

## Wave Interference Lesson Notes

### Learning Outcomes

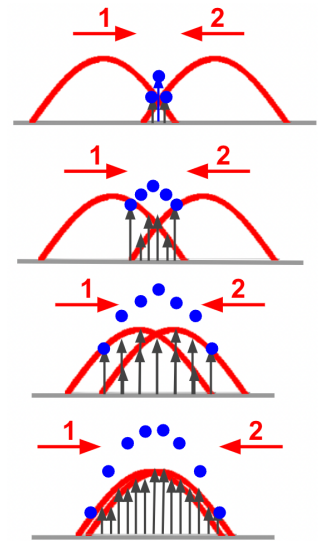
- How do you distinguish between constructive and destructive interference?
- How can the principle of superposition predict the shape of the wave resulting from interference?

### What is Interference?

- Interference is the phenomenon that occurs when two waves moving different directions in the same medium meet up with one another.
- Each wave has their own individual influence upon the medium; but when they meet the medium momentarily takes on a shape that reflects the sum of each influence.

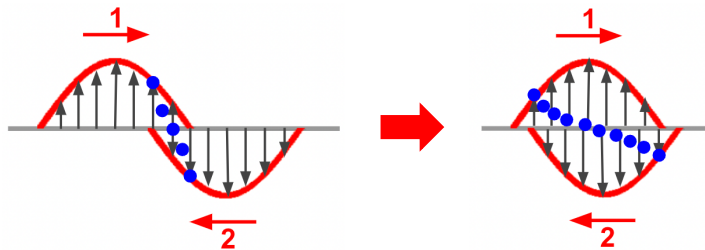
### Constructive Interference

- When waves interfere, there can be locations where the interference is constructive.
- **Constructive interference** causes the medium to be displaced by an amount that is greater than the displacement caused by each interfering wave.
- The meeting of two upward-displaced pulses or two downward-displaced pulses leads to constructive interference.



### Destructive Interference

- Interference can also be destructive if each individual pulse causes the medium to be displaced in opposite directions.
- The meeting of an upward-displaced pulse with a downward-displaced pulse leads to **destructive interference**.
- Sometimes destructive interference of two waves can result in complete cancellation of each other.



### Principle of Superposition

When two waves interfere, the resulting displacement of the medium at any location is the algebraic sum of the displacements of the individual waves at that same location.

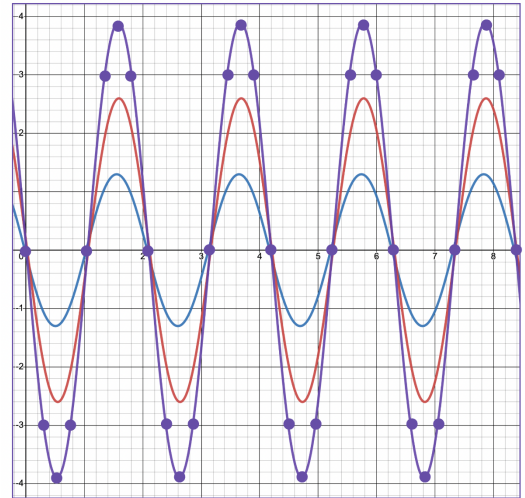
$\Delta Y$ of Pulse 1	$\Delta Y$ of Pulse 2	=	Resulting $\Delta Y$
+1	+2	=	+3
-1	-1	=	-2
+1	-1	=	0
+1	-3	=	-2

### Applying the Principle of Superposition 1

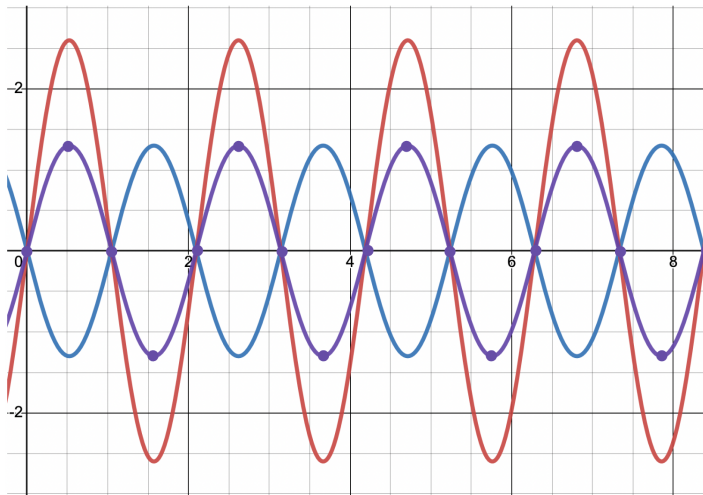
#### Method of Determining Resultant:

1. Pick strategic points.
2. Use grid to identify the  $\Delta Y$  of wave 1 and wave 2 at each point.
3. Add the  $\Delta Y$  of the two waves to determine the  $\Delta Y$  of the resultant. Place a dot on the grid at that point.
4. Once you have enough points, draw the resultant wave.

This is an example of **constructive interference**.

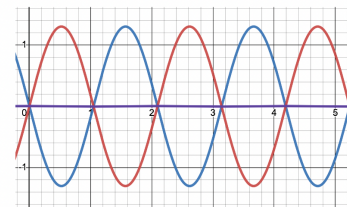


### Applying the Principle of Superposition 2

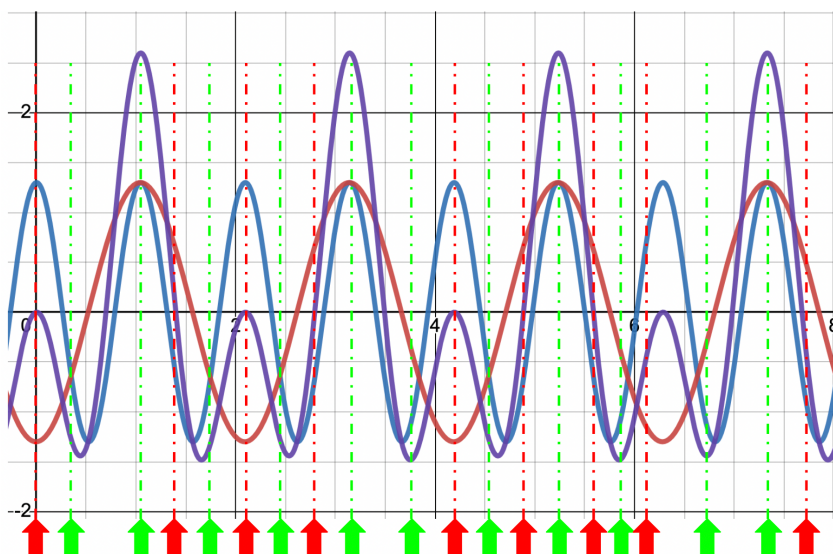


This is an example of **destructive interference**.

Complete cancellation looks like this:



### Applying the Principle of Superposition 3



**↑ = Destructive**

Both waves are displaced in opposite direction.

**↓ = Constructive**

Both waves are displaced in same direction.