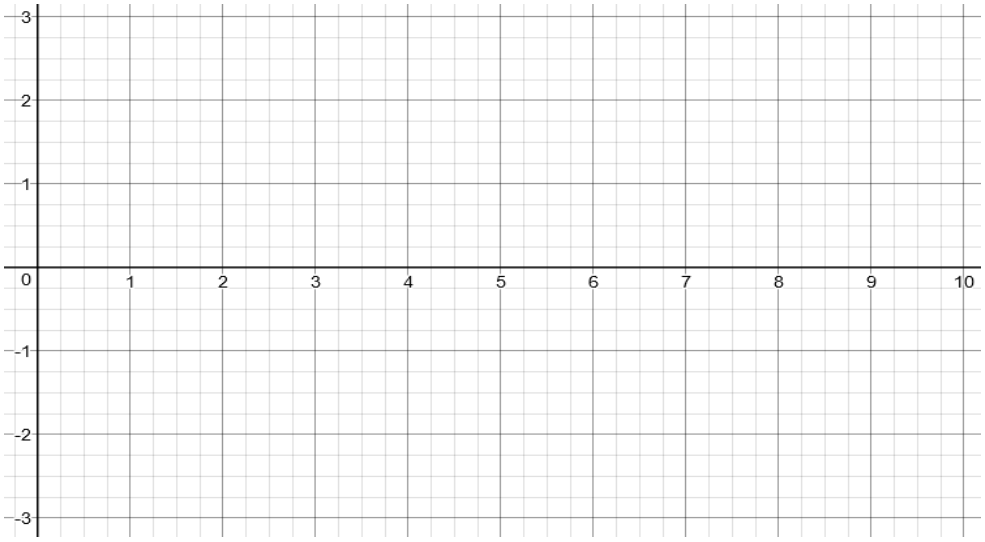
Questions

1. Sound is a(n) _____ vibration that travels in _____ waves.
2. Light is a(n) _____ vibration that travels in _____ waves.
3. A tuning fork has a frequency of 519 Hz. What is its period?
4. A water wave has a speed of 75 cm/s, and a wavelength of 4.0 m. What is the frequency of the waves?
5. A sound wave passes from one medium into another, and its wavelength decreases. What happens to the:
    a. Frequency?
    b. Speed?
6. What is the wavelength of radio waves travelling through the air at 88.1 MHz? Assume that the radio waves travel at the same speed through the air as through a vacuum.
7. What creates a node in a standing wave?
8. What is the speed of sound in air at a temperature of -25.0 °C?
9. Two speakers are placed 1.0 m apart and play a frequency of 2,000 Hz. The speed of sound in the room is 345 m/s. At what angle does the:
    a. First anti-node occur?
    b. Second anti-node occur?
10. Water waves with a wavelength of 8.0 m enter the shallow water of a harbour at 30° and refract to an angle of 20°. What is their new wavelength?
11. A light ray travelling through the air enters a light block at an angle of 45° and refracts to an angle of 39°. What is the refractive index of the glass?
12. Sapphire has a refractive index of 1.76. What is the speed of light in sapphire?
13. A 512.0 Hz tuning fork is struck at the same time as another tuning fork. Beats with a period of 2.000 s are produced. What are the 2 possible frequencies of the other tuning fork?

14. Graph a square wave with a frequency of 0.2 Hz and a distance from crest to trough of 3.0 m.



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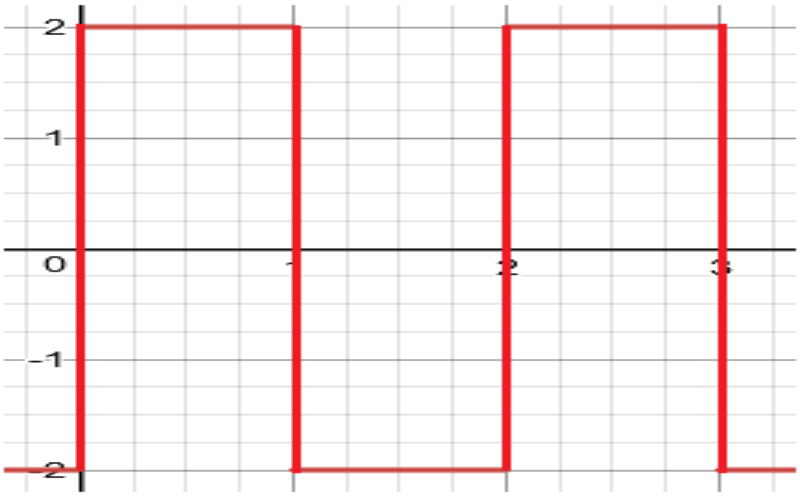
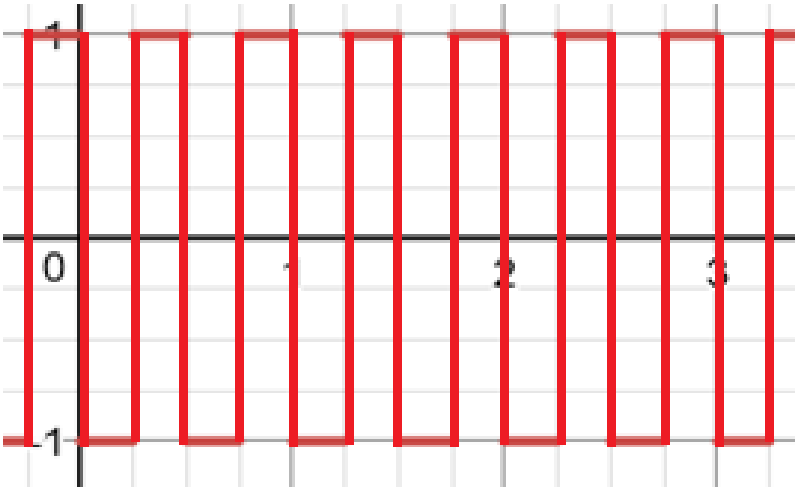
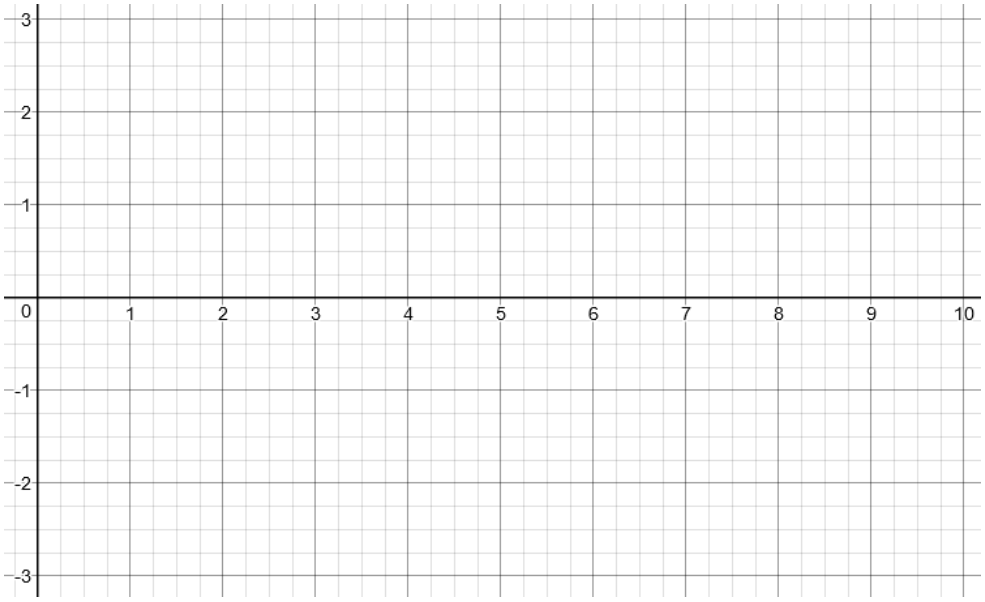


