

Talent Search

The Department of Mathematics at NDSU is happy to announce the start of the annual North Dakota Mathematics Talent Search. The goals of the talent search are to locate high school students in North Dakota and surrounding areas with a talent for solving mathematical problems, to reward these students and their teachers for their efforts, and to encourage these students to attend NDSU and major in the mathematical sciences or engineering.

The Talent Search poses sets of challenging mathematical problems throughout the year which will be posted on our website at

https://www.ndsu.edu/math/ongoing_events/nd_talent_search/

Interested students are strongly encouraged to send in solutions even if they only solve one problem in a set; **finding a good solution to a problem is always an achievement**. The problems do not require advanced mathematical knowledge – just creativity and a feeling or taste for problem solving.

The students who submit a significant number of mathematically sound solutions for each of the three rounds will be rewarded with various prizes.

Please upload and submit your solutions by October 28, 2016, using the form on the website. Alternatively, solutions may be sent by regular mail to:

Talent Search
c/o Maria Alfonseca
Mathematics NDSU Dept.# 2750
PO BOX 6050
Fargo, ND 58108-6050

Please do not forget to include your name, postal address, school, and e-mail address.

Here is the first set of problems:

1. We are given line segments of lengths $1, 2, 3, \dots, 99$. If we have to use all the segments, is it possible to construct a square? How about a rectangle? Justify your answers.
2. Consider all the natural numbers between 1 and 1000 (including both 1 and 1000). Suppose that among these numbers, there are exactly 10 of them such that the sum of their digits is equal to N . What are the possible values of N ?
3. Find the sum of the angles of a five-pointed star (see picture on next page).
4. Ann and Bob play a game with two ordinary dice. Ann wins if she obtains the sum 6 before Bob obtains 7. Bob wins if he obtains the sum 7 before Ann obtains 6. Which player has a better chance of winning if Ann starts the game?

5. A 4 m tall statue is placed on a pedestal which is 3m tall. The best view of the statue corresponds to the maximum viewing angle $\angle BCA$, where C is the observer's eye, A is the foot of the statue (not of the pedestal!) and B is the top of the statue. At what distance should a person whose eye is 1.5 m above the ground be placed in order to obtain the best view?

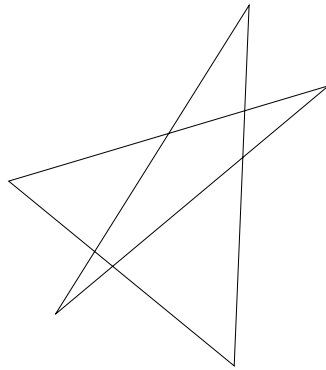


Figure 1: Figure for problem 3