Question.

When Johnny bikes with a tail wind, it takes him 1 hour to travel 15 km. He makes the return trip against the wind in 1 1/2 hours. What is Johnny's speed on a windless day and what is the speed of the wind?

Given:

$$l = 15 \, km$$

$$t_1 = 1 \, h \, ; t_2 = 1.5 \, h$$

Find:

$$v_{bike} = ? \, v_{wind} = ?$$

Solution.

As we know from the kinematics basis:

$$v = \frac{l}{t}, where$$

v is the speed of the object; l is the travelled distance; t is the time.

We can compose the following system of equations:

$$\begin{cases} v_{bike} + v_{wind} = \dfrac{l}{t_1} \\ v_{bike} - v_{wind} = \dfrac{l}{t_2} \end{cases}, where$$

v_{bike} is the Johnny's speed;

v_{wind} is the speed of the wind.

So,

$$\begin{cases} v_{bike} + v_{wind} = \dfrac{15}{1} = 15 \\ v_{bike} - v_{wind} = \dfrac{15}{1.5} = 10 \end{cases} \rightarrow \begin{cases} 2v_{bike} = 25 \\ 2v_{wind} = 5 \end{cases} \rightarrow \begin{cases} v_{bike} = 12.5 \, \dfrac{km}{h} \\ v_{wind} = 2.5 \, \dfrac{km}{h} \end{cases}$$

Answer. $v_{bike} = 12.5 \, \dfrac{km}{h} ; v_{wind} = 2.5 \dfrac{km}{h}$