

Decision Analysis Newsletter



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From The President

M. Elisabeth Pate-Cornell



Spring is a busy time for everyone. This is true for our members in academia as we finish another school year and graduate new students from our programs, and for our members in practice who are (hopefully) interviewing and hiring these new decision analysts. In this busy time, I would like to remind all our members of our upcoming conferences, awards, and elections. In order to get value from your DAS membership, you need to participate.

Upcoming conferences include:

- *INFORMS Conference on OR/MS Practice, April 25-27, 2004, in Cambridge, Massachusetts*

- *CORS/INFORMS Joint Meeting, May 16-19, 2004, in Banff, Canada*

- *INFORMS Fall Meeting, Oct. 24-27, 2004 in Denver, Colorado*

And definitely one to put on the calendar:

- *International Federation of Operations Research Societies, July 11-15, 2005, in Honolulu, Hawaii*

At the INFORMS Practice Conference, James Dyer (past president and Ramsey medal winner), John Butler, Thomas Edmunds, Jianmin Jia, Alexander Chebeskov, and Vladimir Oussanov will be competing for the Edelman Prize with their multi-attribute utility models for Plutonium Disposition.

The Decision Analysis Society will have tracks at Banff, Denver, and Honolulu, so plan on attending.

Awards:

As we do every year, we will be awarding a best publication award, a best student paper award, and a best practice award at the Fall Meeting. Please nominate papers and applications. The details regarding award committee chairs and deadlines are available at the DAS web-site:

faculty.fuqua.duke.edu/daweb/

Elections:

And this summer, we will be electing a new president-elect to replace Greg Parnell when he becomes president at the Fall Meeting. We will also be electing two new council members. Greg is

currently serving as chair of the nominations committee, so if you would like to run or would like to nominate someone to run for president-elect or council member, e-mail Greg at: gregory.parnell@usma.edu.

And now for the good news about the Society in general: the journal is on-track (Thank you, Bob Clemen and Don Kleinmuntz), our finances are in good shape, and our visibility is increasing. Thanks to all of you!

Call for Volunteers

Greg Parnell

The Decision Analysis Society is lead by elected volunteers. We need volunteers to represent the diversity of our membership and help conduct the business of our society. This Fall we have four openings on the Decision Analysis Council: President-Elect, Secretary-Treasurer, and two council members. Each position is elected by the society membership in June/July and takes office at the October INFORMS Meeting. The President-Elect position is a six-year commitment (2 years as President-Elect, 2 years as President, and 2 years as Past President). The other three positions are 2-year positions. Please contact me if you are willing to run for one of the positions or would like more information about the positions.

DA Practice Award

The Decision Analysis Society (DAS) of INFORMS is seeking entries for the sixth annual DAS Practice Award competition. The intent of this award is to recognize, promote, and publicize good decision analysis practice. It includes a cash prize of \$750 and assistance in getting the work published in a suitable journal such as *Decision Analysis* or *Interfaces* if the winner so desires. Previous publication of the work does not preclude it from consideration for this award.

The entry requirements are very simple: Send us a brief two-page summary describing a recent application of decision analysis and your involvement in it by **July 1, 2004**. This summary must include sufficient detail for us to evaluate your work for the competition, but must be no longer than two double-spaced typewritten pages. Normally, it should briefly describe the following:

- 1) the problem and the client company or agency,
- 2) the importance of the problem,
- 3) who in the client organization sponsored the work,
- 4) who did the work,
- 5) what methods or models from decision analysis they used, and how they applied them,
- 6) what the organization learned,
- 7) what happened subsequently, especially how the organization used the results, and
- 8) what was innovative, especially new techniques or new insights.

If necessary, some aspects of the application or results may be disguised to preserve confidentiality, provided that the material that is disclosed is sufficient.

A committee including decision analysis practitioners will evaluate the submissions. We will select three or four finalists based on the summaries and on the results of our "interview" discussions with the analyst and the client. Evaluation criteria include

- a) importance of the problem,
- b) impact on the client's decision making,
- c) benefits to the client organization,
- d) use of decision analysis tools,
- e) quality of the analysis, and
- f) originality.

Please note that a single entry need not score high on all of these dimensions to be a viable contender. The winner will be chosen following presentations by each of the finalists at a special session (generally the Sunday late afternoon session) at the Fall INFORMS Meeting in Denver (Oct. 24-27, 2004) and will be announced at the DAS Awards Session (generally the late afternoon session on Monday) at that meeting.

