LESSON MAKER PRO

Wave Pattern Detectives

Use models to compare amplitude, wavelength, and motion.

GRADE 4 · 4-PS4-1

4-PS4-1 "Develop a model of waves to describe patterns in terms of amplitude and wavelength and that waves can cause objects to move. Clarification Statement: Examples of models could include diagrams, analogies..."

NAME _____ DATE _____

WAVE CLUES

In a wave model, amplitude tells how far a crest or trough is from the resting line. Wavelength is the distance from one repeating point to the next matching point, such as crest to crest. Waves can carry energy that makes objects move.

WORKED EXAMPLE

A wire wave model has a crest, then a trough, then the next crest. Which two points show one wavelength?

1. Look for points that repeat in the same position in the pattern.
2. The first crest and the next crest are matching points.
3. The distance from the first crest to the next crest is one wavelength.

Answer: One wavelength is shown from the first crest to the next crest.

PRACTICE 6 problems

1 A rope wave keeps the same crest height, but its crests become farther apart. Which wave feature changed?

ANSWER _____

2 A student marks two neighboring troughs on a wave model. What wave feature is shown by the distance between the marks?

ANSWER _____

3 Wave A has crests that are lower above the same resting line than Wave B's crests. Which wave has greater amplitude?

ANSWER _____

4 A cork bobs up, down, and up again while a water wave travels across a pond. Does the cork travel across the pond with the wave? Explain.

ANSWER _____

5 One slinky wave has crests close together. Another slinky wave has crests farther apart. Which wave has the longer wavelength?

ANSWER _____

6 Maya says, "Amplitude tells how far apart the crests are." Is Maya correct? Write a corrected statement.

ANSWER _____

_____

APPLY IT Show your work

1 At recess, Leo and Aria each make waves with a jump rope. Leo makes taller crests than Aria. Aria makes crests that are farther apart than Leo's. Which student makes the wave with greater amplitude, and which student makes the wave with longer wavelength?

WORK SPACE

ANSWER _____

2 During a music show, a speaker vibrates near small paper bits. The paper bits begin to wiggle. Explain how this shows that a wave can cause an object to move.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Wave Red has lower crests and crests farther apart. Wave Blue has taller crests and crests closer together. Which wave has greater amplitude? Which wave has longer wavelength? Explain your reasoning. Then develop your own labeled drawings of both repeating waves on separate paper. Draw a resting line for each. Mark amplitude from that line to a crest and wavelength between neighboring crests. Add a cork to one water-wave model, with arrows showing its bobbing and a separate arrow showing the wave traveling across the water. Explain how the model shows a wave making an object move. Compare features without numerical measurements.

WORK SPACE AND ANSWER

ANSWER KEY

Wave Pattern Detectives

GRADE 4 · 4-PS4-1

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A rope wave keeps the same crest height, but its crests become farther apart. Which wave feature changed?	**The wavelength changed.**
2	A student marks two neighboring troughs on a wave model. What wave feature is shown by the distance between the marks?	**The distance shows one wavelength.**
3	Wave A has crests that are lower above the same resting line than Wave B's crests. Which wave has greater amplitude?	**Wave B has greater amplitude.**
4	A cork bobs up, down, and up again while a water wave travels across a pond. Does the cork travel across the pond with the wave? Explain.	**No. The cork mainly bobs up and down while the wave's energy travels across the pond.**
5	One slinky wave has crests close together. Another slinky wave has crests farther apart. Which wave has the longer wavelength?	**The wave with crests farther apart has the longer wavelength.**
6	Maya says, "Amplitude tells how far apart the crests are." Is Maya correct? Write a corrected statement.	**No. Amplitude tells how far a crest or trough is from the resting line.**

PART 2 · APPLY IT

1. **Leo's wave has greater amplitude. Aria's wave has longer wavelength.** Compare crest height to identify amplitude. Compare the spacing between crests to identify wavelength.
2. **The vibrating speaker makes the air move, and the moving air pushes the paper bits so they wiggle.** The speaker's vibration creates a sound wave in the air. That moving energy causes the paper bits to move.

CHALLENGE

Wave Blue has greater amplitude because its crests are taller above the same resting line. Wave Red has longer wavelength because its crests are farther apart. Drawings must show Blue taller from its resting line and Red with wider crest spacing, with amplitude and wavelength correctly marked. In the simplified water-wave model, vertical cork arrows show mainly up-and-down motion while a horizontal arrow shows wave travel. The wave transfers energy that makes the cork move; the cork does not travel across the pond with the wave.

Accept equivalent wording that correctly identifies amplitude as height from the resting line and wavelength as spacing between matching points. For object-motion responses, accept statements that explain energy moving through a wave can make an object move. Require the learner-created wave drawings, labels and object-motion explanation. A verbal comparison alone does not complete the modeling task. Accept equivalent diagrams with trough-to-trough wavelength and amplitude measured from the resting line to a trough; do not require numerical amplitude or wavelength calculations.