Situation 2:Source moving away from a stationary listener

When the car moves away from you, the sound waves that reach you have a longer wavelength and lower frequency. You hear a lower sound.

Wavelength increases

Wavelength decreases

Wavelength remains constant

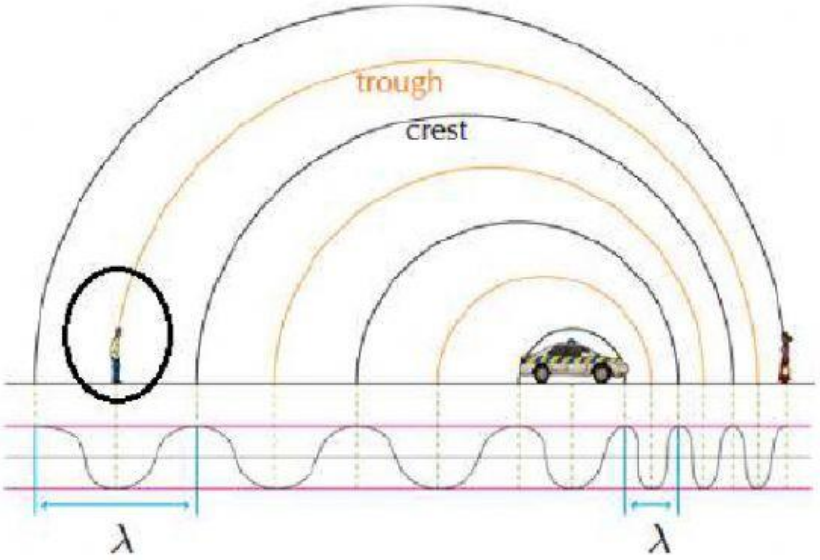


Image source: pg 256 eveything science,siyavula gr 12 physical science

$$f_L = \frac{v \pm v_L}{v \pm v_S} f_S$$

In this case the listener is standing still and thus $V_L = 0$ $m.s^{-1}$

This observed frequency heard by the listener is going to be lower than the fs (frequency made of the source).

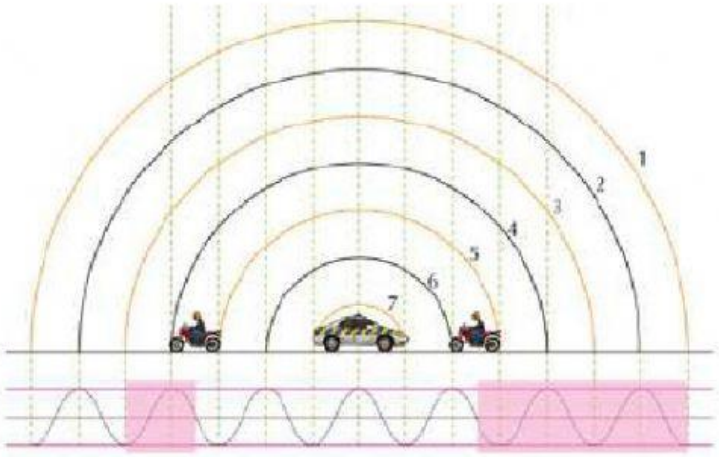
$$f_L = \frac{V + 0}{V \pm Vs} f_S$$

Your (f_L) answer thus needs to be as big as possible.

In order to achieve this the denominator will have to be as big as possible and you will need to add the values at the bottom in order to make the answer value as big as possible.

$$f_L = \frac{V}{V + V_S} f_S$$

Situation 3:Listener moving towards a stationary source



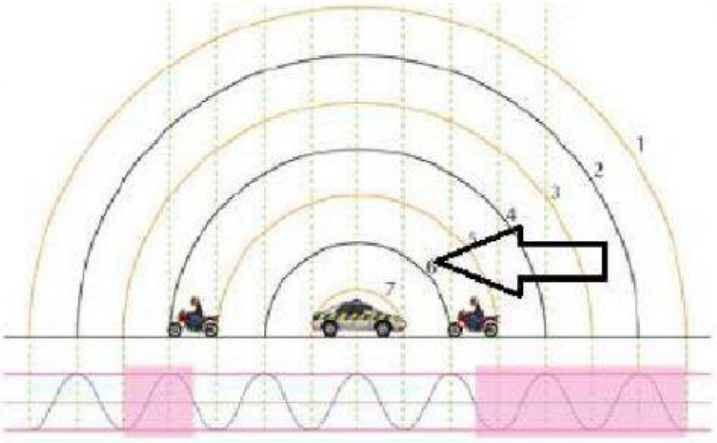
Notice that when the source is stationary, the wavelength and thus the frequency stays the same everywhere around the source.

