Extract

Investigation on the Coin Throwing Game

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1. Introduction

In the “Happy Rainbow Game” (Figure 1), players throw coins onto a game board. Prizes will be awarded according to where the coins land on. Instead of the “Happy Rainbow Game”, we consider the traditional coin throwing game (Figure 2), in which coins are to be thrown onto a game board with square tiles.

Figure 1 (“Happy Rainbow Game”)

Figure 2 (Coin Throwing Game)

To win the coin throwing game, coins have to land entirely inside the square tiles without touching the borders. Figure 3 and Figure 4 illustrate a winning situation and a losing situation respectively.

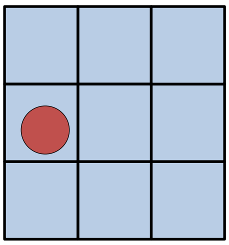

Figure 3 (A winning situation)

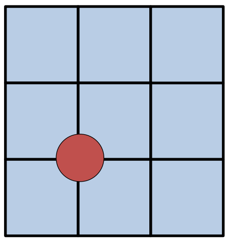

Figure 4 (A losing situation)

4. Conclusion and Discussions

Through this project, we calculated the probability of coins landing in tessellations of tiles of squares, rectangles, triangles, arbitrary triangles and hexagons. In turn, the table below shows our main findings.

Shape	Important Notes	The Formula of Winning Probability
Square	$x \geq 2$	$\frac{n^2(x-2)^2}{(nx-2)^2}$
Rectangle	$x, y \geq 2$	$\frac{n^2(x-2)(y-2)}{(nx-2)(ny-2)}$
Equilateral triangle	$x \geq 2\sqrt{3}$	$\frac{n^2(x-2\sqrt{3})^2}{(nx-2\sqrt{3})^2}$
Arbitrary triangle	$2A \geq a+b+c$	$\frac{n^2(2A-a-b-c)^2}{(2nA-a-b-c)^2}$
Regular hexagon	$x \geq \frac{2\sqrt{3}}{3}$	$\frac{\sqrt{3}n^2(3x-2\sqrt{3})^2}{\sqrt{3}n^2(3x-2\sqrt{3})^2+4(3n^2-4n+1)(3x-\sqrt{3})-8(n-1)\pi}$

n θ ^{2}

θ

θ