1. (8 pts) Suppose that 15% of all children are left-handed. In a class of 18 children, what is the probability that at least three are left-handed?

2. (8 pts) A professor in a statistics course constructs a final exam by selecting six questions at random from a list of eleven questions handed out in advance to the students. Suppose that a particular student has time to prepare answers to the first seven of the eleven questions. What is the probability that the student will be prepared for at least four of the six questions on the exam?

3. (8 pts) The number of raisins in a small cookie from a certain bakery has a Poisson distribution with $\lambda = 2.4$. Suppose we take (select independently) two of these cookies. What is the probability that each will contain at least one raisin?

4. (8 pts) The number of radioactive emissions (which are detected by a Geiger counter) from a sample of ore is (on the average) 24 per minute. Find the probability that during a 15-second span, there will be fewer than 5 emissions.

5. (8 pts) Suppose that 15% of all children are left-handed. Suppose a certain school has 10 classes of 16 children (each). If you check the classes one by one, what is the probability that the first left-handed child will be found in the fifth class?

6. A random variable has the density function

$$f(x) = \begin{cases} 1 \frac{1}{x^2} & \text{if } \frac{1}{2} < x < 1 \\ 0 & \text{otherwise} \end{cases}$$

a) (4 pts) Verify that this is density function.

b) (8 pts) Find the mean and the variance for the distribution

7. Let $x$ have a normal distribution with mean 35 and standard deviation 3.5. Find

a) (6 pts) $P(32 < x < 36)$

b) (6 pts) the value $t$ which is such that 5% of observations are larger than $t$.

8. (8 pts) The time for curing a latex sealant can be treated as a random variable having a normal distribution with mean $\mu = 42$ minutes. Find its standard deviation, if the probability that the curing time will take longer than 50 minutes is 0.07.

9. (8 pts) A large construction firm has won 60% of the jobs for which it has bid. Suppose that this firm bids on 48 jobs over the next year. Approximate the probability that it will win at least 40 of these jobs.

10. (8 pts) In a certain city, the daily usage of water (in million of gallons) can be treated as a random variable having an exponential distribution with $\beta = 3.2$. If the daily available water supply is limited to a maximum capacity of 13 million gallons, what is the probability that on any given day that the water supply will be inadequate?

11. A company manufacturers glass beakers whose fill capacity can be treated a random variable having a normal distribution with mean $\mu = 0.5$ liters and variance $\sigma^2 = 0.016$.

a) (6 pts) If a random sample of size 28 is drawn, what is the probability that the sample mean will exceed 0.52?

b) (6 pts) How large a random sample must be drawn so that the probability that its mean will exceed 0.52 will be less than 0.05?