The Doppler Effect

Lesson objectives

Students will be able to describe and quantitatively analyze the Doppler Effect.

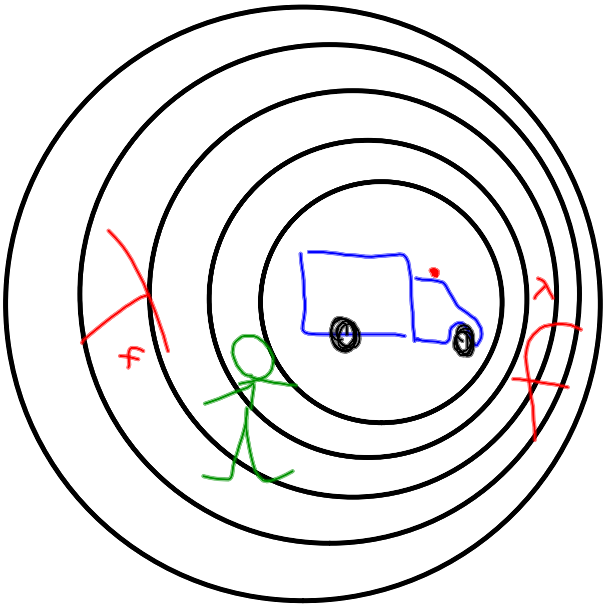
1.1

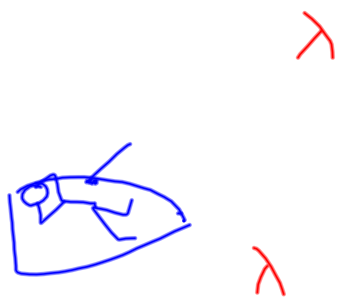
Lesson objectives | Teachers' notes | Lesson notes

Demonstration: The Doppler Rocket

$v = f\lambda$

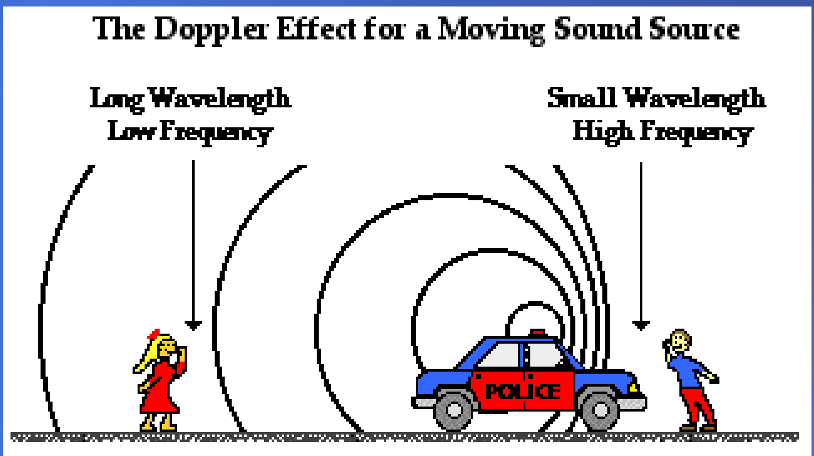
$f = \frac{v}{\lambda}$





So...what's going on with the Doppler Rocket?

When a sound emitting object is moving, the object "catches up" with the waves in front of it, resulting in a higher frequency.



The object moves away from the waves behind it, resulting in a lower frequency.

