MOVING SOURCES

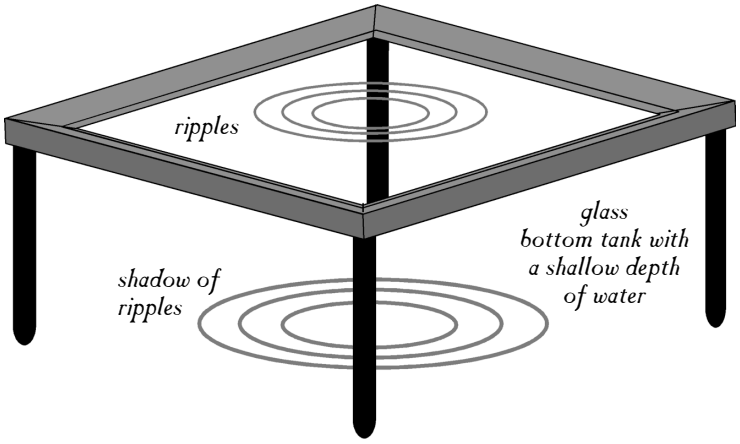
VIDEO DEMONSTRATIONS OF DOPPLER SHIFT AND BOW (SHOCK) WAVES

P:CC : Waves (I) · Doppler Effect and Shock Waves · Ripple Tank

Name:_____ Per:_____ Date:_____

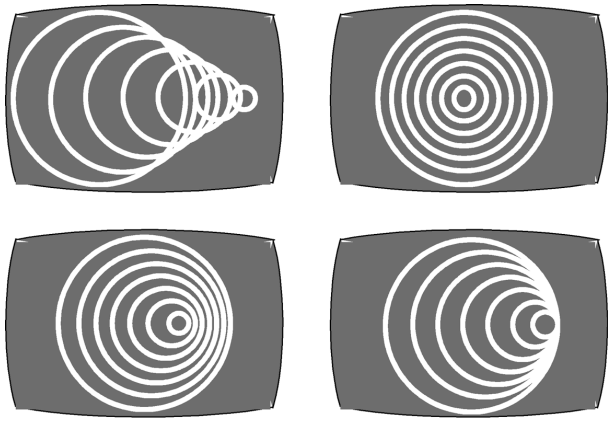
THE RIPPLE TANK

A ripple tank is like a small glass table with raised edges. A shallow depth of water lies atop the glass. Typically, a strong point light source is placed above the tank and shadows of ripples can be seen below the tank. A variety of two-dimensional wave demonstrations can be made by making ripples in the water.



1. THE STATIONARY SOURCE

No, that's not a paper supplier, silly! What would it look like if a series of waves were made by a stationary source *at the center* of the tank? In the video demonstration, they show the waves being generated at the left edge of the tank. Box the correct screenshot, cross out the incorrect ones.

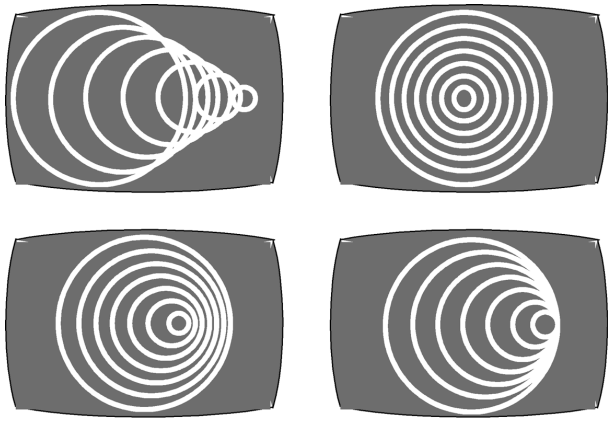


Write a mathematical expression describing the value of the source speed. Then write it in English.

v_s

2. THE MOVING SOURCE ($v_s = 7$ cm/s)

What would it look like if a series of waves were made by a moving source? Box the correct screenshot, cross out the incorrect ones.

