Answer on question #65101, Physics / Other

Question The apparent frequency of a note when listener moves towards a stationary source with velocity 40m/s is 200Hz. When he moves away from the same source with same speed the apparent frequency of note is 160Hz. Calculate velocity of sound in air.

Solution When listener moves towards a stationary source frequency is changed from ν_0 to

$$\nu_1 = \nu_0 \frac{c}{c-v} = \nu_0 \frac{c}{c-40} = 200$$

where c is velocity of sound and v is velocity of listener. When it is moving away then frequency changes to

$$\nu_2 = \nu_0 \frac{c}{c+v} = \nu_0 \frac{c}{c+40} = 160$$

From these two equation we can easily find that

$$\frac{c+40}{c-40} = \frac{200}{160}$$
$$c = 360 \, m/s$$