



### First level tasks. Task 1.

A metal ball, which fell from a height of 20m on the table, bounds of it with the loss of 25% of the speed. After how many seconds after the bound the ball a second time will fall on the board?



### First level tasks. Task 2.

Two loads ( $m_1 = 0.5$  kg and  $m_2 = 0.3$  kg) are suspended to the ends of weightless inextensible cord thrown over a fixed unit without a friction in axis. What is the acceleration, with which the second load is moving?



### First level tasks. Task 3.

A body starts to slide from the top of the inclined plane with the height of 5 m and inclination angle to the horizon of  $45^\circ$ . Determine the speed of the body at the end of the slide, if the friction coefficient between the body and the plane is 0.19.



### First level tasks. Task 4.

A man weighing 60 kg, standing on the skates, horizontally throws beside himself a 2 kg weight with a speed of 3 m/s, and rolls back. After how many seconds after throwing the man will stop if the friction coefficient between the ice and the skates is 0.01?



### First level tasks. Task 5.

At what depth the water pressure is 3 times greater than the atmospheric, if the atmospheric is 100 kPa?



### First level tasks. Task 6.

A bar with attached thread rests on the inclined plane with the inclination angle of  $30^\circ$ . Determine the funicular force when the bar moves out of its location if you pull the thread down parallel to the plane. The bar weight is 0.5 kg, the friction coefficient between the bar and the plane is 0.7, the acceleration of gravity is  $10 \text{ m/c}^2$ .



### First level tasks. Task 7.

A wheel (radius 1m) is rolling without slipping on the horizontal surface at a speed of 1 m/c. Find the maximum speed of the point lying on the wheel.



### First level tasks. Task 8.

A ball with the weight of 100 g, which flew at a speed of 2 m/s, was caught on the fly. What is the average force of the ball impact on the hand if it stopped in 0.02 s?



### First level tasks. Task 9.

What is the minimum effort to pump the water on the ground from the pool with the area size of  $10 \text{ m}^2$  and the depth of 2 m? The water fills the pool halfway.



### First level tasks. Task 10.

A body passed 40 m during 2.5 seconds of in-line uniform acceleration and increased its speed by 3 times. Determine the initial velocity of the body.



### Second level tasks. Task 1.

Somebody lifts the load on the rope with the acceleration. What is the acceleration if tension of the rope increased by 3 times compared to the tension created by the load?



### Second level tasks. Task 2.

A car weighing 2 tons was moving with a speed of 36 km/h and stopped. The length of brake path is 25 m. Determine the value of the braking force.



### Second level tasks. Task 3.

Firstly, acceleration of the body linearly increased from zero to  $4 \text{ m/s}^2$  in 2 s, and then decreased linearly to zero in a time of 1 s. What is the maximum speed that the body has reached?



### Second level tasks. Task 4.

The Planet's mass is 0.2 of the Earth's mass; its diameter is three times smaller than the diameter of the Earth. What is the ratio of the orbital periods of artificial satellites of the planet and the Earth, which are moving along a circular orbit at low level?



### Second level tasks. Task 5.

What work makes a man when he lifts the body with mass of 2 kg to a height of 1 m with acceleration of  $3 \text{ m/s}^2$ ?



### Second level tasks. Task 6.

Two stones are arranged on the same horizontal at a distance of 30 m from each other. One stone is thrown vertically upwards with a speed of 9 m/s and at the same time the second stone is thrown horizontally towards the first stone at a speed of 12 m/s. What is the shortest distance between the stones in the movement?



### Second level tasks. Task 7.

The density of a body is 1.25 times greater than the density of water. By how many times weight of the body in the water is higher than in the air?



### Second level tasks. Task 8.

A horizontally flying bullet with a mass of 10 g hit and got stuck in a ball with a mass of 440 g hanging on a light rod with the length of 40 cm. At what minimum speed of the bullet the ball will complete a full circle in a vertical plane?



### Second level tasks. Task 9.

By how many times the linear velocity of points on the Earth's surface that lay at a latitude of 60, is less than the linear velocity of the point on the equator?



### Second level tasks. Task 10.

The small body slides on a smooth horizontal surface with a speed of 4 m/s and enters the climb. At what height above the horizontal surface the body will rise?



### Second level tasks. Task 11.

A ball mass of 400 g was thrown vertically upwards with a speed of 20 m/c. Then it hits the ground with a speed of 15 m/s. Determine the work against air resistance.



### Second level tasks. Task 12.

A disk thrown at an angle of 45 to the horizon, reached the greatest height of 15 m. What is disk's range of throw?



### Second level tasks. Task 13.

The velocity of the raindrops is 40 m/s at a wind speed of 20 m/s. What will be the speed of the drops at wind speed of 5 m/s? In calm weather drops fall on the ground vertically.



### **Second level tasks. Task 14.**

A steel ball freely falls from a height 20 m. After 1 second from the beginning of the fall, it faces with a fixed plate, inclined at an angle to the horizon of  $30^\circ$ . At what height above the Earth's surface the ball will rise after the hitting? Consider the collision of the ball on a plate perfectly elastic. Air resistance is small.



### **Second level tasks. Task 15.**

The boat should get on the opposite bank of the river along the shortest path (in the frame of reference associated with the bank). Velocity modulus of the river flow is 5 m/c, Velocity modulus of the boat towards the water is 3 m/s. Determine the velocity modulus of the boat towards the bank.