SuperCon2010

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Problem: Paving Bricks (Count All Possible Ways)

This is the problem of counting all possible ways to pave 1×2 bricks on a given square like Fig.1 below.

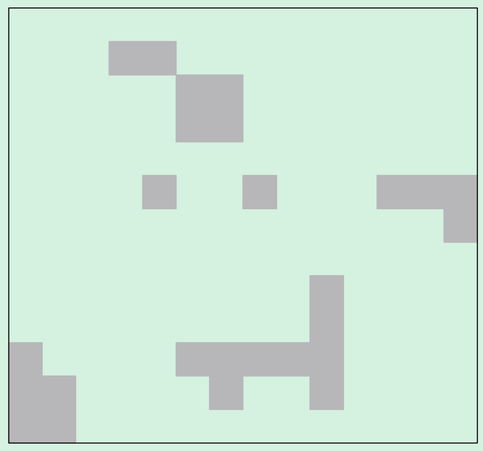


Fig.1: An example of a square.
Shaded parts cannot be paved.

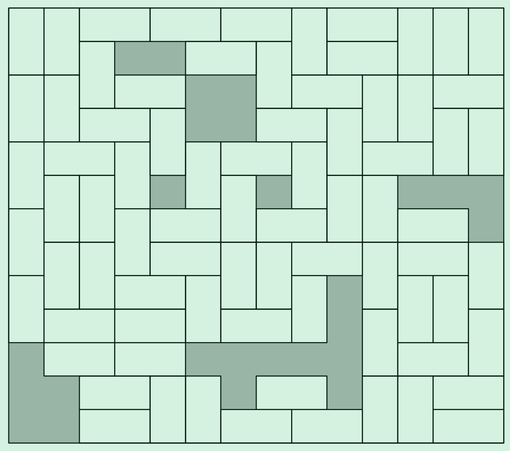


Fig.2: An example of one pavement.

Although this looks like a puzzle, it is closely related to some topics in statistical physics, and counting problems like this has been studied in depth in computational complexity theory.

Preliminaries Problem:

Count the number of ways to pave 1×2 bricks on the following square given by parameters m and n.

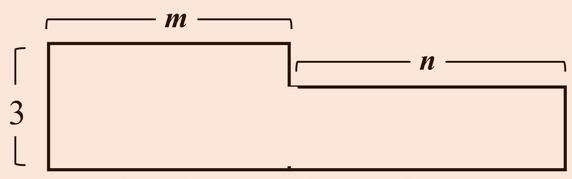


Fig.3: A square for the problem of the preliminaries.

Since the number becomes very large, an actual output is the number modulo a given k. In the case of m = 4 and n = 3, for example, we have the following 41 ways to pave the square; thus, the answer, for a given k = 5 must be 1.

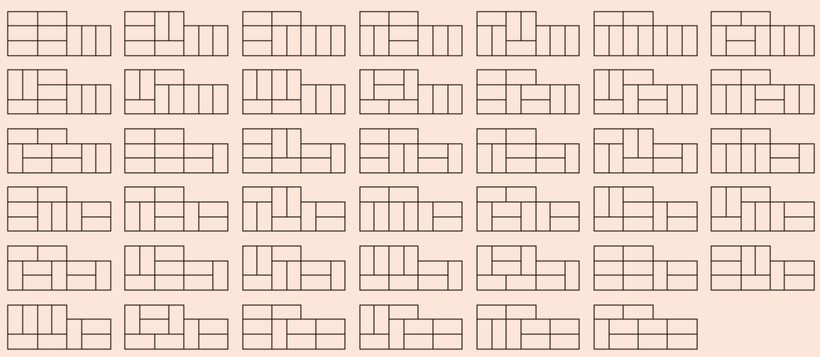
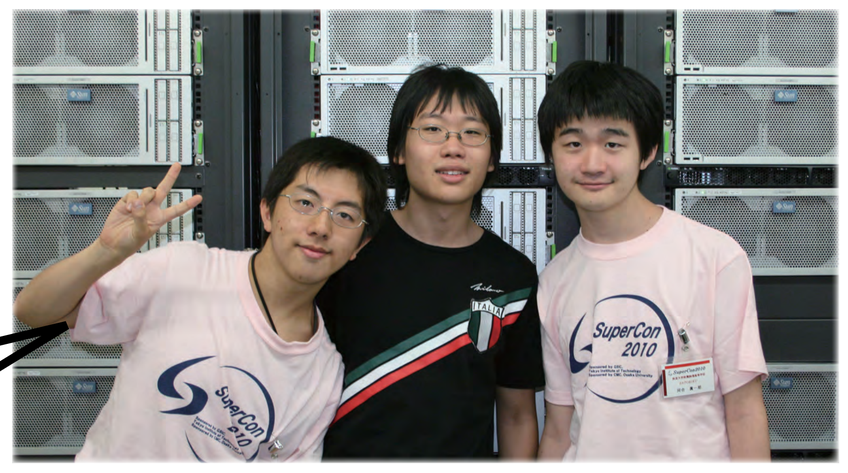


Fig.4: m = 4, n = 3, and k = 5, the answer should be 41 mod 5 = 1.

Finals Problem:

Count the number of ways to pave 1 ×2 bricks for a given set of 10,000 instances, i.e., squares like Fig.1. Each team is given 45 minutes and 9 nodes (i.e., 72 cores) of a subsupercomputer system of TSUBAME, and the one solves the largest number of instances among 10,000.

Results: Team ZATORIKU solved 87,998 instances and became the winner of this year!



Winner: team ZATORIKU
(HARA Masaki, YOSHIZATO Riku, KAWAI Shinichiro)

We are waiting for your challenge next year 2011.
for more imformation, send an e-mail to scadmin@gsic.titech.ac.jp
http://www.gsic.titech.ac.jp/supercon/