X Международная астрономическая олимпиада
X International Astronomy Olympiad

Китай, Пекин 25.X. – 2.XI. 2005 Beijing, China

Задачи теоретического тура

Theoretical round. Problems to solve

язык / language	English

Groups α β

General note. Maybe not all problems have correct questions. Some questions (maybe the main question of the problem, maybe one of the subquestions) may have no real sense. In this case you have to write in your answer (in English or Russian): **«situation is impossible - ситуация невозможна»**. Of course, this answer has to be explained numerically or logically.

1. **The Bear.** The White Bear (whom was already met in the texts of the VII, VIII and IX International Astronomy Olympiads) has returned from Crimea to the North Pole and decided to observe a sunset. Calculate how long this sunset lasts. The solution has to include a picture with an image of the Bear on the North Pole; necessary sizes or angular sizes should be in the picture. Assume that the Earth is spherical. Recollect for yourself the necessary information about the White Bear.
   But can the Bear prolong the observation of sunset, not moving from the Pole? For what time?

2. **Sun.** In one of the ancient models of the Universe the centre of solar system is the Earth rotating around its own axis. The stars are not moving around the Earth. The Moon and the Sun are orbiting the Earth. Mercury and Venus are orbiting the Sun. Mars, Jupiter and Saturn moves around invisible objects which are orbiting the Earth.
   Consider the explanation of the system Earth-Moon to be correct in this model and the mass of Sun to be negligible in comparison with the mass of the Earth-Moon system. Find (by two different ways of solution) the distance between the Earth and the Sun in such a model.
   Find the absolute stellar magnitude of such a Sun.

3. **Andromeda nebula.** We hope that you are familiar with the object Andromeda nebula (M31, NGC 224). Its stellar magnitude $m = 4.4^m$ and its distance from us is 0.7 Mpc. To what distance from this object should we move, if it were to shine as the full Moon? What would the (approximate) angular size of this object be in that case?

При решении каждой задачи можно использовать данные прилагаемой "Таблицы данных о планетах"
Data from the "Table of planetary data" may be used for solving every problem

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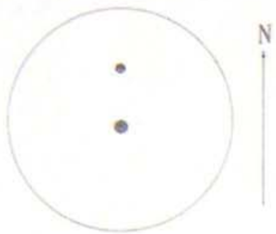
язык / language	**English**

Group α

α**4. Sunspots.** At the day of the winter solstice we observe the Sun in Quito, the capital city of Ecuador in South America (78°W, 0°S). The resulting image is seen in figure 1. There are two sunspots on the Sun. At the same time it is sunrise in Alaska (60°N) and sunset in Windhoek, the capital city of Namibia in Africa (17°E, 23°S). Are these sunspots to be seen in Alaska and Windhoek. (Note: answer «**Да-Yes**» or «**Нет-No**» has to be written in English or Russian.) Draw the images of the observations of the Sun at that time as they are seen in Alaska and Windhoek.



East

West

α**5. Cluster.** Astronomers find a "star" which position in the Hertzsprung-Russell diagram is about 8^m higher than the corresponding stars of the main sequence. Assume that the "star" is a cluster of similar stars and estimate the number of stars in the cluster.

α**6. Earth transit.** At November 7, 2005, the Mars opposition will occur. During this event Mars will be situated at 0.47 a.u. from the Earth, being quite close to the ecliptic line (27′ south of it) as observed from the Earth. For this event the Martian Space Agency is planning the near-Mars space mission with astronauts onboard purposed to observe the Earth transit the centre of the solar disk. To diminish expenses the space mission will follow the optimal way – to observe the transit from the minimum possible distance from Mars. In what constellation will Mars be observed from the station in the middle of the Earth transit?

При решении каждой задачи можно использовать данные прилагаемой "Таблицы данных о планетах".
Data from the "Table of planetary data" may be used for solving every problem.

X Международная астрономическая олимпиада
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Задачи теоретического тура — Theoretical round. Problems to solve

язык / language	*English*

Group β

β4. Pole star. It is known, that the altitude of the Pole star above the horizon is numerically equal to the geographic latitude of the place of observation, and the direction to it is the direction to North. However there are some errors in these rules. Find the maximum errors (in ° and ') while using this way to find the latitude of the place ($\Delta\varphi$) and the direction to North ($\Delta\beta$). The observations are carried out in the observatory Xinglong (Синьлун) near Beijing. The declination of the Pole star is equal to 89°10'. The approximate latitude of Beijing is $\varphi = 40°$.

β5. Cluster. Astronomers find a "star" of the spectral class **A0** which position at the Hertzsprung-Russell diagram is about -7^m – -8^m! (I.e. it is very much higher than the main sequence). Assume that the "star" is a cluster that consists of many similar stars and estimate the possible number of stars in the cluster.

β6. Earth transit. At November 7, 2005, the Mars opposition will occur. During this event Mars will be situated at 0.47 a.u. from the Earth, being quite close to the ecliptic line (27′ south of it) as observed from the Earth. For this event the Martian Space Agency is planning the near-Mars space mission with astronauts onboard purposed to observe the Earth transit on the solar disk (at least transit through the edge of the Sun) and to investigate the Earth's atmosphere. What minimum orbital period of motion around Mars must this space station have?

