PuzzleCorner

I am attending a conference in Italy in June (today is 23 May) and have decided to pursue an almost un-American activity: I am trying to learn a little of the language. I must confess that in high school, I had some Italian and French so I was not 100 percent ignorant of the language, but I was close. Anyway I have some tapes, which I listen to in the car, while walking from the train to work, and while doing some home repairs. It is actually a little fun. So far I recommend it, but the real test comes next month.

I have received a subscription to *The Cryptogram* from Puzzle Corner contributer Rick Hedrick. Readers interested in the subject should contact the American Cryptogram Association, One Pidgeon Dr., Wilbraham MA 01095-2603.

Problems

A/S 1. We start with a Bridge problem from Doug Van Patter that occurred during an ACBL (country-wide) charity event.

North
♠ Q J 10 6 5
♥ A J 10 7
♦ Q 7 5
♣ 3

West
♠ 2
♥ Q 9 6 5 4 3
♦ 10 6 4 3
♣ 9 5

East
♠ 9 7 4 3
♥ 2
♦ A J 2
♣ K 10 7 6 4

South
♠ A K 3
♥ K 8
♦ K 9 8
♣ A Q J 8 2

Your partner opens a skinny one spade. After discovering that one ace is missing, you bid six no trump (trying to protect heart king). Opening heart lead is taken by dummy's ten. The jack of clubs is finessed and the heart king cashed. A low diamond to queen is taken by East's ace, who returns a spade. Can you now make your unlikely contract?

A/S 2. Don "Hoppy" Hopkins has an arithmetical crossword puzzle for us. He often gives out the answer to 7 across as a hint since it is easy to look up, but takes time. If you wish to have this hint see the end of the column.

1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
11.				12.			13.		
14.			15.			16.			
17.			18.		19.		20.		
21.	22.	23.				24.		25.	
26.				27.			28.		
29.			30.			31.			
32.				33.					

ACROSS
1. A multiple of this number is obtained by removing the first digit and placing it after the last digit.
7. The year in the 20th century when Easter is earliest.
11. Divisible by 7, 11, and 13.
12. Multiple of 30 Down.
13. When added to 16 Across is equal to the sum of 23 Down and 25 Down.
14. See 26 Across.
15. A multiple of 9.
16. See 13 Across.
17. This number has the same first and last digits.
18. A multiple of 3.
19. Ten times 31 Across plus five times 13 Across.
21. Factorial 9.
24. Multiple of 28 Across.
26. Sum of 3 Down and 14 Across.
27. See 8 Down.
28. See 24 Across.
29. See 4 Down.
31. See 19 Across.
32. Equal to 22 Down.
33. 105 x π to the nearest integer.

DOWN
1. The cube of a prime number.
2. A multiple of 17 Across.
3. A multiple of 7.
4. Sum of twice 21 Across and 29 Across
5. See 10 Down.
6. This number is equal to the sum of the cubes of its digits.
7. A cube number.
8. The sum of 15 Across and 27 Down.
9. See 20 Down.
10. A multiple of 5 Down.
19. A square number.
20. Ten times 9 Down plus 1.
22. Equal to 32 Across.
23. See 13 Across.
25. See 13 Across.
30. Factor of 12 Across.

A/S 3. Rick Hendrik wonders, given a regular dodecahedron (12 pentagonal faces) with an edge length of 10, what is the largest regular icosahedron (20 triangonal faces) that will fit inside?

Speed Department

Consider the nondecreasing infinite integer sequence (1,2,2,3,3,3,4,4,4,4,5,5,5,5,5,6,6,6,6,6,6,7,...), in which the integer i occurs exactly i times. Using your favorite programming language, write a one-line program without loops to display the nth term (you may use n in your answer).

Solutions

APR 1. Winslow Hartford sends us the following Sheinwold problem in which South is declarer at 6 hearts and is to make the contract against a lead of the D7.

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North
♠ Q 10 8 6 3 2
♥ A J 4
♦ 4 2
♣ Q 7

West	East
♠ 9 7 4	♠ K 5
♥ 8 7 6 5	♥ None
♦ 7	♦ K J 9 6 5 3
♣ K 6 4 3 2	♣ A J 10 9 8

South
♠ A J
♥ K Q 10 9 3 2
♦ A Q 10 8
♣ 5

The following solution is from J. Keilin:

South wins the diamond lead as cheaply as possible and plays to North's heart A. This is followed by a low spade to the South hand, again winning as cheaply as possible. South plays the remaining spade and plays to North's heart J. The spade Q is played on which a low diamond is tossed. That is the first key play. North's last trump is lead to the South hand and all remaining trumps are played. Dummy holds on to two clubs and a spade. This is the second key play. At this point South has won 10 tricks: 1 diamond, 3 spades, and 6 hearts. On the last trump, East is squeezed. If he keeps no more than one club, South plays the club 5. If West wins he must return a club to North's queen and the board is good. If East wins, he must lead away from his diamonds and South takes the last two diamonds.

APR 2. Nebraska was just named the national champion in college football, bringing great cheer to Lincoln but much sadness to State College. Jerry Grossman, asks us to show that round-robbin tournaments always have at least one player "transitively better" than everyone else. Specifically, Grossman writes:

A round-robin tournament was held among n players, each player playing one game against every other player. No game ended in a tie. Show that there exists a player K such that for every other player L, either K beat L, or K beat someone who beat L.

