АСТРОНОМИЧЕСКОЕ ОБЩЕСТВО

EURO-ASIAN ASTRONOMICAL SOCIETY

VIII Азиатско-Тихоокеанская астрономическая олимпиада

VIII Asian-Pacific Astronomy Olympiad

Round **Theo**

Group **β**

Бангладеш, Кокс-Базар 26.XI. – 4.XII. 2012 Cox's Bazar, Bangladesh

язык / language	**English**

Theoretical round

1. **Canopus.** Canopus was a very popular star in problems set of the XVII IAO in Gwangju, Korea (October 16-24, 2012). But nobody had success seeing it during that Olympiad. Maybe here you will be lucky? Calculate time for the best conditions for observation of Canopus during the next 24 hours. Bangladesh time should be used.

2. **Image of Eclipse.** Two weeks ago, in the morning of November 14, 2012, a Total Solar Eclipse was observed in the North-East Australia. The photo (the whole size displayed) was taken by a Canon SX50 HS camera, which has 3000 x 4000 pixels CCD, and the distance between the centres of the adjustant pixels is 1.54 μm (= $1.54 \cdot 10^{-6}$ m). Calculate the focal distance of the camera's objective used to get the image.

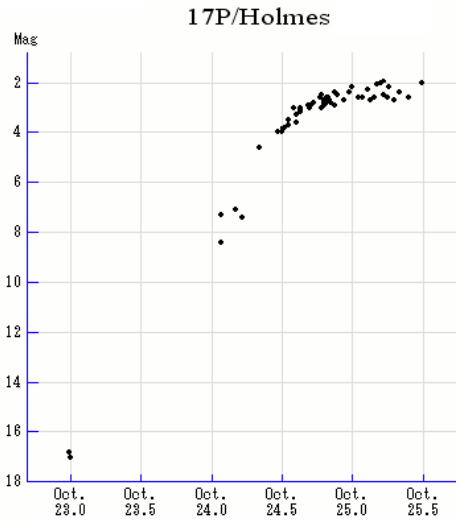
3. **Remote galaxy.** Research of a remote galaxy showed us that the Hα line in its spectrum is observed at a wavelength of 34000 Å. Roughly (with an accuracy of 20%) estimate:

3.1. The receding speed of the galaxy.

3.2. The distance to the galaxy.

4. **Bear and satellite.** The Polar Bear is sitting at the North Pole of the Earth, philosophizes and watches celestial objects. An artificial satellite moving in a circular polar orbit appeared in his vision. The first time the satellite disappeared over the horizon at the longitude of Gwangju, and the next time it disappeared over the horizon at the longitude of Cox's Bazar. At what height above the head of the Polar Bear the satellite flies? The solution has to include an artistic picture with an image of the Polar Bear-observer at the North Pole.

5. **Comet Holmes.** Comet Holmes (17P Holmes) has been known since 1892, being an unremarkable object of 17th magnitude for many years. Based on computations, the diameter of comet's nucleus was estimated to d_0 = 3.4 km. And a few years ago it presented a surprise for all astronomers. In two days on October 23-25, 2007, its brightness suddenly increased many thousands times. As per one of the first versions, of the nucleus of the comet collided with some microcosmic celestial body, and as a result, there was a great explosion, and the nucleus fell apart into many small fragments. The graph shows the magnitude of the comet versus time for the days of outburst. Estimate approximately in how many fragments Comet Holmes was disintegrated according to this model. What was the average size of a fragment?



6. **Planet Bangladeya.** Engineers of Bangladesh created a new planet Bangladeya from a part of the Earth substance. Total area of surface of Bangladeya equals to the area of Bangladesh country (S = 147 600 km^2). The planet is rotating around the Sun by circular orbit so that the mean climate on Bangladeya is the same as in Bangladesh country (the average temperature is 25.6 °C that is 10.5 degrees higher than average on the Earth).

6.1. Estimate the acceleration of gravity at the planet Bangladeya.

6.2. Calculate the duration (in Earth days) of the year on the planet Bangladeya.