

Homework 4

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## Instructions:

- (1) All parts must be completed for credit and are worth 10pts unless otherwise noted
  - (2) You must show work to receive credit
  - (3) Homework can be handed on **Canvas**
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**Question 1: Big Picture (10pts)**

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Recall the survey you put together in homework 1. Briefly discuss about how you might model the responses as random variables. Select 2-4 of your 10 questions and discuss, making sure to highlight underlying distributions you would expect/assume. *i.e. if you were surveying their weight, you might use a normal distribution. If you were asking them their gender you would likely use a binomial.*

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**Question 2: Normal Distribution (25pts)**

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Suppose  $X$  is distribution of midterm scores, where  $X \sim N(75, 4)$

- (a) Find the 90th percentile.
- (b) Find the 5th percentile.
- (c) Why might percentiles more helpful than just looking at raw scores? (5pts)

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**Question 3: Sampling Distribution (25pts)**

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Suppose you flip a coin four times. For every head, you receive one point, and for every tail, you lose one point.

- (a) Write down all possible outcomes, and the associated sample means.
- (b) From this create a sampling distribution of sample means.
- (c) What is the probability  $P(\bar{X} = 0.5)$  ? What about  $P(\bar{X} = 0)$ ? (5pts)

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**Question 4: Sampling Distributions of Sample Proportions (20pts)**

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Of Boston College undergraduate students, 28 out of 100 students fill out a March Madness basketball bracket. At the beginning of March, a random sample of 250 undergrads is drawn.

- (a) What are the mean and standard error of the sampling distribution for the proportion of those who will participate in March Madness? (5pts)
- (b) What is the probability that the sample proportion will be less than 0.30?
- (c) Without doing the calculations, state in which of the following ranges the sample proportion is most likely to be: 0.27 to 0.29, 0.28 to 0.30, 0.29 to 0.31, and 0.30 to 0.32. (5pts)

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**Question 5: Sampling Distributions of Sample Means (20pts)**

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In a particular season, the average number of points for NCAA basketball starting players is 563.3 and a standard deviation of 33. Suppose you select a random sample of 30 of these starting players.

- (a) What is the probability that for this sample, the average number of points is between 560 and 580?
- (b) The probability is 0.22 that the sample mean will be more than what value?