GEOMETRY

This year M. le Clerc de Buffon presented to the Academy some solutions of problems which looked into the game of franc-Carreau. One casts into the air in a chamber tiled by equal & supposed regular tiles, an Ecu, a Louis, & one demands the odds that the coin will fall only on a single tile, or *openly* (*franchement*). He has made very profound & very curious researches on different wagers, different probabilities, but they are all purely numeric, that is to say, that they consist only in some combination of numbers, and nothing very lofty comes out of an arithmetic. The question presented is of a new kind, to those which belong to Geometry, & to the figures which were not yet entered into this matter.

It jumps to the eyes that the more the coin will be smaller in ratio to one of the equal tiles, the more there is to wager that it will fall openly. Thus in this given tile that one supposes square, M. le Clerc inscribes another square always distant from the edges of the tile by the length of the semi-diameter of the ecu or of the Louis, & it is clear that the probability that the coin will fall openly will be to the contrary probability; as the area of the small inscribed square will be to that of the kind of interior margin or of *couronne* that this little square forms in the tile, because the coin will be in the case of not falling openly only when it will fall in a way that its center be on the area of this couronne, since then, seeing the known size of its semi-diameter, it will necessarily go beyond the tile.

It follows from here that in order to play an equal game, that which is always in these matters the goal of the problems as equilibrium in Mechanics, it is necessary that the area of the inscribed square, & that of the couronne of the tile, be equal, & when this is, the semi-diameter of the coin is incommensurable to the side of the tile, & a little more than its 6th part. If it were precisely only this 6th part, the game would begin already to have some slight inequality.

Let the center of a round coin be applied on some point of the tile, it is determined in the moment if it falls openly or not. But this would not be the same thing for a square coin, its center being always set on the same point of the area of the square, if it is only at a certain distance from the sides, it may either fall or not fall openly. It will be the 1st if the sides of the square coin are parallel to those of the tile, & the 2nd if they are not, then it will go beyond the tile by some one of its 4 points. The round coin has always, by virtue of its figure, the same position with respect to the sides of the tile, but not the square coin, & the probability of not falling openly is much greater for this square coin than for the round, all the rest being equal besides.

In order to not enter into a rather subtle geometry, where this subject has led M. le Clerc, who did not ask more than to be led from there, we will content ourselves to give through one of the problems that he has solved, an idea of the different positions which may be made here where a coin falls which one throws.

On a plane which is formed only of equal & parallel boards, one casts a Stick of a certain length, & let one suppose without width. When will it fall openly on a single board?

It will be first when it falls in a position parallel to the length or side of the board on which it falls, but it will be yet in many other positions. Let one imagine the point at the center of the stick to be a certain distance from the side of the board, & let on this point as center let there be described a quarter circle through its extremity the least distant from that side, it will describe a part of this arc inside of the board, & the other part outside, & as much as it will have positions inside, as well will it have open falls, & to the contrary. Consequently the number of open falls will be to the one of the others as the sum of its *interior* positions to the sum of the *exterior*, or, that which is the same thing, as the two portions of the area of the quarter circle, of which the one is inside, the other outside of the board.

It is clear that in the resolution of the total problem there must enter the consideration of the ratio of the length of the stick to the width of the board. If these two magnitudes were equal, the stick would fall openly in all its possible positions only when its point of center would fall on the point of the center of the width of the board. If this width is greater, it has a greater number of points on which the center of the stick can fall openly, & to the contrary. There is therefore a certain width to the board which would render the wager or the game equal, & this is that which M. le Clerc has determined through the area of the Cycloid with much elegance to the judgment of the Academy.