DTP-Math-Circle: Session 4—Probability, Inequalities and Quantum Mechanics

Oct 14 2022

1 The Gabbar probabilities

To appreciate this problem, please see the iconic scene from the Hindi film Sholay: https://www.youtube.com/watch?v=chi9hsfYcDE

Note the following sequence of events:

- Gabbar takes a revolver from one of his henchmen. It has 6 bullets. The way a revolver works is the following. There is a cylinder, which has 6 compartments where bullets are loaded. These compartments are arranged symmetrically, one in each 60-degree sector of the cylinder. After every bullet is fired, the cylinder rotates by 60 degrees, so that the next compartment is ready to be fired from.
- He then shoots 3 bullets in air. So bullets have been fired from three consecutive compartments, and the remaining 3 compartments are loaded.
- He spins the cylinder fast and randomly, so that no one knows where the loaded compartments are.
- He shoots at his henchmen (call them A, B, and Kalia) one by one, to see if they survive (the compartment is empty) or die (the compartment is loaded). These are the three shots that we shall always refer to in this problem.
- It turns out that all three henchmen survive.
- Gabbar kills them anyway by firing the next three shots from the loaded compartments. These shots will not be a part of our problem.

Now let us calculate the probabilities related to the following:

(a) Before Gabbar shoots at A, what is the probability that A would survive? that B would survive ? that Kalia would survive ?

(b) Gabbar shoots at A, but A survives. Now what is the probability that B would survive ? that Kalia would survive ? Should Kalia ask Gabbar to shoot him before B?

(c) Gabbar shoots at B, but B survives. Now what is the probability that Kalia would survive ?

(d) If Gabbar had rotated the revolver at random after shooting A and B, what would be the probabilities of survival of A, B, and Kalia ?