Teoretical round

Group A (juniors, < 16 years old).

1. What can one see in the Moon's sky more often - the Sun or the Earth?

2. In a new postal service a huge cannon shots a postal shell from England to New Zealand. Can you estimate the duration of the shells flight?

3. It is known that the equatorial coordinates of vernal equinox are 0 hr and 0 deg. Which are the North ecliptic pole coordinates?

4. Suppose that the Sun collapsed suddenly to a black hole. How would the orbital period of the Earth be affected?

5. Can we distinguish the lunar Mare Crisium, which diameter is 520 km, by a naked eye?

6. There are about of 250 millions of stars in the elliptical galaxy **M32** (a satellite of Andromeda galaxy). The visual magnitude of this galaxy is $\mathbf{9^m}$. If luminosities of all stars are equal, what is the visual magnitude of one star in this galaxy?

Theoretical round

Group B (seniors, > 16 years old).

Text of these problems is available also in Bulgarian, Danish, Portuguese and Russian.

1. Is it possible to observe solar eclipses, meteors, comets, auroras, rainbows, noctilucent clouds and artificial satellites on the Moon?

2. There are Cepheids variables in our own Galaxy as well as in other galaxies. Why was the "period-luminosity" relation first recognized for Cepheids in the Magellanic Clouds?

3. Because precession, the vernal equinox point moves slowly (50" per year) in the sky. Along what celestial circle does it move - the equator or the ecliptic?

4. Artificial Earth satellite moves with a speed of 6.9 km/sec along the circular equatorial orbit in the direction of the Earth rotation. What is the period of the satellite appearance above any fixed equatorial point?

5. Can we distinguish the lunar Mare Crisium, which diameter is 520 km, by a naked eye?

6. There are about of 250 millions of stars in the elliptical galaxy **M32** (a satellite of Andromeda galaxy). The visual magnitude of this galaxy is $\mathbf{9^m}$. If luminosities of all stars are equal, what is the visual magnitude of one star in this galaxy?