Curious Counts
Author(s): Martin Gardner
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Shuffle your cards, toss your dice, fold up pieces of paper, and punch the numbers on your calculator. Can you solve these counts, or do they leave you curious?

Curious Counts

Martin Gardner

1 A Curious Count

Shuffle a deck of cards and then start dealing them face up to form a pile. Say "Ten" when you deal the first card, "Nine" when you deal the second, "Eight" when you deal the third, and so on. In other words, as you deal you count backward from 10 to 1. Assume that each face card (king, queen, or jack) has a value of 10.

As soon as you deal a card with a value that is the same as the number you say aloud, stop dealing and start a new pile. If you reach 10 without finding a match, "kill" the pile by putting a card face down on top of it. Repeat this procedure until you have dealt four piles. If all four have been "killed," which is very unlikely, start the test all over again after another shuffle of the deck.

After the four piles are finished, add the values of the cards at the top of each "living" pile. Call this sum k. Deal k cards from the remainder of the deck and then count the cards that remain.

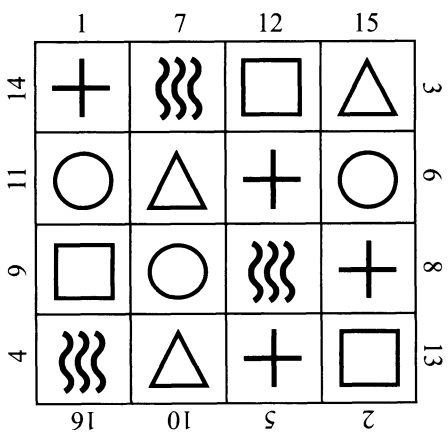
How many are they?

Answers may be found on page 26.

2 A Rotating Matrix

Think of a number from 1 through 16. Locate that number on the border of the matrix below. Turn the page so the number is at the top of the matrix. Count the cells from left to right, top to bottom, starting the count on the top left corner cell. Note the symbol in the cell where the count ends.

What symbol is it?



3 Around the Square

Toss a die on the table. Multiply the number by 8. Add 4. Add the number on the top of the die and remember the sum.

Put your finger on cell A below and say "One." Tap clockwise around the square, tapping the cells as you go, and counting 2, 3, 4, and so on. Stop tapping when you reach the sum you're remembering.

On what letter did your finger end the count?

A	B	C	D
I			E
H	G		F

4 Number Names

Think of any number from 1 through 100. Write down its name. Count the number of letters in its name to obtain a second number. Count the number of letters in the second number to obtain a third number. Continue in this way until the chain of numbers ends on a number that keeps repeating.

What is this number?

5 Turn Two and Cut

Hold a packet of ten cards face down in your left hand. Turn the top pair of cards face up and then cut the packet at any spot you like. Again, turn the top two cards face up and cut. Keep up this turning a pair and cutting for as long as you like. This, of course, will randomize the positions of the face-up cards in the packet.

After you decide to stop reversing and cutting, deal the cards in a row on the table. Reverse all the cards at even positions along the row; that is, turn over the second, fourth, sixth, eighth, and tenth card.

How many cards in the row will now be face up?

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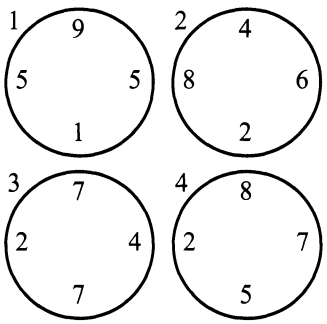
6 A Surprising Sum

Below are four circles. Choose any number in Circle 1. Cross it out and then write it down as the first digit of a number that you are creating. Select any digit in Circle 2. Cross it out. Put it down as the second digit of the number you are forming. Select a digit in Circle 3. Cross it out and make it the third digit of your number. Select a digit in Circle 4. Cross it out. This will be the fourth and last digit of your number.

Now create three more four-digit numbers in exactly the same way. Select the digits from the four circles, taking the circles in 1, 2, 3, 4 order. Cross out digits as you use them. You now have randomly formed four numbers, each with four digits. Add the four random numbers.

What's the total?



7 A Remarkable Number

Enter 999999 in your calculator and then divide it by seven. The result will be a mysterious number.

Multiply this number by any number obtained by tossing a die. Arrange the digits of the product in increasing order starting with the smallest digit, then the next higher one, and so on to the largest digit. This will form a six-digit number.

What is the number?

8 Another Calculator Test

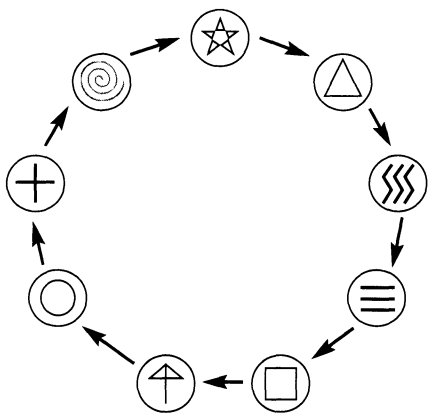
Your calculator keyboard has a square of digits from 1 through 9. Select any row, column, or main diagonal. Arrange the three digits you selected in any order and then jot them down on paper as a three-digit number. For example, if you selected the middle column, you have the digits 852. You can put them in any order you like, such as 528, 285, and so on.

