

CSD3240/MAT340/SEM4108 Week 10

Tutorial

Question 1. A class of 120 students (independently) take an exam. Let S_{120} be the class average. If we assume prior to the exam that each student has an expected grade of 72 with a standard deviation of 12, use the Central Limit Theorem approximate the probability that S_{120} is within 4 points of 72. Leave your answer in terms of Φ .

Question 2. An experiment counting the number of mutants in a bacterial culture has the following distribution:

Number of Mutants	0	1	2	3	4
Probability	0.1	0.3	0.1	0.4	0.1

Suppose we run this experiment 40 times. Let X_{40} be the resulting total number of mutants from all 40 experiments.

1. Compute the mean number of mutants resulting from one experiment.
2. Compute the standard deviation in the number of mutants from one experiment.
3. Use the Central Limit Theorem to approximate the probability that X_{40} is between 81 and 87. Leave your answer in terms of Φ .

Question 3. Assume SAT scores are normally distributed with mean 1518 and standard deviation 325.

1. If one SAT score is randomly selected, find the probability that it is between 1440 and 1480.

2. If 16 SAT scores are randomly selected, find the probability that they have a mean between 1440 and 1480.
3. Why can the central limit theorem be used in part (2) even though the sample size does not exceed 30?

Question 4. The lengths of pregnancies are normally distributed with a mean of 268 days and a standard deviation of 15 days.

1. If one pregnant woman is randomly selected, find the probability that her length of pregnancy is less than 260 days.
2. If 25 pregnant women are put on a special diet just before they become pregnant, find the probability that their lengths of pregnancy have a mean that is less than 260 days (assuming that the diet has no effect).
3. If the 25 women do have a mean of less than 260 days, does it appear that the diet has an effect on the length of pregnancy, and should the medical supervisors be concerned?

Question 5. Assume that a test has a mean score of 75 and a standard deviation of 10. Assume the distribution of scores is approximately normal.

1. What is the probability that a person chosen at random will make 100 or above on the test?
2. What score should be used to identify the top 2.5
3. In a group of 100 people, how many would you expect to score below 60?
4. What is the probability that the mean of a group of 100 will score below 70?