Noesis

The Journal of the Mega Society
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EDITORIAL
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Several people have asked how taking GRE's for college credit is going. Here's a short report.

Studying for the tests, even the ridiculous subjects such as poli sci, provides me with an excuse to avoid doing what I oughta. Of course, nobody buys this excuse. Funny how I'll study for GRE's, but never could force myself to study for regular classes.

I've taken eight GRE's so far and have received six score reports. I've passed everything so far, have received about 180 semester units of credit, and have five majors, some in subjects I know little about, such as history. Any of you willing to put in about two dozen hours of study time per test could perform a similar feat. Or maybe you could pass the tests on the basis of actually knowing something, heaven forbid.

Not all my scores have much to do with my anticipated performance based on practice tests. My ratio of right to wrong answers on the actual history GRE was four to one, while on the four practice tests I took, it was three to two, with the variance you'd expect from tossing a biased coin 160 times--n times p times (1 - p). I have a built-in check of ETS's grading system--I count the number of answers I've left blank on each test. (There's a guessing penalty on the subject tests.) This should agree with the number of questions ETS says I've left blank. On one test, , their count and my count was off by 20 questions. I sent them a fee to have the test rescored by a human, and my score improved by sixty points. All this leads me to wonder if ETS assigns some scores at random, but when it's in my favor, I don't bug them about it. Or perhaps ETS says some problems have more than one right answer. This would be very weird, but would explain my history score.

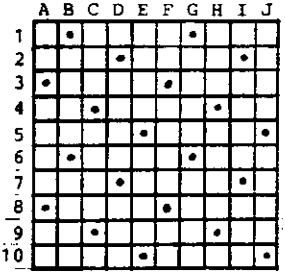
I've saved the meanest tests, math and physics, for last, when I'll have had the most practice. The stupid irony is that I'll be lucky to get in the 60th percentile in these subjects which were actually my majors when I went to real college, while I've scored in the high 90's on daffy stuff such as education and sociology. This is because education majors are lucky to find the testing room (especially if the test is administered by the jerks at USC), while math/physics people walk in with backpacks stuffed with study guides and cram to the last second.

In straightening the confused stacks of stuff littering my condo, I found enough Noesis submissions to put together a decent issue. Here it is.

PUZZLES INSPIRED BY THE GAME OF BATTLESHIP

In the game of "Battleship," each player hides his fleet within a 10x10 grid. The opponent tries to find and sink each ship by firing (naming) grid squares until all the squares of each ship have been hit. The battleship is the largest ship in the fleet and occupies five adjacent squares arranged in a straight line--vertically, horizontally, or diagonally.

In playing this game, I discovered that the most efficient strategy in finding the opponent's battleship was to name (fire at) grid squares arranged in the following pattern:



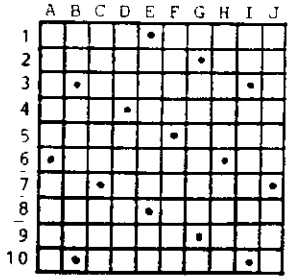
With this pattern, it takes at most 20 shots to hit the enemy battleship, no matter where it is. In other words, any possible grouping of five adjacent squares arranged in a straight line will contain at least one (in this case, one and only one) marked cell.

Note also that this pattern is equally effective regardless of the size or shape of the board. The board can be enlarged or shrunk in any manner or direction, and the illustrated pattern is still the most efficient in terms of locating a linear battleship of five adjacent squares.

This discovery led me to wonder about other potential battleship lengths and what the most efficient search pattern would be for those.

It turns out that some are easily determined and some are not. The hard ones concern lengths of any even number of squares or of an odd number that is an even multiple of three (nine, for example). The rest (odd numbers not an even multiple of three) are relatively easy because they are a variation of the pattern illustrated above.

For example, suppose that a battleship is seven squares in length instead of five. What is the most efficient pattern for locating it? The answer is the following pattern, also independent of the size and shape of the board.