Jack Bross sent us a (nondeterministic) algorithm together with a proof by induction.

The basic strategy for finding a team that is "transitively better" than all other teams is actually pretty simple. Pick a team (A) and check to see if it is transitively better than all other teams. If not, then there is a team B which not only defeated A, but defeated every team which A beat. Test to see if B is transitively better. If not, there is a team C (etc). Eventually, you run out of teams, and hit one that is transitively better than all other teams. Note that there may be more than one such team, so this doesn't actually "decide" any championship, necessarily. To prove that this works, we need a proof by induction (sigh).

Let S(0) be the set of all teams, and x(0) a randomly selected starting team. If x(0) isn't the team we're looking for, then let S(1) be the set of all teams which beat x(0) and which beat every team that x(0) defeated. Let x(1) be an element of S(1). Now keep going, defining S(n+1) to be the set of all teams which beat x(n) and which beat every team that x(n) defeated. Again, pick x(n+1) in S(n+1). Claim: S(n+1) is a subset of S(n): If y is in S(n+1), then it defeated every team that x(n) defeated. But x(n) defeated x(n-1), so y defeated x(n-1). Also, if x(n-1) defeated a team z, then x(n) defeated z. But then y defeated z, since it defeated every team that x(n) beat. So y is by definition in S(n).

Basically, this means that each set S(n) is contained in the previous set. You "throw out" at least one element every recursive step (because you throw out the x(n)'s). S(0) is finite. Therefore, the process has to stop sooner or later. In order for the process to stop, one of your x(n)'s has to be transitively better than any other team.

APR 3. Robert Moeser has one that he suggests you solve by hand for N≤5, but use a computer if you want to try larger N. Use N identical cubes and create a solid object by joining them only by gluing a face against another face such that the two faces are in perfect alignment. Consider that two such objects are identical if one can be rotated and placed in exact correspondance with the other. (Objects that are mirror images, however, are considered different.)

How many different objects can be made with N = 1, 2, 3, 4... cubes?

Winslow Hartford reports that in the December '89 issue of *World Game Review* the first 8 answers are 1, 1, 2, 8, 29, 166, 1023, and 6922. Ken Rosato sent us the pictures shown below for the first four cases and Matthew Fountain used diagrams (also shown below) for the first five cases. Fountain writes.

There is 1 object formed when N=1 or N=2. There are 2 when N=3, 8 when N=4, and 29 when N=5. To find these objects I drew diagrams in which lines joined the center of blocks glued together. To avoid too many diagrams, I drew diagrams representing N-1 blocks in heavy lines and then drew light lines representing where the Nth block could be added to form an object not duplicating any previously considered. The lines connected the centers of the blocks. I investigated all possible different arrangements for N-1 blocks as starting points. *(Please see Figures 1 and 2 at right.)*

Better Late Than Never

F/M SD. Frank Rubin notes that a "Scrabble" word (i.e., one in the *Official Scrabble Players Dictionary*) PARADROP has more letters than BARBARA, all from the allowed set.

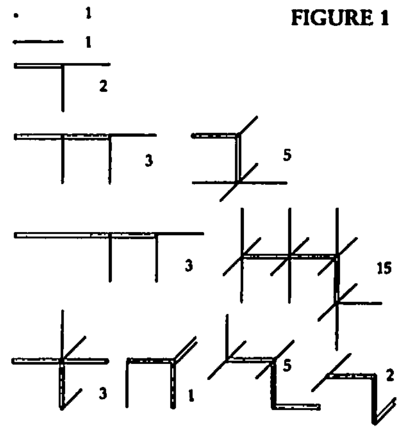

FIGURE 1

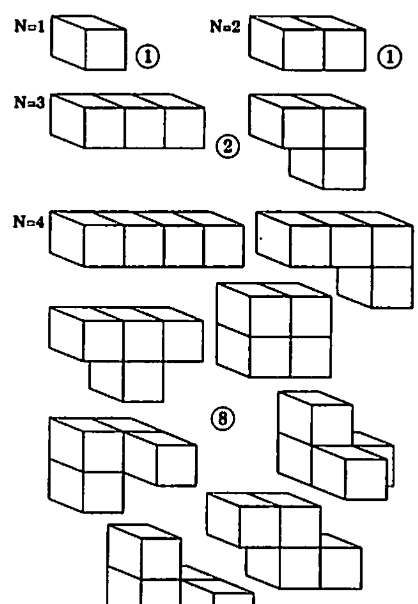

FIGURE 2

APR SD. Frank Rubin and Joshua Abraham noted that you can move matchstick(s) to convert the leftmost triangle to N and then read the middle triangle as O. This gives NO "triangle."

Other Responders

Responses have also been received from W. Cluett, R. Freedman, H. Gilinson, J. Grossman, E. Lund, A. Ornstein, R. Price, E. Rose, L. Schaider, L. Steffens, A. Ucko, M. VanPatter, and G. Zartarian.

Proposer's Solution To Speed Problem

In Basic, PRINT INT(SQR(ABS(2*n%)) +1/2)

The hint for A/S 2 is 1913.