

**Practical round. Problems to solve**

Group α – problems 11-12,
Groups β , γ – problems 11-13.

Reminding. Problems of the Practical round compiled in such a way that when writing solutions, use of any language is not required from the participant. So

texts are not allowed

in solutions of the problems (neither in the native language, nor in English).

12($\alpha\beta\gamma$). Bolide. A fireball was observed from three different observing sites I, II, III. The position of the observation sites, the altitude and azimuth of start and end points of the fireball's trajectory are given in Table.

	observation point		start point (A)		end point (B)	
	longitude	latitude	azimuth	altitude	azimuth	altitude
I	127.3° E	35.7° N	17°	35°	77°	10°
II	128.5° E	37.0° N	235°	–	139°	–
III	128.5° E	35.4° N	325°	–	48°	–

Azimuths are measured eastward from the North direction, and altitude measured above the horizon, and both the angular measurements are in degrees. Following the steps below, find true trajectory and location on the surface of Earth of fallen debris of the fireball (meteorite).

- 12.1.** You are provided by a scaled marked graph paper. Mark the 3 observing positions (I, II, III) and draw a projected trajectory of the fireball as seen on the surface of the Earth.
- 12.2.** Calculate the longitude and latitude of start (λ_A , φ_A) and end (λ_B , φ_B) points of the fireball and total length L of the trajectory projected on the Earth surface.
- 12.3.** Find the heights of starting point h_A and end point h_B of the fireball's trajectory.
- 12.4.** Where can you find a meteorite, if it survives passage through the atmosphere and hits the ground? Calculate the longitude and latitude (λ_C , φ_C) of the location of the meteorite on the surface of Earth's.
- 12.5.** Finally, redraw the table below to your answer-book and fill the empty cells with you results.

point	longitude λ	latitude φ	L (km)	h_A (km)	h_B (km)	You may find the meteorite at	
						longitude λ	latitude φ
A							
B							