This pattern requires, at most, 14 shots on a 10x10 board to hit the battleship at least once.

This leads to the following series of questions:

1. (a) If a linear battleship consists of 6 adjacent squares, what is the most efficient search pattern on a 10x10 board? (Remember that every possible location of the battleship must be taken into account.)

   (b) What is the most efficient search pattern on a board of infinite size? For example, is it the same as the answer in 1.a. or does the above answer take advantage of the edges of the board?

2. Same as above except that the battleship consists of 8 adjacent squares.

3. Same as above except that the battleship consists of 9 adjacent squares.

4. Same as above except that the battleship consists of 10 adjacent squares.

5. Same as above except that the battleship consists of 5 adjacent squares and the board consists of 100 adjacent hexagons (rather than squares) arranged in ten horizontal rows of ten each (honeycomb pattern).

Finally, does anyone know if there is a branch of mathematics dealing with this kind of problem? If so, what is it called and what are some good references? (I would think that this kind of knowledge would have practical applications.)

Jeff Ward

PUZZLES FROM GERALDINE BRADY

[Editor's comment: I don't know what Geraldine Brady's association with the author of these problems is. Who wrote these?]

The following problems have been designed to study high intelligence. Each of the following four problems has one correct answer. For each problem, choose an item on the second line so that the first item on the first line relates to the second item as the third item relates to your answer. If you think you have solved at least one of them, write to me at:

P.O.Box 1391
Princeton, NJ 08542-1391

Please provide the best explanation you found for each of your answers. If you want copies of this sheet send a self-addressed, stamped envelope and 10 cents per copy.
I will answer letters with two or more correct solutions and, possibly, those with one correct solution.
I will not provide the solutions and will not indicate which problems were solved correctly.
I will, however, indicate the total number of correct solutions. Feel free to point out to me any ambiguities.

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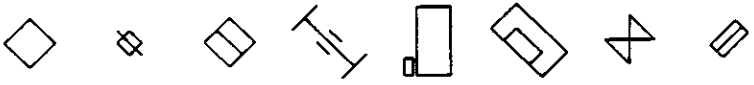

A B C D E F G H

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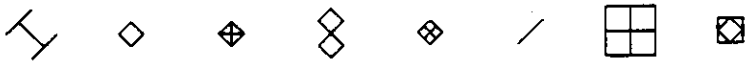

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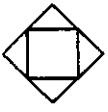
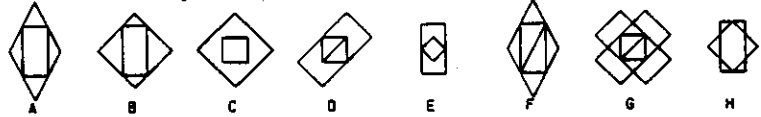
4  is to  as  is to



A B C D E F G H

A LETTER FROM KEVIN LANGDON

[Editor's comment: Kevin Langdon and I both take a long time to write. Put us together and you get truly glacial time lags.]

COMMENTS ON NOESIS ##65-66 BY KEVIN LANGDON

I'm pleased to see that the idea of having members of Mega "requalify" for membership has been dropped. Now we seem to be off to a much better start with the merged group.

Rick Rosner mentioned an important question in *Noesis* #65: how are we to organize ourselves to consider possible entrance tests? A psychometrics committee seems to be one of the basic requirements to operate one of these high-I.Q. societies, but it has long seemed redundant to me, given the limited availability of people with expertise in high-range psychometrics (or the patience to acquire it), for each of the various societies to have its own committee.

A number of people I've been talking with have expressed an interest in the idea of a high-range psychometrics journal which would publish test normings and articles and letters on intelligence, intelligence testing, and the meaning of very high scores on standard I.Q. tests and of high scores on the tests constructed by Bloom, Harding, Hoeflin, Inman, Langdon, etc. (Note that all these names end with the "n" sound or a variant of it.)

