Hint 2

IMPORTANT! The next task is both a hint and an alternative to the main task. Three important points:

1. You can continue to send the solution to the main problem.

2. At any moment before the final deadline you can start to solve the Alternative problem. If you do so, at the beginning of the solution write: *I am doing the Alternative problem!* In this case a penalty coefficient for the Alternative problem is

$$0{,}7 \cdot \sum_i \frac{k_i \cdot p_i}{10},$$

where p_i is a point for the problem item, and k_i is a penalty coefficient for the corresponding problem's item at the moment of moving to the Alternative problem. In other words, maximal points for the alternative problem equals to the maximal points you can gain at the moment of moving to the alternative one multiplied by 0,7. Also, we remind you that a penalty coefficient can't be less than 0,1. Solutions of the main problems from that moment will not be checked. Be careful!

3. The task consists of several items. The penalty multiplier earned **before** is applied to all points. In the future, each item is evaluated as a separate task. If you send a solution without any item, this item's solution is considered as Incorrect. For more information about scoring points for composite tasks, see the rules of the Cup.

Alternative task

Fermi Paradox

Returning the temporarily borrowed books back to the Archive, Hedgehog met his old friend in the corridor, who also happened to be an amateur astronomer, Bear. Although this time Hedgehog was in a particularly melancholic mood and did not have a bundle of treats in his paws, Bear was still very glad to see him and to listen to a story about an unusual object spotted in the night sky. Suddenly, Bear remembered that he had once observed something very similar through his homemade telescope. The friends compared the data they had and came to the following conclusion:

The object observed by Bear was moving at a speed whose magnitude was equal to one of the two speeds analyzed by Hedgehog. The angle between the radius vector and the velocity vector of this object was equal to one of the following values: $\{70°, 75°, 80°, 85°, 90°, 95°, 100°, 105°, 110°\}$.

For Bear's observation, assume that all the angle values from the list, as well as each of the possible speed magnitudes, are equally probable.

1. *(10 points)* Determine the probability that Hedgehog and Bear definitely observed different celestial bodies.

Recall that earlier, Hedgehog analyzed two appearances of an unidentified object in the night sky and managed to establish that the angle between the directions of observation of his object was $\alpha = \pi/3$, the angle between the directions of the velocities of the same object at the moments of observation was $\beta = \pi/4$, and the ratio of the magnitudes of the velocities at the moments of observation was $k = \{\sin(2\pi/3)\}/\{\sin(\pi/12) + \sin(\pi/4)\}$.