Math 373 Practice Exam 1 Score _____/50

Write your answers in the space provided, scratch paper isn't graded. Round numeric answers to 2 decimal places.

1(__/2). DEFINITION. For bivariate data with random variables x and y with means x and y and std. devs. s_x and s_y, the *correlation coefficient* is $r =$

2(__/2). CHEBYSHEV'S THEOREM. State the theorem:

3(__/6). Experiment units: 1.1, 1.5, 3.0, 3.0, 3.9, 5.5, 6.3. Warning, these are the units, not the population, not the measurements. For each unit, we measure the nearest integer, i.e., round to the nearest integer. Thus 5.5 rounds to 6.
(a) List the population of this experiment:
(b) Is the variable of this experiment discrete quantitative, continuous quantitative, or qualitative?
(c)(3) For this variable list the median, mean and mode. If any of these does not exist or doesn't make sense, write ※.
median
mean
mode
(d) Draw a pie chart for the data.

4(__/7). Population data: 0, 1, 2, 5, 5, 5, 8, 9, 10. This could be a population or a sample. Find the following parameters and statistics for the random variable x with the above measurements.
(a) mean =
(b) sample std. dev. s =
(c) population std. dev. σ =
(d) The upper quartile Q_3 =
(e) The interquartile range IQR =
(f) What proportion of the measurements are within 1 population std. dev. of the mean?
(g) The z-score (use sample std. dev.) of the largest item.

5(__/6). Population data, x first, y second coordinate: (-1, 0), (0, 0), (0, 1), (1, 0), (1, 0).
(a)(2) Find the correlation coefficient.
(b)(2) Find equation of the least-squares line.
(c) If $y = 3$, estimate what x is.
(d) Make a scatterplot.

6(__/4). A worker-operated machine occasionally produces defective items. If the worker follows the operating instructions, it produces defectives with probability .01; otherwise it produces defectives with probability .03. If the worker follows instructions 90% of the time, what proportion of the items produced will be defective?

7(__/6). A key ring has 3 keys, only one fits your lock. Suppose you select a key at random; if it doesn't work, you randomly select one of the remaining two until you get a key which does work. If the first key doesn't fit but the second does, you've made two tries.
(a) Draw a tree diagram for this experiment.
(b) What is the probability that three tries are needed?
(c) What is the expected number of tries?
(d)(3) What is the std. dev. for the number of tries?

8(__/4). A pair of dice is rolled. If the two numbers are the same, we get a "double". Now suppose a pair of dice is rolled 10 times. Find:
(a) The probability of getting a double on the first roll?
(b) The probability of getting exactly 5 doubles in 10 rolls?
(c) The expected number of doubles in 10 rolls?
(d) The std. dev. for the number of doubles in 10 rolls?

9(__/3). The number of people entering an emergency room per day is 9.
(a) What is the std. dev. of this number?
(b) What is the probability that exactly 2 enter?
(c) What is the probability that at most 2 enter?

10(__/6). A bowl has 5 blue balls and 3 red balls. Three balls are randomly selected from the bowl.
(a) What is the probability that exactly 2 balls are blue?
(b) What is the mean number x of blue balls drawn?
(c) Find the std. dev. of x.

11(__/4). Suppose $P(5 < x) = .3$ and $P(7 < x) = .02$. Find the mean and std. dev. of the normal random variable x.

Answers

1. $r = \frac{s_{xy}}{s_x s_y}$ where $s_{xy} = \Sigma(x_i - \bar{x})(y_i - \bar{y})/(n-1)$.
2. CHEBYSHEV'S THEOREM. At least $1 - 1/k^2$ measurements are within k std. dev. of the mean.
3. (a) 1, 2, 3, 3, 4, 6, 6.
   (b) discrete quantitative.
   (c) median = 3, mean = 3.57, mode ※.
4. (a) 5 (b) 3.54 (c) 3.33 (d) 8.5 (e) 7 (f) .56 (g) 1.41
5. (a) $r = -.13$ (b) $y = .21 - .07x$ (c) -39.86
6. .012.
7. (b) .33 (c) 2 (d) .82
8. (a) .17 (b) .01 (c) 1.67 (d) 1.18
9. (a) 3 (b) .005 (c) .006
10. (a) .54 (b) 1.88 (c) .71
11. $\mu = 4.32$ and $\sigma = 1.31$ (see Lecture 8)