Prince Sultan University

Department of Mathematical Sciences

STAT 101 – Final Examination

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Time allowed: 150 minutes Maximum points: 80 points

1. (10 points) A data set consists of 9 measurements. The following information is given.
$$\sum x_i = 143.2 \quad \text{and} \quad \sum x_i^2 = 2532.28$$
(a) Calculate the mean and the variance of the data.
(b) Within what limits would you expect at least 84% of the measurements to lie?
(c) Would it be unusal to find that one of the 9 measurmenrs equals 34? Explain?
(d) If the distribution is mound shaped, what is the 84^{th} percentile?

2. (5 point) A coin is tossed 10 times. Suppose that the coin is not fair, and that for each toss of the coin, the probability of getting a head is 0.6.
(a) Find the probability of obtaining more than 6 tails?
(b) What is the expected number of tails in the 10 tosses?

3. (5 points) The ETS Verbal Aptitude Test is designed so that the scores of high school seniors taking the test will have a normal distribution with average 500 and standard deviation 100. A college wants their students to be in the top 12.5% for verbal aptitude. What minimum qualifying score should they set?

4. (6 points) Two fair dice are tossed.
(a) What is the probability that the sum of the number of dots shown on the upper faces is equal to 8?
(b) What is the probability that both dice show an odd number?

5. (8 points) Suppose that $P(A) = 0.4$, $P(B) = 0.3$, and $P(A \cup B) = 0.6$.
(a) Find $P(A|B)$
(b) Are *A* and *B* independent? Why?
(c) Are *A* and *B* mutually exclusive? Why?

6. (4 points) A worker-operated machine produces a defective item with probability 0.02 if the worker folloes the machine's operating instructions exactly, and with probability 0.05 if he does not. If the worker follows the instructions 85% of the time, what proportion of all items produced by the machine will be defective?

7. (6 points) Let *x* be a binomial random variable with $n = 36$ and $p = 0.54$. Use the normal approximation to find:
(a) $P(15 \le x \le 20)$
(b) $P(x > 30)$.

8. (8 points) Given the following data set: 32, 35, 30, 18, 29, 38, 31, 28, 40, 27, 30.
   (a) Find the interquartile range.
   (b) What is the 50^{th} percentile?
   (c) Use the range approximation to estimate the value of *s* for this set.

9. (8 points) Let *x* represent the number of times a customer visits a grocery store in a 1-week period. Assume this is the probability distribution of *x*:

x	0	1	2	3
$p(x)$	0.1	0.4	0.4	0.1

   (a) Construct a probability histogram for $p(x)$.
   (b) Calculate the average and the standard deviation of *x*.
   (c) What proportion of all the measurements would fall into the interval $\mu \pm 2\sigma$

10. (6 points) In an entrance examination usually 46% of the students fail. In a particular year, a random sample of n = 100 students is selected. Find the probability that the sample proportion $\hat{p}$ of failures lies within the interval (0.35, 0.55).

11. (8 points) In a big family, there are 12 children of whom 3 are girls. A sample of 4 children is randomly selected from this family. Let *x* denote the number of girls in the sample.
   (a) Find the hypergeometric probability distribution for *x*.
   (b) Calculate the mean and the variance for *x*.

12. (6 points) The average score of all pro golfers for a particular course has a mean of 70 and a standard deviation of 3. Suppose 36 golfers played the course today. Find the probability that the average score of the 36 golfers exceeded 71.

Best Wishes