При решении каждой задачи можно использовать данные прилагаемой "Таблицы данных о планетах".
Data from the "Table of planetary data" may be used for solving every problem.

Тезисы решений задач теоретического тура

Theoretical round. Sketches for solutions

язык / language	
язык / language	*Русский*
язык / language	***English***

1. **The Bear.** For an observer on the North Pole the sunset happens once a year, in time close to the day of the autumnal equinox. For the observer on the North Pole the angle between the ecliptic and the horizon is equal to $\varepsilon = 23.5°$. During the sunset the Sun lowers to the angle equal to its apparent angular diameter, that is $\alpha = 32'$. During this time the Sun transits angular distance on ecliptic is equal to $\varphi = \alpha/\sin\varepsilon$. Thus, the duration of sunset is $\tau = \varphi/v = \alpha/(v\cdot\sin\varepsilon)$, where v is the speed of the Sun on the ecliptic, equal to $v = 360°/365.25^d = 0{,}986°$ per day. Thus,

$$\tau = (32/60)° / (360°/365{,}25^d) / \sin 23.5° = 1.36 \text{ days or } 32.5 \text{ hours.}$$

Yes, during the sunset the Bear will come to twist the head 490 degrees!

As for the prolongation of the observation of the sunset, the Bear can use the effect of depression of the physical horizon, if it rises on the back feet. That is, he can begin to observe sunset lyng on ground (pardon, on ice), where the horizon dip can be disregarded, and to finish, costing on back feet. For the last case the depression of the physical horizon makes

$$\Delta\varphi = \arccos(R/(R+h)) \approx ((R+h)^2 - R^2)^{1/2}/R \approx (2h/R)^{1/2} \text{ (in radians).}$$

Where R is the radius of the Earth, , and h is the height of eye level above the surface of the Earth (ice). For the height of an eye of a White Bear about 2 m above the surface, the horizon depression is about 3 '. So, the Bear can prolong observation of sunset almost by 10 %, namely

$$\Delta\tau = (3/60)° / (360°/365{,}25^d) / \sin 23.5° = 3 \text{ hours.}$$

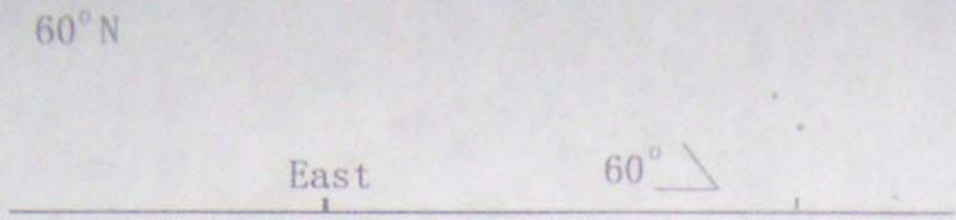
2. **Sun.** The both ways are to use the III General Kepler's law. The first way is to compare the system Earth-SunInModel (365,25 days) with system Earth-Moon (27,37 days) taking into account the same total mass of system. The second way is to compare the system Earth-SunInModel (total mass of system is mass of Earth+Moon) with real system Earth-Sun (total mass of system is mass of Sun+Earth+Moon ≈ mass of Sun).

3. **Andromeda nebula.** The full Moon stellar magnitude is $m_M = -12.7^m$. So we should come nearer to the Andromeda nebula so that the stellar magnitude changes from $m = 4.4^m$ to $m_M = -12.7^m$, i.e. for $\Delta m = 17.1^m$. The formal calculation gives us N = exp(17.1/5) = 2630 times 0.7 Mpc / 2630 ≈ 270 pc. Taking into account that the angular size of the Andromeda nebula in our sky is about 2°-3°, i.e. the linear size is about $5\cdot 10^{-2}\cdot 0.7$ Mpc = 35 000 pc, we see that the formal answer has no real sense. There is no real sense for the question about the angular size as well (formal answer is 130 radians).

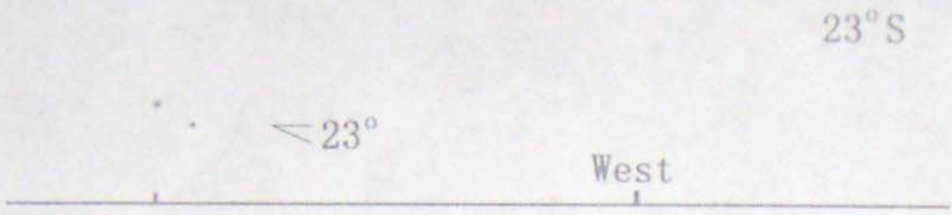
Answer: «situation is impossible – ситуация невозможна»

α4. **Sunspots.** the answer for the first question is "to be seen" («**Да-Yes**»).

