LESSON MAKER PRO

Waves on the Move

Use wave models to compare speed and behavior.

GRADE 8 · 8.17.a

8.17.a "Use models to compare and contrast light and sound wave behaviors, including reflection, refraction, diffraction, and speed, as waves propagate and interact with matter."

NAME _____ DATE _____

FIND THE SPEED

A wave's speed is the distance it travels divided by the time it takes: speed = distance / time. Keep distance and time on the same trip, and compare speeds in the same units. For an echo, sound travels to a surface and back.

WORKED EXAMPLE

Sound travels 990 m through cold air in 3 s. Find its speed.

1. Write the rule: speed = distance / time.
2. Substitute: speed = 990 m / 3 s.
3. Divide: speed = 330 m/s.

Answer: 330 m/s

PRACTICE 6 problems

1 Sound travels 680 m through air in 2 s. What is its speed?

ANSWER _____

2 Sound travels 7,500 m through water in 5 s. What is its speed?

ANSWER _____

3 Light travels about 1,200,000 km through empty space in 4 s. What is its approximate speed?

ANSWER _____

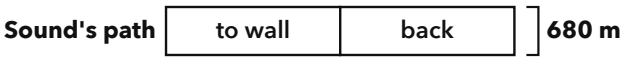
4 The table models light traveling through two materials. In which material is light slower, and by how many km/s?

LIGHT SPEED MODEL

Material	Distance traveled	Time
Air	300,000 km	1 s
Glass	200,000 km	1 s

ANSWER _____

5 A clap makes an echo when sound travels to a wall and back. Use the path model. How far is the wall from the clap, and what wave behavior causes the echo?



ANSWER _____

6 Sound spreads through an open doorway and reaches a listener to the side. It travels 34 m in 0.1 s. What is its speed, and what wave behavior occurs at the doorway?

ANSWER _____

APPLY IT Show your work

1 A student claps in a parking garage and hears the echo 0.4 s later. Sound travels at about 340 m/s in the garage. How far away is the wall that reflected the sound?

WORK SPACE

ANSWER _____

2 At a pool, a student watches a toy underwater. Light from the toy changes direction as it passes from water into air. Use the approximate speeds in the model. What fraction of its speed in air is light's speed in water? Name the behavior shown by the change in direction.

LIGHT SPEED MODEL

Material	Approximate light speed
Water	225,000 km/s
Air	300,000 km/s

ANSWER _____

CHALLENGE One step up

At a gym doorway, a student standing around a corner hears a speaker but cannot see a light next to it. The table models how far each wave travels along an open path. Calculate each wave's speed. Explain why the sound reaches the student even though the light does not. Is the speed difference the reason?

WAVE TRAVEL MODEL

Wave	Distance	Time
Sound in air	34 m	0.1 s
Light in air	600,000 km	2 s

WORK SPACE AND ANSWER

ANSWER KEY

Waves on the Move

GRADE 8 · 8.17.a

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Sound travels 680 m through air in 2 s. What is its speed?	**340 m/s**
2	Sound travels 7,500 m through water in 5 s. What is its speed?	**1,500 m/s**
3	Light travels about 1,200,000 km through empty space in 4 s. What is its approximate speed?	**300,000 km/s**
4	The table models light traveling through two materials. In which material is light slower, and by how many km/s?	**Glass; 100,000 km/s slower**
5	A clap makes an echo when sound travels to a wall and back. Use the path model. How far is the wall from the clap, and what wave behavior causes the echo?	**340 m; reflection**
6	Sound spreads through an open doorway and reaches a listener to the side. It travels 34 m in 0.1 s. What is its speed, and what wave behavior occurs at the doorway?	**340 m/s; diffraction**

PART 2 · APPLY IT

1. **68 m** Sound travels 340 × 0.4 = 136 m in the round trip. Divide by 2 to find the one-way distance: 68 m.
2. **3/4; refraction** Divide 225,000 by 300,000 to get 3/4. The change in direction at the boundary is refraction.

CHALLENGE

Sound: 340 m/s. Light: about 300,000 km/s. Sound diffracts, spreading around the doorway toward the student. Light also diffracts, but its spreading at a doorway is too small to notice. The speed difference does not explain why the student hears the speaker but cannot see the light.

Accept equivalent fractions for 3/4. Light speeds are approximate; accept answers that clearly distinguish diffraction from a difference in speed.