

Answer the problems on **separate** paper. You do not need to rewrite the problem statements on your answer sheets. Do your own work. **Show all relevant steps** which lead to your solutions. Attach this question sheet to the front of your answer sheets.

1. During one stage of a manufacturing process, a bake-lite coating has to be applied in a kiln to a ball-socket assembly. Historically, the fusing process has an 85 percent success rate for bonding the bake-lite onto the socket. If an inspector randomly selects 16 ball-socket assemblies, what is the probability that the fusing process for the socket will have been successful for at least 13 of the assemblies?
2. Two boxes, one containing 14 bottles of sodium chloride salt and the other containing 8 bottles of potassium chloride salt, were mixed up together. A new clerk is asked to assemble an order for 6 bottles of salt and randomly selects bottles from the mixed lot. What is the probability that the order will include at most 2 bottles of potassium chloride?
3. The number of weekly brown-outs during peak summer usage is a Poisson process with an average of 3 brown-outs per week. What is the probability that during a two-week period of the peak summer usage there will be at most 4 brown-outs?
4. The time to complete a junior-level statistics exam is random variable which is approximately normally distributed with mean $m = 80$ minutes and variance $s^2 = 90$.
 - a. What is the probability that a (randomly selected) student taking the exam will finish in less than 70 minutes?
 - b. What is the probability that a (randomly selected) student taking the exam will require more than 100 minutes to finish?
5. According to the DMI, during the teenage years (15-19) 68% of teenager drivers will be involved in one or more serious car accidents. If 125 drivers (age 20) are selected randomly, what is the probability that at most 70 of them were involved in one or more serious cars accidents during their teenage years?
6. Steel balls are manufactured by Gehring Steel for use in bearings. The bearing specs require that the ball diameters have a mean of 0.3500 cm and a standard deviation of 0.0025 cm. If a batch of balls for the bearings is produced which meets the specs, what is the probability that a randomly selected sample of 40 balls from the batch will have a mean diameter between 0.3495 and 0.3508?
7. Inspecting ceramic tiles prior to their shipment, a quality-control engineer exams 6 cartons (chosen at random), each of which contains 150 tiles. The following table reports the number of defectives in each of the chosen cartons.

Carton Number	1	2	3	4	5	6
Number of Defectives	2	3	6	0	4	7

Assuming that the data can be treated as a random sample from a population which is approximately normal, what is the maximum error (at the 98% confidence level) between the sample mean for the number of defective tiles per carton and the true population mean for the number of defective tiles per carton?

8. Measurements of the acidity (pH) of rain samples were recorded at 13 sites in an industrial region:

3.5, 5.1, 5.0, 3.6, 4.8, 3.6, 4.7, 4.3, 4.2, 4.5, 4.9, 4.7, 4.8

 (Sum of values = 57.7; sum of squares of values = 259.83). Determine a 95% confidence interval for the mean acidity of rain in that region.
9. Historically, there has been a probability of 18% that a randomly selected coyote from the Big Bend National Park has rabies. If six coyotes are randomly selected from the Big Bend National Park, what is the probability that at most one of them will have rabies?
10. A distributor sells a chlorine-water mixture in liter bottles. Suppose the percentage of chlorine in a chlorine-water mixture is normally distributed with a mean of 19%. If the probability of selecting a mixture with 19.65% or more chlorine is 0.12, what is the standard deviation for the distribution?