

**STAT 201: Elementary Statistics Session 13 & 14, Spring 2015**

**Practice Set for Exam III**

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1. (20 points) The top free throw shooters in NBA usually have about 90% chance of making any given free throw. Suppose one player, say Kevin Durant, shot 10 free throws in a game. Answer the following questions.

- Let  $X$  be the number of shots that Kevin made. What assumption should be checked before claiming that  $X$  has a binomial distribution?
- Suppose  $X$  has a binomial distribution. Clarify  $n$  and  $p$ .
- Find the probability that he made at least 9 free throws.

2. (15 points) State and prove the empirical rule with the help of Z-score table.

3. (15 points) The wingspan of recently cloned monarch butterflies follows a normal distribution with mean 9 inches and standard deviation 0.75 inches. Answer the following questions.

- What is the proportion of butterflies has a wingspan less than 8 inches?
- What is the proportion of butterflies has a wingspan wider than 10 inches?
- What is the proportion of butterflies has a wingspan between 9 and 11 inches?

4. (20 points) Construct the sampling distribution of the sample proportion of heads obtained in the experiment of flipping a coin three times. Note this is not a fair coin. The probability of observing a head is 0.7.

5. (15 points) In the 2008 General Social Survey, respondents were asked if they favored or opposed the death penalty for people convicted of murder. The results are given below:

Sample	X	N	Sample p	95% CI
1	1263	1902	0.664038	(0.642811, 0.685265)

Here  $X$  refers to the number of participants who say yes, and 95% CI is the 95% confidence interval. Answer the following questions.

- Show how the **sample p** is obtained
- Calculate the standard error of sample p and show how the **95 % CI** is obtained.
- Interpret the 95% confidence interval.

6. (15 points) Answer the following questions.

- Suppose  $X \sim N(\mu, \sigma^2)$ , which is a normal distribution with mean  $\mu$  and variance  $\sigma^2$ , what is the sampling distribution of  $\bar{X}$ ?
- Suppose we have two populations, one follows Binomial( $n, p = 0.5$ ) and the other follows Binomial( $n, p = 0.9$ ). Which one converges faster to normal? *Hint: first figure out what "faster" means in the context of this problem.*
- State, in plain English, the Central Limit Theorem.