Submitters are responsible for obtaining any necessary company or agency clearances. All submissions should include a separate cover page with the name, address, telephone number and website (if any) of

- 1) the submitting decision analyst (specify one person to contact from an analysis team), and
- 2) a contact person at the client organization who is knowledgeable about the work and its impact from a managerial or user's (rather than an analyst's) perspective. Submissions from external consultants are welcome, but we encourage consultants to co-author submissions with people from the client organization where appropriate.

Membership in DAS (which costs \$20 for an INFORMS member or \$30 for a non-INFORMS member, see <http://faculty.fuqua.duke.edu/daweb/damember.htm>) is a prerequisite for the submitting decision analyst to participate in the competition.

Please send entries and direct any questions to:

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DA Student Paper Award

Submission Deadline: **June 1, 2004**

The Student Paper Competition Award is given annually to the best decision analysis paper by a student author, as judged by a panel of the Decision Analysis Society of INFORMS. Students who did not complete their Ph.D. prior to May 1, 2003 are eligible for this year's competition.

The award is accompanied by a plaque and a \$500 honorarium. The winner will also be invited to briefly present his or her paper at the Fall INFORMS meeting in Denver, October 24-27, 2004.

If you are a faculty member who is supervising students, please inform them of this opportunity. If your students are not currently members of DAS, you might also encourage them to join. If you are a student reading this, please encourage your classmates to submit a paper and to join the society. DAS is a congenial organization of about 700 members (of which nearly 20% are students). Joining DAS provides a good start toward developing a professional identity. However, students do not need to be DAS members to be eligible for the competition.

All students doing work in or related to decision analysis (e.g., decision methodologies, experimental studies, and applications) are encouraged to submit a paper. The work must be predominately that of the student. Although faculty members or other mentors can be co-authors if appropriate, preference will be given to sole-authored work. The paper should be 30 pages or less (double spaced and 12 point font) and in the standard format of Management Science or Operations Research.

To be considered for the 2004 competition, please send an electronic version of your paper (either MS Word file or PDF format) to Jeff Stonebraker at jeff.stonebraker.b@bayer.com (alternatively, send to Jeff Keisler at jeff.keisler@umb.edu). Again, all submissions must be received by June 1, 2004.

Jeff Stonebraker, Ph.D.
Bayer Biological Products

and

Prof. Jeffrey M. Keisler
University of Massachusetts Boston

Co-chairs

DA Publication Award

Deadline for nominations: **June 1, 2004**

The Decision Analysis Publication Award is given annually to the best decision analysis journal article or book published in the second calendar year prior to the year in which the award is given. For consideration for this year's award, a work should have been published during CALENDAR YEAR 2002. The award is accompanied by a plaque and a \$750 honorarium. The intent of the award is to recognize the best publication in "decision analysis, broadly defined." This includes, but is not necessarily limited to, theoretical work on decision analysis methodology (including behavioral decision making and non-expected utility theory), descriptions of applications, and experimental studies. Nominations are invited at this time. Please send them as soon as possible, but in any event to arrive no later than JUNE 1, 2004, to:

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E-mail is preferred—just send the author's name(s) and the full journal citation or book title. **SELF-NOMINATIONS ARE ACCEPTABLE AND ARE RECOMMENDED.** Historically, most nominations for this award have been self-nominations, so don't rely on your admiring colleagues to nominate your work. However, others who wish to write in support of a publication (in a substantive way regarding impact of the work) are very welcome to do so. Testimonials by those who have benefited from a work published in 2002 will be very helpful to our decision process.

The award will be presented at the INFORMS Annual Meeting in Denver October 24-27, 2004. This award is sponsored by the Decision Analysis Society of INFORMS. Membership in the Decision Analysis Society is not a condition for being a nominator or a nominee, so please feel free to forward this announcement to other colleagues.

Names of past winners of the Decision Analysis Publication Award are posted on the DAS Awards web page at

www.informs.org/Prizes/DecisionAnalysisSocPrize.html.

Ramsey Medal

The Frank P. Ramsey Medal is the highest award of the DAS. It was created to recognize distinguished contributions to the field of decision analysis. The Ramsey Medalists are recognized for having made substantial further contributions to that theory and its application to important classes of real decision problems. The Medal is accompanied by a \$1,000 honorarium. For further information and a list of previous winners, please see the web page:

<http://www.informs.org/Prizes/DecisionAnalysisSocPrize.html#RamseyMedal>

Nominations for this award are welcome. Any additional information in support of a nomination would also be welcomed, including a resume, CV, or a summary of the contributions of the candidate. Please send this information to the Chair of the Ramsey Award Committee before July 1, 2004. The Ramsey Award Committee is composed of the previous winners of the award.

