



Math Connections

8.19 Electromagnetic Waves in Communication Devices

Name: _____ Date: _____

Use the following information to answer questions 1–6.

Electromagnetic waves are produced by vibrating charged particles, resulting in changes in electric and magnetic fields. Microwave, radio, radar, visible light, ultraviolet, x-rays, and gamma rays are well-known frequencies of electromagnetic waves.

Electromagnetic waves are described using their wavelength, frequency, speed, and period.

- The speed of the wave (v) can be calculated using the equation $v = \lambda f$ where v is the speed in meters per second, λ is the wavelength in meters, and f is the frequency in Hertz.
- The period of the wave (T) can be calculated using the equation $T = 1/f$ where T is the period in seconds and f is the frequency in Hertz.

1. A wave cycles up and down three times per second, and the distance between each wave is 1.7 m. Calculate the following:

a. Frequency of the wave

b. Wavelength

c. Speed

2. A sound wave with a frequency of 320 Hz travels through air with a velocity of 300 m/s. Calculate the wavelength.



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3. A gamma ray is a high energy, high frequency electromagnetic wave that travels at the speed of light, 3.0×10^8 m/s. Calculate the wavelength if the frequency of the wave is 10^{20} Hz.

4. The frequency of a longitudinal sound wave is 900 Hz and the speed is 320 m/s. What is the wavelength?

5. Which wave has a greater wavelength, red light or blue light?

6. Electromagnetic waves such as radio waves travel at the speed of light, 3.0×10^8 m/s. Find the frequency of a wave with a wavelength of 2.5 m in megahertz (MHz). The conversion rate from Megahertz to Hertz is 1:1,000,000.