Lecture 25

Example: Suppose that you order 500 apples and you know from previous orders that the mean weight of an apple is 0.2 kg with std dev 0.1 kg. What is the probability that the total weight of the 500 apples is less than 98 kg?

Problem: A restaurant serves three dinners costing \$12, \$15 and \$20. For a randomly selected couple, let X be the cost of the man's dinner and let Y be the cost of the woman's dinner. The joint pmf of X and Y is given as shown.

$p(x,y)$		y = 12	15	20
	12	.05	.05	.10
x	15	.05	.10	.35
	20	.00	.20	.10

(a) Suppose that when a couple opens a fortune cookie, they find the message "You receive a refund equal to the difference between the cost of your most expensive and least expensive meal". How much does the restaurant expect to refund?

Problem: I have three errands where X_i is the time required for the i-th errand, $i = 1, 2, 3$ and X_4 is the total walking time between errands. Suppose that the X's are independent normal rvs with means $\mu_1 = 15$, $\mu_2 = 5$, $\mu_3 = 8$, $\mu_4 = 12$, and standard deviations $\sigma_1 = 4$, $\sigma_2 = 1$, $\sigma_3 = 2$, $\sigma_4 = 3$. I plan to leave my office at 10 am and post a note on the door reading "I will return by t am."

(a) What time t ensures that the probability of arriving later than t is 0.01?

Problem: The mean tensile strength of type-A steel is 105 ksi with standard deviation 8 ksi. For type-B steel, the mean tensile strength is 100 ksi and standard deviation 6 ksi. Let $\bar{X}$ be the sample average of 40 type-A specimens and let $\bar{Y}$ be the sample average of 35 type-B specimens.

(a) What are the approx distbns of $\bar{X}$ and $\bar{Y}$?

(b) What is the approx distbn of $\bar{X} - \bar{Y}$?

(c) Calculate approximately $\mathrm{P}(-1 \leq \bar{X} - \bar{Y} \leq 1)$.

Problem: Let $X_1, \ldots, X_n$ be rvs corresponding to n independent bids for an item on sale. Suppose each X_i is uniformly distributed on $[100, 200]$.

(a) If the seller sells to the highest bidder, what is the expected sale price?

Problem: The mean weight of luggage for an economy passenger is 40 lb with std dev 10 lb. The mean weight of luggage for a business class passenger is 30 lb with std dev 6 lb. Suppose that there are 12 business class and 50 economy passengers on a given flight.

(a) What is the expected total luggage weight and standard deviation?

(b) What is the prob that the total luggage weight is at most 2500 lb if luggage weights are independent and normally distributed?

Problem: If the amount of soft drink I consume is independent of consumption on other days and is normally distributed with $\mu = 13$ oz and $\sigma = 2$ oz, and I currently have two six-packs of 16-oz bottles, what is the probability that I will have some soft drink remaining after two weeks?

Problem: In an area with sandy soil, 50 small trees of a certain type are planted, and another 50 trees are planted in an area with clay soil. Let X be the number of surviving trees after one year planted in the sandy soil and let Y be the number of surviving trees after one year planted in the clay soil. Suppose the one-year survival probability of a tree planted in sandy soil is 0.7 and the one-year survival probability of a tree planted in clay soil is 0.6.

(a) Approximate $\mathrm{P}(-5 \leq X - Y \leq 5)$**.**

Problem: Suppose calorie intake at breakfast is a rv with mean 500 and std dev 50, calorie intake at lunch is a rv with mean 900 and std dev 100, and calorie intake at dinner is a rv with mean 2000 and std dev 180. Assuming that intakes at the three meals are independent, what is the probability that the average daily intake over the next year is at most 3500?