Ripple Energy

Use a wave model to compare amplitude and energy.

8.PS4.1 "Use mathematical representations to describe patterns in a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline the rule connecting amplitude to relative energy, then circle the amplitude and energy values for the 2 mm and 4 mm ripples so you can compare how both quantities change.

Ripples in the Tank

1. At a science museum, a paddle makes steady ripples in a shallow water tank. A sensor records how far each crest rises above the water's resting level. This height is the wave's amplitude. The paddle keeps the ripple rate steady, and the water depth stays the same. Only the amplitude changes between trials.

2. The table shows a simple model of the tank's waves. Each amplitude is measured in millimeters. The energy numbers are relative units, not joules: they show how the waves compare under the same conditions. In this model, relative energy equals amplitude multiplied by itself. The pattern holds here because the ripple rate and water conditions do not change.

SIMPLE MODEL OF TANK RIPPLES

Amplitude (mm)	Relative energy (units)
1	1
2	4
3	9
4	16

3. A taller ripple carries more energy, but energy does not rise by the same factor as amplitude. If amplitude is multiplied by a number, this model multiplies relative energy by that number twice. The sensor measures amplitude, not energy. Scientists use those measurements and the model to compare ripples under controlled conditions.

2 ANSWER WITH EVIDENCE

Use the passage

1. When amplitude increases from 1 mm to 3 mm, what are the two energy values? By what factor does energy increase?

2. Compare the 2 mm and 4 mm ripples. By what factor does amplitude increase, and by what factor does relative energy increase?

3. If the same model included a 5 mm ripple, what would its relative energy be? Show your calculation.

4. How many more relative energy units does a 4 mm ripple have than a 3 mm ripple? Show your subtraction.

3 YOUR TURN

Your own words

Choose two amplitudes not shown in the table, with one exactly twice the other. Calculate their relative energies using the model, then explain how doubling amplitude changes energy.

ANSWER KEY

Ripple Energy

GRADE 8 · 8.PS4.1

PART 1 · READ AND MARK

Underline the rule connecting amplitude to relative energy, then circle the amplitude and energy values for the 2 mm and 4 mm ripples so you can compare how both quantities change. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	When amplitude increases from 1 mm to 3 mm, what are the two energy values? By what factor does energy increase?	**Energy increases from 1 to 9 relative units, a factor of 9.**
2	Compare the 2 mm and 4 mm ripples. By what factor does amplitude increase, and by what factor does relative energy increase?	**Amplitude doubles, while relative energy increases from 4 to 16 units, a factor of 4.**
3	If the same model included a 5 mm ripple, what would its relative energy be? Show your calculation.	**5 × 5 = 25 relative energy units.**
4	How many more relative energy units does a 4 mm ripple have than a 3 mm ripple? Show your subtraction.	**16 − 9 = 7 more relative energy units.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

I chose amplitudes of 5 mm and 10 mm. Their relative energies are 5 × 5 = 25 units and 10 × 10 = 100 units. Doubling the amplitude makes the relative energy four times as large.

Accept any two positive amplitudes absent from the table if one is twice the other, both energies are the squares of those amplitudes, and the comparison states that energy increases by a factor of 4.