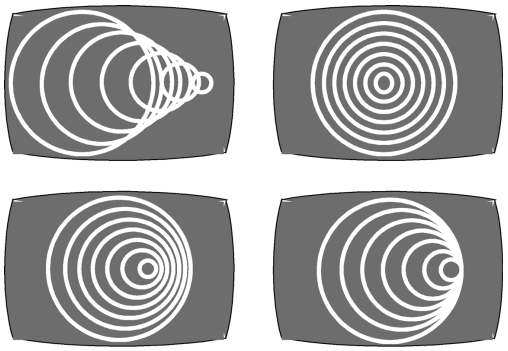


Write a mathematical expression describing the value of the source speed relative to the wave speed. Then write it in English.

v_s

3. THE FASTER SOURCE (v_s = 19 cm/s)

What would it look like if a series of waves were made by a faster-moving source? Perhaps a source moving at a speed equal to that of the waves. Watch the segments with the source moving slightly slower and slightly faster than the waves. Ask the instructor to sketch an image of what happens when the source and waves move at the same speed. Box the correct shot.

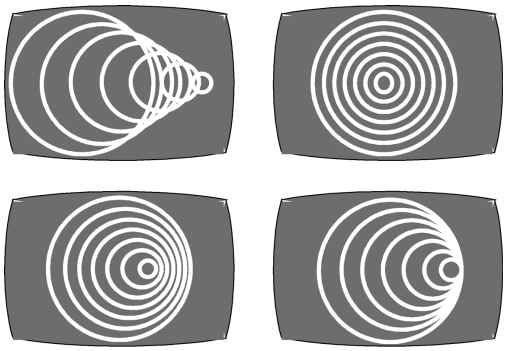


Write a mathematical and English expression describing the value of the source speed relative to the wave speed.

v_S

4. THE FASTEST SOURCE (v_s = 30 cm/s)

What would it look like if a series of waves were made by a source moving faster than the waves? Ask the instructor to freeze the frame when the source is at the center of the tank so you can make a sketch. Label the edges of the bow (shock) wave.



Write a mathematical expression describing the value of the source speed relative to the wave speed.

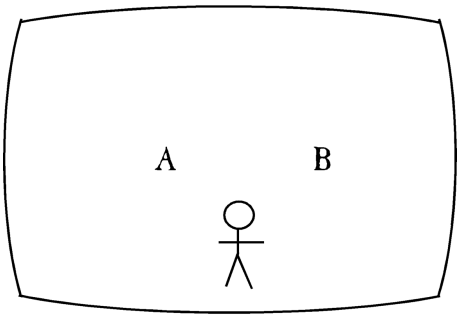
v_S

Write the expression involving θ and what it means.

5. THE MOVING SOURCE II (v_s = 14 cm/s)

Ask the instructor to draw a little dude on the screen using a dry-erase pen. Have the instructor show the moving source footage again.

a. If the waves represented sound, what would the observer hear when the source was at position A?

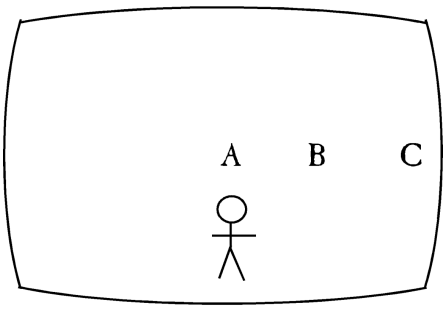


b. What would the observer hear when the source was at position B?

6. THE FASTEST SOURCE II (v_s = 34 cm/s)

With the little dude still on the screen, have the instructor show the fastest source footage again.

a. If the waves represented sound, what would the observer hear when the source was at position A?



b. What would the observer hear when the source was at position B?

c. What would the observer hear when the source was at position C?