Sooner or later we must either give up the pretense that we're measuring something or submit the instruments we're using to the peer-reviewed publication process which is an essential part of the scientific process as we know it today. Therefore, a number of academic psychometricians will be included on the journal mailing list. This will be useful for us and will be the beginning of a needed bridge between designers, evaluators, and users of the standard type of I.Q. and aptitude tests and those of the high-range tests which are used as the basis for admission to societies like Mega.

Cyd Bergdorf is willing to act as publisher of the first few issues of the proposed journal. The first issue will be published when enough material has been collected. (Camera-ready submission are preferred.) The journal will be available to anyone with an interest in the subject. The cost will be $10 for four issues (one year).

There is a particularly high concentration of people with relevant expertise in the Mega Society (and this was also the case for each of the formerly separated societies individually). I encourage those of you who are interested in being involved in the journal project to write to Cyd at P.O. Box 711, Excelsior, MN 55331.

I disagree with Ron Hoeflin regarding the optimal term for elected officers of a society such as ours. I have seen a number of the societies brought to a standstill because an officer or officers did not perform the duties of the office(s) he, she, or they held, or performed them in violation of the constitution of the organization involved and/or the rights of members of that organization. Preventing this kind of trouble is worth reading campaign material and voting once a year.

Ron raises a good question: What about the existing constitution of the Mega Society? I suggest that it be printed in *Noesis* soon, so that people from the former Noetic Society can see what we're talking about here and members of the former Mega Society can refresh their memories. After we take a look at it, let's talk about how we want to handle it.

I'm interested in seeing how things go in the new Mega Society. I'm sending in my ten bucks and I encourage others to do the same.

Rick Rosner complains of long tests, but there is a reason they're that way. Forty items is generally considered a minimum for good reliability. So I think we should slow down on things like Chris Cole's project to build a short high-ceiling test and think a little more about what's really possible.

I, too, was intrigued by Chris Harding's *Multimax Test*. I took the test but have not yet received a score report.

Claims that any test has a ceiling of 211 (or even 190) are statistically meaningless. There isn't enough data, either in the tested populations or in the anchor populations used in norming such standard tests as the *Stanford-Binet* and the *SAT*, to differentiate meaningfully above the mid-170's.

I have no objection to the editor's abbreviation of material from Ron Hoeflin and me regarding one another's past involvement in disputes in Mega and other HIQ societies. I think that Ron and I were each trying to point out that the other is likely to continue behaving as he has in the past.

This far down the road, I feel no need to say more than what has already been printed in *Noesis* with regard to the history of disagreement between Ron and me. I have nothing against Ron and respect his accomplishments in psychometrics, in organizing various HIQ societies, and for joining with me in protesting the tyranny (which, sadly, continues to this day) of the officers of the ISPE.

What I have tried to do, in the various societies of which I've been a member, is to be an activist for democracy and member rights; I have opposed the pronouncements and actions of others when they threatened these fundamental necessities for honorable association among peers.

Rick wrote about a very interesting effect having to do with the complexity of the relativistic transformation of objects. According to Rick, "They don't just shorten in the direction of relative travel--they rotate away from the viewer, they curl away from the viewer like fried pork rinds." I saw an animated film of this effect once; it's stomach-wrenching and quite surreal.

A LETTER FROM RON HOEFLIN

[I'm anticipating a scathing response to this. Ed.]

January 11, 1992

Ronald K. Hoeflin
P. O. Box 539
New York, NY 10101

Dear Rick:

I just received Noesis 75 and 76. I was starting to suspect that the Mega Society was going the way of the dodo bird.

A university press has invited me to submit my manuscript for my book-length treatise on metaphysics, so I will be putting that manuscript together over the next 6 to 12 months. My tentative title for the book is Hyperphilosophy: A Theory of the Nature and Structure of Philosophy.

