

Zadania „czeskie”

<http://physicstasks.eu/pl>



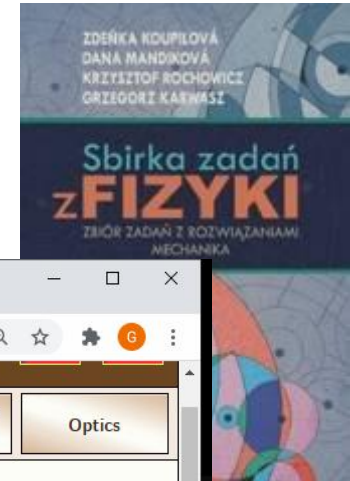
http://dydaktyka.fizyka.umk.pl/nowa_strona/?q=node/238

"Sbirka zadań z fizyki. Zbiór z rozwiązaniami"

Z. Koupilová, D. Mandiková, K. Rochowicz, G. Karwasz
(Wyd. Naukowe UMK, 2013)

<https://wydawnictwo.umk.pl/pl/products/3243/sbirka-zadan-z-fizyki-zbior-z-rozwiazaniami-mechanika>

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Mechanics | Mechanics | Thermodynamics | Electricity and magnetism | Optics

Moving Boat Task number: 1987

A boat sails on a river against its current from point A to point B and back to point A again. The velocity of the boat in relation to water is identical in both cases and is equal to $4 \text{ km} \cdot \text{h}^{-1}$. The velocity of the current is $1.6 \text{ km} \cdot \text{h}^{-1}$. Determine the ratio of the time the boat takes to sail from point A to point B and back and the time it would take the boat to cover the same distance on a still lake.

Given values

Hint 1: Velocity of the boat sailing from A to B

Hint 2: Velocity of the boat sailing from B to A

Hint 3: Time ratio

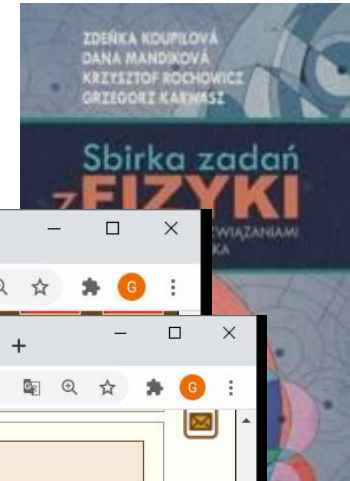
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Z. Koupilowa, H. Mandlikova, K. Rochowicz, G. Karwasz, *Zbirka zadań z fizyki*, UMK, 2014

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Mechanika

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Tasks

- Kinematyka
 - Motion Given by a Motion Graph II (L2)
 - Motion Given by a Motion Graph III (L3)
 - Motion Given by a Motion Graph IV (L4)
 - A lift (L2)
 - Annie's Ride (L1)
 - Passing of a train I (L1)
 - Passing of a train II (L1)
 - Moving Boat (L2)**
 - Rescue Plane (L2)
 - Rolling of a Ball (L2)
 - Basketball player (L2)
 - A garden hose (L3)
 - Water streaming out of the tank (L3)
 - A Cannon Firing Down a Hill (L4)
 - Cottage Dwellers (L2)
 - The voyage of a raft (L3)
 - Mouse and Cat (L3)
 - Sliding of a line segment I (L3)
 - An ant on a rod (L4)
 - A ladybug crawling on a rotating cylinder (L4)
 - Movement of a Particle I (L4)
 - Movement of a Particle II (L4)
 - Motion of a drop (L4)
 - Bullet in Vacuum (L4)

Given values

$v = 4 \text{ km} \cdot \text{h}^{-1}$	velocity of the boat in relation to water
$r = 1.6 \text{ km} \cdot \text{h}^{-1}$	velocity of the current
t	time it takes the boat to sail from point A to point B and back
t'	time it takes the boat to cover the same distance on a still lake

$\frac{t}{t'} = ?$

Hint 1: Velocity of the boat sailing from A to B

Draw a free body diagram for sailing against the current and mark both velocities into it.

What is the velocity of the boat in relation to the shore when it sails against the current? Is it smaller or greater than when the boat sails on still water? How big is the difference? How long will it take the boat to cover the distance from A to B with this velocity?

Solution of Hint 1

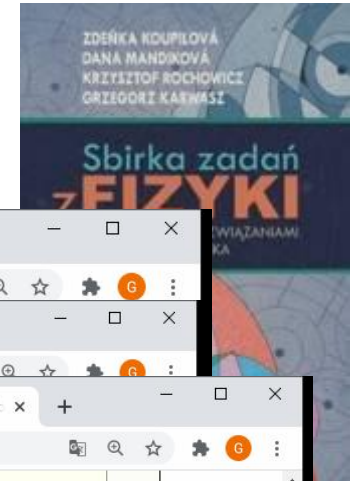
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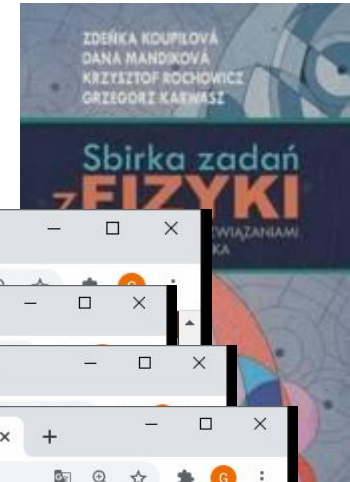
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Hint 2: Velocity of the boat sailing from B to A

Hint 3: Time ratio

The time the boat needs to cover the distance $2AB$ on still water with velocity v , as well as the ratio of both times, can be easily determined.

Solution of Hint 3

On a still lake, the boat sailing with velocity v would cover the distance $2AB$ in time t' :

$$t' = \frac{s}{v} + \frac{s}{v} = \frac{2}{v} s.$$

We determine the ratio t/t' :

$$\frac{t}{t'} = \frac{\frac{2v}{v^2 - r^2} s}{\frac{2}{v} s} = \frac{v^2}{v^2 - r^2} = \frac{1}{1 - \frac{r^2}{v^2}}.$$

Numerically:

$$\frac{t}{t'} = \frac{4^2}{4^2 - 1.6^2} = \frac{16}{13.44} \doteq 1.19.$$

Overall solution

Let us assume the distance AB is equal to s km.

Wpisz tu wyszukiwane słowa

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26.10.2020

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