Answer on Question #42034 – Physics – Mechanics | Kinematics | Dynamics

1. The speed of a motor boat with respect to water is v = 14 m/s. The speed of water with respect to the banks is 6 m/s. When the boat began travelling upstream, a buoy was dropped from it. A buoy is a body that can float in water. The boat travelled 6.3 km upstream (with respect to banks), turned about and caught up with the buoy. Find the time T lapsed between dropping the buoy and catching up with it again.

$v = 14\frac{m}{s}$
$u = 6\frac{m}{s}$
$s = 6300\,m$
$T - ?$

Solution.

The speed of the buoy equals to the speed of the river.

When the boat goes upstream, its speed with respect to banks is $v-u$. When the boat goes downstream, its speed with respect to the banks is $v+u$.

One can make an equation of the equality of time, which was elapsed by the buoy and by the boat (the boat goes s upstream and $(s+uT)$ downstream):

$$T = \frac{s}{v-u} + \frac{s+uT}{v+u}.$$

One can find the time T:

$$T = \frac{2s}{v-u}.$$

Let check the dimension: $[T] = \frac{m}{\frac{m}{s}} = s$.

Let evaluate the quantity: $T = \frac{2\cdot 6300}{14-6} \approx 1575(s) \approx 26.3(\min)$.

Answer: $26.3\min$.