Regarding your dispute with C. M. Langan at the end of issue 76 as to whether a metaphysical system can be final, complete, and finitely expressible, I agree with you that metaphysical systems are merely tentative approximations and never final. As Whitehead wrote: "Metaphysical categories are not dogmatic statements of the obvious; they are tentative formulations of the utmost generalities." I think the best way to think of a metaphysical system is to liken it to a geometrical coordinate system. The spherical coordinate system for a 3-dimensional sphere has three "categories"—latitude, longitude, and altitude—just as a rectangular coordinate system in 3 dimensions has three—length, breadth, and height. Both sets of categories are "complete" and "finitely expressible." But they are still only rough-and-ready scaffoldings for organizing our geometrical data about the universe. A 10-dimensional model of the universe would clearly need a new set of geometrical categories consisting of 10 "categories" corresponding to each of the dimensions.

And just as Chris Cole feels I ought to consider retiring my Mega Test as more knowledge about it leaks out into the public domain, so the simpler coordinate systems need to be retired as scientists think up more complex models of the universe. The metaphysician tries to find an even more general set of categories than the physicist needs. Mathematical objects, for example, are employed by physicists, which means that physicists tacitly accept them as important objects in the world. Yet the physicist never makes mathematical objects the subject of his physical theories or experiments, except in the naive sense that he might weigh the amount of ink that a particular symbol adds to a sheet of paper! The philosopher or metaphysician wants to try to figure out as complete a list as possible of all the types of objects that might be the subject of our intellectual scrutiny. He trusts the physicist to catalogue physical objects and the mathematician to catalogue mathematical objects, but he wonders what additional types of objects there might be besides the physical and the mathematical. David Hume thought that these were the only two types when he wrote the famous concluding paragraph of his Enquiry Concerning Human Understanding, which reads:

> When we run over libraries, persuaded of these principles, what havoc must we make? If we take in our hand any volume; of divinity or school metaphysics, for instance; let us ask, Does it contain any

> abstract reasoning concerning quantity or number? No. Does it contain any experimental reasoning concerning matter of fact and existence? No. Commit it then to the flames: for it can contain nothing but sophistry and illusion.

Those who accuse Hume of being anti-metaphysical ignore the fact that he did herewith allow for two basic metaphysical categories, namely, quantity or number and fact or existence.

My own theory expands this list to include three more categories, corresponding to the domains of ethics, epistemology, and aesthetics. I associate Hume's quantitative category with the realm of deduction and his factual category with the realm of induction. These five categories for my system emerge from the analysis of a purposive act just as the three rectangular coordinates emerge from an analysis of a cube and the three spherical coordinates emerge from the analysis of a sphere. I do not claim that my framework is final and definitive, however, since all sorts of complex scaffoldings are possible. Some scaffolding may arise with over a hundred categories, for instance. But a scaffolding is just a way of helping us to acquire knowledge, of building knowledge by keeping our catalogue of different types of objects reasonably clear and intelligible. A scaffolding to build a starship would no doubt have to be a bit more sophisticated than a scaffolding to build a brick outhouse!

As for C. M. Langan's metaphysical system, I am not even sure if it has categories, and if so, how many it has. It looks like the sort of system that might interest a researcher in the field of advanced logic or mathematics, but for me personally it is too obscure and opaque to my own level of understanding for me to gain any interesting insights whatever from it. My own system, on the other hand, throws some interesting light on a possible analysis of personality types, which might be construed as spontaneous metaphysical orientations. My five categories help me to better understand the personality theories of Freud, Jung, Storr, Oldham, and Cattell, for example. It also conceivably illuminates why Peano had five axioms for number theory and perhaps even why Godel grouped the basic types of axioms for logical systems, in his famous 1931 paper on undecidability, into five groups. If Langan's system makes sense, perhaps it is too advanced to help me with my humble pursuits, like trying to use a scaffolding for a skyscraper to build a latrine. If Mr. Langan gains insights from his system, I am happy for him. But I myself gain absolutely no insights from his system, so that for my own humble latrine-building enterprises his scaffolding is utterly useless. Or to take another analogy, one does not need to employ the complicated mathematical machinery of Einstein's general theory of relativity for most elementary problems in mechanics such as would arise in practical pursuits such as firing an artillery piece in time of war.

