Teacher Guide: Wave interference activity

**Group Members**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Objective:** Working in a group, you will explore different visual models that illustrate how two waves combine so that both can occupy the same space.

# Model One

Two different ways that waves can interfere with each other. 
Concept Questions

1. Predict how the waves in Set A combine and sketch the result.

*The waves will combine to form a wave with twice the magnitude.*

1. Predict how the waves in Set B combine and sketch the result.

*The waves will combine and cancel out.*

1. Set A represents **constructive wave interference**. Define this term in your own words.

*Constructive interference describes when waves combine that have amplitude in the same direction so that the result is a wave with a larger amplitude than the original waves.*

1. Set B represents **destructive wave interference**. Define this term in your own words.

*Destructive interference describes when waves combine that have amplitudes opposite directions so that the result is a wave with a smaller amplitude than the original waves.*

**For the following, assume the two waves have the same frequency and velocity but are traveling in opposite directions.**

1. Sketch a wave that will destructively interfere with the wave on the left.
2. Sketch two waves that are different from the previous drawings that will destructively interfere when they meet.

*Drawings will vary, but amplitudes of the waves should be inverted about the zero line so that they cancel.*

1. Sketch two waves that will only partially experience destructive interference.

*Drawings will vary, but amplitudes of the waves should be inverted about the zero line so that they cancel.*

1. Sketch a wave that will constructively interfere with the following wave. 

# Model 2

Wave interference using a different way to draw the area under peaks and troughs.

1. Two pulse waves are sent through a spring in opposite directions as shown above. On the graph below, sketch the result of the pulse waves at the instant they combine. Is this **constructive** or **destructive** interference?

*This is destructive interference. The 2 squares directly above the zero line cancel the two squares directly below it.*

1. Two pulse waves are sent through a spring in opposite directions as shown below. On the graph below, sketch the result of the pulse waves at the instant they combine. Is this **constructive** or **destructive** interference?



*This is constructive interference. Since both wave amplitudes are above the zero line, they combine to produce a new amplitude that is the positive sum of both amplitudes.*

1. Sketch an original pulse wave pattern using blocks to represent peak and trough area and show the result of the combined pulse waves.

*Drawings will vary. Check that amplitudes above (positive) and below (negative) the zero line add correctly.*