

Coverage for Exam 2

1. Mathematical Induction (Sections 5.1, some of 5.2)

Mathematical induction is a technique for proving statements of the form “ $P(n)$ is true for all positive integers n ”. Every proof by induction consists of two steps. Know what they are, and why these steps imply that you’ve proven the statement above. Practice proving by induction by solving exercises in your book.

2. Counting (Sections 6.1, 6.3, 6.5)

We are primarily interested in determining the size of some set S . Based on the description of S , we then have to decide which technique to use to compute $|S|$. For example, if an element of S can be constructed in stages, and different choices lead to different results, then the product method is most appropriate; if S is described by an “at least” statement, the complementation method is often the best approach, etc. Again, solve exercises in your book to develop the ability of figuring out which techniques match with which problems.

Finally, there were three other classes of counting problems that we considered: (1) counting the number of ways of distributing indistinguishable balls into distinct boxes, (2) counting the number of ways of distributing distinct balls into distinct boxes, and (3) counting the number of ways of arranging objects in a circle. We have a formula for each one. Aside from knowing these formulas, make sure that you know how to “map” seemingly different sounding problems into these classes.

3. Probability (Sections 7.1, 7.2, 7.4)

We considered the different ways of computing the probability of an event. The simplest is when the outcomes are all equally likely; but remember that this assumption does not always hold true so know what you should do otherwise. You also learned about conditional probability and independent events. In each case, make sure that you know the formulas *and* when they should be used.

Random variables are functions that assign outcomes to real numbers. They provide an alternate way of describing events. Know how to compute the expectation and variance of a random variable. Remember that for some problems, your job is to define a random variable as well.