

Jenny Au
Lesson 4
3/18/2014-3/28/2014

Summary of Lesson: Speaker Cone

While Mr. Vera's class was working with volumes of solids, bringing in a design experiment of speaker cones was a good way for students to see the applications dealing with volumes of solids.

Speaker cones can work as a cone that projects sound in a wider directional range that can spread out like a megaphone. Inversely, speaker cones can act as a sound capturing receiver. The objective of this experiment was compare the sound pressure level of a cylinder shape and cone shape and have the students decide which they think would be the better speaker cone design.

Students were familiar with the volume of a cylinder and the volume of a cone, but truncated cone was a shape the students have never seen before. The volume of a truncated cone was given to the students. The diameter of the foam covering the microphone part of the sound pressure meter was given as a design criteria and the height for the cylinder and truncated cone had to be the same. Students made their cylinder and truncated cones. They had to find the volume of each shape.

For the experiment, the set up was placing the cylinder on the sound pressure meter. This meter faces the speaker directly in front at 1 feet away and this is considered the 90 degree angle. They move the device to a 45 degree angle and then at 0 degree angle (facing the side of the speaker). For the three angles, the sound pressure level was measured and this was repeated for the truncated cone. The data was collected and the students had to find a relationship between the sound pressure level measured and the angles related to each shape.

The students found that the cone had higher sound levels.

GK-12 Lesson Plan

Teacher: A.J. Vera

Period: 1,2,3,5,7

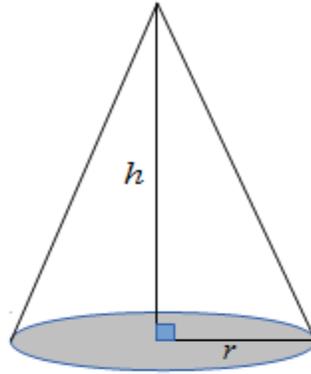
Date(s): 3/18/2014-3/28/2014

Class: Lawrence High School Geometry Class

SETTING THE STAGE	
<u>Essential Question</u>	How would you design your speaker cone?
<u>Content Objective(s)</u> (Student-friendly)	Speaker cones can work as a cone that projects sounds in a wider directional range that can spread out like a megaphone. Inversely, speaker cones can act as a sound capturing receiver. The objective is to compare a cylinder shape and a cone shape for design of speaker cone.
<u>Connection to previous or future lessons</u>	Volume of solids used as a design parameter in the speaker cone design. Changing the angle of the position of the sound pressure level meter
<u>Critical Thinking Questions</u>	Is there a relationship between the volume of the cone/cylinder and the sound pressure level?
<u>Key Vocabulary</u>	Cone, cylinder, speaker design, sound, sound pressure level, volume
<u>Materials Needed/Safety</u>	Paper, scissors, tape, sound pressure level meter, random noise generator, speaker, amplifier, ruler
ACTIVE INSTRUCTION	
<ul style="list-style-type: none"> • Launch (Engage) 	Volume of cone and cylinder and truncated cone were given. Tip of the cone is cut off and becomes truncated cone. Students in groups of 4 were given paper to construct a cylinder and a truncated cone of the same height. They were to design the radius of the truncated cone. The parameters given were the diameter of the sound pressure level meter.
<ul style="list-style-type: none"> • Investigation (Explore) 	After construction of the cone and cylinder, the volume of each shape was calculated. For the experiment, the set up was placing the cylinder on the sound pressure meter. This meter faces the speaker directly in front at 1 feet away and this is considered the 90 degree angle. They move the device to a 45 degree angle and then at 0 degree angle (facing the side of the speaker). For the three angles, the sound pressure level was measured and this was repeated for the truncated cone.
TIME FOR REFLECTION	
<ul style="list-style-type: none"> • Summarization (Explain & Extend) 	Students presented their experiment. Each group had different design parameters for the radius of the truncated cone. The cone is a better design to capture the sound at various angles.
<ul style="list-style-type: none"> • Assessment (Evaluate) 	Mr. Vera grades them for class participation in his own grading book.

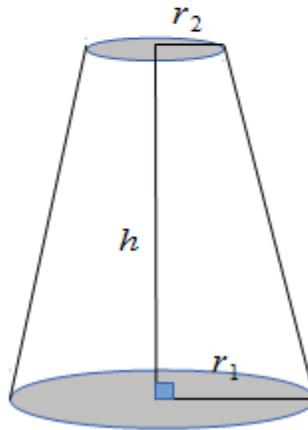
Volume of Cone

$$V = \frac{1}{3} \pi r^2 h$$



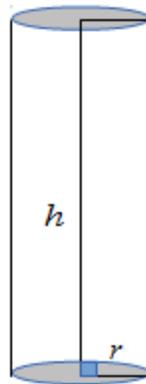
Volume of Truncated Cone

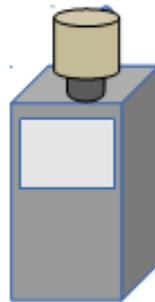
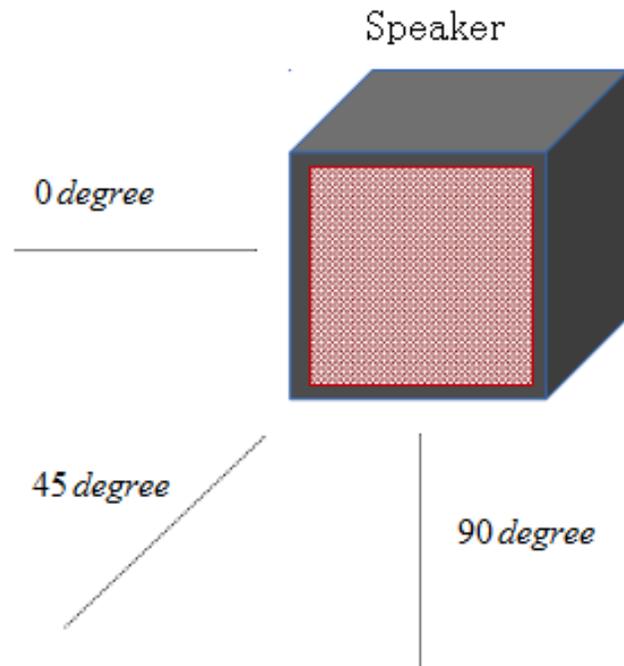
$$V = \frac{1}{3} \pi (r_1^2 + r_1 r_2 + r_2^2) h$$



Volume of Cylinder

$$V = \pi r^2 h$$





Place truncated cone or cylinder over the sound pressure level meter