

Math 425/525 - Homework 2

Due Monday 02/18

1. *Problem 4.2:* Can SS ever have a value less than zero? Why or why not?
2. *Problem 4.4:* What does it mean for a sample to have standard deviation of 0? Describe such a sample.
3. *Problem 4.8:* A population has a mean of $\mu = 30$ and a standard deviation of $\sigma = 5$. **a)** If 5 points were added each score, what would be the new mean $\hat{\mu}$ and standard deviation $\hat{\sigma}$? **b)** If each score were multiplied by 3, what would be $\hat{\mu}$ and $\hat{\sigma}$?
4. *Problem 4.19:* For the following *sample* of $n = 5$ scores, compute the SS , variance and standard deviation. $X = \{9, 6, 2, 2, 6\}$
5. Suppose we have the population $X = \{1, 1, 1, 2, 2, 4, 5, 5, 5, 6, 6, 6, 7, 9, 9\}$ with $N = 15$. **a)** Determine the variance of this population. **b)** Choose any 5 elements from this population to serve as a sample. List those elements, and determine the variance of that sample. **c)** Compare the two variances that you have calculated.
6. *Problem 5.4:* For a population with $\mu = 50$ and $\sigma = 8$, **a)** Find the Z -score for each of the X values: $\{54, 62, 52, 42, 48, 34\}$, **b)** Find the X value associated with each of the Z -scores: $\{1, .75, 1.5, -.5, -.25, -1.5\}$.
7. *Problem 5.14:* For a population with a standard deviation of $\sigma = 8$, a score of $X = 44$ corresponds to $z = -.5$. What is the population mean?
8. A jar contains 20 red marbles, of which 10 are large and 10 are small, and 30 blue marbles, of which 10 are large and 20 are small. If 1 marble is randomly selected from the jar, **a)** What is the probability of obtaining a blue marble? **b)** What is the probability of obtaining a large marble? **c)** What is the probability of obtaining a large blue marble? **d)** What is the probability of obtaining a red marble if you know that you drew a small marble?
9. *Problem 6.7:* Find each of the following probabilities for a normal distribution: **a)** $P(Z > .25)$, **b)** $P(Z > -.75)$, **c)** $P(Z < 1.2)$, **d)** $P(Z < -1.2)$, **e)** *BONUS:* Can you give me a nonzero value for $P(Z > 6)$ with at least two significant digits?
10. *Problem 6.14:* The distribution of IQ scores is normal with $\mu = 100$ and $\sigma = 15$. What proportion of the population has IQ scores **a)** Greater than 140? **b)** Between 120 and 140? **c)** Between 90 and 109?
11. *Problem 6.19:* A consumer survey indicates that the average household spends $\mu = \$185$ on groceries each week. The distribution of spending amounts is approximately normal with a standard deviation of $\sigma = \$25$. **a)** What proportion of the population spends more than \$200 per week on groceries? **b)** What is the probability of randomly selecting a family that spends less than \$150 per week on groceries? **c)** How much money do you need to spend on groceries each week to be in the top 20% of the distribution?
12. *Problem 6.24:* A roulette wheel has alternating red and black number slots (and also green, but we will ignore those for this problem). If a gambler always bets on black to win, what is the probability of winning at least 24 times out of 36 total spins?