

# The MacMahon Cubes

Article by Fred Horn

Ask anybody how many different six-sided die are possible and he will give you a look as though you—maybe—have ‘lost your mind.’ “Endless of course” he will answer, referring to size; material, etc. and when knowing more: “and both opposite sides total 7!”



A smart person also comes up with: “Two, the die and its mirror image.” But when we also view with closer consideration the patterns for the eyes of the ‘numbers’ placed on the sides, it is clear that more solutions are possible.

Three ‘eye-combinations’ (1, 4, 5) are 4-times symmetrical.



The other three ‘eye-combinations’ (2, 3, 6) are 2-times symmetrical.

When we combine this under the precondition that opposite sides count a total of 7 ‘eyes,’ we find  $2 \times 2 \times 2 \times 2 = 16$  different dice.

And how about the color die used for many childrens’ games?



There is *no* standard for the order of the colors, thus how many different dice are possible?

At the end of the 19th century a certain Percy Alexander MacMahon, officer in the English Army, asked himself the same question:

“When I use 6 different colors and I color the faces of a six-sided die with these colors, how many different dice will that produce?”

There are exactly 30 different ways to color the dice under these conditions.



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In 1892 MacMahon registered his “The Mayblox Puzzle” with 8 cubes (dice) out of the total set of 30.

The *Mayblox Puzzle* was produced and published by the London firm, R. Jounet in 1892.

The goal of the puzzle is to complete a  $2 \times 2 \times 2$  die with all 6 colors on the outside and the same color on touching sides inside.



In his book, *Mathematical Pastimes* from 1921, MacMahon describes a more complicated puzzle that can be played with the 30 cubes:

“Take one cube out of the set of 30 and use this as your example (cube). Find the 8 cubes out of the 29 that are left and form a  $2 \times 2 \times 2$  die conforming to the rules of *The Mayblox Puzzle* with the outside look of the example cube.”

But further, from the remaining 21 cubes, again choose one as an example cube and find 8 others to make the bigger one!

Today it isn’t easy to find a set of MacMahon Cubes, but it is easy to make yourself a set.

Purchase enough children’s block puzzles to get 30 cubes. You could of course also use clean wooden cubes, but you would have to paint each one and on some woods a bleeding effect could occur.

The paper one finds adhered to the outside of a child’s block-puzzle cube is easier to paint on.

You will need some ‘patience’ and six contrasting colors of paint—for example, red, blue, yellow, green, orange, and purple). Being meticulous and working methodically you’ll end up with 30 different cubes. Here is my own self-painted set—I used black and white instead of orange and purple.



## MacMahon-Domino Game

Rules (for 2-5 players)

Each player gets the same number of cubes leaving a “stock” of 10-12 cubes. One player starts by placing one of his cubes in the middle.

Next player (going clockwise) places one of his cubes side to side with the same color touching.

Next player places one of his cubes side to side, same color touching, to form a “basis” of  $2 \times 2$  cubes.

Next cube to be placed must fill the last place on the first level.

Note: any sides that touch **MUST** have the same color.

In that way, level after level must be filled up. When a player cannot place a cube according to the rules he must take a cube from the “stock” pile.

First player who places his last cube wins.

AGPC



A long time ago I made a copy of this image. It was on the cover of one of those science-fiction pulp magazines...

What struck me, as you could imagine knowing my interest in abstract games, was the "Amazing" design of the game in the picture.

What game were they playing, and at what point in the game had they arrived?

Taking a good close look at the lady's face, the non-visible player is, I guess, making the final and winning move!

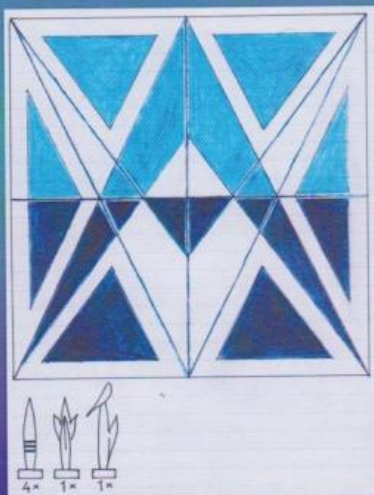
# AMAZING

by Fred Horn

From the picture above, I drew the board and the design of the game pieces making a fair guess of how many of each type a player would utilize.

Over the years I have tried to invent a playable game with these materials, but alas, up to this point the "flash of lightning" hasn't hit me.

Do you have any ideas?



Today, a quick search on the Internet makes it possible to find out additional information about this magazine and sheds some light on the inside story.

The cover is from 1957 and the story, told and published in the magazine, is titled "Deadly Decoy" written by Clyde Mitchell, a pseudonym for Randall Garrett and Robert Silverberg.

Note: more details can be found (about these writers) in the 2009 publication of the book: "A Little Intelligence" by Randall Garrett and Robert Silverberg

Introduction by Robert Silverberg.  
Cover painting by Carol Heyer;  
Design by Deborah Miller.  
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Publisher: Crippen & Landru.

Mysteries From Two  
Science Fiction Masters

Randall Garrett (1927-1987) and Robert Silverberg, two of the greatest writers of science fiction, were also accomplished mystery writers.

"A Little Intelligence" collects their best mystery short stories, all written in the 1950s, mostly under the joint pseudonym of Robert Randall. With many of them set in future, the stories explore the topics of morality, theology, and humanity within their mysteries.

I ordered the book, but to my disappointment the story "Deadly Decoy" has no relation at all to the picture on the cover of the magazine. Thus, I believe the story mentioned on the cover "Equation of Doom—This World Died Screaming" is the one to search for.

But until a copy of this issue of *AMAZING* can be found it will remain a mystery.

However, we do have the name of the artist who drew the cover illustration. His name was easy to find: Ed Valigursky.

But after all that, it's still a pity. We don't have any more information about the rules of the pictured game!

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