At Alaska:



In Windhoek:



β4. Полярная звезда. Для широты местности φ эта погрешность Δφ равна реальной разнице между высотами Северного полюса мира и Полярной звезды, которая может быть от -Δδ до +Δδ, где Δδ = 50' – разница склонений Полярной звезды и Северного полюса мира, то есть от -50' до +50'. Таким образом, Δφ = Δδ = 50'.

Для направления на Север дело обстоит хитрее. Будем проводить на небесной сфере большие круги через точку Зенита и Полярную звезду в различные моменты времени. Погрешность определяется тем, как далеко от настоящего направления на Север упирается в горизонт конкретный большой круг. Максимальная погрешность Δβ – разница между большим кругом, проходящим через Северный полюс мира, и большим кругом, проходящим через Полярную звезду в её максимальном удалении по горизонтали. Для нахождения данной разницы спроецируем эти два больших круга на плоскость горизонта, получим две прямые, угол между которыми Δα находится из условия Δδ = Δβ·cosφ. Таким образом,

$$\Delta\beta = \Delta\delta/\cos\varphi.$$

Для широты Пекина:

$$\Delta\beta = \Delta\delta/\cos 40° = \Delta\delta/0{,}77 \approx 1°05'.$$

α5. Cluster. Let us consider that the absolute stellar magnitude and lightness of the cluster are M(cluster) and I(cluster), of a star in the cluster is M(star) and I(star). Initial relationship is:

$$I(\text{cluster}) = I(\text{N-stars}) = N \cdot I(\text{one-star}).$$

So

$$\lg I(\text{N-stars}) = \lg N + \lg I(\text{one-star}),$$
$$\lg N = \lg I(\text{N-stars}) - \lg I(\text{one-star}),$$
$$5/2 \lg N = 5/2 \lg I(\text{N-stars}) - 5/2 \lg I(\text{one-star}) = \Delta M,$$
$$\lg N = 2/5\, \Delta M,$$
$$N = 10^{0.4 \cdot \Delta M}.$$

As it done

$$\Delta M = M(\text{cluster}) - M(\text{one-star}) = M(\text{N-stars}) - M(\text{one-star}) = 8^m.$$

So

$$N = 10^{0.4 \cdot 8} = 10^{3.2} = 1585 \text{ stars} \approx 1600 \text{ stars}.$$

Answer: about 1600 stars.

Note: Answer "1585 stars" is not correct! There is data "about 8^m", so it is approximate value. For example, by varying this value only by only 0.1^m we will get range of formal answers from 1445 to 1738, and by 0.5^m: from 1000 to 2512.

β5. Cluster. Stars of **A0** spectral class have absolute stellar magnitude about 0^m. So the problem is analogous to α2 with the difference in magnitude of "about 7^m – 8^m". Analogous to α2 solution we can find approximate boundaries of number of stars in the claster.

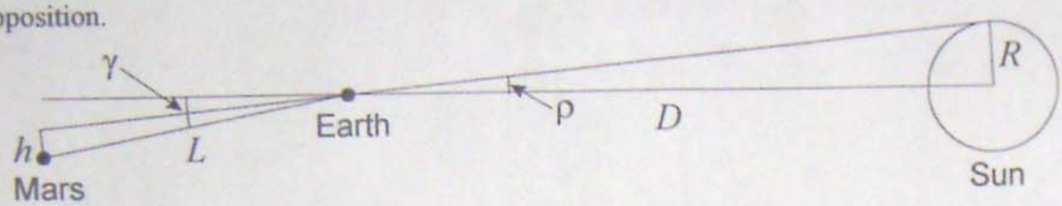
$$N_{min} = 10^{0.4 \cdot 7} = 10^{2.8} = 631 \text{ stars} \approx 600 \text{ stars.}$$

$$N_{max} = 10^{0.4 \cdot 8} = 10^{3.2} = 1585 \text{ stars} \approx 1600 \text{ stars.}$$

Answer: about from 600 to 1600 stars.

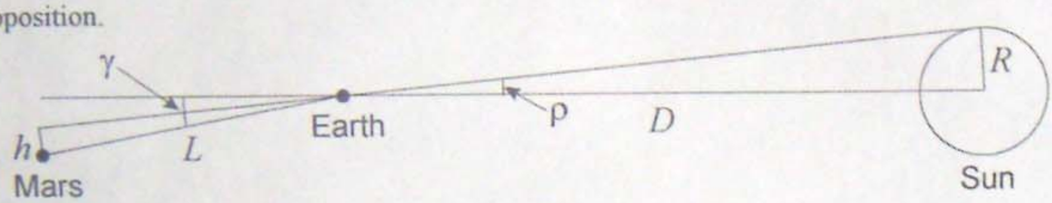
Note once more: Answer about "from 631 to 1585 stars" is not correct! There is data " about -7^m – -8^m ", so we have approximate values.

α6. Earth transit. The figure shows the configuration of Sun, Earth and Mars in the moment of Mars opposition.



While middle of the Earth transit being observed from the minimal possible distance from Mars, Mars will be situated near the South Ecliptic pole in the Doradus contellation, near to Large Magellanic Cloud.

β6. Earth transit. The figure shows the configuration of Sun, Earth and Mars in the moment of Mars opposition.



