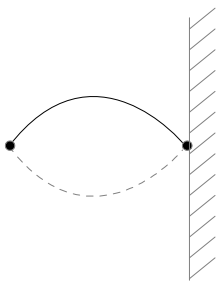


Interference

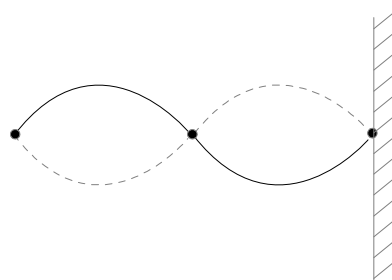
When two waves overlap, their effects combine (interfere). The result is the *superposition* of the original two waves; for example if a crest overlaps a crest, a larger amplitude crest results (constructive interference). If a trough overlaps a crest, the waves cancel and a smaller amplitude results (destructive interference).

Standing Waves

Standing waves are produced when two waves of equal amplitude and frequency, travelling in opposite directions, interfere. The resulting wave does not travel but instead vibrates in a fixed position, with a number of *nodes* (points which don't move).



standing wave with 2 nodes



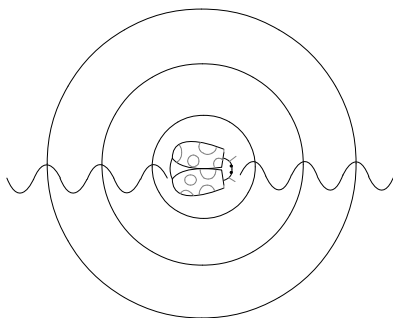
standing wave with 3 nodes

Doppler Effect

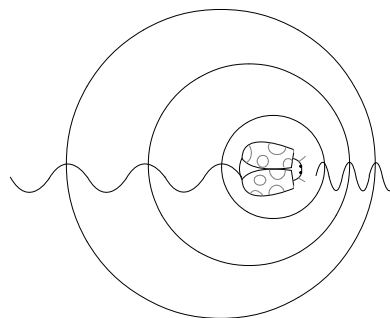
If an object is moving as it produces waves, the frequency of the waves in front will be greater than the frequency of the waves behind. This happens because the wave speed is constant, so the object is moving away from the waves behind and catching up with the waves in front.

If this happens with sound, we hear higher *pitch* when the object is moving towards us and lower pitch when the object is moving away. This is *not* related to the volume (loudness) of the waves, since volume is related the amplitude not the frequency.

Example: A bug producing ripples on water (lines represent crests)



bug not moving



bug moving right