

Math 221: Basic Statistics Exam #2A

Week #10

Name: _____

INSTRUCTIONS: You may use a calculator for this exam and a letter-sized study sheet with information written on a single side. You must show all of your work in order to receive full credit. Read each question carefully. Be certain that you have answered the question that was asked. Answers supplied as decimals must be accurate to *at least four decimal digits*.

| Problem | Points | Score |
|---------|--------|-------|
| 1 | 10 | |
| 2 | 10 | |
| 3 | 10 | |
| 4 | 10 | |
| 5 | 10 | |
| 6 | 10 | |
| 7 | 10 | |
| 8 | 10 | |
| 9 | 10 | |
| 10 | 10 | |
| Total | 100 | |

- (3) A sociologist surveyed the households in a small town. The random variable x represents the number of dependent children in the households.

Below is a probability table reflecting this random variable.

| x | 0 | 1 | 2 | 3 | 4 | Total |
|-----------|------|------|---|------|------|--------------|
| $P(x)$ | 0.08 | 0.30 | | 0.34 | 0.12 | |
| $xP(x)$ | | | | | | |
| $x^2P(x)$ | | | | | | |

- (a) Fill in the probability value that is missing in row #2.

- (b) Use row #3 to calculate the mean or expected value of x , $\mu = E(x)$.

- (c) Use row #4 and relevant formulas to calculate the variance of x and its standard deviation σ .

- (4) In a certain segment of the U.S. population, 37% have type O+ blood. 10 people from this group donate blood and each donor's type is recorded.
- (a) What is the probability that exactly 4 of them will have type O+ blood?

- (b) what is the probability that **at least one** of them will have type O+ blood?

(5) An athlete competing in a specific extreme sport has a 20% probability of sustaining a serious injury during a competition. Using a **geometric model**, find the probabilities that the competitor

(a) will sustain her first injury during her fourth competition?

(b) will not be injured during her first 3 competitions?

[EC] will not be injured during her first 5 competitions, **if** she already survived the first 3 competitions without a scratch?

- (6) The human resources department of a small company keeps track of the number of employees that call out sick each day. They find that, on average, 4.5 employees are sick each day. The head of human resources comes to you and asks you to calculate some probabilities. Use the Poisson distribution to determine the probability that
- (a) exactly 4 people will be sick tomorrow,

(b) **at least** two people will be sick tomorrow.

(7) A company manufactures engine parts. The diameters of the engine parts are normally distributed with a mean of 4 inches and a standard deviation of 0.03 inch.

(a) Estimate the probability that an engine part diameter is between 3.91 inches and 4.09 inches.

(b) Determine an interval, symmetric about the mean, in which about 68% of the engine part diameters will fall.

(8) Given the standard normal distribution Z , use the accompanying table to compute the following probabilities:

(a) $P(Z < 2.12)$

(b) $P(-1.32 < Z < 1.44)$

(c) $P(Z > -0.96)$

(9) The speed of cars on the NJ turnpike during a given hour is normally distributed with a mean μ of 61 mph and a standard deviation of 5 mph. If a car is randomly targeted by a patrol car, what is the probability that it is

(a) travelling less than 65 mph?

(b) travelling faster than 70 mph?

(10) A certain automobile tire model has a life expectancy of 40,000 miles and a standard deviation of 2500 miles.

(a) Find a z-score that represents the 97th percentile value.

(b) For this tire model, 97% **will not last** past what number of miles?

(c) For this tire model, 97% **will last** past what number of miles?