The BIG SIGMAA News

Volume 12, Issue 2 **Fall 2016**

Business, Industry, and Government Special Interest Group of the Mathematical Association of America

BIG Events at JMM Atlanta

Special points of interest:

- Dr. Thomas Barr of the AMS has organized a Career Booth for the Exhibit Hall during JMM, co-sponsored by BIG SIGMAA and SIAM. Read about it on page 2.
- There will be a contributed paper session at JMM devoted to PIC Math activities. Read more about PIC Math in Suzanne Weekes' article in last Spring's BIG SIGMAA newsletter.
- Thanks as always to Collin Carbno for the artwork.

Inside this issue:

In January mathematicians of the world will be converging on Atlanta for the annual Joint Mathematics Meetings (JMM), the joint annual meeting of the American Mathematical Society (AMS) and the Mathematical Association of America (MAA), with additional sessions of the Society for Industrial and Applied Mathematicians (SIAM), the Association for Women in Mathematics (AWM), the National Association for Mathematicians (NAM), and the Association for Symbolic Logic (ASL). JMM claims to be the largest mathematical meeting in the world; nearly 6,300 mathematicians attended the meetings last January in Seattle. The 2017 meetings will be held January 4-7. There is an exciting lineup of invited speakers and, of course, lots of interesting sessions of shorter talks. You can find the details on the JMM website (http://jointmathematicsmeetings.org/jmm), including short biographies of the invited speakers.

The BIG SIGMAA will have a BIG presence at the meetings, as always. On Thursday morning, BIG SIGMAA, together with the MAA, the AMS, and SIAM, is sponsoring a panel discussion on Multiple Paths to Mathematics Careers in Business, Industry, and Government. Allen Butler, the BIG SIGMAA Chair, is one of the organizers. Panelists will discuss multiple paths to mathematical careers in business, industry, and government. They will share what they wish they had known and done as graduate students or postdocs and they will give advice about what an early- or mid-career mathematician can do to make connections in business, industry, and government.

The BIG contributed paper session will be on Friday morning. Six speakers, from both industry and academia, will talk about their experiences in applying mathematics to BIG problems; you can find the listing of the speakers in the program on the JMM website.

On Friday evening, Dr. Eva Lee, a professor at the H. Milton Stewart School of Industrial & Systems Engineering at Georgia Tech, will present the BIG SIGMAA guest lecture. The title of her talk will be *Optimization-Based Machine Learning Ap-*

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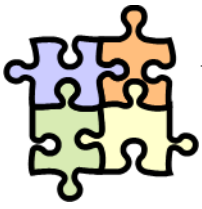


The Puzzle Corner

This puzzle is from *The Ultimate Puzzle Site*.

In a certain ten-digit number, each digit from 0 to 9 occurs exactly once.
The first digit of the number is divisible by 1.
The number formed by the first two digits is divisible by 2.
The number formed by the first three digits is divisible by 3.
The number formed by the first four digits is divisible by 4.
The number formed by the first five digits is divisible by 5.
The number formed by the first six digits is divisible by 6.
The number formed by the first seven digits is divisible by 7.
The number formed by the first eight digits is divisible by 8.
The number formed by the first nine digits is divisible by 9.
The number formed by all ten digits is divisible by 10.

What is the number? (*Answer on page 4.*)

The BIG Career Booth at the 2017 Joint Mathematics Meetings

For the first time at the Joint Mathematics Meetings, the AMS, the MAA, and SIAM are sponsoring a *BIG Career Booth* in the Exhibit Hall. This booth will be a venue for people in Business, Industry, Government agencies and labs, and many other areas to

- Raise awareness of their organizations and career opportunities among mathematically-trained undergraduates, graduate students, PhDs, and the faculty who advise them, and
- Network with the talent attending the largest mathematics conference in the world.

From the afternoon of Wednesday, January 4 through the morning of Saturday, January 7, the BIG Career Booth debuts in the Exhibit Hall at the Joint Mathematics Meetings in Atlanta, Georgia. Located in the area of the meeting with maximal attendee traffic, the booth will provide BIG representatives with a convenient, highly-visible, and cost-effective platform. In the months leading up to the meetings, the Booth will be advertised through the publications, websites, and networks of AMS, MAA, and SIAM so as to build awareness and anticipation among the people that BIG representatives will want to meet.

To learn more about the booth and to request time slots for your organization, please visit the request form. There you can provide contact information, schedule preferences, and answer a few questions that will make links to your website and logo appear optimally on the Booth web page.

The booth's sponsors hope you will find this to be a great opportunity and look forward to your participation in the BIG Career Booth!

The BIG Career Booth is sponsored by AMS, MAA, and SIAM through the Joint Committee on Employment Opportunity. Please contact thb@ams.org for more information or to provide feedback.

