



Big State U

The Admissions Office at Big State University needs to decide how many in-state students and how many out-of-state students to admit to the next class. Like many universities, Big State U has limited resources, and budget considerations have to play a part in admissions policy.

Here are the constraints on the Admissions Office decision.

- The college president wants this class to contribute a total of at least \$2,500,000 to the school after it graduates. In the past, Big State U has gotten an average of \$8,000 in contributions from each in-state student admitted and an average of \$2,000 from each out-of-state student admitted.
- The faculty at the college wants entering students with good grade-point averages. Grades of in-state students average less than grades of out-of-state students. Therefore, the faculty is urging the school to admit at least as many out-of-state students as in-state students.
- The housing office is not able to spend more than \$85,000 to cover costs such as meals and utilities for students in dormitories during vacation periods. Because out-of-state students are more likely to stay on campus during vacations, the housing office needs to take these differences into account. In-state students will cost the office an average of \$100 each for vacation-time expenses, while out-of-state students will cost an average of \$200 each.

The college treasurer needs to minimize educational costs. Because students take different courses, it costs an average of \$7,200 a year to teach an in-state student and an average of \$6,000 a year to teach an out-of-state student.

Your job is to recommend how many students from each category should be admitted to Big State U. You need to minimize educational costs, as the treasurer requires, within the constraints set by the college president, the faculty, and the housing office.

Your write-up should include a proof that your solution is the best possible within the constraints. Show any graphs that seem helpful, and explain your reasoning carefully.

Adapted from *An Introduction to Mathematical Models in the Social and Life Sciences*, by Michael Olinick, Addison-Wesley, 1978, p. 169.