Chair: **James S. Dyer**

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IFORS Hawaii 2005

The 17th Triennial Conference of the International Federation of Operational Research Societies (IFORS) will be held in Honolulu, Hawaii, July 11-15, 2005. The Decision Analysis Cluster chairs will be Jianmin Jia (Jamie) and John Butler. Jamie and John invite you to consider sessions you would like to chair, topics you would like to see covered, and presentations you would like to make: jjia@cuhk.edu.hk and butlerj@cob.ohio-state.edu. We will follow up with messages through DAList and future editions of the DAS Newsletter.

Website: www.informs.org/Conf/IFORS2005

Aloha,

Jamie and John

Assessing Risk Tolerance

Bob Clemen

A typical approach used to assess the risk tolerance parameter R for an exponential utility function $U(y) = 1 - \exp(-y/R)$ is to ask the decision maker (DM) the following: “Suppose you face a gamble where you can win y with probability 0.5 or lose $y/2$ with probability 0.5. What is the largest y for which you would be just willing to take this gamble? I’m looking for the largest y that makes you just indifferent between taking the gamble or not.” (See Figure 1.) It’s easy enough to calculate numerically that the y that makes the DM indifferent is $y_i \approx 0.96R$. Given the general lack of precision in subjective assessments, we usually use y_i as a reasonable estimate for R .

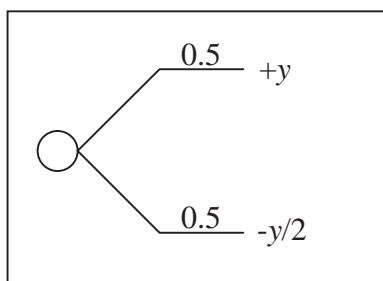


Figure 1. The conventional approach to assessing risk tolerance for an exponential utility function. Find the value of y that makes you just indifferent to taking the gamble or not.

Anyone who has taught this in class and asked students to assess R in this way knows that it is important to frame the question in a way that helps the individual think in terms of investments or lawsuits, not carnival-like lottery games. But there are other issues that we could ask about this assessment. In particular, maybe it would be easier to ask the individual to give the y^* that they would prefer. Again, it’s not difficult to show (analytically this time), that this optimal y^* is given by $y^* = -(2/3)\ln(1/2)R \approx 0.46R$. Roughly, take the assessed y^* and multiply times two to get the risk tolerance. From another perspective, assessing the optimal y^* might be difficult because the expected utility function is relatively flat in the neighborhood of the optimum (von Winterfeldt & Edwards 1986).

There are also behavioral questions that we could ask. One question related to the two assessments above is whether individuals are really able to make these assessments. In particular, when we ask for the indifference y_i , perhaps the DM gives us y^* instead. Or perhaps the DM takes y^* as an anchor and adjusts toward y_i . If so, is the adjustment adequate?

Another particularly intriguing question arises from Bleichrodt, Pinto, & Wakker (2001) (hereafter BPW), the paper that won the DAS publication award last fall. In that paper, BPW suggest that when individuals respond to typical reference-lottery questions in a utility assessment, their responses are

distorted in ways that are predictable according to Prospect Theory. In particular, the responses may display loss aversion if one of the reference prizes is negative and distortion of probabilities according to the probability weighting function. (BPW appeal to cumulative Prospect Theory in this respect.)

BPW do not apply their analysis to the conventional method for assessing risk tolerance, but it is possible to do this. The first result is that, if we stick with the 50-50 gamble in Figure 1, there is no positive y that will make the DM indifferent. This is because the loss-aversion coefficient that BPW use (based on data from Tversky & Kahneman 1992), is 2.25. Thus the loss of $y/2$ is weighted so heavily that an equal chance at y can never offset the loss enough to achieve indifference. (There is also a slight asymmetric effect due to the probability weighting function.) Following through with the logic, the optimal y^* would be zero.

