The theory of probability becomes of enhanced value to gamblers when it is used with the law of large numbers. The law of large numbers states that:

“If the probability of a given outcome to an event is P and the event is repeated N times, then the larger N becomes, so the likelihood increases that the closer, in proportion, will be the occurrence of the given outcome to N*P.”

For example:-

If the probability of throwing a double-6 with two dice is 1/36, then the more times we throw the dice, the closer, in proportion, will be the number of double-6s thrown to of the total number of throws. This is, of course, what in everyday language is known as the law of averages. The overlooking of the vital words 'in proportion' in the above definition leads to much misunderstanding among gamblers. The 'gambler's fallacy' lies in the idea that “In the long run” chances will even out. Thus if a coin has been spun 100 times, and has landed 60 times head uppermost and 40 times tails, many gamblers will state that tails are now due for a run to get even. There are fancy names for this belief. The theory is called the maturity of chances, and the expected run of tails is known as a 'corrective', which will bring the total of tails eventually equal to the total of heads. The belief is that the 'law' of averages really is a law which states that in the longest of long runs the totals of both heads and tails will eventually become equal.

In fact, the opposite is really the case. As the number of tosses gets larger, the probability is that the percentage of heads or tails thrown gets nearer to 50%, but that the difference between the actual number of heads or tails thrown and the number representing 50% gets larger.

Let us return to our example of 60 heads and 40 tails in 100 spins, and imagine that the next 100 spins result in 56 heads and 44 tails. The 'corrective' has set in, as the percentage of heads has now dropped from 60 per cent to 58 per cent. But there are now 32 more heads than tails, where there were only 20 before. The 'law of averages' follower who backed tails is 12 more tosses to the bad. If the third hundred tosses result in 50 heads and 50 tails, the 'corrective' is still proceeding, as there are now 166 heads in 300 tosses, down to 55-33 per cent, but the tails backer is still 32 tosses behind.

Put another way, we would not be too surprised if after 100 tosses there were 60 per cent heads. We would be astonished if after a million tosses there were still 60 per cent heads, as we would expect the deviation from 50 per cent to be much smaller. Similarly, after 100 tosses, we are not too surprised that the difference between heads and tails is 20. After a million tosses we would be very surprised to find that the difference was not very much larger than 20.

A chance event is uninfluenced by the events which have gone before. If a true die has not shown 6 for 30 throws, the probability of a 6 is still 1/6 on the 31st throw. One wonders if this simple idea offends some human instinct, because it is not difficult to find gambling experts who will agree with all the above remarks, and will express them themselves in books and articles, only to advocate elsewhere the principle of 'stepping in when a corrective is due'.

It is interesting that despite significant statistical evidence and proof of all of the above people will go to extreme lengths to fulfill there belief in the fact that a corrective is due. The number 53 in an Italian lottery had failed to appear for some time and this lead to an obsession with the public to bet ever larger amounts on the number. People staked so much on this corrective that the failure of the number 53 to occur for two years was blamed for several deaths and bankruptcies. It seems that a large number of human minds are just simply unable to cope with the often seemingly contradictory laws of probability. If only they had listened to their maths teacher. The full story is publish here.

An understanding of the law of the large numbers leads to a realisation that what appear to be fantastic improbabilities are not remarkable at all but, merely to be expected.