LESSON MAKER PRO

Wave Speed Lab

Use wave models to connect speed, wavelength, and frequency.

GRADE 8 · 8.17

8.17 "Use models of mechanical and electromagnetic waves to qualitatively describe the relationships among wave properties, including amplitude, wavelength, and frequency. a. Use models to compare and contrast light and sound wave behaviors..."

NAME _____ DATE _____

THE WAVE RULE

A wave's speed equals its wavelength times its frequency: speed = wavelength × frequency. Wavelength is the distance from one wave peak to the next, and frequency is the number of waves that pass a point each second. In the same material, a higher frequency means a shorter wavelength if the wave's speed stays the same.

WORKED EXAMPLE

A wave moves along a spring. Its wavelength is 7 m, and its frequency is 6 Hz. What is its speed?

1. Write the rule: speed = wavelength × frequency.
2. Substitute: speed = 7 m × 6 Hz.
3. Multiply: speed = 42 m/s.

Answer: 42 m/s

PRACTICE 6 problems

1 Use the table to find the speed of sound wave A.

SOUND WAVE MODEL

Wave	Wavelength	Frequency
A	2 m	170 Hz

ANSWER _____

2 A sound wave travels at 340 m/s and has a wavelength of 5 m. What is its frequency?

ANSWER _____

3 A sound wave travels at 340 m/s and has a frequency of 85 Hz. What is its wavelength?

ANSWER _____

4 These sound waves travel through the same air. Which wave has the higher frequency, and how does its wavelength compare with the other wave's wavelength?

TWO SOUND WAVES

Wave	Wavelength	Frequency
A	1.7 m	200 Hz
B	3.4 m	100 Hz

ANSWER _____

_____

5 A radio wave, which is an electromagnetic wave, has a wavelength of 300 m and a frequency of 1,000,000 Hz. What is its speed?

ANSWER _____

6 A 425 Hz sound wave travels at 340 m/s and reflects off a wall back into the same air. What is the reflected wave's wavelength?

ANSWER _____

APPLY IT Show your work

1 At a concert, a speaker plays a 40 Hz bass note and then an 80 Hz bass note. Both sound waves travel through air at 340 m/s. What is the wavelength of each note?

WORK SPACE

ANSWER _____

2 At a school game, a student listens to an FM radio broadcast. Use the model to find the broadcast wave's speed. Which travels faster, the radio wave or the announcer's sound wave?

WAVES AT THE GAME

Wave	Wavelength	Frequency	Speed
Radio wave	3 m	100,000,000 Hz	?
Sound wave in air	Not given	Not given	340 m/s

ANSWER _____

CHALLENGE One step up

A 200 Hz sound wave travels from air, where its speed is 340 m/s, into water, where its speed is 1,500 m/s. Its frequency stays the same. Find its wavelength in each material. Explain why the wavelengths differ.

WORK SPACE AND ANSWER

ANSWER KEY

Wave Speed Lab

GRADE 8 · 8.17

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Use the table to find the speed of sound wave A.	**340 m/s**
2	A sound wave travels at 340 m/s and has a wavelength of 5 m. What is its frequency?	**68 Hz**
3	A sound wave travels at 340 m/s and has a frequency of 85 Hz. What is its wavelength?	**4 m**
4	These sound waves travel through the same air. Which wave has the higher frequency, and how does its wavelength compare with the other wave's wavelength?	**Wave A has the higher frequency. Its wavelength is half of wave B's wavelength.**
5	A radio wave, which is an electromagnetic wave, has a wavelength of 300 m and a frequency of 1,000,000 Hz. What is its speed?	**300,000,000 m/s**
6	A 425 Hz sound wave travels at 340 m/s and reflects off a wall back into the same air. What is the reflected wave's wavelength?	**0.8 m**

PART 2 · APPLY IT

1. **40 Hz note: 8.5 m; 80 Hz note: 4.25 m.** Divide speed by frequency for each note: 340 / 40 = 8.5 m and 340 / 80 = 4.25 m.
2. **The radio wave travels at 300,000,000 m/s, faster than the sound wave.** Multiply 3 m by 100,000,000 Hz to find the radio wave's speed. Compare 300,000,000 m/s with 340 m/s.

CHALLENGE

The wavelength is 1.7 m in air and 7.5 m in water. The wave travels faster in water while its frequency stays at 200 Hz, so its wavelength is longer in water.

Accept equivalent decimal forms, such as 0.50 m for 0.5 m. For the comparison items, accept wording that clearly identifies the faster wave or the shorter wavelength.