

COLLEGE RANKING

(Multi-parameter problem solving)

Focus:

In this lab, you will produce a one-dimensional solution to a multi-dimensional problem.

Overview:

An important aspect of engineering is that a typical problem does not have one definite solution. Further, the problem often involves several parameters that can be varied in many different ways. In manipulating these parameters, one often finds that a trade-off exists among them. In other words, improving one parameter often means causing another to suffer. Considering this, it is easy to see how several good “solutions” may exist for a particular problem. Each solution depends a great deal on the approach and discretion of the engineer.

For example, when engineering firms submit proposals, no two will be alike, and there is no single measure of which is best. Which is chosen depends on which dimensions of the problem are considered most important. Factors such as cost, reliability, time, politics, and community concern often work at cross-purposes.

Procedure:

Attached is a list of 20 hypothetical colleges, and 12 pieces of data on each:

1. ***Academic Reputation*** - based on a survey of college presidents, provosts, and deans of admissions
2. ***Percentage of freshman who had been in the top 10% of their high school class***
3. ***SAT/ACT scores, the 25th to 75th percentile range***
4. ***Acceptance Rate*** – percentage of students who apply to the school and are accepted
5. ***Financial Resources Rank*** - Generous per student spending indicates that a college can offer a wide variety of programs and services. U.S. News measures financial resources by using the average spending per student on instruction, research, student services, and related educational expenditures. Spending on sports, dorms, and hospitals doesn't count
6. ***Student to Faculty ratio***
7. ***Percentage of Faculty who are full time***
8. ***Percentage of courses in which there are 20 or fewer students***
9. ***Percentage of courses in which there are 50 or more students***
10. ***Average alumni giving rate*** - percentage of alumni who donate money to the college
11. ***Average freshman retention rate*** - percentage of freshman who return sophomore year
12. ***Six year graduation rate*** – the percentage of a graduating class who earned a degree in six years or less.

Your task is to devise a ranking system that will reflect what you consider most important in a college. To do this, you will have to decide how to weight each of the 12 criteria you have been given. The data you have been given comes in several formats (numbers, percentages, ratios, ranges); therefore, you need to convert it into a form that can be inserted into a single equation.

Keep in mind that you do not have to assign equal weighting to the entire range of data *within* a category. The number, whether it be a ranking or quantity, that represents a particular school's score on a particular variable is only a metric allowing it to be compared with other schools. Sometimes the data may, if used as a given, apply a sharper distinction within a category than is necessary or relevant. For example, is a college that spends \$60,000 per student doing fully twice as much as one that spends \$30,000? If you think not, you could simply divide the list into several groups on this criterion, and assign weights by group. This way, you could make the differentiation on a certain factor less sharp.

There is a similar problem to deal with if you choose to convert all the categories to rankings: the real difference between, for example, data with highest percentages of 75%, 69%, 49%, and 48% is badly represented by a simple conversion to 1, 2, 3, 4, since a 20-point gap and 1-point gap are treated as equal. Again, one solution would be to group schools whose scores on this criterion fall within certain proximity.

In assigning weights, also consider which categories of data are factual or opinion-based.

Write-up:

You must turn in the following:

1. A printout of your Excel spreadsheet, including final "scores" and ranking for each college. Make sure all columns are adequately labeled.
2. An explanation of your formula. How did you compute the final scores for the ranking, and why did you weight the data as you did?
3. A graph (created in Excel) which best displays your evaluation.

GRADING

Prioritization – 1 pt

Scaling – 1 pt

Formula – 1 pt

Computation – 0.5 pts

Graph – 2 pts

Readability – 0.5 pts

Explanation –

How the answer was computed – 1 pt

Why did you weight the data as you did – 3 pts

Note: This table exists as an Excel spreadsheet at www.jhu.edu/virtlab/finals/FINALS/labs/l11/col_ranking.xls

Name	Academic Rep.	% freshmen in top 10% of HS class	SAT/ACT 25th-75th %ile	acceptance rate	financial resources rank	student-faculty ratio	% faculty who are full-time	% of classes under 20	% of classes with 50 or more	average alumni giving rate	average freshman retention rate	6 year grad rate
Benedict Arnold U.	25	87	1360 - 1490	29	36	12:01	96.6	55.4	10	41	98	96
Cal Ripken Tech	21	85	1340-1540	21	22	6:01	93.8	69.2	8	32	97	92
Diplomas-R-Us	1	99	1400-1580	9	10	6:01	91.8	71.3	11	61	98	96
Duchess U.	7	90	1310-1500	18	17	11:01	98.2	54.2	19	32	96	93
Emory Board U.	12	96	1350-1530	14	8	6:01	84.2	71.5	9	36	98	96
Fly-By-Night U.	13	95	1350-1530	16	13	8:01	96.7	71.1	6	36	97	94
Hall Institute	1	94.6	1390-1590	7	3	7:01	95	79.5	8	35	97	97
Karweit Kollege	1	90	1360-1550	7	12	6:01	99.6	70.4	13	34	98	95
Koresh Divinity School	7	96	1470-1580	13	1	3:01	98.4	64.3	10	36	98	90
Londontown U	7	87	1300-1510	21	4	9:01	98.0	67.8	11	38	97	92
Mr. Rogers U	13	91	1380-1530	23	14	7:01	97.3	75.0	6	30	97	94
North-Northwest U	19	96	1420 - 1490	21	4	7:01	94.6	70.2	10	29	97	94
Offshore U.	16	90	1360-1570	12	15	8:01	91.9	59.5	8	49	98	95
Pilaf U.	21	87	1310-1500	29	20	7:01	94.9	63.9	9	34	95	89
Smartmouth	19	85	1330 - 1490	18	15	8:01	93.6	64.1	9	23	97	91
VA Macho Inst.	5	97	1410-1590	8	2	5:01	99.6	75.8	7	36	99	96
Votre Dame	7	97	1390-1570	10	10	6:01	91.9	79.7	7	33	99	96
Wawa Institute	7	89	1400-1560	19	8	7:01	85.3	77.8	5	33	98	92
Whattsamatta U	1	98	1410-1560	10	6	8:01	93.6	62.6	13	35	98	93
Zanvyl Hopkins	13	93	1330-1530	9	26	9:01	92.9	68.3	10	36	98	96