



# DOPPLER EFFECT



**DOPPLER EFFECT:** The shift in frequency of a wave emitted by a source moving relative to an observer as perceived by the observer: the shift is to higher frequencies when the source approaches and to lower frequencies when it recedes.

$v_s$  = Speed of source     $f$  = Original frequency     $f'$  = Apparent frequency     $v_o$  = Speed of observer     $v$  = Speed of sound in air

$$f' = \left( \frac{v + v_o}{v} \right) f$$



$$f' = \left( \frac{v - v_o}{v} \right) f$$



$$f' = \left( \frac{v}{v - v_s} \right) f$$



$$f' = \left( \frac{v}{v + v_s} \right) f$$



$$f' = \left( \frac{v + v_o}{v - v_s} \right) f$$



$$f' = \left( \frac{v - v_o}{v + v_s} \right) f$$



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$$f' = \left( \frac{v + v_o}{v + v_s} \right) f$$



## Shortcut Trick

Whenever source moves towards observer, then do subtraction in denominator and vice-versa.

Whenever observer moves towards source, then do addition in numerator and vice-versa.