Herbert Simon

2016 marks the 100th anniversary of the birth of Herbert Simon, a Nobel Prize laureate who did work in political science, economics, sociology, psychology, and computer science. He is generally credited with being one of the founders of several important scientific domains, including artificial intelligence, information processing, decision-making, problem-solving, organization theory, and computer simulation of scientific discovery. Among his many scientific awards were the APA Award for distinguished Scientific Contributions to Psychology, the ACM Turing Award, the National Medal of Science, the IJCAI Award for Research Excellence, and the Nobel Memorial Prize in Economics. To mark the centennial of his birth, here are some quotations from Dr. Simon.

One finds limits by pushing them.

What information consumes is rather obvious: it consumes the attention of its recipients. Hence a wealth of information creates a poverty of attention, and a need to allocate that attention efficiently among the overabundance of information sources that might consume it.

There are no morals about technology at all. Technology expands our ways of thinking about things, expands our way of doing things. If we're bad people we use technology for bad purposes and if we're good people we use it for good purposes.

Human beings, viewed as behaving systems, are quite simple The apparent complexity of our behavior over time is largely a reflection of the complexity of the environment in which we find ourselves.

The social science, I thought, needed the same kind of rigor and the same mathematical underpinnings that had made the "hard" sciences so brilliantly successful.

Engineering, medicine, business, architecture, and painting are concerned not with the necessary but with the contingent—not with how things are but with how they might be—in short, with design.

Anything that gives us new knowledge gives us an opportunity to be more rational.

In the computer field, the moment of truth is a running program; all else is prophecy.

I don't care how big and fast computers are, they're not as big and fast as the world.

Most of us really aren't horribly unique. There are six billion of us. Put us all in one room and very few of us would stand out as individuals. So maybe we ought to think of worth in terms of our ability to get along as a part of nature, rather than being the lords over nature.

BIG Events at JMM Atlanta (continued)

(Continued from page 1)

proach for Predicting Vaccine = Immunity. Dr. Lee uses mathematical modeling to attack important problems in medical and healthcare decision analysis. Specific research areas include health risk prediction, early disease prediction and diagnosis, optimal treatment strategies and drug delivery, healthcare outcome analysis and treatment prediction, and public health and medical preparedness. After her talk there will be a reception, followed by the annual BIG SIGMAA business meeting. All BIG SIGMAA members are encouraged to attend the business meeting.

On Saturday morning the BIG SIGMAA, the MAA BIG committee, and SIAM are sponsoring a contributed paper session on PIC Math (Preparation for Industrial Careers in Mathematical Sciences). PIC Math is an NSF-funded program of the MAA and SIAM that prepares students in mathematics and statistics to succeed in careers in nonacademic careers. (For more details about PIC Math, see the article by Suzanne Weekes, one of the organizers of this session, in last Spring's BIG SIGMAA newsletter.) Twelve speakers will talk about their experiences in PIC Math or similar programs; the listing of the speakers is in the program on the JMM website.

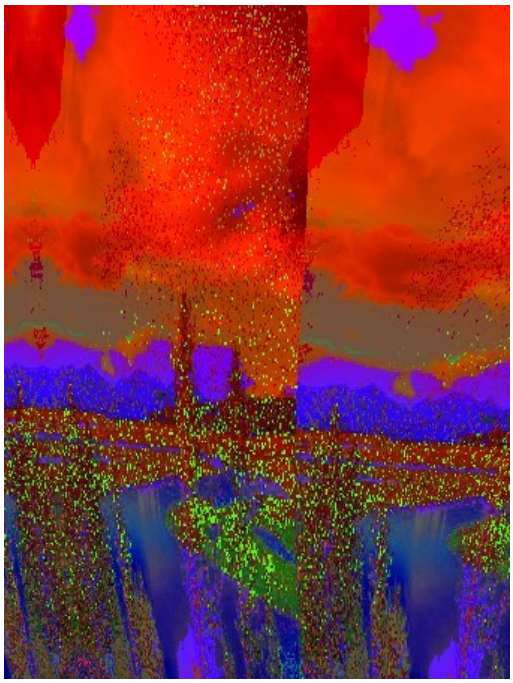
Finally, with the AMS, the MAA (through BIG SIGMAA), and SIAM are sponsoring a BIG Career Booth in the exhibits area. The booth will be open when the exhibits are open, from 12:15 Wednesday to noon Saturday. For more information, see the article about the BIG Career Booth elsewhere in this newsletter.

You can register in advance for the meetings until December 20, and you can register and reserve housing until December 12, but it's best to register before November 22. If you do, the meeting program and your meeting badge will be mailed to you before the meetings; you'll also have a better chance of obtaining the hotel of your choice.

I hope to see as many BIG SIGMAA members as possible at the meetings.

Mathematical Poem

I
Built
In time
A model,
Mathematical
In nature and capable of
Forming a description of the world that's bound to last
As long as nature itself can last and grow and continue to give life to us all.



