LESSON MAKER PRO

Wave Math Lab

Find wave speed, frequency, and wavelength in real situations.

HIGH SCHOOL · P.7

P.7 "Obtain, evaluate, and communicate information regarding the propagation, properties, and applications of waves. a. Use mathematics and computational thinking to describe the relationships among the velocity, frequency..."

NAME _____ DATE _____

THE WAVE RELATIONSHIP

A wave's speed v equals its frequency f times its wavelength λ, so v = fλ. To find frequency, use f = v/λ. To find wavelength, use λ = v/f. Keep distance units consistent when you calculate.

WORKED EXAMPLE

A wave has a frequency of 7 Hz and a wavelength of 9 m. What is its speed?

1. Start with v = fλ.
2. Substitute: v = 7 Hz × 9 m.
3. Calculate: v = 63 m/s.

Answer: 63 m/s

PRACTICE 6 problems

1 A wave has a frequency of 5 Hz and a wavelength of 6 m. Find its speed.

ANSWER _____

2 A wave has a frequency of 12 Hz and a wavelength of 3 m. Find its speed.

ANSWER _____

3 A wave travels at 80 m/s and has a frequency of 10 Hz. Find its wavelength.

ANSWER _____

4 A sound wave travels at 1500 m/s and has a frequency of 500 Hz. Find its wavelength.

ANSWER _____

5 A wave travels at 48 m/s and has a wavelength of 6 m. Find its frequency.

ANSWER _____

6 Use the table to find the frequency of wave A and the frequency of wave B.

TWO WAVES

Wave	Speed (m/s)	Wavelength (m)
A	24	2
B	24	6

ANSWER _____

APPLY IT Show your work

1 A gaming headset plays a 110 Hz tone. If sound travels at 330 m/s through the air, what is the tone's wavelength?

WORK SPACE

ANSWER _____

2 A Wi-Fi signal has a frequency of 1.5×10^9 Hz and travels at 3×10^8 m/s. What is its wavelength?

WORK SPACE

ANSWER _____

CHALLENGE One step up

A 170 Hz sound wave travels from air, where its speed is 340 m/s, into helium, where its speed is 1020 m/s. Find its wavelength in each gas. Explain why its frequency stays the same when it enters helium.

WORK SPACE AND ANSWER

Wave Math Lab

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A wave has a frequency of 5 Hz and a wavelength of 6 m. Find its speed.	**30 m/s**
2	A wave has a frequency of 12 Hz and a wavelength of 3 m. Find its speed.	**36 m/s**
3	A wave travels at 80 m/s and has a frequency of 10 Hz. Find its wavelength.	**8 m**
4	A sound wave travels at 1500 m/s and has a frequency of 500 Hz. Find its wavelength.	**3 m**
5	A wave travels at 48 m/s and has a wavelength of 6 m. Find its frequency.	**8 Hz**
6	Use the table to find the frequency of wave A and the frequency of wave B.	**Wave A: 12 Hz; wave B: 4 Hz**

PART 2 · APPLY IT

1. **3 m** Use $\lambda = v/f$. Divide 330 m/s by 110 Hz to get 3 m.
2. **0.2 m** Use $\lambda = v/f$. Dividing 3×10^8 by 1.5×10^9 gives 0.2 m.

CHALLENGE

The wavelength is 2 m in air and 6 m in helium. The source sets the frequency, so the wave keeps its frequency as its speed and wavelength change at the boundary.

Accept equivalent units, such as 20 cm for the Wi-Fi wavelength. In the challenge, accept an explanation that the wave cannot change how often it oscillates when it crosses the boundary.