

MAKO Puzzles

Find the Radius of the Softball

A volleyball with a radius of 8 inches sits in the corner of a room, touching the floor and two walls simultaneously. A softball sits on the floor between the volleyball and the corner. The softball touches the floor, the two walls, and the volleyball. What is the radius of the softball?

A Trigonometric Sum

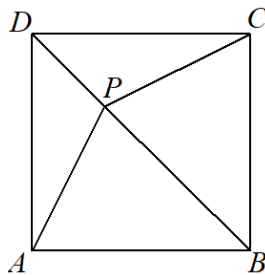
Evaluate $\cos^2 1^\circ + \cos^2 2^\circ + \cos^2 3^\circ + \dots + \cos^2 90^\circ$.

A Digital Dilemma

Find the smallest positive integer whose last digit is "6" such that moving the "6" to the beginning of the number increases its value by a factor of 4. For example, the number 1236 would be transformed to 6123, which is more than four times as large, while 3126 becomes 6312, which is less than four times as large. You are to find a number which is transformed to one exactly four times as large.

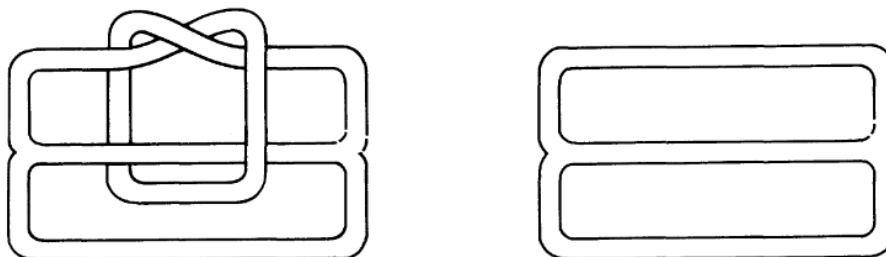
Acute Probability

A point P is chosen uniformly and at random from a unit square $ABCD$. What is the probability that triangle ABP is an acute triangle?



A Knotty Conundrum

Can the figure on the left be continuously deformed to the one on the right?



The answers are below.

Rules for playing KENKEN®

- 1) Choose a grid size.
- 2) Fill in the numbers from 1 to grid size.
- 3) Do not repeat a number in any row or column.
- 4) The numbers in each heavily outlined set of squares, called cages, must combine (in any order) to produce the target number in the top corner using the mathematical operation indicated.
- 5) Cages with just one square should be filled in with the target number in the top corner.
- 6) A number can be repeated within a cage as long as it is not in the same row or column.

6×	4+		2-
	11+		
			7+
2÷			

5-		7+		20×	9+
1-			12+		
13+	4-				
		5	7+		
3-		3-		2÷	4-
4-		1-			

Answers to MAKO Puzzles 2018

Find the Radius of the Softball

$$r = 16 - 8\sqrt{3} \approx 2.14 \text{ in}$$

A Trigonometric Sum

The sum is 44.5.

A Digital Dilemma

The original number is 153846. Transferring the last digit to the front gives $615384 = 4 \times 153846$.

Acute Probability

The probability is $1 - \frac{\pi}{8} \approx .607$.

A Knotty Conundrum