The angular radius of the Sun visible from the Earth is equal to

$$\rho = \arcsin(R/D) = 16'.$$

Here R is the radius of the Sun, D is the distance between Sun and Earth. Let L will be the distance between Earth and Mars. Being observed from the Earth, the angular distance between the Mars and ecliptic line γ is larger than angular radius of the Sun, thus, as can be seen in the figure, there will be no Earth transit on the solar disk observable from Mars, it will be a pity for Martians. To observe it anyway, they have to go by the distance h towards the ecliptic plane (northwards). Taking into account that all angles are small and the Earth is many times smaller than the Sun, we will calculate this distance:

$$h = L \sin(\gamma - \rho) = 0.0015 \text{ a.u.} = 224\,000 \text{ km.}$$

To reach the distance required having the minimal orbital period, the Earth transit observation point must be the apocenter of the orbit. The pericenter distance cannot be less than the radius of Mars r (about 3400 km). The minimal large semi-axis of the station orbit will be about

$$a = (r + h) / 2 = 114\,000 \text{ km.}$$

This value is 0.296 of the large semi-axis of the Moon orbit around the Earth. Calculating the period, we have to take into account that the mass of the Mars is 0.107 of the mass of the Earth. Using General III Kepler law:

$$a^3/(T^2 M) = \text{const},$$

we find that the station orbital period is about 0.49 of the lunar period or 13.5 days. For the mission to be successful, the station must be launched at October, 31, in three days after the theoretical round of X IAO.

Задачи практического тура

Practical round. Problems to solve

язык / language	*Русский*

Groups α and β

$\alpha\beta$7. **Рефракция.** Зенитное расстояние (Z) определяется как угол между направлениями на астрономический объект и на зенит наблюдателя (Z=0° для объекта в зените и Z=90° для объекта на горизонте). Из-за атмосферной рефракции видимое (измеряемое) зенитное расстояние (Z_m) меньше, чем истинное (Z_t), на величину R (в секундах дуги). Данные приведённой ниже таблицы могут быть использованы при наблюдениях на уровне моря при температуре 10°:

Z_m	R	Z_m	R	Z_m	R	Z_m	R
0°	0″	50°	70″	82°	394″	87°	863″
10°	10″	60°	101″	83°	444″	88°	1103″
20°	21″	70°	159″	84°	509″	89°	1481″
30°	34″	80°	319″	85°	593″	89°31'	1760″
40°	49″	81°	353″	86°	706″	90°	2123″

Для зенитных расстояний Z_m меньше, чем некоторое значение Z_F, приближённая формула для вычислений:

$$R = 60{,}25''\cdot(B/760)\cdot(273°/(273°+t°))\cdot\tan Z_m \quad (1),$$

где B – атмосферное давление в мм ртутного столба, t° – температура в °C.

7.1. Найдите диапазон значений Z_m, в котором можно использовать формулу (1) с точностью 1″, т.е. найдите Z_F.

7.2. Найдите широту места наблюдения с точностью 0,1', если в то время, когда в июне Солнце наиболее высоко поднимается в небе, его наблюдаемое зенитное расстояние равно 16°34,4'. (Для заданной точности ε = 23°26,4').

7.3. Вычислите (с точностью 0,1') истинное зенитное расстояние Z_t для центра Солнца в тот момент, когда при заходе весь диск Солнца только что скрылся на горизонте (t = 10°C).

7.4. Используя приведённую выше информацию, сделайте необходимые вычисления и нарисуйте видимую форму Солнца в тот момент, когда мы видим, что его нижний край только что коснулся горизонта. 1 клеточка в сетке соответствует 2'. Пометьте, какие данные и метод вычислений Вы использовали при решении.

Считать, что при отсутствии атмосферной рефракции угловой диаметр Солнца равен 32,0'.

Задачи практического тура **Practical round. Problems to solve**

язык / language	*Русский*

Group β

8. Планетарная туманность. Планетарная туманность – это расширяющийся газообразная оболочка, образовавшаяся при взрыве центральной звезды. Шаровая планетарная туманность IC 418 наблюдается с помощью спектрографа, щель которого фиксирует лучи, пришедшие от точки примерно на половине радиуса туманности, как показано на рисунке 1. Рисунок 2 (по осям – поток и длина волны) – это полученная эмиссионная линия [N I], которая имеет лабораторную длину волны λ = 5200.26 Å. Явно видны два пика.

