

22s:039 Probability and Statistics for Engineers
Exam 2A
Fall 2007

Thursday, November 1, 5:30 - 7pm

100 possible points

Student Name _____

Section [letter/#] _____

Section [day/time] _____

TA's name _____

Instructions:

- 1) Make sure you have the correct number of pages. There are 7 pages and 14 questions. Each question is worth 5, 7, or 10 points (+1 point for your section number).
- 2) Please use a pencil.
- 3) Questions can be clarified, but no hints will be provided.
- 4) You have 1.5 hours to complete the exam.
- 5) Show your student ID to your TA when handing the exam in.
- 6) Please hand-in your formula sheet with your exam.
- 7) If not stated, round answers to four significant digits.
- 8) You may begin, good luck.

Questions 1-5.

Suppose random variables X and Y have the joint probability distribution below:

		X		
		0	3	7
Y	0	0.05	0.05	0.10
	1	0.15	0.25	0.40

1. Find $f_X(x)$ and state clearly below. [7 pts]

2. Find $E(X)$. [7 pts]

3. Find the conditional distribution of Y given $X=7$ and state clearly below. [7 pts]

4. Find $E(Y|X=7)$. [7 pts]

5. Determine $\text{Cov}(X, Y)$. [7 pts]

Question 6.

6. In Iowa, many farms have their own silos for holding corn (or maize). At a specific farm with one silo, the capacity for the silo is 12,000 bushels of corn. During harvest, each wagon is filled and the corn from the wagon is placed in the silo.

The amount of corn in each wagon is normally distributed with a mean of 300 bushels and a standard deviation of 30 bushels (the variability is due to machine operator). Wagons are independent of each other.

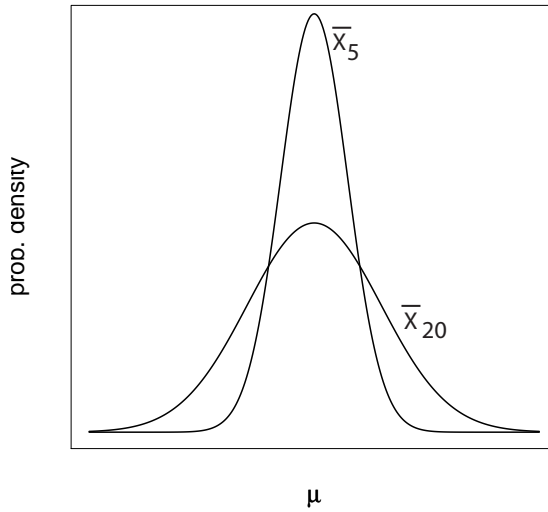
What is the probability that if 39 wagons of corn are emptied into the silo, that the silo will be at or over capacity? [10 pts]

Question 7.

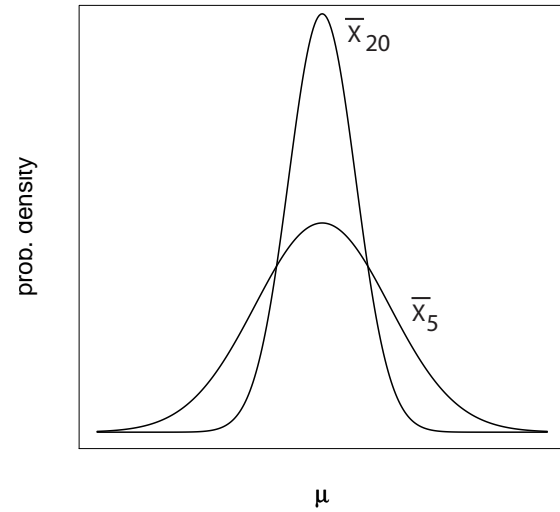
7. Let \bar{X}_n be an estimator for the population mean μ in a population distributed as $N(\mu, \sigma^2)$. So, \bar{X}_5 is a sample mean from a simple random sample of size $n = 5$.

Circle the letter of the graphic below that coincides with the appropriate distributions for \bar{X}_5 and \bar{X}_{20} . [5 pts]

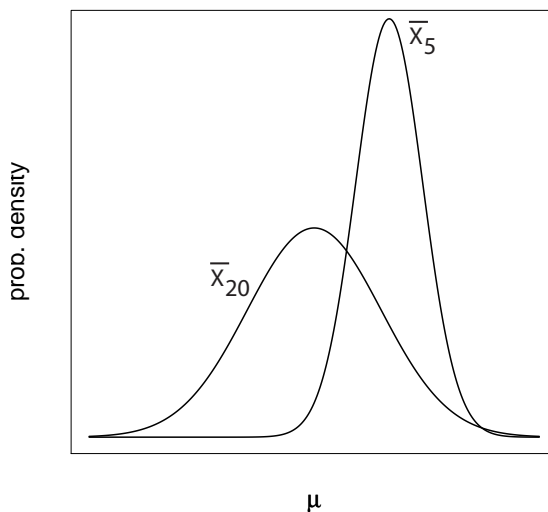
A)



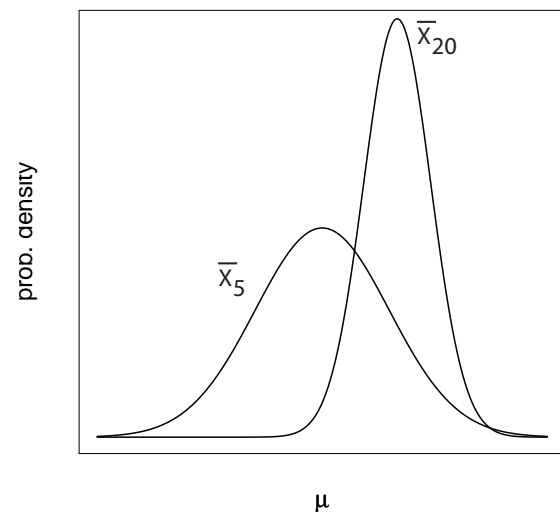
B)



C)



D)



Question 12.

12. A random sample of size 30 is taken from a population with a mean of 150 and a variance of 95. What is the approximate 90th percentile of the sampling distribution of \bar{X} ?
[7 pts]

Question 13.

13. Consider the bivariate normal distribution with the following parameters:
 $\mu_X = 6, \sigma_X = 1, \mu_Y = 10, \sigma_Y = 2$ and $\rho = 0.6$

What is the mean of the conditional distribution of Y given $X = 8$? [7 pts]

Questions 14.

14. The mean weight of women in a certain population is 132 pounds. The mean weight of men is 168 pounds. Weight in both groups has a standard deviation of 15 pounds.

If a random sample of 30 men and 30 women is taken, what is the probability that the sample mean weight for men minus the sample mean weight for women is greater than 45 pounds? [7 pts]