Ron Hoeflin

P.S. I recently came across one of Rudolf Carnap's wisecracks about metaphysicians: "Metaphysicians are musicians without musical ability."

PUZZLES FROM LEROY KOTTKE

[Hey, maybe Ward's and Kottke's questions can adapted for the short form test. Some of Kottke's questions are encountered in a physics curriculum, but items three and four seem promising. What do you think? Ed.]

Science Questions

Enclosed is a set of questions that relate to science that I have personally encountered over the years, and whose solutions I have found interesting, illuminating and amusing.

1. A steel wire is stretched over two steel posts through a groove (frictionless) in the top of each post. To pull the wire tight, a freely suspended five pound weight is hung on each end. What is the tension in the wire?

2. A cubical box is filled with balls, all the same size. The relative dimension of the balls (diameter) is one tenth the size of the box. Can the empty space between the balls be reduced by using balls of smaller dimension? Assume that the balls do not "pack"; that is they sit directly on top of each other.

3. A bat uses ultrasonic echolocation to navigate. It works something like this: The bat emits a pulse of frequency varying "chirped" ultrasonic energy. The pulse duration is 5 millisecs. The chirp starts at 100 khz and ends at 30 khz. The speed of sound is approximately 1000 ft. /sec. How far apart, in range, must two objects be, at a minimum, such that the bat can distinguish them as two separate entities?

4. A person is said to have "perfect pitch" meaning that a single note on the piano can be distinguished from any other note. If the note is played for a short enough time, however, it can't be distinguished from another note. If the note "A" 440 Hz is played, how long must it be held so that it is theoretically distinguishable from A# (466.16 Hz.)?

5. It is a common observation that a conical pile of sand or gravel has an angular measure of 110 degrees at the apex. Is there a good reason for this?

6. When exposed to the night sky, a thermometer loses heat by radiation at a rate proportional to the temperature difference between the thermometer and the night sky. Can you propose an experiment to measure the temperature of the night sky?

7. A level designed for measuring angles can be used as an accelerometer; how can it be calibrated so that a horizontal acceleration scaled in "g's" can be read?

LeRoy Kottke
4787 Dawson Dr.
Ann Arbor, MI 48103

A SHORT STORY BY KEVIN L. SCHWARTZ

In Memory

Alone with Monica, you walk down the sidewalk on the way to a concert. She swings her shiny black oboe case; you swing your grey violin case until the sharp edge of your stand bites into your fingers. Neither of you speaks; leaves rustle; otherwise the evening's still. As you approach each street lamp, shadows dart at your feet, crescendo into giants, then, as you come under the full light, diminuendo into nothing.

Never on a sunny day were you so acutely aware of Monica's presence. You can scarcely see her through the gathering flurries, but your mind fills in the details: how if you turned your head you'd see her auburn hair flowing down past her shoulders; how you'd see her green eyes. You've never paid attention to the color of her eyes, yet now you know they must look this certain way.

Two blocks until the crossroads where you meet Monica's orchestra friends. The rest of the way she'll spend on the better-lit road, distracted by the chatter of the girls; the rest of the way you'll keep six feet behind: you always have; you always do; you always will. Out of Monica's darkness, into light alone.

Fleeting intimacy soon fades to a mere image of a beautiful, cold, pale girl on a beautiful, cold, dark night. Gradually, over years, memory of the night supplants memory of the girl -- perhaps her name's not Monica, but Sonya, or Alyssa; perhaps her hair's not reddish brown, but grey-brown, or white. Years later you'll feel a sharp pang of deja vu upon venturing out on a fall night; yet even that feeling must fade, until you remember just the color of her pupils -- nothing.

How does it touch you, if in some distant future you won't recall how it feels to walk next to a lovely girl? Nothing matters but the walk with Monica; all you can do is feel that cold fusion of dread and longing. For who knows? Perhaps you'll never reach the crossroads after all, and all your worry would be over nothing.