Suppose we modify the gamble as in Figure 2 so that there is a $2/3$ chance to gain x and a $1/3$ chance to lose $x/3$. Based on BPW’s model, the x_i that makes the DM indifferent is about 7% greater than R : $x_i \approx 1.07R$. Likewise, the optimal x^* for this gamble is almost exactly equal to $R/2$. The similarity of these results with those for an expected-utility-maximizer (i.e., one who is not subject to BPW’s distortions) using Figure 1 is serendipitous; just change the gamble to make it more attractive, thereby accounting for the Prospect-Theory effects, and use the results in essentially the same way as before.

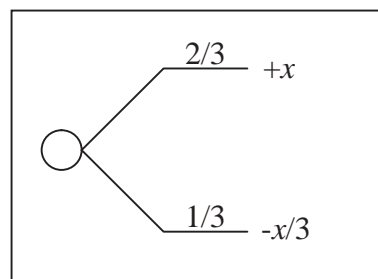


Figure 2. A different reference gamble for assessing risk tolerance.

One might ask how an EU-maximizer would respond to the gamble in Figure 2. The answer is that she would have $x_i \approx 3.21R$ and $x^* \approx 1.34R$.

The table below summarizes these results. And I hope that the message is obvious at this point: When we ask assessment questions like those described above, based on our current state of knowledge it is not entirely clear what the responses mean, and thus it is not clear what we should take the individual’s “true” risk tolerance to be. Nevertheless, I offer the following observations:

--Continued on next page.

Risk Tolerance contd.

- BPW’s empirical results are indeed compelling. In light of those results, it is easy to believe that individuals may be subject to the same distortions when assessing risk tolerance using any reference lottery.
- When I ask students to assess risk tolerance using Figure 1, some indicate a y_l that is very small or zero. Perhaps these individuals experience BPW’s distortions more than others.
- My impression is that individuals tend to give responses to the conventional assessment question that seem lower than they should be. This could be because of BPW’s effects, an inclination to anchor on the optimal value, a negative reaction to gambles presented in such raw form, a combination of these, or other reasons entirely.

Gamble	Indifference		Optimum	
	EU	BPW	EU	BPW
+y, 0.5 -y/2, 0.5	$y_l = 0.96R$	--	$y_l = 0.46R$	$y^* = 0$
+x, 0.67 -x/3, 0.33	$x_l = 3.21R$	$x^* = 1.07R$	$x_l = 1.34R$	$x^* = 0.50R$

Looking at this seemingly straightforward aspect of decision-analysis practice through a behavioral lens raises interesting questions about what we get when we use our conventional risk-tolerance assessment method. And there are other approaches that we have not mentioned; even though the gambles described above are convenient, individuals might give better responses (more consistent and more accurate) when they consider more realistic lotteries, such as a combination of US treasury bills and a market index fund. Addressing these issues will require some careful behavioral studies, and I hope that someone in our field will take up the challenge!

References:

Bleichrodt, H., Pinto, J. L., & Wakker, P. P. (2001). Making descriptive use of prospect theory to improve the prescriptive use of utility. *Management Science*, 47, 1498-1514.

Tversky, A., & Kahneman, D. (1992). Advances in prospect theory: Cumulative representation of uncertainty. *Journal of Risk and Uncertainty*, 5, 297-323.

von Winterfeldt, D., & Edwards, W. (1986). *Decision Analysis and Behavioral Research*. Cambridge, MA: Cambridge University Press.

INFORMS, Denver

Believe it or not, it is time for us to start getting organized for the INFORMS annual meeting in Denver this coming October 24-27.

First, thanks to those of you who have already contacted us and offered to organize sessions. We feel like we are a little ahead of the game — but we want to stay there and we know time moves fast.

As we try to fill out the schedule, we’d like to be able to take into account the interests of society members to the greatest extent possible. So, if there are topics you are particularly interested in hearing about or speakers you are particularly interested in hearing, please drop us an email. While we will endeavor to take all ideas into account, your input will receive a particularly sympathetic reading if it includes an offer to organize a session or give a talk as well.

Once we’ve reviewed all the responses, we’ll be contacting you - probably in mid-March - to firm up the details of your session. Thanks for your time, and please respond to both of us (kara.morgan@fda.gov, kjenni@geomatrix.com) and put “DAS” somewhere in your title line.

Thanks again and we look forward to seeing you in Denver!

