Biased Die

Assignment 7
CS251: Computer Laboratory

Jayant Agrawal
(14282)

INSTRUCTOR
Prof. Arnab Bhattacharya

Department of Comuter Science and Engineering
INDIAN INSTITUTE OF TECHNOLOGY KANPUR
KANPUR 208016, INDIA

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1 Introduction

A cubical dice has 6 faces, numbered 1,2,3,4,5,6. A fair dice on random throw can give any of the face with equal probability. Figure 1 shows the picture of a dice.

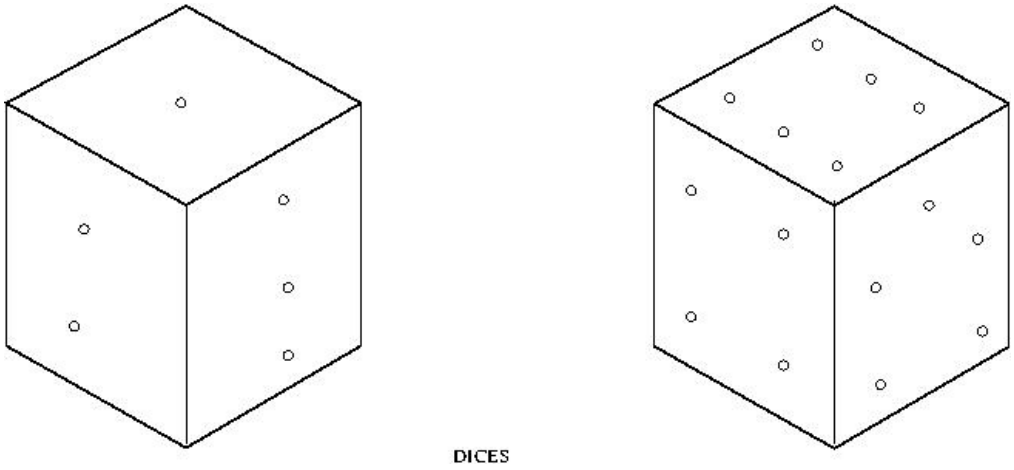

Figure 1: Dice: Different Orientation

2 Expectation

Expectation of a random variable is the long-run average value of repetitions of the experiment. Let X be any random variable. Let the sample space be U.

$$U = a_1, a_2, ..., a_n$$

Let P be the set of probabilities.

$$P = p_1, p_2, ..., p_n$$

Then expexted value of the random variable X is

$$E(X) = \sum_{i=1}^{n} X(a_i) \times p_i$$

For a dice U={1,2,3,4,5,6} and

$$\sum_{i=1}^{6} (P_i) = 1$$

3 The Experiment

(1 1)	(1 2)	(1 3)	(1 4)	(1 5)	(1 6)
(2 1)	(2 2)	(2 3)	(2 4)	(2 5)	(2 6)
(3 1)	(3 2)	(3 3)	(3 4)	(3 5)	(3 6)
(4 1)	(4 2)	(4 3)	(4 4)	(4 5)	(4 6)
(5 1)	(5 2)	(5 3)	(5 4)	(5 5)	(5 6)
(6 1)	(6 2)	(6 3)	(6 4)	(6 5)	(6 6)

Table 1: Sample space for throwing a pair of die

Possible outcome	1	2	3	4	5	6
Probabilties for die 1	1/6	1/6	1/6	1/6	1/6	1/6
Probabilities for die 2	17/120	17/120	17/120	17/120	13/60	13/60
Probabilities for die 3	7/60	7/60	7/60	7/60	4/15	4/15

Table 2: Probability distribution

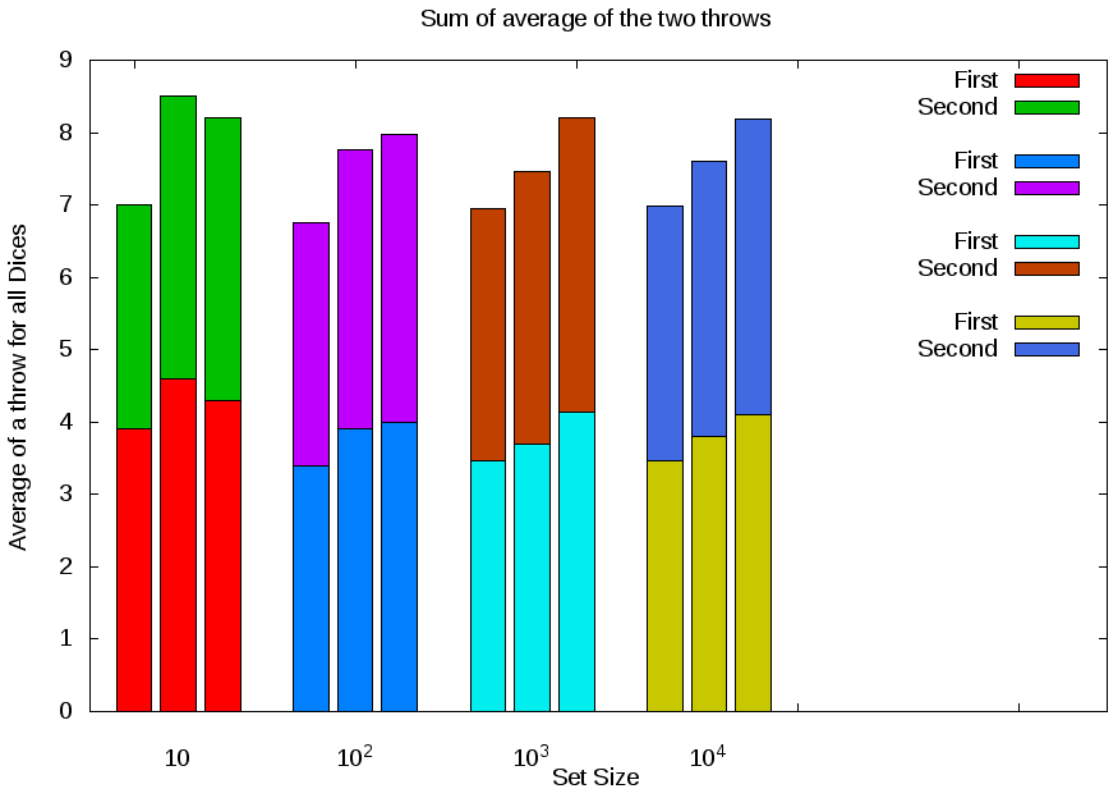

Figure 2: Histogram

4 Histogram

From Table 2, one can find the expected value of sums for die 1, die 2 and die 3.

- Expected value of sum for die1 = 7
- Expected value of sum for die2 = 7.6
- Expected value of sum for die3 = 8.2

For dice 1 every outcome is equally likely and hence expectation is the average of all possible outcomes. While for die 2 and 3 the probability of higher outcome(5,6) as output is higher and hence expectation for them is higher. In case of die 3 their is more baising so expectation for die 3 is more than that of die 2.

5 Conclusion

The expected value is greatest in die 3 followed by die 2 and least in die 1.

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