MathsJam South

OMG22

October 7th, 2022

Solve

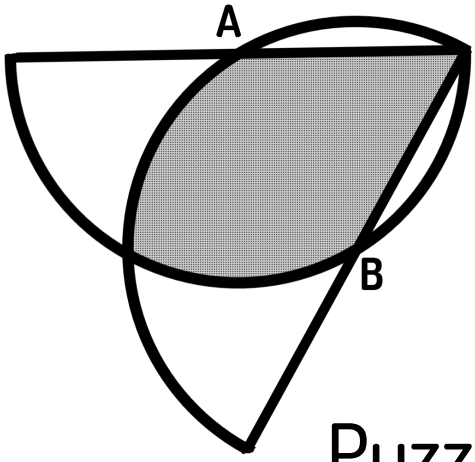
$x = ?$

$$x^x = 2^{2048}$$

Discuss Random walk on the integers

Amy and Andre are taking a walk on the integers. Starting from zero, each day they take turns in flipping a coin and then move together **+1** if the coin is heads or **–1** if it is tails. Their coin flips create a simple random walk from the origin on the integers, so we know for sure that they we will return to the origin infinitely many times. However, their "random" walk never comes back to the origin, so we know for sure that one of them did not follow the rules!

Is it possible to figure out from the walk whether it was Amy or Andre who did not follow the coin-flipping rule? Source: Gil Kalai's Combinatorics blog



Puzzle

Above are two identical semicircles with radius 3. Their intersection points A and B are at the centres. What is the area of shaded region?

Make:

Minimally marked ruler

Design a ruler that can measure lengths of 1 through 12 units.

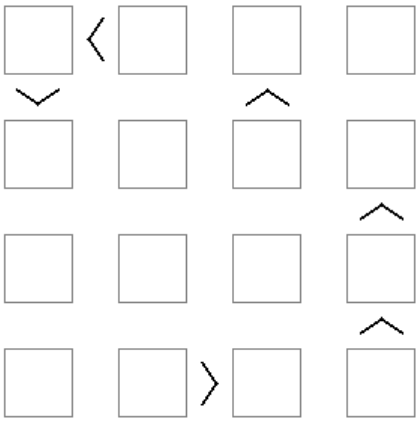
You are given an unmarked 12-unit ruler and are allowed to make at most four marks that divide it into five segments (the marks must be perpendicular to the length of the ruler). How can you use those marks to measure any integer length between 1-12? What about 13 units?

Example:
Suppose the problem was the same, but you had an unmarked 6-unit ruler that had to measure 1 through 6 units. You can accomplish this by making two marks on the ruler leaving gaps of 1, 3, and 2 (see above).

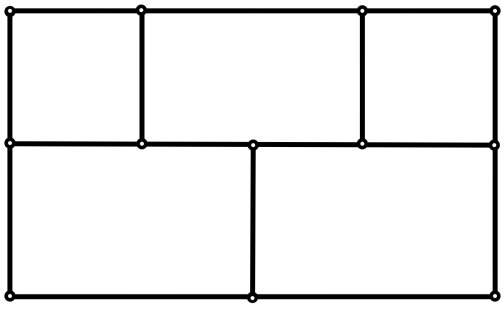
It is obvious how to measure 1, 2, 3, and 6 unit lengths using this ruler, but also 4=1+3 and 5=3+2

Play: Futoshiki

Place 1-4 once each into every row and column while obeying the inequality signs.



More at www.futoshiki.org



Cross the network

source: Martin Gardner

Can you draw a continuous line across the closed network (left) so that your line crosses each of the 16 segments of the network once only? What about if it was on the surface of a sphere, or a torus?