Karen Jenni
and
Kara Morgan

Cluster co-chairs

Student Travel Support

In keeping with our objective of encouraging student participation at the national INFORMS meetings, this year DAS has funds available to support student travel for the 2004 Denver meeting. While the exact amount is yet to be determined, in the past these travel awards have been in the vicinity of \$200. In addition to being a student, the winners should be presenting a paper in the DAS track of INFORMS where the student made a significant contribution to the work.

To be eligible, abstracts need to be received by **April 1**. In addition to an abstract, a statement explaining how the work fits in the scope of decision analysis is required. Both the abstract and the statement of fit should be submitted to the track chairs Kara Morgan (Kara.Morgan@FDA.GOV) and Karen Jenni (KJenni@geomatrix.com). Once papers have been accepted we will chose the winning student(s).

Please let your students know about this opportunity. Let me know if you have any questions.

John Butler
Assistant Professor of Accounting and MIS
Ohio State University
www.cob.ohio-state.edu/~butlerj

DA Journal - First Issue Appears

Bob Clemen and Don Kleinmuntz

By the time you read this, all members of the Decision Analysis Society should have received the first issue of *Decision Analysis*. As you can imagine, as your editors, we are very pleased to have reached this milestone. It has taken a long time to get to this point, but we are delighted that the journal is now a tangible product.

The second issue is already in production, and we expect it to be mailed at the end of May. Here are the contents for Volume 1, Issue 2:

- **Speaking of Decisions: Precise Decision Language**, by Ron Howard, with comments by Jim Smith, Ralph Keeney, Craig Kirkwood, and Rex Brown
- **An Analysis of a Strategic Decision in the Sport of Curling**, by Keith Willoughby and Kent Kostuk
- **Javelin Diagrams: A Graphical Tool of Probabilistic Sensitivity Analysis**, by James Felli and Gordon Hazen
- **Elicitation of Probabilities Using Competitive Scoring Rules**, by Marc Kilgour and Yigal Gerchak

Although it is wonderful to see our journal launched, we should not assume our work is done. One of the facts of life of a new journal is that as soon as production begins, the comfortable pipeline of accepted papers that we all worked so hard to create begins to shrink very quickly. At this point, the next papers to be accepted for publication – and several are near acceptance – will most likely appear in the last issue of 2004.

This is both a challenge and an opportunity. The challenge is that we must keep the flow of high quality manuscripts coming. The opportunity is for you as authors: We are making a strong appeal for you to submit your current papers as soon as you can. We will do everything possible to provide fast turnaround. With good submissions and fast reviews, we can promise that an accepted paper will appear quickly. However, you should think of this as a one-time offer! Our intention is that by the time Volume 3 is ready to appear, we will see submission rates climb and the

pipeline increase to a level that will mean a longer lag between acceptance and publication.

Thanks again to all the members of DAS who helped us launch *Decision Analysis* by both submitting and reviewing papers. And thanks to the council, officers, and members for supporting our efforts throughout the past five years. We hope that everyone sees the journal's launch not as a culminating event followed by a denouement, but, rather, as a first act following a protracted overture. Most of all, though, we hope that you think of *Decision Analysis* first when considering publication outlets for your next great work.

Opportunity for DA

Kara Morgan

First, a show of hands – how many DA folks have heard about OMB Circular A-4? In September 2003, OMB issued Circular A-4, which describes the process that should be followed for regulatory analysis by all federal agencies. As you all are undoubtedly aware, John Graham from the Harvard Center for Risk Analysis, a Carnegie-Mellon-trained decision analyst, is now leading the Office of Information and Regulatory Affairs (OIRA) at OMB, and his hand is markedly in this document. The guidance instructs readers that all regulatory analyses should include:

- A quantitative analysis characterizing the probabilities of the relevant outcomes and an assignment of economic value to the projected outcomes
- Identification of monetary and non-monetary values at stake
- Input from stakeholders and experts
- A sensitivity analysis of the assumptions
- Strong analysis of alternatives
- Careful considerations of the key attributes of the regulatory decision

- Continued on next page

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Opportunity for DA... Contd.

- Full description and analysis of the uncertainties, including statistical variability and incomplete knowledge about the relevant relationships

This analysis should also be

- Transparent
- Reproducible

Further, the guidance directs agencies to consider doing a value of information analysis when uncertainty has a significant effect on the final conclusions about net benefits. This analysis would provide insight about the decision to regulate in the face of uncertainty rather than waiting until more information is available. "The costs of being wrong may outweigh the benefits of a faster decision."

