Math 210—Project 1
Social Theory...

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Some data and inspiration from
Gil Strang, projects for Linear Algebra talk, AMS/MAA Meeting Jan 1999 (San Antonio)

Q.I. Temad, Inc.
zero O Street
Lonlinc, SK
04685
1 February 1999

Linear Mathematics, Inc.
Suite 6, Strawmarket Business Plaza
Lonlinc, SK, 04685

Dear LMI:

Allow us first to introduce our company: Q.I. Temad, Inc., is a pioneer in socio-psychological research, liberally funded by thoughtful think-tanks with historical and (most importantly) backward-thinking roots. We have contacted you to resolve the mathematical quandry that has recently come to bedevil the convoluted and anomolous minds that are those of our staff.

Through probing self-examination, we have come to believe that *everyone* is related to *everyone else* through what we shall call "six-degrees of friendship." That is, if you examine the friends of the friends of the friends of the friends of the friends of the friends of one of our staff, you will find among that group one of your friends. Of course, we were at first concerned only with our friends, but given the nature of our profession we have also developed an intense personal interest in your friends as well. However, while admirably well-equipped to address the issues of the the mind, our staff is not spectacularly impressive in the intellectual department when it comes to such quantifiable matters as are suggested by this postulate, and it is thus with no small amount of consternation that we have turned to your company to determine its veracity.

We suspect that it is reasonable to initially suppose that any given person would be likely to know those people in their immediate vicinity, and that there will be some small random variation in this supposition introduced by people moving from one place to another. Thus in a small world of, say, six people (whom we shall call for the sake or our example Amy, Brian, Catherine, Darrel, Edna, and Frank), we might suppose that Brian would know Amy and Catherine, Darrel would know Catherine and Edna, Edna, Darrel and Frank, and Frank would know Edna and... Well, the world is round, so let's say he also knows Amy. If some of these people had recently moved, who knows whom might change somewhat, probably randomly (with some small probability) so that someone on one side of our small round world would know someone on the other side of the circle instead of one of their immediate neighbors. Unfortunately, there are rather more people in the world than six (we are willing to assume at least several hundred), so that it exceeds the humble powers of our analysis to determine if the friends six removed of one of the people in our world would in fact know everyone else in the world. It is this that we need you to determine. While the probability with which people are assumed to move will, if we may be permitted a small pun, probably play a role in this, we would be content with the consideration of some reasonable small value of this variable.

Our initial efforts in the analysis of this matter were spearheaded by the redoubtable Dr. maybe-the-P.-stands-for-precocious Gavin LaRose, who hinted that our humble assets were insufficient to cover his fees, but that he enjoyed laughing at us. We are relatively certain that he intended to say "with us." In any event, he expressed the belief that it would be possible to establish some sort of "transfer matrix" that would express the relationships described above and which could therefore be used to determine the answer to the question that has been a significant contributor to our recent insomnia.

We need you to develop some answer to this dilemma upon whose horns we are delicately poised, which should be presented in a written report to be submitted by the 15th of February. If you should find that you have questions regarding this project, Dr. LaRose has indicated that he would be delighted to provide what modest assistance as he is able give. We regret, however, that owing to other responsibilities he will be unavailable to assist on this project over the course of the weekend preceding the due-date of your report.

It is difficult to indicate the eagerness with which we await your results.

Your most sincerely,

Simon F. Reud
Head Theorist, Q.I. Temad

sfr:glr