Mr. **Kevin L. Schwartz**, 1987
1032 Centre St; Newton Centre, MA 02159; (617) 964 - 5679

FROM RICHARD MAY

In a postcard, Richard May writes that former Mega member Dave Garvey had Crohn's disease.

[I believe this is some kind of intestinal wasting which some radio call-in doctors associate with too much toothpaste. Correct me if I'm wrong, as I must be. Also, Richard, correct me about your phone number. I've called you many times, with never an answer. I must not be calling the right number.]

A LETTER (AND AN ASK MARILYN COLUMN) FROM ROBERT D. RUSSELL

3313 Circlewood Court
Grapevine, TX 76051-6520
March 20, 1993

Rick Rosner
Editor, Noesis
5139 Balboa Blvd, #303
Encino, CA 91316-3430

Dear Rick,

Marilyn Vos Savant writes the "Ask Marilyn" column in Parade Magazine, wherein she answers difficult and interesting questions from readers.

In her column of 24 Jan 93, she stated that the number of different license plates "using letters and numbers, and a maximum of seven letters and numbers in combination" allowed "78,364,164,096 seven-character combinations."

I calculated that the correct answer is 43,521,414,336.

On January 24, I wrote to Marilyn to suggest that perhaps she'd erred, or perhaps I calculated incorrectly. To date, I've neither seen a correction in her column nor received a reply.

Realizing that I may have made an error and that she doesn't have time for individual replies, I'm providing the question and my solution to members of the Mega Society for a critique. If anyone would like to point out my error or how Marilyn may have come up with her answer, I would be interested in reading it.

The question was posed as:

> "Using letters and numbers, and a maximum of seven letters and numbers in combination, how many different license plates would that amount to?"

In calculating my solution, I considered the following premises:

> There are 26 letters and 10 digits available, as Marilyn stated in her answer, so we both have this premise as a common starting point.
>
> However, the question is actually about PERMUTATIONS since any specific set of characters can be in any arrangement
>
> Thus the formula is $P_{n,r} = \frac{n!}{(n-r)!}$
>
> Yet we allow fewer than seven characters to appear on a license, so that we must consider the permutations of 36 characters taken six at a time, five at a time, . . . , one at a time.

The solution, therefore, is the sum:

$P_{36,7}$ = 42,072,307,200
$P_{36,6}$ = 1,402,410,240
$P_{36,5}$ = 45,239,040
$P_{36,4}$ = 1,413,720
$P_{36,3}$ = 42,840
$P_{36,2}$ = 1,260
$P_{36,1}$ = 36
Answer = 43,521,414,336

In playing around with optional concepts that Marilyn might have used to come up with her answer, I considered:

1. The COMBINATION of 36 characters taken seven at a time is

$$C_{n,r} = \frac{n!}{r!(n-r)!} = \frac{36!}{7!(36-7)!} = 8,347,680,$$

which is further from 78,364,164,096.

2. If a BLANK SPACE as a character, the permutation would be:

$P_{37,7}$ = 51,889,178,880.

However, that fails as a solution because identical sets of real characters that differ only in the location of the blank (e.g., 123_4AB, 12_34AB) would not count as different license plates. Thus my 43,521,414,336 should be correct as it permits only unique sets of real characters.

I would like to see what the members and subscribers think. Enclosed is a photocopy of the article.

Cordially,

Russ

Robert D. Russell

Enclosure

Ask Marilyn®

BY MARILYN VOS SAVANT

There is a single path up a mountain. A climber starts up at around 6 a.m. and arrives at the top around 6 p.m. He stays there overnight, starts down the next day at about 6 a.m. and arrives at the bottom around 6 p.m. On both days, he travels at varying speeds—enjoying the scenery, stopping for lunch, etc. What are the chances that there was a spot on the mountain path that he passed at exactly the same time both days?

—Jerry Biel, Englewood, Fla.