Mathematical art by Collin Carbno

Double Limerick

This double limerick was written by Ronald Knox (1888-1957), an English Catholic priest and scholar who also wrote detective fiction and satirical essays.

There once was a man who said "God
Must think it exceedingly odd
If he finds that this tree
Continues to be
When there's no one about in the Quad."

"Dear Sir, Your astonishment's odd;
I am always about in the Quad.
And that's why the tree
Will continue to be
Since observed by Yours faithfully, God."

Business, Industry, and Government Special Interest Group of the Mathematical Association of America

Business • Industry • Government
Special Interest Group of the MAA

from the MAA Website:

BIG SIGMAA serves as a unifying link between business, industry, and government mathematicians, academic mathematicians, and mathematics students. The SIGMAA provides resources and a forum for MAA members who share an interest in mathematics used in business, industry, and government, aids in professional development, helps build partnerships between industry and academics, and increases awareness of opportunities for mathematicians in business, indus-

Puzzle Corner Solution

First digit: Every number is divisible by 1, so the clue about the first digit gives us no information.

Tenth digit: A number is divisible by 10 if and only if it ends in 0; thus the tenth digit is 0.

Fifth digit: A number is divisible by 5 if and only if it ends in 0 or 5; thus the fifth digit is either 0 or 5. Since 0 has already been used, the fifth digit must be 5.

Second, fourth, sixth, and eighth digits: A number is divisible by 2, 4, 6, or 8 only if it is even—that is, only if it ends in 0, 2, 4, 6, or 8. Thus the second, fourth, sixth, and eighth digits must be one of those numbers. Since 0 has already been used, these digits must be 2, 4, 6, or 8, in some order.

First, third, seventh, and ninth digits: Since 0, 2, 4, 5, 6, and 8 have already been used (in some order), the first, third, seventh, and ninth digits must be 1, 3, 7, and 9 in some order.

Third digit: A number is divisible by 3 if and only if the sum of its digits is 3. Thus the first three digits have the following properties:

The first digit is 1, 3, 7, or 9.
The second digit is 2, 4, 6, or 8.
The third digit is 1, 3, 7, or 9.
No digit is repeated.
The sum of the digits is divisible by 3.

There are 20 such combinations of digits; we'll leave it to you to figure out what they are.

Fourth digit: A number is divisible by 4 if and only if the last digit is divisible by 4 (that is, equals 0, 4 or 8) and the next-to-last digit is even, or the last digit is congruent to 2 mod 4 (that is, equals 2 or 6) and the next-to-last digit is odd. Since the third digit of our ten-digit number is odd, it follows that the fourth digit must be 2 or 6. When this information about the fourth digit is combined with the 20 possibilities for the first three digits, some of the resulting 40 combinations of four digits drop out (those with two 2s and or two 6s). When all is said and done, there are 30 possible combinations for the first four digits, which we'll leave for you to sort out.

Sixth digit: A number is divisible by 6 if and only if it is divisible by both 2 and 3—that is, if and only if it is even and the sum of its digits is divisible by 3. We have already said that the sixth digit is either 2, 4, 6, or 8, so the number formed by the first six digits is even. Since the sum of the first three digits is divisible by 3, it is sufficient that the sum of the fourth, fifth, and sixth digits be divisible by 3. Since the fourth digit is either 2 or 6, the fifth digit is 5, and the sixth digit is either 2, 4, 6, or 8, there are two possibilities for the fourth, fifth, and sixth digits: 258 and 654; that is, if the fourth digit is 2 then the sixth digit is 8 and if the fourth digit is 6 the sixth digit is 4. When combined with the 30 possibilities for the first four digits, there are 20 possible combinations for the first six digits, which you can figure out.

Eighth digit: A number is divisible by 8 if and only if the number formed by the last two digits is divisible by 8 and the second-from-last digit is even, or the number formed by the last two digits is congruent to 4 mod 8 and the second-from-last digit is odd. Since the second-from-last digit of the number formed by the first eight digits is the sixth digit, which is even, the number formed by the seventh and eighth digits must therefore be divisible by 8. In addition, the seventh digit is 1, 3, 7, or 9, so there are four possibilities for the seventh and eighth digits: 16, 32, 72, and 96. Combined with the 20 possibilities for the first six digits, we arrive at 10 possibilities for the first eight digits, which of course we're leaving to you to figure out.

Seventh digit: For the 10 possibilities for the first eight digits, only one has the property that the number formed by the first seven digits is divisible by 7. Thus there is actually only one possibility for the first eight digits, which you can easily determine now.

Ninth digit: Since we now know the first eight digits and we know that the tenth digit is 0, there's only one digit left to be the ninth digit. You can check that the sum of the first nine digits is divisible by nine, and therefore the number formed by the first nine digits is divisible by 9, as required.

Answer: We now know all ten digits of the number, but the margin of this newsletter is too small for me to write any more.