

Kerry Ojakian's MTH 23.5 Class

Due Date: Tuesday December 7

HW #3

General Instructions:

- Do **not** write answers and work on a printout of this homework. Put all answers and work on separate paper (no need to copy the question).
- Homework must be relatively neat.
- Homework exercises must be done in order (if you skip an exercise, still write down the number and leave some blank space).
- You must show all work.
- While you may work with other students or tutors, do not copy someone else's work or data, or have someone else do the work for you.

The Assignment

1. Let x be a random variable that represents the amount of sugar in the blood, detected by a doctor's test. Suppose that x is normally distributed with mean 85 and standard deviation 25.

Note: Use Excel only on part (b).

- (a) What is the probability that on a single test, the amount of sugar is less than 60? (do NOT use the Excel command)
 - (b) (*Use Excel*) Suppose that the doctor takes 10 tests and finds the average: \bar{x} .
 - i. Why is the distribution \bar{x} normal?
 - ii. What is the mean and standard deviation of \bar{x} ?
 - iii. What is the probability that \bar{x} is less than 60?
 - iv. Why is the last probability smaller than the probability from part (a), which also asks about 60?
2. (*Use Excel*) Suppose a sample of some lions in California is taken and their weights (in pounds) are: 68, 104, 128, 122, 60, 64. We can calculate that $\bar{x} = 91$ and the standard deviation is 30.7 (you do not need to calculate these values; just trust that they are correct).

Find a 80% confidence interval for the mean weight of lions in California.

3. Suppose μ represents the average height of men in The Bronx. Someone takes a random sample of 35 men from The Bronx and finds that the mean height of these 35 men is 68 inches, and the standard deviation for these 35 men is 5 inches.
- (a) Find a 70% confidence interval for μ .
 - (b) **Without** a calculation answer this question: Suppose you stuck with the sample of 35 men, but wanted a 95% confidence interval. Would the 95% confidence interval be larger or smaller than the interval from part (a)? Justify your answer (briefly, without a calculation).

4. Suppose we have the following data set:

$$X : x_1 = 2, \quad x_2 = -3, \quad x_3 = 2, \quad x_4 = 0, \quad x_5 = 4, \quad x_6 = -1$$

Evaluate the following:

- (a) $\sum x$
 - (b) $(\sum x) / 6$
 - (c) What is the mean of the data?
 - (d) What is the median of the data?
 - (e) What is the mode of the data?
 - (f) What is the range of the data?
 - (g) What is the sample standard deviation of the data? (Use Excel)
5. (a) Compute a 75% Chebyshev interval for some data that has mean 40 and standard deviation 5.
- (b) For the Chebyshev interval you just computed, if you were told that it was a normal distribution, then how much data would be in the interval?
6. Suppose three 6-sided dice are rolled (each die is numbered 1 to 6). Use the fact the three rolls are independent!
- (a) What is the probability that the three rolls in order are: 3, 1, 1.
 - (b) What is the probability that among the three dice you only get 5s and 6s?

7. Given $P(A) = 0.3$ and $P(B) = 0.4$ and $P(A \text{ and } B) = 0.2$, calculate the following:

- (a) $P(A|B)$
- (b) $P(B|A)$
- (c) $P(A \text{ or } B)$

8. In the USA, four year colleges have a graduation rate of about 60%, and two year colleges (like Bronx Community!) have a graduation rate of about 30% (yes, I believe these percentages are correct!).

As a social note: these numbers are not great! (I hope you can do all you can, and we can help you do all you can, to be in that 30%!).

- (a) Suppose there are 16 two year college students in a class. What is the probability that 5 or fewer graduate? (Use the Excel command)
- (b) Suppose there are 16 two year college students in a class. What is the probability that at least half of them graduate? (Use the Excel command)
- (c) Suppose there are 10 students in a class at a four year college. What is the probability that they all graduate? **Do this problem using the formula, without the Excel command.**
- (d) Use Excel to experiment and answer this question: Consider different numbers of two year college students (call this number n). What is the largest that you can choose n so that the probability that all of them graduate is greater than the chance that 10 four year college students graduate?
- (e) What are you going to do to make sure you're in the 30% ?!

9. Open Stax Textbook, page 427, exercises: 3, 4, 5

(Note: The needed numbers are given on page 426)

10. Open Stax Textbook, page 477, exercises: 6 to 12

(Note: Good question! Some will make you think ...)