It's 100%, and here's how to visualize the proof: Imagine both of the climber's trips taking place at once. The climber starts up at the same time that his "twin" starts down. At some point along the way—regardless of whether one stops for lunch and the other doesn't stop at all—they will undoubtedly meet as they pass each other. That will be the place and time.

When poured from a container, honey will diminish in dimension and seemingly in proportion to the distance that it falls. Why? It seems to me that it should remain the same.

—William E. McCraney, Huntington Beach, Calif.

The honey picks up speed as it falls; so, for the same flow rate, it takes less cross-sectional space. You can demonstrate this with your kitchen faucet (without an aerator). Water does the same thing but, because it's less viscous than honey, at a different rate.

Boy, am I in shock! I recently took the Law School Admissions Test and just about failed it. This, after a brilliant academic career of straight A's and advanced degrees at two of the most prestigious universities in the country!

The LSAT presented baffling logic puzzles and other types of questions that I had never been exposed to before. Does this mean that I'm dumb, after all, and that my grade-point average is meaningless?

—Shocked, Fort Worth, Tex.

No way! It has been my experience that highly educated people who have difficulty with logic and the like have simply spent much more time learning *what* to think than they have learning *how* to think. It may be a deficit in your education, but it certainly isn't a deficit in you.

Using letters and numbers, and a maximum of seven letters and numbers in combination, how many different license plates would that amount to?

—John E. Giles Jr., Atwater, Calif.

Assuming that we can use 26 letters and 10 digits, there are 78,364,164,096 seven-character combinations, if you don't mind plates like ZZZZZZZ and 0000000 —enough for more than 314 automobiles for each man, woman and child in the United States.

??

What happens four times in every week, twice in every month, but only once in a year?

—Jonathan Stagg, Peoria, Ill.

And it doesn't happen at all in a day. It's the letter "e."

I've got stuff all over the place, but a friend of mine says there's a saying that goes something like, "Don't keep anything in your house that you don't know to be useful or believe to be beautiful." What do you think about that?

—J. Ward, Seattle, Wash.

Well, it sounds pretty good on the surface, but I wouldn't actually recommend it. I'd hate to be the cause of all those divorces.

ANSWER TO LAST WEEK'S BRAINTEASER: Because you didn't finish the mile! It's 10 blocks from 20th Street to 10th Street, but only *nine* blocks from 10th Street to 1st Street.

If you have a question for Marilyn vos Savant, who is listed in the "Guinness Book of World Records Hall of Fame" for "Highest IQ," send it to: Ask Marilyn, PARADE, 750 Third Ave., New York, N.Y. 10017. Because of volume of mail, personal replies are not possible.

[Editor's comment: I'd think Savant's answer would be too large because of the possible indistinguishability of the letter "O" and zero, but this is a dumb objection, as mine tend to be. Actually, it looks like Savant just used 36 to the 7th power as her answer. Considering Russell's technique of allowing fewer than seven symbols in a license, Savant's answer actually underestimates the number of possible licenses by about three percent. However, many possible license wouldn't make it past the DMV, because they say nasty stuff. We could have a contest to see what's the nastiest thing which could be said in seven symbols, but we might lose members if we printed it.]

WHY I'M INTERESTED IN INTELLIGENCE TESTING
by Chris Cole

I have in hand a copy of the Terman Concept Mastery Test (Form T), which I got from Ron Hoeflin. This is the test used by Terman to track 1004 gifted children into mid-life. This test shows what is wrong with high-level intelligence tests.

Terman's sample questions are fine:

Shoe: Foot :: Glove: (a. Arm b. Elbow c. Hand)
Kitten: Cat :: Calf: (a. Horse b. Cow c. Lion)

But it is all down hill from there. Here are some typical questions from the test, and what is wrong with them:

39. Proletarian: Worker :: Brahmin: (a. Bull b. Aristocrat c. India)
This is a vocabulary question.
40. Bacchus: Revelry :: Ceres: (a. Agriculture b. Love c. Hunting)
This is a mythology question.
55. Danube: Black Sea :: Euphrates: (a. Persian Gulf b. Red Sea c. Caspian Sea)
This is a geography question.
69. Maoris: New Zealand :: Ainus (a. China b. India c. Japan)
This is an anthropology question.

