Wave Problems I

What is the equation that relates *frequency* (f) and *period* (T) for a wave?

What is the equation that relates the *speed* of a wave (v) to its *wavelength* (λ) and *frequency* (f) ?

Frequency and Period

1. A certain wave has a period of 3 seconds. What is its frequency?

2. A wave has a frequency of 10 Hertz. What is its period?

3. A mass on a spring is going up and down with a frequency of 0.5 Hertz. How long does it take to go up and down once?

4. A mass on a spring goes up and down 4 times every second.
   a. How long does it take the mass to go up an down once?

   b. What is the frequency of the mass going up and down?

5. You are sitting in a boat while waves go by. You bob up and down once every 5 seconds.
   a. What is the period of the waves?

   b. What is the frequency of the waves?

Speed, Wavelength & Frequency

6. Two students are shaking a rubber hose with a frequency of 2 Hertz (cycles per second). The speed of a wave in the hose is 3 m/s. What is the wavelength of the resulting wave?

7. Some students are shaking a slinky. The waves they are making are 2.5 meters long and the speed of the wave is 4 m/s. What is the frequency of the waves?

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8. An ocean wave has a wavelength of 6 meters and a frequency of 1/2 Hertz. How fast is the wave traveling?

9. The speed of sound is 340 m/s. If someone were to play a C note (f = 261 Hz.) on a guitar, how long a sound wave would be created?

10. Someone is doing an experiment sending waves in a tube filled with some gas. They send waves with a frequency of 200 Hz, and measure the wavelengths to be 12 meters long. How fast do the waves travel in the gas?

11. Waves travel in a steel pipe at about 5000 m/s.
    a. How long would a wave be if it had a frequency of 300 Hz?

    b. What frequency would a wave have if it had a wavelength of 3.2 meters?

Everything

12. You are on a boat in the ocean during a wicked storm. There are huge waves rolling under the boat, and you are going up and down once every 7 seconds. You notice that the waves are 25 meters from crest to crest. How fast are the waves traveling in the water?

13. Two students are standing exactly 7 meters apart and they are each shaking a slinky. There are exactly 4 whole waves between the two students. They are shaking the slinky with a frequency of 3 Hz. How fast are the waves traveling in the slinky?

14. The speed of wave in a slinky is 1.75 m/s. The slinky is stretched between two students so that it is 5 meters long. At what frequency should the slinky be shaken, so that there is exactly two whole wave between the students?

Answers: 1) 1/3 Hz 2) 1/10 s 3) 2 s 4. a) 0.25 s b) 4 Hz 5. a) 5 s b) 0.2 Hz 6) 1.5 m 7) 1.6 Hz 8) 3 m/s 9) 1.3 m 10) 2400 m/s 11. a) 16.7 m b) 1563 Hz 12) 3.57 m/s 13) 5.25 m/s 14) 0.70 Hz