Mathematical Contest in Modeling
Summaries and Results
Simpson College
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Profitable Assignments for a Successful Meeting

by
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Successful Participant

We were asked to give a list of assignments to an arbitrary number of board members for small group meetings for An Tostal Corporation, as well as an algorithm that could be used to adjust the assignments if members were added or canceled. These assignments were to attain as much of a mix of the members as possible. The criteria for the assignments were as follows:

- For the morning sessions, no board member could be in the same senior officer's group.

- No discussion group could contain a disproportionate number of in-house members.

We found an optimal assignment for each of the nine in-house members and the twenty other members during the morning session; while assigning each of the six senior officers to the six discussion groups respectively. Both criteria for the assignments were sufficiently met in our model to the assignments during the morning sessions.

We also created a C++ computer program which would accurately allow the secretary to enter any member’s number and tell them what discussion group they are in during any of the three morning sessions. This program can aide in the secretary's time management to allow more time for more important tasks. One limitation to this program is that there isn't much variation and it only calculates the member assignments for the morning sessions. With more time allowed, a sufficient program can be written for the afternoon session assignments as well.

During the afternoon session we found another sufficient solution to member assignments excluding the requirements of the senior officers from the morning session. We were able to mix each of the in-house members so that they are arranged differently in the discussion groups. After pairing all members together in their respective assignments we found a minimal number of common membership of groups.

In order to attain as much of a mix of the members as possible, we concluded that all members will be paired with six to ten other members throughout the entire day; some with one other member more than twice, but only during one session in the afternoon. Each of the nine in-house members are paired with others ranging from four to eight members three or four times during the entire day. No in-house member is paired with any other in-house member more than once, thus minimizing the mix and keeping each group proportionate with in-house members.

The Velociraptor Problem

by
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Successful Participant

We have developed and analyzed a mathematical model for a description of the hunting strategy for a Velociraptor mongoliensis chasing its prey, the Thescelosaurus neglectus. We began by researching what was already known about the velociraptor and the thescelosaurus, and current methods of studying the strategies of modern day predatory animals, such as cheetahs and wolves. From the information

found, we decided to form our model based on logic, rather than on discrete mathematical equations. Through the gathering of facts and manipulation of the specifications given to us, such as turning radius and maximum velocities, we were able to develop models that were successful in determining the possible hunting strategy or one velociraptor and a pair of velociraptors. We devised our model based on biological advantages and disadvantages of each, and the strategy that they would both use to limit their disadvantages and increase their advantages. From analysis of the collected data, we found the most successful model to be that of two velociraptors chasing a thescelosaurus from behind, on opposite sides, to keep it running in a relatively straight path. Therefore, we have concluded that the velociraptor was more successful when hunting in groups, at night, and under adverse running conditions. We tested our models with observations of living predators with similar hunting characteristics.