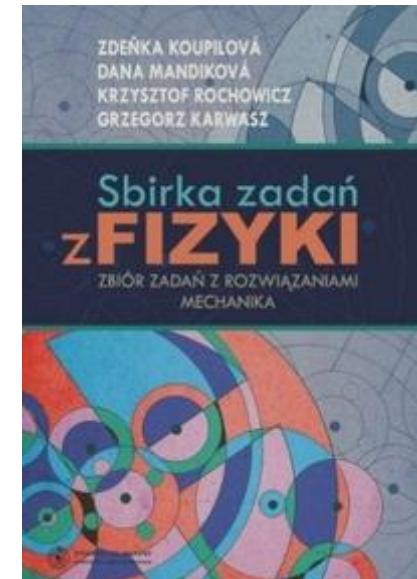


Zadania „czeskie”

<http://physicstasks.eu/pl>



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

"Sbirká zadań z fizyki. Zbiór z rozwiązaniami"

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

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

Interactive exercises in Internet



The screenshot shows a web browser window with multiple tabs open at the top. The main content area displays an interactive physics exercise titled "Moving Boat". The exercise is categorized under "Mechanics". A sidebar on the left lists various tasks under "Kinematics of mass point". The central text describes a scenario where a boat sails from point A to point B against a current and back to point A, with given velocities and a question about the time ratio. Three hints are provided: Hint 1 (Velocity of the boat sailing from A to B), Hint 2 (Velocity of the boat sailing from B to A), and Hint 3 (Time ratio). On the right side, there are icons for L2, a share button, a Czech flag, and an envelope. The bottom of the screen shows a Windows taskbar with the date and time (06:26, 26.10.2020).

Wydział Fizyki | astronomia | IOP A portable | Quantum | Inflationary | Connection | Kocioł gazu | VALVOLA | Moving Boat

Niezabezpieczona | physicstasks.eu/1987/moving-boat

Mechanics Thermodynamics Electricity and magnetism Optics

About Show task

code: >

Tasks Task filter »

- Kinematics of mass point (30)
 - Motion Given by a Motion Graph I (L2)
 - Motion Given by a Motion Graph II (L3)
 - Motion Given by a Motion Graph III (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)

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

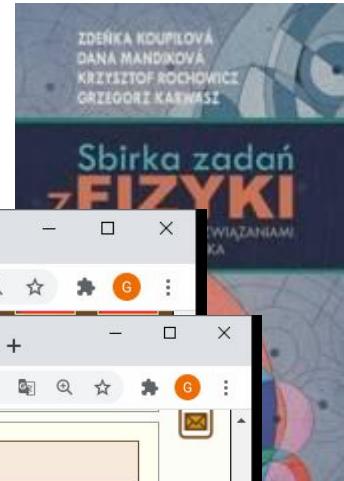
Hint 3: Time ratio

Wpisz tu wyszukiwane słowa

06:26 26.10.2020

<http://physicstasks.eu/1987/moving-boat>

Interactive exercises in Internet



3_Int

Niezabezpieczona | physicstasks.eu/1987/moving-boat

Mechanics

- About
- Show task
- code:
- Tasks
 - Kinematics
 - Motion Given by a Motion Graph II (L2)
 - Motion Given by a Motion Graph III (L3)
 - 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

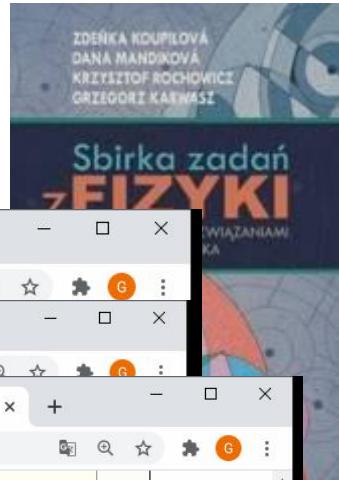
Wpisz tu wyszukiwane słowa

06:28
26.10.2020

<http://physicstasks.eu/1987/moving-boat>

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

Interactive exercises in Internet



The screenshot shows a web browser window with three tabs open, all displaying the same physics task from physicstasks.eu/1987/moving-boat. The task involves a boat moving from point A to point B against a current.

Solution of Hint 1:

Fig.1 (against the current):

A diagram illustrates the boat's motion. A horizontal line represents the water surface. Point A is at the left end, and point B is at the right end. A blue arrow labeled \vec{r} points from A to B, representing the current velocity. A red arrow labeled \vec{v} points from the boat towards B, representing the boat's velocity relative to the water. The distance between A and B is labeled s .

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

The velocity of the boat against the current in relation to the shore is equal to the difference of the boat velocity in relation to water and the velocity of the current, that is:

$$v_1 = v - r.$$

If the boat sailed on still water, its velocity would be greater by the velocity of the current r .

The boat will travel the distance s against the current in time:

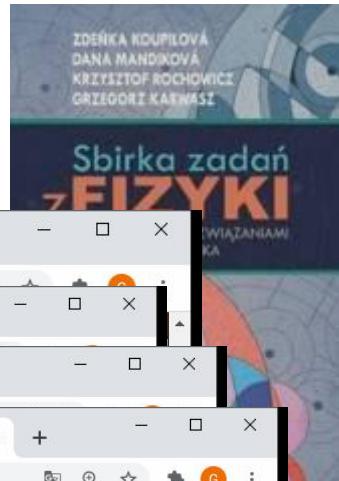
$$t_1 = \frac{s}{v_1} = \frac{s}{v - r}.$$

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

Hint 3: Time ratio

<http://physicstasks.eu/1987/moving-boat>

Interactive exercises in Internet



3_Int

Niezabezpieczona | physicstasks.eu/1987/moving-boat

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.

http://physicstasks.eu/1987/moving-boat