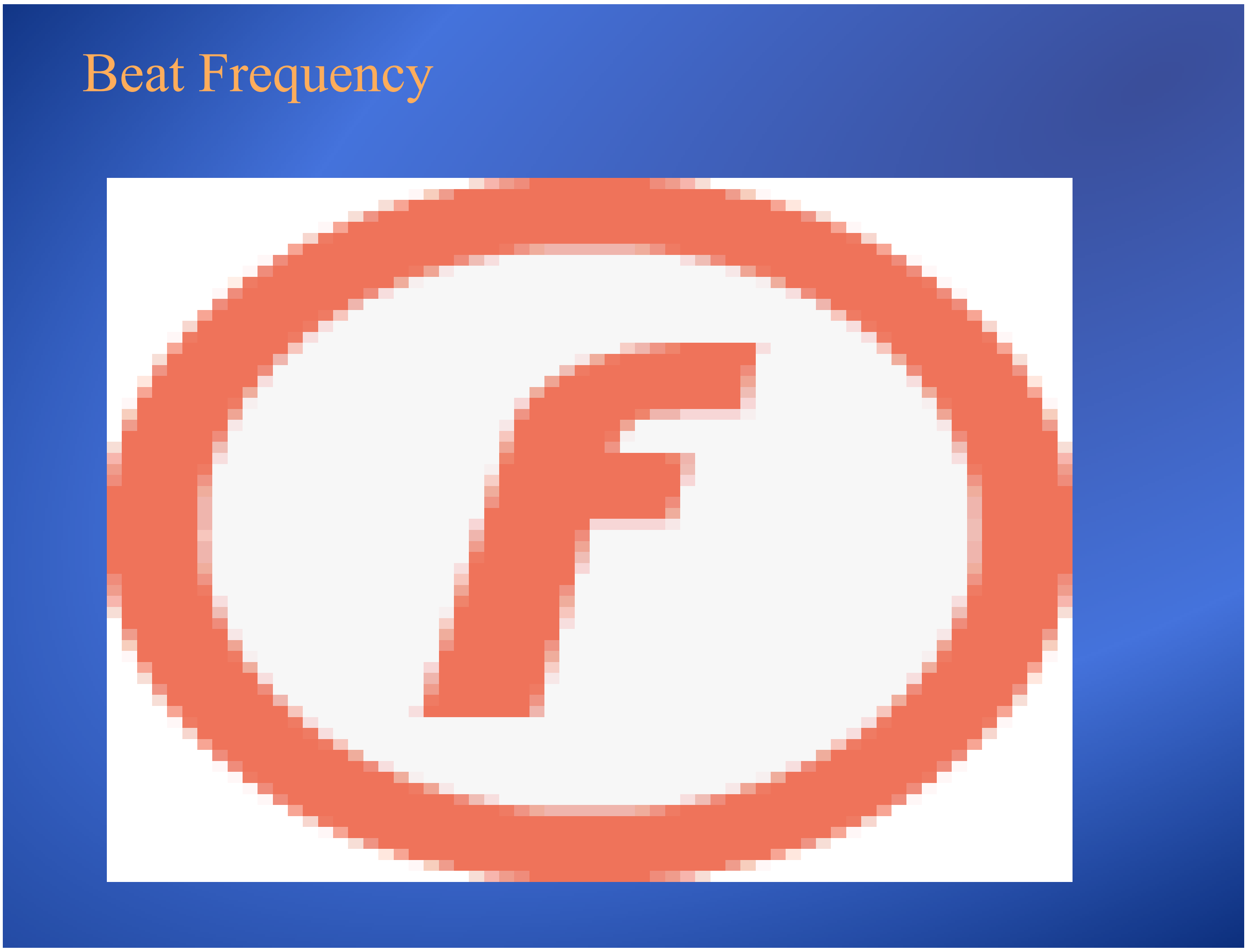
$$f = \left(\frac{v}{v \pm v_s}\right) f_s$$

Example 8.4, p. 432

A train is travelling at a speed of 30.0 m/s. Its whistle generates a sound wave with a frequency of 224 Hz. You are standing beside the tracks as the train passes you with its whistle blowing. What change in frequency do you detect for the pitch of the whistle as the train passes, if the speed of sound in air is 330 m/s?

Practice Problems, p. 432, #1 - 4

What would happen if the object emitting the sound was travelling faster than the sound?


Beat Frequency

A beat frequency is produced when two waves are nearly identical. The beat frequency is the difference frequency of the waves.

Example 8.4

p432

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p432 #1, 2, 4