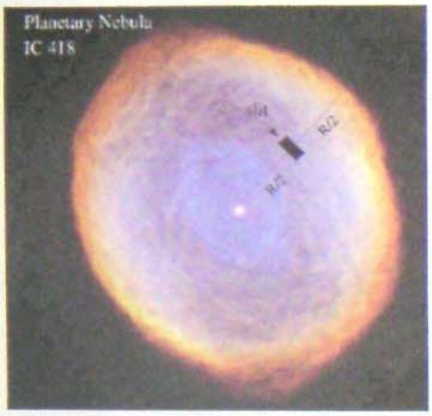


Рис. 1

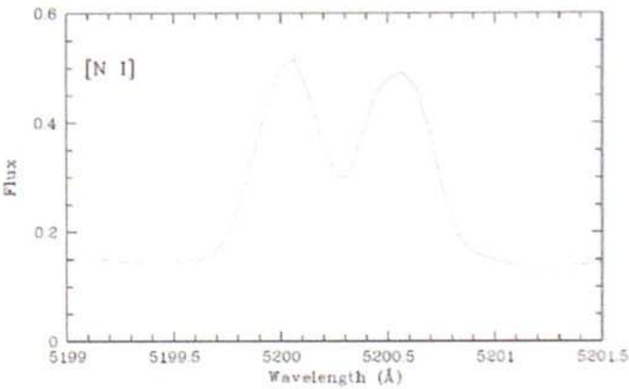


Рис. 2

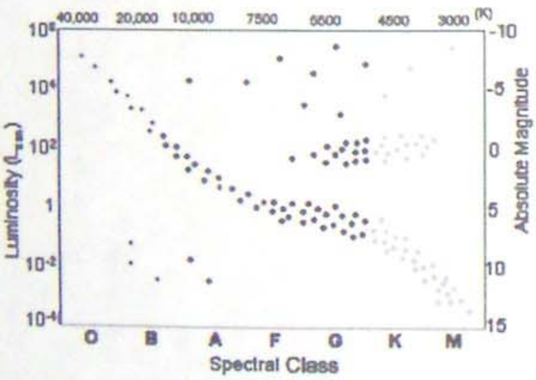


Рис. 3

8.1. Нарисуйте на диаграмме Герцшпрунга-Рассела (рисунок 3) кривую эволюции звезды главной последовательности, которая может взрываться с образованием планетарной туманности. Отметьте положение планетарной туманности (planetary nebula).

8.2. Считая, что IC 418 имеет диаметр α = 12" и удалена от нас на расстояние L = 330 Пк, вычислите её возраст. Этот возраст, кстати, астрофизики называют " динамическим возрастом".

X Международная астрономическая олимпиада
X International Astronomy Olympiad

Китай, Пекин 25.X. – 2.XI. 2005 Beijing, China

Observational round. Problems

Задачи наблюдательного тура

язык language	*English*
язык language	*Русский*

Groups α, β

English	***Русский***
1.1. Find Mars on the sky and show it. 1.2. Write three constellations, which stars are quite around it. 1.3. Draw down its position on the sky map. 1.4. Find the angular distance between Mars and the Pleiades.	1.1. Найдите на небе Марс, покажите его. 1.2. Напишите три созвездия, звёзды которых находятся вокруг него. 1.3. Нанесите его положение на карту. 1.4. Определите угловое расстояние между Марсом и Плеядами.
2. Find the stellar magnitudes of the star β Per using data about comparing stars (α Per = $1,8^m$ and η Per = $3,8^m$) and write the answer on the map. You have a sky map of the necessary region.	2. Используя звёзды сравнения (α Per = $1,8^m$ и η Per = $3,8^m$), определите звёздную величину звёзды β Per и напишите ответ на карте. Карта данной области неба прилагается.
3. You have two minutes for using the telescope to find M31 and show it to the supervisor. You may use more time but the mark will be less in this case.	3. У Вас есть две минуты, чтобы навестись телескопом на M31 и показать результат проверяющему. Вы можете использовать дополнительное время, но оценка будет ниже в этом случае.
Maximum total time for all jobs is **12 minutes**.	Максимальное время выполнения задания – **12 минут**.

