LESSON MAKER PRO

Wave Speed Lab

Connect wave speed, frequency, and wavelength.

HIGH SCHOOL · P.7.a

P.7.a "Use mathematics and computational thinking to describe the relationships among the velocity, frequency, and wavelength of a propagating wave."

NAME _____ DATE _____

THE WAVE RULE

A wave's speed equals its frequency multiplied by its wavelength: speed = frequency × wavelength. Use frequency in hertz (Hz) and wavelength in meters (m) to find speed in meters per second (m/s).

WORKED EXAMPLE

A wave has a frequency of 7 Hz and a wavelength of 8 m. Find its speed.

1. Write the rule: speed = frequency × wavelength.
2. Substitute the values: speed = 7 Hz × 8 m.
3. Multiply: speed = 56 m/s.

Answer: 56 m/s

PRACTICE 6 problems

1 A wave has a frequency of 4 Hz and a wavelength of 3 m. Find its speed.

ANSWER _____

2 A wave travels at 90 m/s and has a frequency of 15 Hz. Find its wavelength.

ANSWER _____

3 A wave travels at 120 m/s and has a wavelength of 10 m. Find its frequency.

ANSWER _____

4 Wave A has a frequency of 2 Hz and a wavelength of 9 m. Wave B has a frequency of 3 Hz and a wavelength of 10 m. Find each speed and identify the faster wave.

ANSWER _____

5 A wave has a frequency of 40 Hz and a wavelength of 25 cm. Find its speed in m/s. Remember that 100 cm = 1 m.

ANSWER _____

6 A wave travels at a constant speed and has a wavelength of 6 m. Its frequency doubles. Find its new wavelength and explain why.

ANSWER _____

APPLY IT Show your work

1 At a concert, a speaker produces a sound wave with a frequency of 85 Hz. If sound travels at 340 m/s, what is the wave's wavelength?

WORK SPACE

ANSWER _____

2 A phone sends a Bluetooth signal at 2.4 GHz. The wave travels at 300,000,000 m/s. What is its wavelength in meters? Use 1 GHz = 1,000,000,000 Hz.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Waves travel through the same rope at a constant speed. Use the table to find both missing wavelengths. Then explain how wavelength changes when frequency doubles.

WAVES ON A ROPE

Frequency (Hz)	Wavelength (m)
10	6
20	?
40	?

WORK SPACE AND ANSWER

Wave Speed Lab

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A wave has a frequency of 4 Hz and a wavelength of 3 m. Find its speed.	**12 m/s**
2	A wave travels at 90 m/s and has a frequency of 15 Hz. Find its wavelength.	**6 m**
3	A wave travels at 120 m/s and has a wavelength of 10 m. Find its frequency.	**12 Hz**
4	Wave A has a frequency of 2 Hz and a wavelength of 9 m. Wave B has a frequency of 3 Hz and a wavelength of 10 m. Find each speed and identify the faster wave.	**Wave A: 18 m/s. Wave B: 30 m/s. Wave B is faster.**
5	A wave has a frequency of 40 Hz and a wavelength of 25 cm. Find its speed in m/s. Remember that 100 cm = 1 m.	**10 m/s**
6	A wave travels at a constant speed and has a wavelength of 6 m. Its frequency doubles. Find its new wavelength and explain why.	**3 m. At a constant speed, doubling frequency halves wavelength.**

PART 2 · APPLY IT

1. **4 m** Divide speed by frequency: 340 m/s ÷ 85 Hz = 4 m.
2. **0.125 m** Convert 2.4 GHz to 2,400,000,000 Hz. Divide 300,000,000 m/s by 2,400,000,000 Hz to get 0.125 m.

CHALLENGE

At 20 Hz, the wavelength is 3 m. At 40 Hz, it is 1.5 m. When frequency doubles at a constant speed, wavelength halves.

Accept equivalent units where appropriate, such as 12.5 cm for the Bluetooth wavelength. For the challenge, the wave speed is 60 m/s throughout.