1.

Strictly speaking, test is any [statistical](https://en.wikipedia.org/wiki/Statistical) [hypothesis test](https://en.wikipedia.org/wiki/Hypothesis_test) in which the [sampling distribution](https://en.wikipedia.org/wiki/Sampling_distribution) of the test statistic is a [chi-square distribution](https://en.wikipedia.org/wiki/Chi-square_distribution) when the [null hypothesis](https://en.wikipedia.org/wiki/Null_hypothesis) is true. In most cases, test statistic arise from an assumption of independent normally distributed data, and a chi-squared test can then be used to reject the hypothesis that the data are independent.

4.

(1) Whether to keep rolling or stop depends on whether the expected gain of keep rolling is larger than zero. If next is 1, the gain is -35, otherwise we could safely reach 43 or above, corresponding to a gain of 8 or larger. Hence the expected gain of keep rolling is larger than -35/6 + 8 \* 5/ 6 >0. Therefore, it’s better to keep rolling.

(2) The 1st rolling could be 2, 3, 4, 5, 6. Then we consider the most likely value when we stop after the first rolling.

If the 1st rolling is 2, we continue with at least another two rollings, and the most probable outcome of two rollings’ sum is 7 ( = 1+6 = 2+5 = 3+4 = 4+3 = 5+2 = 6+1, 6 cases reach 7), giving a total stop value at 35+2+7 = 44.

if the 1st rolling is 3, we would stop if 2nd rolling is 6, with total value reaching 44. Otherwise, we continue with at least another two rolling, with the most probable outcome at 7 or 6. Hence, the most likely ending value is still 44.

if the 1st rolling is 4, we would stop if 2nd rolling is 5 or 6, with total value reaching 44 or 45. Otherwise, we continue with another two rollings, which gives the most probable value at 7 or 6 or 5. Hence the most likely ending value is 44 or 45. By the same token, any other case all have the most probable ending value at 44. Therefore the 44 is the most probable outcome.

9

Denote as the expected number of acrossed bridges starting from island .

Easy to obtain from island 1, we have:

On the other hand, we have:

By solving above two equations, we have