АСТРОНОМИЧЕСКОЕ ОБЩЕСТВО

EURO–ASIAN ASTRONOMICAL SOCIETY

Round **Theo**

Group **α**

VIII Азиатско-Тихоокеанская астрономическая олимпиада

VIII Asian-Pacific Astronomy Olympiad

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 3000×4000 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. **Sunspot.** Astronauts who arrived at Mercury observe the Sun. They see a sunspot located just in the center of the visible solar disk. After what time will this spot be in the centre of the solar disk once again? The sidereal period of the equatorial regions of the Sun is 25.38 days.

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?
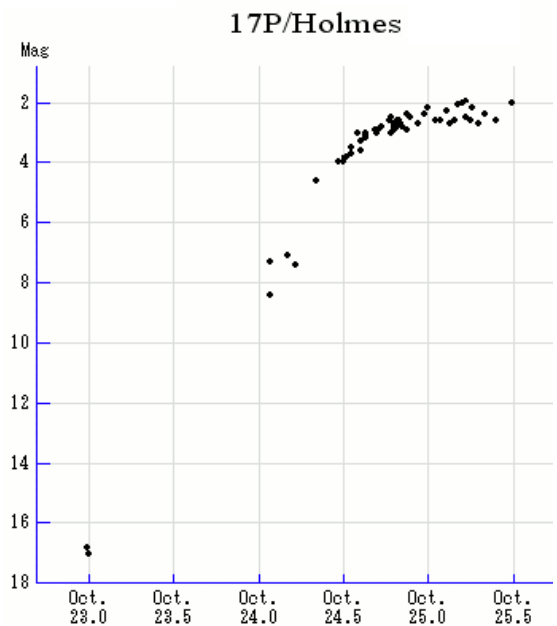
6. **Planet Bangladeya.** Engineers of Bangladesh created a new planet Bangladeya from a part of the Earth substance. Total area of surface of Bangladeya equals to the area of Bangladesh country ($S = 147\,600$ km²). Estimate the acceleration of gravity at the planet Bangladeya.