Астрономическое общество — Euro-Asian Astronomical Society

X Международная астрономическая олимпиада
X International Astronomy Olympiad

Пекин — 25.X. - 2.XI. 2005 — Beijing

Протокол жюри   Jury minutes   Group α

№	Шифр	Ф. И. О. участника		Команда	Теоретический тур						Практ-Набл			Сумма				Дип	
№	Code	Name of particiant		Team	Theoretical round						Pract-Observ			Sum				Dip	
					1	2	3	4	5	6	7	8	9	Т	П	Н	Σ		
		Family name	Given name	Max	8	8	8	8	8	8	10	10	20	48	20	20	88		
1	IN-J-1	Jain	Mehul	India	8.0	5.7	6.3	6.0	8.3	6.5	10	6	13	40.8	**16.0**	13.0	**69.8**	I	BR
2	IN-J-2	Singh	Udbhav	India	7.3	5.0	7.7	8.0	8.7	1.5	9	5	17.5	38.1	14.0	**17.5**	69.6	I	BO
3	IR-J-1	Fatahisavadjani	Azadeh	Iran	6.0	8.0	5.5	8.0	8.0	7.0	6	4	17	**42.5**	10.0	17.0	69.5	I	BT
4	KR-J-2	Taak	YoonChan	Korea	8.0	4.0	6.0	7.3	8.0	5.7	9	6	10.5	39.0	15.0	10.5	64.5	I	
5	CN-J-1	Cheng	Tong	China	6.0	2.0	7.7	7.0	7.0	6.7	9	6	6.5	36.3	15.0	6.5	57.8	I I	
6	BG-J-3	Kurtenkov	Aleksandar Atai	Bulgaria	6.0	8.0	5.0	1.3	7.7	6.3	6	4	11	34.3	10.0	11.0	55.3	I I	
7	IN-J-3	Nayak	Soumyashant	India	7.3	4.3	8.7	2.3	7.7	1.5	6	2	14.5	31.8	8.0	14.5	54.3	I I	
8	ID-J-3	Gunawan	Hartono	Indonesia	3.5	7.0	5.0	5.0	6.5	1.5	8	0	15	28.5	8.0	15.0	51.5	I I	
9	RU-J-3	Korsunov	Igor Sergeevich	Russia	8.0	8.0	2.7	2.0	7.3	0.7	6	8	8.5	28.7	14.0	8.5	51.2	I I	
10	RU-J-2	Shabanov	Andrey Aleksan	Russia	7.7	6.0	7.7	2.7	8.0	0.0	5	0	12	32.0	5.0	12.0	49.0	I I	
11	BJ-J-2	Yan	Wenchi	Beijing	1.0	6.0	7.7	3.3	7.0	2.7	5	1	13.5	27.7	6.0	13.5	47.2	I I	
12	KR-J-1	Ahn	Dae Kun	Korea	6.7	5.3	6.0	4.7	4.7	5.7	4	0	10	33.0	4.0	10.0	47.0	I I	
13	RU-J-1	Smolentsev	Igor Alexandrov	Russia	6.0	2.5	8.0	0.0	7.3	3.7	6	6	6.5	27.5	12.0	6.5	46.0	I I	
14	ID-J-1	Utama	Muhammad Iqb	Indonesia	5.0	1.5	5.0	2.5	8.0	5.5	5	6	7	27.5	11.0	7.0	45.5	I I	
15	CN-J-2	Xu Z.-J.	Zhiji	China	3.0	4.0	4.3	2.0	7.3	4.7	10	2	7	25.3	12.0	7.0	44.3	I I I	
16	BG-J-2	Kokotanekova	Rosita Dimitrova	Bulgaria	4.0	4.0	6.0	4.7	7.3	0.7	3	2	11.5	26.7	5.0	11.5	43.2	I I I	
17	IR-J-2	Baniasadi	Pouya	Iran	4.5	5.0	5.0	4.0	6.5	0.5	1	2	14	25.5	3.0	14.0	42.5	I I I	
18	BG-J-1	Zhivkova	Neli Ivanova	Bulgaria	1.5	7.0	5.7	2.7	6.3	2.3	6	0	9	25.5	6.0	9.0	40.5	I I I	
19	IR-J-3	Rezaei Mianroodi	Jamshid	Iran	8.0	3.5	5.0	4.0	6.5	1.0	5	2	4	28.0	7.0	4.0	39.0	I I I	
20	CN-J-3	Yuan	Ye	China	5.0	0.7	6.0	5.3	7.0	2.0	3	2	5.5	26.0	5.0	5.5	36.5	I I I	
21	SM-J-2	Milovicj	Matija	Serbia and Monte	2.5	7.7	4.3	2.0	5.7	1.3	6	0	3	23.5	6.0	3.0	32.5	I I I	
22	BJ-J-3	Du	Yujia	Beijing	1.0	1.0	5.7	3.3	6.7	0.7	0	3	10.5	18.3	3.0	10.5	31.8	I I I	BB
23	SM-J-1	Milicjevicj	Luka	Serbia and Monte	1.5	1.0	5.3	3.7	8.0	1.0	4	2	5	20.5	6.0	5.0	31.5	I I I	
24	TH-J-3	Issaranon	Theerasit	Thailand	1.0	2.3	6.3	2.7	7.0	1.0	5	1	4	20.3	6.0	4.0	30.3		
25	BR-J-1	Lima	Nathan Willig	Brazil	2.0	5.0	5.3	1.3	3.7	0.3	3	1	8.5	17.7	4.0	8.5	30.2		
26	TH-J-2	Kamnirdsittiseree	Thanapon	Thailand	1.0	8.0	4.3	2.7	7.0	1.7	1	0	4	24.7	1.0	4.0	29.7		
27	BJ-J-1	Zhang	Xinjun	Beijing	1.0	2.7	2.7	2.7	6.7	1.7	3	0	8.5	17.3	3.0	8.5	28.8		
28	EE-J-1	Zavyalov	Stanislav	Estonia	0.7	8.0	4.0	1.0	4.3	0.0	4	1	5.5	18.0	5.0	5.5	28.5		
29	BR-J-3	da Mata	Henrique Olivei	Brazil	3.7	2.0	5.0	0.0	3.3	2.3	3	3	6	16.4	6.0	6.0	28.4		
30	SM-J-3	Dragovicj	Natasha	Serbia and Monte	1.0	3.7	3.7	2.0	7.0	1.0	3	1	5.5	18.3	4.0	5.5	27.8		
31	TH-J-1	Iadtrong	Sawanya	Thailand	1.0	1.7	6.0	2.7	7.5	1.7	3	0	3	20.5	3.0	3.0	26.5		
32	ID-J-2	Jabbar	Hizbullah Abdul	Indonesia	1.0	4.0	3.0	4.0	6.0	0.5	6	0	2	18.5	6.0	2.0	26.5		
33	RO-J-3	Turcu	Tudor Cristian	Romania	3.0	5.7	4.0	1.7	0.0	1.5	2	0	7	15.8	2.0	7.0	24.8		
34	RO-J-2	Margarint	Vlad-Dumitru	Romania	1.3	2.3	1.3	1.3	4.7	1.5	3	1	7	12.5	4.0	7.0	23.5		
35	RO-J-1	Popescu	DanielFlorin	Romania	1.0	2.3	1.7	1.7	0.7	2.0	3	1	5	9.3	4.0	5.0	18.3		
36	BR-J-2	Nascimento	Gustavo Donad	Brazil	0.3	0.3	0.0	2.3	0.0	0.0	0	0	7.5	3.0	0.0	7.5	10.5		

