

4. year

5. problem set

deadline for the solutions

18.5.2009

FX [f:ks]

www.fks.sk/fx

fx@fks.sk

powered by FKS

KTFDF FMFI UK

Mlynsk Dolina

842 48 Bratislava

FX13 Pulleys

Tinka has found a huge pile of rope and pulleys in her basement, so she decided to make herself a pulley body. And since one is never enough, she made two, as shown in the pictures. What are the accelerations of all the bodies attached to the pulleys in both cases? All the pulleys and ropes are massless and there is an infinite amount of pulleys in the right picture.

FX14 Efficient compost

Judita knows, that a compost produces heat. So she decided to help the world with the heat from her garden compost heap. To do so, she made two reversible periodic heat engines, working as shown in the diagram, ABD and BCD. The gas used in the engines is the air, since it's cheap. What is the ratio of the efficiencies of these two engines?

FX15 Spheres

Pete has put into the inter-stellar space 2009 different metal spheres. He has charged the spheres with charges q , $-2q$, $3q$, ..., $-2008q$ and $2009q$, where q is positive. Show, that there is at least one sphere, with the charge density positive all over its surface.

For the pictures in the problems FX13 and FX15, please see the slovak version <http://www.fks.sk/fx/fx4zad5.pdf>.