

Tutorial 5

- 1) Suppose that a particular trait (such as eye color or left-handedness) of a person is classified on the basis of one pair of genes, and suppose also that d represents a dominant gene and r a recessive gene. Thus, a person with dd genes is purely dominant, one with rr is purely recessive, and one with rd is hybrid. The purely dominant and the hybrid individuals are alike in appearance. Children receive 1 gene from each parent. If, with respect to a particular trait, 2 hybrid parents have a total of 4 children, what is the probability that 3 of the 4 children have the outward appearance of the dominant gene?
- 2) A communication system consists of n components, each of which will, independently, function with probability p . The total system will be able to operate effectively if at least one-half of its components function.
 - a) For what values of p is a 5-component system more likely to operate effectively than a 3-component system?
 - b) In general, when is a $(2k + 1)$ -component system better than a $(2k - 1)$ -component system?
- 3) Consider an experiment that consists of counting the number of α particles given off in a 1-second interval by 1 gram of radioactive material. If we know from past experience that, on the average, 3.2 such α particles are given off, what is a good approximation to the probability that no more than 2 α particles will appear?
- 4) If independent trials, each resulting in a success with probability p , are performed, what is the probability of r successes occurring before m failures?
- 5) Compute the expected value and the variance of a negative binomial random variable with parameters r and p .