LESSON MAKER PRO

Wave Speed Switch

Calculate how frequency, wavelength, and speed connect.

HIGH SCHOOL · PS.PS4.1

PS.PS4.1 "Use mathematical representations to explain both qualitative and quantitative relationships among frequency, wavelength, and speed of waves traveling in various media."

NAME _____ DATE _____

THE WAVE RULE

Wave speed equals frequency times wavelength: v = f × wavelength. If frequency stays the same, a faster wave has a longer wavelength.

WORKED EXAMPLE

Find the speed of this wave on a rope.

Frequency	Wavelength
11 Hz	3 m

1. v = f × wavelength
2. v = 11 Hz × 3 m
3. v = 33 m/s

Answer: 33 m/s

PRACTICE 4 problems

1 A wave has a frequency of 20 Hz and a wavelength of 4 m. Find its speed.

ANSWER _____

2 A wave travels at 36 m/s with a wavelength of 9 m. Find its frequency.

ANSWER _____

3 A wave travels at 56 m/s with a frequency of 7 Hz. Find its wavelength.

ANSWER _____

4 A 10 Hz wave travels at 40 m/s. Its wavelength doubles while its frequency stays the same. Find its new speed and explain.

ANSWER _____

APPLY IT Show your work

1 At a concert, a bass speaker plays an 85 Hz tone. Sound travels through air at 340 m/s. Find the wavelength.

WORK SPACE

ANSWER _____

2 An underwater robot sends a 750 Hz sound signal through water at 1500 m/s. Find the wavelength.

WORK SPACE

ANSWER _____

CHALLENGE One step up

A wave crosses from one rope section into another. Its frequency stays at 12 Hz. Find the wavelength in each section. How does the change in wavelength compare with the change in speed?

WAVE SPEEDS

Rope section	Speed
A	48 m/s
B	72 m/s

WORK SPACE AND ANSWER

ANSWER KEY

Wave Speed Switch

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A wave has a frequency of 20 Hz and a wavelength of 4 m. Find its speed.	**80 m/s**
2	A wave travels at 36 m/s with a wavelength of 9 m. Find its frequency.	**4 Hz**
3	A wave travels at 56 m/s with a frequency of 7 Hz. Find its wavelength.	**8 m**
4	A 10 Hz wave travels at 40 m/s. Its wavelength doubles while its frequency stays the same. Find its new speed and explain.	**80 m/s. At the same frequency, doubling wavelength doubles speed.**

PART 2 · APPLY IT

1. **4 m** Divide speed by frequency: 340 m/s ÷ 85 Hz = 4 m.
2. **2 m** Divide speed by frequency: 1500 m/s ÷ 750 Hz = 2 m.

CHALLENGE

A: 4 m; B: 6 m. Speed and wavelength both increase by a factor of 1.5.

Accept equivalent explanations that correctly state speed and wavelength change by the same factor when frequency stays constant.