**Doppler Effect**

1. When an automobile moves towards a listener, the sound of its horn seems relatively

a. low pitched b. high pitched c. normal

1. When the automobile moves away from the listener, its horn seems

a. low pitched b. high pitched c. normal

1. The changed pitch of the Doppler effect is due to changes in

a. wave speed b. wave frequency

1. Circle the letter of each statement about the Doppler Effect that is true.
   1. It occurs when a wave source moves towards an observer.
   2. It occurs when an observer moves towards a wave source.
   3. It occurs when a wave source moves away from an observer.
   4. It occurs when an observer moves away from a wave source.
2. True / False: A moving wave source does not affect the frequency of the wave encountered by the observer.
3. True / False: A higher frequency results when a wave source moves towards an observer.
4. Two fire trucks with sirens on speed towards and away from an observer as shown below.



a) Which truck produces a higher than normal siren frequency?

b) Which truck produces a lower than normal siren frequency?

8. What is the frequency heard by a person driving at 15 m/s toward a blowing factory whistle (800. Hz) if the speed of sound is 340.6 m/s?

9. From the previous problem, what frequency would he hear after passing the factory if he continues at the same speed?

10. A car approaching a stationary observer emits 450. Hz from its horn. If the observer detects a frequency of 470. Hz, how fast is the car moving? The speed of sound is 343 m/s.

11. While standing near a railroad crossing, a person hears a distant train horn. According to the train's engineer, the frequency emitted by the horn is 440 Hz. The train is traveling at 20.0 m/s and the speed of sound is 346 m/s.

a) What would be the frequency of the train's horn if the train were at rest?

b) What is the adjusted frequency that reaches the bystander as the train approaches the crossing?