Jury Chairman — Jin Zhu

X International Astronomy Olympiad — Beijing China — Пекин Китай — 2005.10.25-11.2 — X Международная астрономическая олимпиада

Jury Vice-Chairman — M.G.Gavrilov

Euro-Asian Astronomical Society

Астрономическое общество — Euro-Asian Astronomical Society

X Международная астрономическая олимпиада
X International Astronomy Olympiad

Пекин — 25.X. - 2.XI. 2005. — Beijing

Протокол жюри — Jury minutes — Group β

№	Шифр	Ф И О участника		Команда	Теоретический тур						Практ-Набл			Сумма				Дип	
№	Code	Names of particiant		Team	Theoretical round						Pract-Observ			Sum				Dip	
					1	2	3	4	5	6	7	8	9	Т	П	Н	Σ		
		Family name	Given name	Max	8	8	8	8	8	8	10	10	20	48	20	20	88		
1	ML-S-1	Popov	Andrey	Moscow Land	6.7	7.3	7.7	7.7	7.0	7.5	9	8	9.5	**43.9**	17.0	9.5	**70.4**	I	BR
2	CN-S-1	Dong	Jing	China	8.0	2.3	6.0	6.7	6.7	5.3	10	10	15	35.0	**20.0**	15.0	70.0	I	BP
3	IN-S-3	Dang	Abhishek	India	6.0	8.0	8.0	5.7	8.0	4.3	9	5	13	40.0	14.0	13.0	67.0	I	
4	BJ-S-2	Yang	Yi	Beijing	6.7	2.0	6.0	7.7	6.7	8.0	9	4	15	37.0	13.0	15.0	65.0	I	
5	BR-S-2	Villar Coelho	Felipe Ferreira	Brazil	7.7	3.3	7.7	7.5	7.0	5.7	6	9	11	38.9	15.0	11.0	64.9	I	
6	KR-S-1	Jang	Won Seok	Korea	8.0	7.3	7.5	7.0	8.7	3.0	6	7	10	41.5	13.0	10.0	64.5	I	
7	BG-S-3	Kalinov	Ignat Ganchev	Bulgaria	5.0	6.3	6.0	5.7	6.0	1.3	7	8	19	30.3	15.0	**19.0**	64.3	I	BO
8	BJ-S-1	Huang	Chenliang	Beijing	7.3	6.0	5.0	7.7	6.7	5.7	10	6	9.5	38.3	16.0	9.5	63.8	I	
9	IN-S-4	Silva	Ralph	India	8.0	5.5	6.0	4.0	9.0	5.7	9	4	12	38.2	13.0	12.0	63.2	I	
10	IN-S-5	Deshpande	Viraj	India	8.7	5.5	8.7	4.3	8.0	8.0	7	4	8	43.2	11.0	8.0	62.2	I	
11	RU-S-1	Mazikin	Dmitry Mihailovi	Russia	8.0	7.0	6.0	5.7	7.0	6.0	7	5	8.5	39.7	12.0	8.5	60.2	I I	
12	IR-S-3	Afsari Ardchi	Niloufar	Iran	5.0	0.0	6.0	8.0	4.5	4.0	8	9	15	27.5	17.0	15.0	59.5	I I	
13	IN-S-2	Bapat	Asilata	India	5.3	6.0	8.0	8.0	4.7	2.7	9	3	12	34.6	12.0	12.0	58.6	I I	
14	RU-S-2	Akimbitov	Renat Ildarovich	Russia	7.0	7.5	7.3	4.3	7.7	6.0	4	5	7.5	39.8	9.0	7.5	56.3	I I	
15	IR-S-4	Pazira	Hiva	Iran	8.0	5.0	6.5	8.0	6.5	1.0	3	5	13	35.0	8.0	13.0	56.0	I I	
16	ID-S-2	Ahkam	Ahmad Agung	Indonesia	6.5	7.0	6.0	8.0	6.0	1.0	5	6	8.5	34.5	11.0	8.5	54.0	I I I	
17	IN-S-1	Gund	Ved	India	5.3	2.0	6.3	5.7	7.7	1.7	3	5	17	28.6	8.0	17.0	53.6	I I I	
18	BG-S-2	Borisov	Kiril Biserov	Bulgaria	4.5	3.7	6.0	4.7	8.0	2.7	6	9	8.5	29.5	15.0	8.5	53.0	I I I	