However when the listener moves towards the source, the frequency (pitch) will still increase. Why would this happen?

Well, remember what frequency is…..

It's the number of waves that reach the listeners ear per second.

Thus if the listener moves towards the source, more waves will reach their ear per second (because he is moving towards the source creating the waves) and thus the pitch increases.



Wavelength increases

Wavelength decreases

Wavelength remains constant

$$f_L = \frac{v \pm v_L}{v \pm v_S} f_S$$

*It's very important that when you write a test on this section, that you always write the original formula first, and then after that you can substitute your zero and decide to make the ± a + or -.

Now, the source is stationary, so let's start there

$$f_L = \frac{v \pm v_L}{v + 0} f_S$$

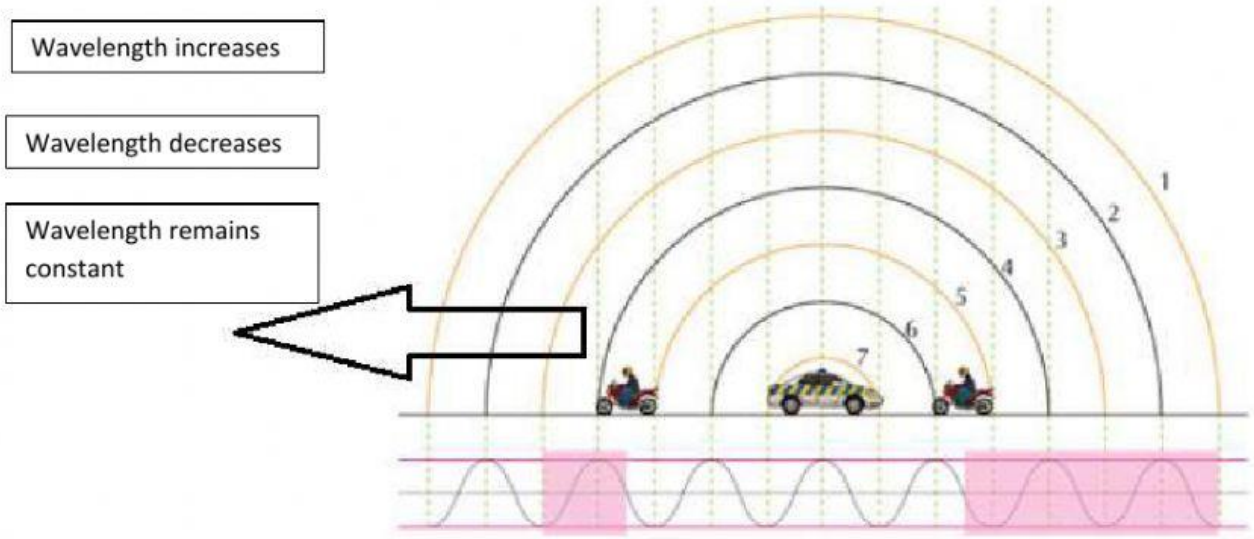
Then you need to decide if the answer value is going to get bigger or smaller. In this case the frequency (pitch) heard by the listener will increase, and thus the answer will increase.

To get this to happen the numerator will have to get bigger and thus we will add the numbers at the top.

$$f_L = \frac{v + v_L}{v} f_S$$

Situation 4:Listener moving away from a stationary source

If the listener moves away from the source, less waves will reach their ear per second and thus the pitch decreases.



$$f_L = \frac{v \pm v_L}{v \pm v_S} f_S$$

Now, the source is stationary, so let's start there

$$f_L = \frac{v \pm v_L}{v + 0} f_S$$

Then you need to decide if the answer value is going to get bigger or smaller. In this case the frequency (pitch) heard by the listener will decrease, and thus the answer will decrease.

$$f_L = \frac{v - v_L}{v} f_S$$

To get this to happen the numerator will have to get smaller and thus we will subtract the numbers at the top.