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| Group # |  |  |  |  |
| Names |  |  |  |  |
| Seat Numbers |  |  |  |  |

Lab 7B: ACT Scores

Your document name must have the following format: **Lab\_7B\_Group#.docx**

Your accompanying R file name must have this format: **Lab\_7B\_Code\_Group#.R**

Your R code should have comments to help readers understand your code. You should properly label each section of your code with the problem and subsection (e.g., 2c).

1) Suppose the ACT scores at High School A are normally distributed with a mean of 27 and standard deviation of 3.

1. Use R to generate 10,000 simple random samples of size 2 from the proposed distribution above. Plot a histogram of the resulting sample mean. Superimpose a plot of a normal density curve that approximates the sampling distribution of the sample means of two randomly selected ACT test scores from High School A.
2. Repeat a) with samples of size 25. Make sure the histogram has the same horizontal scale as that of the histogram in a) for easier comparison.
3. Explain why we can use the normal distribution to approximate the histograms in a) and b) even though the samples are less than 30.
4. What is the probability that the mean ACT score of 3 randomly selected students at High School A is greater than 29? What is the probability that the mean ACT score of 25 randomly selected students at High School A is greater than 29? Explain why one of the two probabilities is greater than the other?

2) Suppose the ACT scores at GCGS follow the probability distribution:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ACT Score | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 |
| Probability | 0.01 | 0.02 | 0.03 | 0.04 | 0.05 | 0.05 | 0.05 | 0.05 | 0.06 | 0.07 | 0.08 | 0.09 | 0.4 |

1. Use R to generate 10,000 simple random samples of size 4 from the proposed distribution above. Plot a histogram that approximates the sampling distribution of the sample means of 4 randomly selected ACT scores at GCGS. Explain why we cannot use the normal distribution to approximate the true sampling distribution in this case.
2. Repeat a) with sample sizes of 30. Superimpose a plot of a normal density curve that approximates the sampling distribution of the sample means of 30 randomly selected ACT scores at GCGS. Explain why we can apply the normal approximation in this case.