ICTS-RRI Math Circle, Saturday 28 October, 2023
Alea Jacta Est

Supurna and Sam

October 26, 2023

This session, we will explore two themes which appear to be unrelated: one relates to the throw of dice and the other to engines.

2:30 pm

Alea Jacta Est: You may have noticed that Julius Caesar has appeared several times in the maths circle exploration

Figure 1: Alea Jacta Est

sheet. Here he is again! The quote in latin means "The die is cast". Caesar said this when he crossed the Rubicon, a river in northern Italy, in defiance of the Roman Senate. The rest is history.

You may have heard that "gambling is bad". But life is uncertain and full of gambles. What is bad is gambling on adverse odds, like at a Casino or a race track. The very fact that the casino and race track stay in business is evidence that the odds of *your* winning are small. Intelligent gambling balances risk and reward. The activities below will help you become a better gambler.

When you throw a fair die (the plural is dice), you find that the numbers 1 to 6 are equally likely. We start with a game of dice (like in the Mahabharata). Two dice are thrown and you have to bet on whether the dice will come up seven, under seven or over seven. If you guess correctly, you will be rewarded with cards. Whoever gets the most cards wins.

Then, each table will be given a pair of dice and you will throw them 25 times and plot the distribution: How many times each number from 1 to 12 appears. Try to understand this distribution. What is the mean (average) of the distribution? The variance (the spread)?

Then we will write down a polynomial on the blackboard to easier compute these quantities. The next problem is to devise a new set of dice, in which we put different numbers on the six sides to get the same distribution as regular dice.

(This may go to another math circle session)
3:45 pm
break for tea
    4:00 pm onwards:
You will be handed an engine and asked to figure out how it works! Good luck!