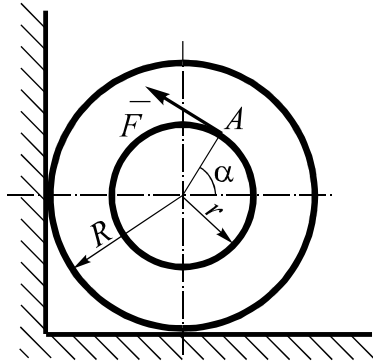


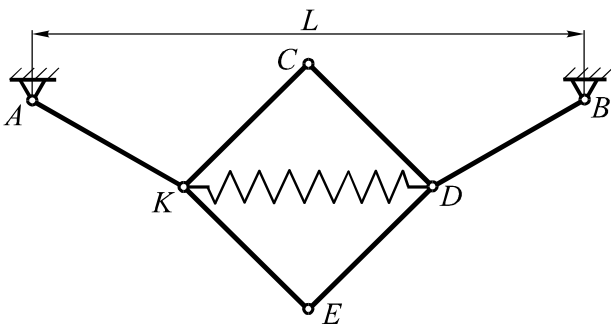
Problems of Contest – 2013

Problem S1–2013



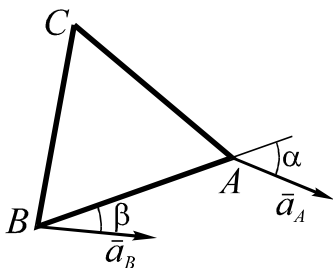
Step block has weight G and lies on a smooth horizontal surface. The block is in contact with rough vertical wall. Radii R and r are known. Coefficient of static friction of the block with the wall is equal to f . Force F is applied tangentially to a circle at point A which position is determined by the angle α . For what values of force F , the block will be in equilibrium?

Problem S2–2013



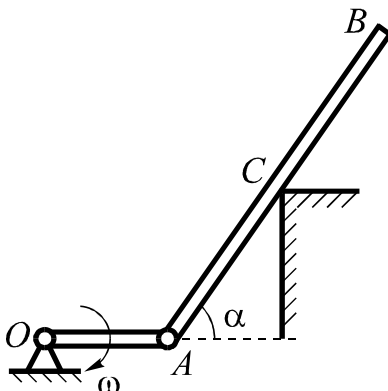
The system of related identical homogeneous rods which have length l and mass m , is located in a vertical plane. Rods KC , CD , DE , and EK form a square in the position of equilibrium. Determine the force of the spring KD , if $L = l(\sqrt{2} + \sqrt{3})$.

Problem K1–2013



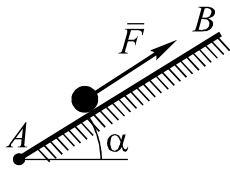
Equilateral triangle ABC moves in its own plane. At a certain moment of time points A and B have the same acceleration. Their vectors make angles α and β with the direction of the line AB (α and β are unknown). It is known that $\alpha - \beta = \varphi$. Determine how many times the acceleration of point C is more than acceleration of point A .

Problem K2–2013



Flat mechanism consists of a crank OA which length is l , and a rod AB which is pivotally attached to the crank. The intermediate point of rod AB slides on a ledge C . The crank OA rotates with a constant angular velocity ω . For the position shown in the drawing ($\alpha = 60^\circ$, $AC = 2l$), determine the acceleration of the point of the rod AB , which currently has the lowest velocity.

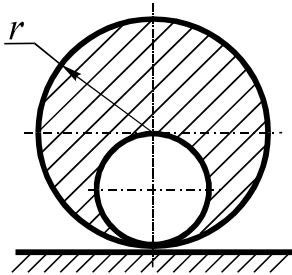
Problem D1–2013



At the initial time the material point of $m = 1$ kg is at rest on a rough surface. Coefficient of friction is equal to $f = 0.6$. A force $F = 0,1 gt$ (in Newtons) was applied to the material point.

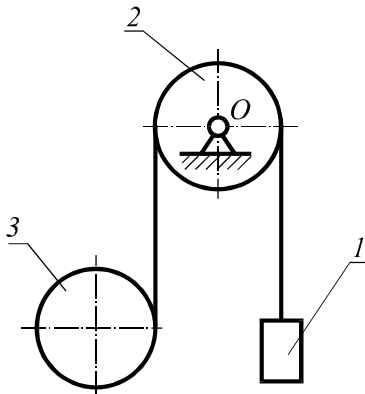
Determine the dependence of the impulse of force and its work on time, if $\alpha = 30^\circ$.

Problem D2–2013



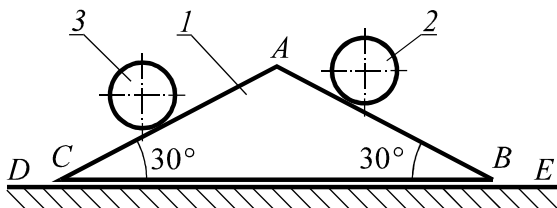
A cylindrical hole with a radius $r/2$ was cut from a homogeneous solid cylinder of radius r . The resulting body was placed in a position of unstable equilibrium on a smooth horizontal surface, as shown in the figure. The body was given the infinitesimal angular velocity. Determine the largest angular velocity and angular acceleration of the body at its subsequent motion.

Problem D3–2013



The load 1 is suspended from a weightless thread and over-thrown through the block 2, which rotates around a fixed horizontal axis O . The other end of the thread is wound on disc 3. 1 and 2 bodies mass are the same and equal to m . Block 2 and disk 3 are the solid homogeneous discs. The system starts from the rest under the action of gravity. Determine the values of body 3 weight when tension force in the left and right branches of the thread differs in 2 times. Friction forces are neglected.

Problem D4–2013



The triangular prism 1 with mass m is placed on the rough horizontal surface DE and can slide along this surface. A solid homogeneous cylinder 2 of the same mass m is put on the smooth face AB of the prism. A solid homogeneous cylinder 3 of the same mass m is put on the face AC of the prism and can roll along this face without slipping. Determine the values of the friction coefficient between the prism 1 and surface DE when the prism remains motionless despite the movement of cylinders.