

2017 Asia and Pacific Mathematical Contest in Modeling

Problem A: Effects of Sleep on Human Body

The World Association of Sleep Medicine has set March 21 as World Sleep Day every year since 2001 so as to draw attention to the importance and quality of sleep. The mental state of a whole day depends on the sleep quality last night, and high sleep quality naturally ensures people to be energetic. According to statistics, however, the rate of insomnia in Chinese adults is as high as 38.2%, and the rate of insomnia in adolescents is rising meanwhile. In general, it belongs to the category of insomnia if the time to fall asleep is more than 30 minutes, so we believe many participants are also the insomniac. Long-term insomnia makes people feel tired, lack of energy in the whole day, and cannot concentrate attentions, so the efficiency of working and study is accordingly low. Severe insomnia even will cause autonomic nerve function disorder, resulting in imbalance and various problems of various systems in the body.

Many factors affect insomnia, and they can generally be divided into objective and subjective factors. Objective factors are environmental changes, tea or coffee before going to bed, and so on, and subjective factors are generally the pressure of life, emotional loss, mental excitement and other spiritual factors. However, the brains of young people in the period of growth and development are extremely prone to fatigue due to learning and work stress. Therefore, they must pay special attention to bed rest to ensure a good and healthy body.

Human body's sleep quality and data of various indicators possibly affecting the sleep quality are given in Annex I. (Source and test number are not indicators)

The relevant scores for sleep conditions are given in Annex II ("0" for good, "1" for normal, "2" for poor, and "3" for very poor), the higher the score, the worse the sleep condition.

(1) Analyze the relationship between the indicators given and the quality of sleep according to the data in Annex I, if there is no correlation between one or several indicators and sleep quality, find it or them out and delete.

(2)Analyze the relationship between the diagnosis results and sleep.

(3)Assuming you are a doctor, what diagnosis would you make to the patient based on the data in Annex III? Give your diagnosis result.

(4)How to scientifically arrange our rest time for the health of the body? Develop appropriate sleep program and evaluate its effectiveness.