

2nd Canadian Astronomy Olympiad 2018

1. On September 17th 2009, Uranus was in opposition and Saturn in conjunction, i.e. the distance between these planets was the largest possible.

After how many years will this situation repeat itself?

2. In the time it took for the light from a distant galaxy to reach us, the galaxy receded by 10 Mpc. How far away (initially) was this galaxy?

3. Two neutron stars of the same mass rotate around a common center with a period of 7 hours. What is the distance between them, if the mass of each of them is 1.4 times the mass of the sun?

The mass of the sun is $M_{Sun} = 2 \times 10^{30} \text{ kg}$.

4. Amateurs use following method to estimate the field of view (FOV) of their telescopes: (1) locate a star with known declination, adjust the telescope so that the star crosses the field of view along its diameter, measure the time it takes to cross and use this to estimate the FOV.

For a telescope ($d = 400\text{mm}$, $f = 4000\text{mm}$) the crossing time of αAur ($\delta = +46^{\circ}0'14.4''$) is 2.5 minutes. Can the moon be seen in full through this telescope, i.e. if the moon was full could you fit it in the FOV in its entirety?

5. A given elliptical galaxy has magnitude of 18^m and redshift of 0.1. Estimate the mass of the galaxy. Interstellar absorption is neglected.

6. On a sunny Solar noon on June 22, an observer standing upright on a flat surface found that his shadow had a length equal to his height. At what latitude was the observer located?