Wave 1

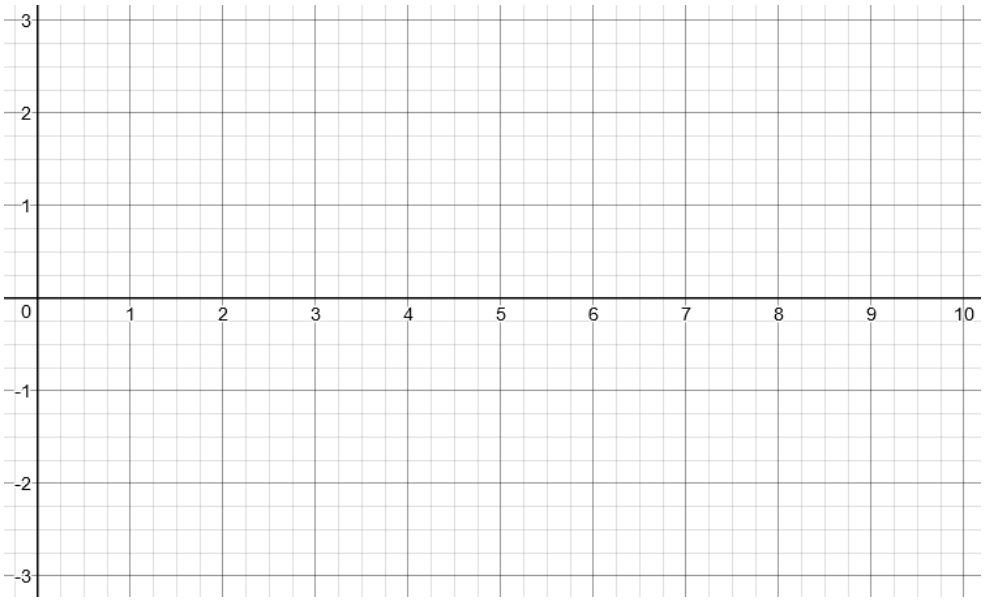


Wave 2

a. Draw the waveform of wave 1 plus wave 2.



b. Draw the waveform of wave 1 minus wave 2. Hint: Subtracting a number is the same as adding the opposite number (i.e. 5 - 2 = 5 + -2).



16. A wave has a fundamental frequency of 126 Hz. What is the:
    a. First harmonic?
    b. First overtone?
    c. Second harmonic?
    d. Second overtone?
17. What is the speed of a plane flying at Mach 3.00 through -10.0 °C air?
18. While camping, a camper sees a flash of lightning. 11 seconds later, they hear thunder. How far away was the lightning? Assume that the temperature is 20.0 °C.

See over →

Answers

1. Mechanical, longitudinal
2. Electromagnetic, transverse (circular)
3. $T = 1.93 \times 10^{-3}$ s
4. f = 0.19 Hz
5. a. The frequency stays the same.
   b. The speed decreases. Since $v = f\lambda$, and f has not changed, decreasing λ decreases v.
6. $\lambda = 3.40$ m
7. Total destructive interference between a wave and its reflection.
8. v = 316 m/s
9. a. 9.9°
   b. 20°
10. $\lambda = 5.5$ m
11. $n_2 = 1.1$
12. $v = 0.568c = 1.70 \times 10^8$ m/s
13. f = 512.5 Hz or f = 511.5 Hz
14. See solutions.
15. See solutions.
16. a. 126 Hz
    b. 252 Hz
    c. 252 Hz
    d. 378 Hz
17. v = 975 m/s
18. d = 3,800 m = 3.8 km