



**International Olympiad of Astronomy and Space Sciences  
 for Juniors  
 Romania– Cămpulung Moldovenesc  
 October 31 – November 7 2022  
 Theoretical Round**

**III. The second long problem - The rocket that destroys the threatening asteroid – 100 points**

With the help of a rocket, R, launched from a spaceship, N, an asteroid, A, must be destroyed, approaching the Earth threateningly, coming right in the direction of the center of the Earth, as shown in the drawing in Figure 1. There are positions of the ship spacecraft, N and the asteroid A, respectively, at the time of the launch of the rocket R, to meet the asteroid A, when the speed of the spacecraft, N, relative to Earth, is constant, oriented along the spacecraft line - asteroid, and the speed of asteroid A, relative to Earth, is considered constant,  $\vec{v}_N$ , oriented along the spacecraft line - asteroid, and the speed of asteroid A, relative to Earth, is considered constant,  $\vec{v}_A$ , its direction forming an angle  $\alpha$  with the direction of the spacecraft, N.

During the flight of the rocket, from its launch to the impact with the asteroid, it is considered that the Earth, relative to the Sun, is at rest, and the movements of the rocket, R, the spacecraft, N, and the asteroid, A, are rectilinear and uniform movements.

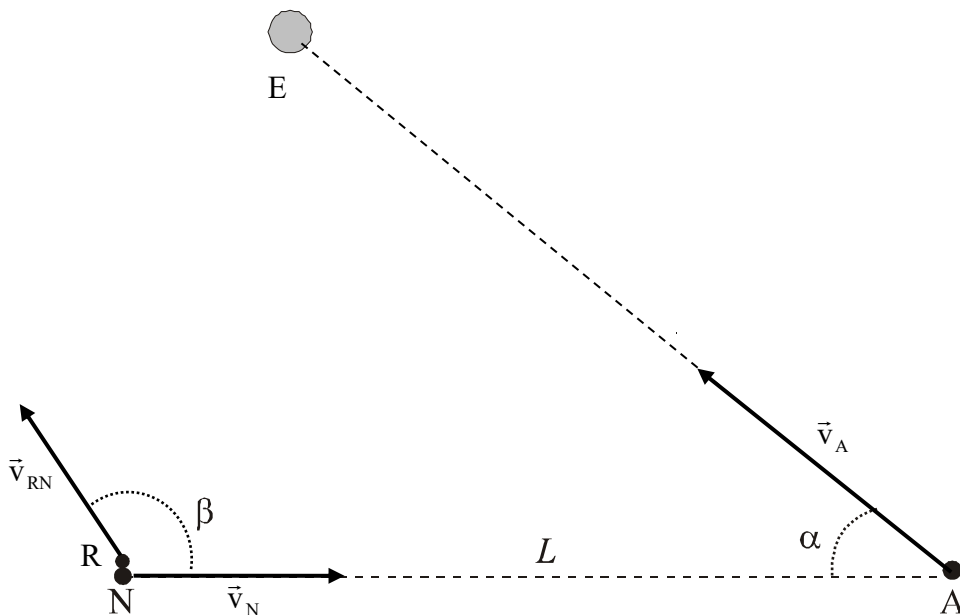


Fig. 1

We assume, that the direction of absolute displacement of the rocket R is perpendicular to the direction of absolute movement of asteroid A.

Determine the angle  $\beta$ , at which the rocket R was launched, relative to the direction of movement spacecraft, N.