Clearly, this is nothing short of a call to decision analysts to turn their attention to regulatory analysis. You can find the A-4 Circular by going to www.omb.gov and searching on, "A-4."

Another new development from OMB that has implications for use of decision analysis is Performance Budgeting. Performance Budgeting requires agencies to link their performance to their budget, with the expectation of performance goals accounting for 90-95% of each agency's budget. In order to link performance and budget, agencies must show how funding activities and projects influence the achievement of performance goals and ultimately, the achievement of long-term outcome goals. Influence diagrams could be used to show how funding of particular programs is related to performance. Then, research could be undertaken to show the quantitative relationships between these variables. These final diagrams will also permit agencies to do marginal costing (e.g., how much increase in performance can I buy with a budget increase of \$x?)

In summary, the benefits of using a decision analytic approach is certainly not lost on OMB at this point in time, and I hope that all DAer's can rise to the occasion to help provide the assistance that many agencies will need for these analyses.

Answers to Previous Puzzles

Jayavel Sounderpandian

1. Ron Howard the Director

We do not know what Ron Howard told Jeff Keisler. But the solution to the cryptogram is: "ILL LET YOU GO THIS TIME. BUT DON'T YOU EVER VIOLATE EU AXIOMS AGAIN!"

Itzhak Ravid, Patrick Noonan, Scott Cantor, Ralph Keeney and Frederick Krumm sent in correct solutions to the cryptogram.

2. Money Trees on Groves

Assume for a moment the distance between two adjacent trees is 1 unit. Let I be the number of trees in the interior and P on the perimeter of the selected polygon. Let A be its area. Then by Pick's theorem, $I + P/2 - A = 1$. Multiplying the equation by 500 reveals that for all polygons, the net revenue will be \$500. For a proof of Pick's theorem, see for example,

www.cut-the-knot.org/ctk/Pick.shtml.

Itzhak Ravid and Frederick Krumm sent in correct answers.

3. Heat Transfer

One (of four) possible answer is to move, starting from hot to cold tub, 3, 15, 20, 20 gallons. The fact that the colder tub must end at 94 degrees can be used to prove that four moves are necessary. Possible temperatures are anywhere from 92.5 to 96.67 degrees.

Itzhak Ravid and Frederick Krumm sent in correct answers.

Abstract Received

Utility-Transversality: A value based approach. by Jim Matheson and Ali Abbas

We examine multiattribute decision problems where a value function is specified over the attributes of a decision problem, as is typically done in the deterministic phase of a decision analysis. When uncertainty is present, a utility function is assigned over the value function to represent the risk attitude of the decision maker towards value. With this structure, we derive a "chain rule" for deriving the risk attitude towards any attribute from the risk attitude of the utility function towards value combined with a "risk attitude" induced by the value function. We show that the value function plays a major role in determining risk attitude towards an attribute. In this sense there is only one dimension of risk attitude once the value function is determined. We then define utility transversality equations, and show how the risk attitude of one attribute may be derived from the risk attitude of another through transversality. Value functions that do not induce risk attitude are defined as risk neutral. This important class of value functions includes the multilinear family. We present several examples to illustrate how this approach unifies the derivation of several classical results.

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The Provocative Page

Jayavel Sounderpandian

E-mail your solutions to the puzzles on this page to me (sounderp@uwp.edu) before August 1, 2004. Names of those who submit correct answers will be mentioned in the August issue.

1. Why Worry, Dude

Worried about something? Solve this cryptarithm I made up for you!

$$Y * WORRY = DOOOOD$$

2. Places Everyone!

Place seven points in a plane such that among any three of them some two will be exactly one inch apart.

3. Minimal Perimeter I

You are given an acute triangle ABC and a point P on side AB.

- a) Find two points Q and R on sides BC and CA, respectively, so that the perimeter of triangle PQR is minimum.
- b) If you are also allowed to choose the point P on side AB how will you choose it to further minimize the perimeter?
- c) What is the solution to parts a) and b) if the triangle is not acute?

4. Minimal Perimeter II

You are given a rectangle ABCD and a point P on side AB.

- a) Find three points Q, R and S on sides BC, CD and DA, respectively, so that the perimeter of quadrilateral PQRS is minimum.
- b) If you are also allowed to choose the point P on side AB how will you choose it to further minimize the perimeter?

5. Batteries Not Included

Here is a problem I composed for chess enthusiasts in DAS. White is to play and mate in five moves against any defense. To write your solution, I would prefer you use a1-h8 notation.

