



Theoretical round. Basic criteria. For work of Jury

Note. The given sketches are not full; the team leaders have to give more detailed explanations to students.
But the correct solutions in the students' papers (enough for 8 pts) may be shorter.

Note. Jury members should evaluate the student's solutions in essence, and not by looking on formal existence the mentioned sentences or formulae.
The formal presence of the mentioned positions in the text is not necessary to give the respective points.
Points should be done if the following steps de facto using these positions.

α -1. Star rise in Moletai.

1.1. Totally 5 pt, including:

Understanding approach that culmination is the middle point between star rise and star set – 1 pt.

Time of the first star rise on September 8 calculation, result 0:03 – 1 pt.

Using sidereal approach for the future calculations – 1 pt.

Issue that next sunrise will be still on September 8 – 1 pt.

On September 9 the star will rise after one more sidereal day, that is at 23:55 – 1 pt.

1.2. Totally 3 pt, including:

Argumentation about the star is above the horizon $\frac{1}{4}$ days, $\frac{1}{8}$ of rotation before the culmination and $\frac{1}{8}$ of rotation after – 1 pt.

Correct illustration – 1 pt.

Rises approximately at south-east, answer: SE – 1 pt.

β -1. RadioAstron.

1.common. Totally 1.5 pt, including:

General approach, formula $\delta = \lambda / D$ – 0.5 pt.

The base for interferometers it is the distance between its elements – 0.5 pt.

Understanding $\delta_{\min} = \lambda_{\min} / D_{\max}$ – 0.5 pt.

1.1. Totally 3.5 pt, including:

Understanding $\lambda_{\min} = 1.19$ cm – 0.5 pt.

The maximum base of the Earth-"Spektr-R", in which "Spektr-R" is at apogee, and the ground-based telescope is at the opposite side of the globe $D_{\max} = A + R$ – 0.5 pt.

The directions perpendicular to the base of Earth-"Spektr-R" – perpendicular to the major axis – 0.5 pt.

The apogee distance can be found as $A = 2a - (R+h)$ – 0.5 pt.

Using Kepler's third law to find a , $a^3/a_J^3 = \tau^2/T_J^2$ – 0.5 pt.

Final calculations and correct result – 1 pt.

1.2. Totally 3 pt, including:

The maximum base $D_{\max} = b + R$ – 1 pt.

Calculation semi-minor axis using the geometric properties of the ellipse – 1 pt.

Final calculations and correct result – 1 pt.