19	RU-S-3	Kolodin	Dmitriy	Russia	7.0	7.5	8.0	6.7	6.7	1.3	3	5	7	37.2	8.0	7.0	52.2	I I I	BB
20	TH-S-2	Nutalai	Songkiat	Thailand	0.7	3.7	7.7	8.3	7.5	5.3	5	9	5	33.2	14.0	5.0	52.2	I I I	
21	ML-S-2	Gulamov	Igor	Moscow Land	6.7	3.3	2.3	7.7	7.0	8.0	3	6	7.5	35.0	9.0	7.5	51.5	I I I	
22	ML-S-4	Trushin	Dmitry	Moscow Land	6.3	5.3	4.0	8.0	5.7	6.0	0	6	10	35.3	6.0	10.0	51.3	I I I	
23	IR-S-2	Sohrabkhani	Negin	Iran	5.0	2.0	5.0	8.0	6.0	2.0	1	6	16	28.0	7.0	16.0	51.0	I I I	
24	BG-S-1	Georgieva	Aleksandra Tod	Bulgaria	7.0	2.3	6.0	7.0	5.0	2.3	2	5	14	29.7	7.0	14.0	50.7	I I I	
25	ID-S-1	Zahedy	Fakhri Saleh	Indonesia	1.5	4.0	7.0	7.5	5.0	1.0	7	9	8	26.0	16.0	8.0	50.0	I I I	
26	EE-S-1	Ljulko	Edvard	Estonia	2.7	2.0	8.0	7.0	3.7	4.7	5	9	7	28.0	14.0	7.0	49.0	I I I	
27	CN-S-3	Li	Meng	China	5.0	7.7	5.0	4.7	3.0	1.0	2	3	15	26.3	5.0	15.0	46.3		
28	BR-S-3	Furtado	Gustavo Amara	Brazil	4.7	4.0	6.3	5.0	4.3	1.7	5	6	9	26.0	11.0	9.0	46.0		
29	RO-S-3	Serban	Nicu-David	Romania	7.0	4.0	4.7	4.0	4.7	3.0	3	4	11.5	27.3	7.0	11.5	45.8		
30	ML-S-3	Chulkov	Dmitry	Moscow Land	5.7	7.7	8.0	4.7	3.0	4.5	2	4	5	33.5	6.0	5.0	44.5		
31	IR-S-1	Pirbadian	Sahand	Iran	1.0	1.0	4.0	8.0	4.5	1.0	3	5	17	19.5	8.0	17.0	44.5		
32	SM-S-1	Jankovicj	Urosh	Serbia and Monte	5.0	1.7	5.3	8.0	3.0	0.7	7	6	7.5	23.7	13.0	7.5	44.2		
33	BR-S-1	Martins Torres Jun	Marcos Alberto	Brazil	0.0	6.0	7.0	5.5	2.7	1.7	4	5	10.5	22.8	9.0	10.5	42.3		
34	RO-S-2	Hodrea	Voicu-Mihai	Romania	4.3	2.3	5.3	0.0	2.7	6.0	10	5	6.5	20.6	15.0	6.5	42.1		
35	LT-S-3	Kapocius	Vytis	Lithuania	3.7	0.7	3.7	3.5	3.7	5.0	4	4	12.5	20.2	8.0	12.5	40.7		
36	LT-S-1	Davidonis	Romas	Lithuania	5.3	0.0	2.7	4.5	0.0	1.0	4	8	14	13.5	12.0	14.0	39.5		
37	CN-S-2	Xu	Zhen	China	1.0	0.3	6.7	4.3	1.0	0.7	6	5	14	14.0	11.0	14.0	39.0		
38	RO-S-1	Ioo	Vilmos-Szilvesz	Romania	3.7	4.3	4.7	6.0	0.3	2.5	2	5	10	21.5	7.0	10.0	38.5		
39	SM-S-2	Manojlovicj	Sonja	Serbia and Monte	1.5	5.7	3.7	4.7	4.0	1.3	2	3	8	20.8	5.0	8.0	33.8		
40	TH-S-1	Chanchaiworawit	Krittapas	Thailand	2.7	1.7	4.3	5.0	3.5	1.0	3	1	6	18.2	4.0	6.0	28.2		
41	EE-S-2	Tsherkashina	Jana	Estonia	0.0	0.7	2.3	4.0	3.7	1.7	5	3	5.5	12.3	8.0	5.5	25.8		
42	SE-S-1	Wennstroem	Bror Viktor	Sweden	0.5	0.0	1.5	0.0	0.5	0.5	2	1	2	3.0	3.0	2.0	8.0		

Jury Chairman — Jin Zhu

Beijing China
Пекин Китай
2005.10.25-11.2

Jury Vice-Chairman — M.G.Gavrilov