

**STAT40720 Intro. to Data Analytics**

**Assignment 2**



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**Question 1**

Statement **(a)** is more probable. The standard deviation of the sample distribution of x̅ (called the standard error, ) is inversely proportional to the square root of the sample size. This means a smaller sample size will produce a larger standard error, i.e. a wider sample distribution, increasing the probability a particular random sample will have a sample mean x̅ lying away from the population mean.

**Question 2**

**(a) Find P(3 yrs. < x < 4 yrs.)**

The NCST tables for the Normal Distribution shows values only for the positive side of the mean. The Normal Distribution is symmetric about the mean, yielding:

Now, converting the above values for x into normalised z values.

This yields a normalised representation of the probability interval equivalent to:

**(b) P(3 successes) given B(4, 0.6247)**

**(c) P(3 yrs. < x̅ < 4 yrs.)**

The standard error, of the sample distribution of x̅ is given by:

Using the equivalences calculated in (a) above, the new normalised z values are:

Now, the probablility the sample mean lies in the interval 3 years to 4 years is given by:

**Question 3**

**(a) Find the 95% CI**

Since the sample size is large (N>30), and in lieu of the true population standard deviation, the sample standard deviation can be used to construct the 95% Confidence Interval of the population mean, given the sample mean.

Using the NCST tables, the z-critical value is:

Now, the 95% Confidence Interval for the population mean of concurrent gym users is given by:

**(b) Comment on 90% CI**

Given the z-critical value for the 90% Confidence Interval is lower than of the 95% CI, this would yield a narrower range.

However, this question can be answered more intuitively by realising that estimating the location of the population mean to a lower confidence level, allows you to place the outer bounds closer to the sample mean.