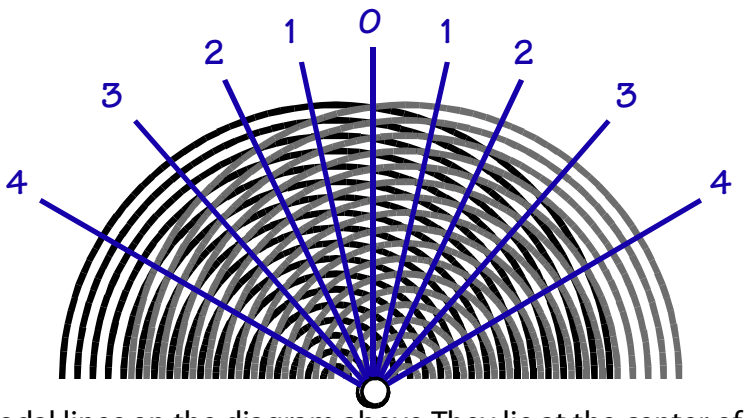
   a. This region would best be identified as a(n) ___ nodal _√_ antinodal zone. Label it on the diagram.

   b. Draw and label two more lines to identify regions of this type. (Start the line at the "origin" of the line already drawn—indicated by the small circle.)

   c. Draw and label two **dashed** lines to identify regions of the opposite type.

SUSTAINED INTERFERENCE

4. Observe what happens on P:CC when the two sources undergo sustained oscillations.



5. Draw and label antinodal lines on the diagram above. They lie at the center of the __√__ bright ___ dark zones. The nodal zones are __√__ dark ___ bright.

6. Consider the magnified and enhanced view of a section of the pattern shown below. Point S_1 is the location of the first source; S_2 is the location of the second source.

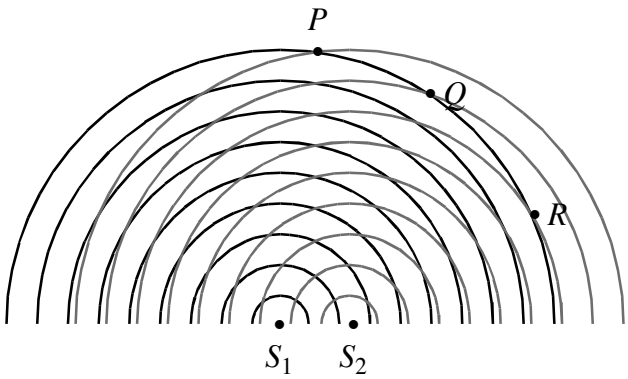
a. Point P lies on a double crest along the central antinode.

i. What is the pathlength from point S_1 to P in terms of the wavelength of the waves? 9λ

ii. What is the pathlength from point S_2 to P in terms of the wavelength of the waves? 9λ

iii. What is the difference in pathlengths?

√ 0λ	__0.5λ	__1.0λ	__1.5λ
__2.0λ	__2.5λ	__3.0λ	__4.0λ



b. Point Q lies on a double crest along the first antinode to the right.

i. What is the pathlength from point S_1 to Q in terms of the wavelength of the waves? 9λ

ii. What is the pathlength from point S_2 to Q in terms of the wavelength of the waves? 8λ

iii. What is the difference in pathlengths (most nearly)? 1λ

c. Point R lies on a double crest along the second antinode to the right. What is the difference in pathlengths from S_1 and S_2 to R (most nearly)? 2λ

7. Label the antinodal lines in the diagram AT THE TOP OF THE PAGE in terms of the pathlength differences they represent, expressed in wavelength multiples. (It's much harder to describe than it is to do. In other words, it's "easier **done** than **said**." Try to contain your laughter.)

8. The numbers are referred to as the _____order_____ numbers, abbreviated with the letter____m____.