Indian Statistical Institute

BSDS Ist Year

Academic Year 2024 - 2025: Semester I

Course: Probability Theory I

Instructor: Antar Bandyopadhyay

Assignment # 5

Date Given: September 18, 2024 **Date Due: September 26, 2024**
Total Points: 10

2.2.4 Suppose that each of 300 patients has a probability of 1/3 of being helped by a treatment independent of its effect on the other patients. Find *approximately* the probability that more than 120 patients are helped by the treatment.

2.2.6 To estimate the percent of district voters who oppose a certain ballot measure, a survey organization takes a random sample of 200 voters from a district. If 45% of the voters in the district oppose the measure, estimate the chance that:

(a) exactly 90 voters in the sample oppose the measure;

(b) more than half the voters in the sample oppose the measure.

You may assume that all voters in the district are equally likely to be in the sample, independent of each other.

2.4.6 A box contains 1000 balls, of which 2 are black and the rest are white.

(a) Which of the following is most likely to occur in 1000 draws with replacement from the box?

fewer than 2 black balls, exactly 2 black balls, more than 2 black balls

(b) If two series of 1000 draws are made at random from this box, what, approximately, is the chance that they produce the same number of black balls?

2.4.10 Let N be a fixed "*large*" integer. Consider n independent trials, each of which is a success with probability $1/N$. Show that if $n \approx \frac{5}{3}N$, then the chance of *at least two successes* is approximately 1/2.