Select another row, column, or main diagonal. Do the same thing with its three digits to make a second three-digit number. Write it down.

Using the calculator, multiply one of the three-digit numbers by the other. Add all the digits in the product. Call the sum k.

Turn to the magic circle of symbols below. Put your finger on the star, calling it 1, then tap your finger clockwise around the circle, counting 2, 3, 4, … until you reach the number k.

What symbol did your count stop on?



9 End of a Chain

Think of any three-digit number with no two of its digits alike. Write the digits in ascending and descending order. Subtract the smaller number from the larger to get a second number. For example, if you thought of 614, you would subtract 146 from 641. Arrange the new number's digits in ascending and descending order. Subtract the smaller from the larger to get a third number. Keep doing this until you reach a number that keeps repeating itself.

What is this number that ends the chain?

10 What's the Word?

Crease a sheet of paper as shown below and letter the eight cells from A to H. Fold the sheet into a packet eight leaves deep by folding in any way you like along the creases. After you do this, some cells in the packet will face one way, other cells will face the opposite way. Because you made the folds at random, there seems to be no way to know which cells face which way.

Trim the four sides of the packet with scissors, so that no cell is attached to another cell. Spread the pieces on the table. Can you arrange the face-up pieces to spell a common English word? If you can, stop. If you can't, turn over all the pieces. Try again to spell a word with the face-up pieces.

You are sure to succeed. What word do you spell?

A	D	E	H
B	C	F	G

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11 A Three-Dice Stack

You need three dice for this test. Toss the first die on the table. On top of it put the tossed second die. The third die goes on top of the other two, turned so its top face is 1.

If you inspect this stack from all sides, you'll note that five faces cannot be seen. Add these faces as follows: check the two touching faces between the top and middle dice. Write down their sum, and put the top die aside. Check the two hidden faces that are touching between the two dice that remain. Add the numbers, write down the sum, and put the top die aside. Subtract both touching face sums from 20, and say this number out loud as you look at the bottom face of the remaining die.

What do you notice?

12 Nine-Card Spell

Remove nine cards from a deck. Shuffle them, and then hold them face down in your left hand. Reverse the third card from the top of the packet. Spell the name of the reversed card as follows. Let's assume it was the queen of hearts. Spell Q-U-E-E-N by dealing five cards to the table, one card for each letter. Place the remaining cards on top of the five just dealt.

Pick up the packet. Spell O-F by dealing two cards to the table. Again, put the remaining cards on top of those just dealt.

Now spell H-E-A-R-T-S. Put the cards in your hand on top of the tabled pile.

Follow this procedure, using the name of the card you have reversed. Note that the number of letters in the name can vary from 10 (for example, the ace of clubs) to 15 (for example, the eight of diamonds).

After spelling the name of the reversed card, how far down is it from the top of the packet? ■

Answers

See answers on page 26.

Continued from p. 9

	first	second	third	fourth	fifth
Hughes	491	1501	10	0	0
Slutskaya	1511	491	0	0	0
Kwan	0	10	1992	0	0
Cohen	0	0	0	2002	0
Suguri	0	0	0	0	2002

As you can see in the table above, the final rankings for the top three skaters depend upon which nine of the fourteen judges are chosen. The determination of the Olympic champion is left to chance. This lack of reproducibility is one of the most troubling aspects of the newly proposed system. For the competitors, this method is especially unfair and capricious. Perhaps the ISU was lured by the idea that introducing an element of randomness into the judging method would increase its fairness. The examples above clearly show that this is not the case. In light of this and the fact that the proposed method would not prevent negative block voting, it appears to be a hasty and ill-planned change.

Thinking back to our motivating example, what is interesting to note is that a majority of judges preferred the Russians to the Canadians. In this case, one should be very skeptical of a system which awards the gold to the Canadians. Instead of changing the judging method, the skating community would be better served if there were changes in the training of judges and in the punishment of those found guilty of block voting. The recent three-year suspensions given to the French judge and her supervisor seem to be a promising sign. However, a recent US proposal requiring a lifetime ban for any judge convicted of ethical violations was voted down by the ISU. Without such sanctions in place, it seems that the judging of figure skating might remain an "embarrassment" for years to come. ■

For Further Reading

For up-to-date information on the proposed judging system, see `www.isu.org`. For more details about the BOM method, read the article "Rating Skating" by Gilbert Bassett and Joseph Persky in the September 1994 *Journal of the American Statistical Association*. For details on judging systems for other sports, see the 1993 book *Mathematics and Sports* by L.E. and A.L. Sadovskii. Finally, for an introduction to collective choice theory, read Alan Taylor's 1995 book, *Mathematics and Politics: Strategy, Voting, Power and Proof.*

I am afraid that I rather give myself away when I explain. Results without causes are much more impressive.

—Sir Arthur Conan Doyle (1859–1930),
spoken by Sherlock Holmes in *The Stockbroker's Clerk*

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