

Homework Assignment Number Five Solutions

Problem 1.

Given a standard normal distribution, find the area under the curve which lies

- (a) to the left of $z = 1.43$
- (b) to the right of $z = -0.89$
- (c) between $z = -2.16$ and $z = -0.65$

Problem 2.

The daily amount of coffee, in liters, dispensed by a machine located in an airport lobby is a random variable X having a continuous uniform distribution with $A = 7$ and $B = 10$. Find the probability that on a given day the amount of coffee dispensed by this machine will be

- (a) at most 8.8 liters
- (b) more than 7.4 liters but less than 9.5 liters
- (c) at least 8.5 liters.

Problem 3.

In the November 1990 issue of Chemical Engineering Progress a study discussed the percent purity of oxygen from a certain supplier. Assume that the mean was 99.61 with a standard deviation of 0.08. Assume that the distribution of percent purity was approximately normal.

- (a) What percentage of the purity values would you expect to be between 99.5 and 99.7?
- (b) What purity value would you expect to exceed exactly 5% of the population?

Problem 4.

The average life of a certain type of small motor is 10 years with a standard deviation of two years. The manufacturer replaces all free all motors that fail while under guarantee. If he is willing to replace only 3% of the motors that fail, how long a guarantee should he offer? Assume that the lifetime of a motor follows the normal distribution.

Problem 5.

You flip a coin 100 times.

- (a) What is the probability that you obtain at least 40 heads? Use the binomial distribution.
- (b) What is the probability that you obtain at least 40 heads? Use the normal approximation to the binomial distribution.

Problem 6.

The life of a certain type of device has an advertised failure rate of 0.01 per hour. The failure rate is constant and the exponential distribution applies.

- (a) What is the mean time to failure?
- (b) What is the probability that 200 hours will pass before a failure is observed?
- (c) What is the probability that exactly 3 of 5 devices are functioning after 200 hours?

Problem 7.

Using the gamma distribution with $\alpha = 4$ and $\beta = 1/3$, find

- (a) $P(X < 1/2)$
- (b) C where $P(X < C) = 0.05$

Problem 8.

Using the Chi-Squared distribution with $v=10$, find

- (a) $P(\chi^2 < 4)$
- (b) C where $P(\chi^2 < C) = 0.05$

Problem 9.

Using the t-distribution with $v=10$, find

- (a) $P(t < -1)$
- (b) C where $P(t < C) = 0.05$

Problem 10.

Using the F-distribution with $v_1=8$ and $v_2 = 12$, find

- (a) $P(F < 1)$
- (b) C where $P(F < C) = 0.05$