Is a spelling bee an intelligence test? It may be the case that spelling is correlated with intelligence, but it is not the same as intelligence. I think Terman meant to produce a concept mastery test (which is a fine synonym for intelligence, as far as I'm concerned), but he could not think of enough hard analogies, so he got lazy and used hard questions from other disciplines.

The trouble is, we now can produce machines that can spell much better than we can (or do the simple information look-ups that are required by the above questions). But we cannot produce machines that can master concepts better than we can. So it is now interesting to quantify how good people (and ultimately machines) are at mastering concepts. This is why I am interested in true intelligence tests, and why I think the Ultra Test is worth working on.

I will give one example of a good "aha!" (or concept mastery) problem:

Start with a half cup of tea and a half cup of coffee. Take one tablespoon of the tea and mix it in with the coffee. Take one tablespoon of this mixture and mix it back in with the tea. Which of the two cups contains more of its original contents?

Answer on next page.

The two cups end up with the same volume of liquid they started with. The same amount of tea was moved to the coffee cup as coffee to the teacup. Therefore each cup contains the same amount of its original contents.

Every year most of the top U. S. math majors in college take the Putnam Exam, which is a twelve-question, six-hour exam. This exam is intended to weed out the very best, most promising, young mathematicians, and history shows that it is sufficient, if not necessary, to score in the top ten on the Putnam to have a productive career in math. For example, Feynman scored in the top three (in fact, he scored number one, although this was not published).

Over the years, the Putnam Exam has evolved in the direction that I am trying to take the Ultra Test. Although the Putnam requires too much specialist knowledge to be an intelligence test, I reproduce below some questions from the Putnam that do not require much specialist knowledge and that I think give the feel of the Exam.

1966 A-6. What is $\sqrt{1+2\sqrt{1+3\sqrt{1+4\sqrt{1+\ldots}}}}$?

1967 A-3. If $f(x)=ax^2-bx+c$ has integer coefficients, what is the least value of a such that f(x) has two distinct zeros in $0<x<1$?

1972 B-2. A particle moving on a straight line starts from rest and attains a velocity v_0 after traversing a distance s_0. If the motion is such that the acceleration was never increasing, find the maximum time for the traversal.

1947 11. a, b, c, d are distinct integers such that $(x-a)(x-b)(x-c)(x-d)-4=0$. If x is an integer, what is it?

1949 B-3. If any two points on a closed plane curve are no more than one unit apart, what is the radius of the smallest circle that completely contains the curve?

Earlier in this issue, Kevin Langdon argues that we should submit our proposed (and supposed) intelligence tests to the peer-reviewed publication process, and proposes that we start a journal that will include academic psychometricians on the mailing list. This is an interesting *non sequitur*, although I think we all understand why Kevin makes it. The truth is that no reputable psychometrics journal would publish an analysis of any of our tests. This is for a variety of reasons which we are all familiar with and which I will not belabor here. The point I want to make is that the road to scientifically accurate, and generally accepted, high-level intelligence tests will be a long and winding one. I suspect that the initial inroads, by the way, will not come from psychometricians, or even from psychologists of any stripe, but rather from computer scientists, who will be working from much the same motivation that I am.

However, a journey of a thousand miles starts with a single step. We are already a few steps into this journey, and I would like to make the Ultra Test the next step. So please be on the lookout for good problems and send them in.

Answers to Putnam Exam problems on the next page.

1966 A-6. 3
1967 A-3. 5
1972 B-2. $2s_0/v_0$
1947 11. (a+b+c+d)/4

1949 B-3. $1/\sqrt{3}$ (in n dimensions $\sqrt{\frac{n}{2(n+1)}}$)