Math 121   **Test #2**   **Fall 2009**

1. (22 pts) A sample contains the following data:

$$21, \quad 24, \quad 25, \quad 26, \quad 29, \quad 39, \quad 41, \quad 44, \quad 48.$$

   For this sample,

   (a) (3 pts) Find the mean.

   (b) (3 pts) Find the standard deviation.

   (c) (3 pts) Find the variance.

   (d) (4 pts) Find the z-score of 39.

   (e) (4 pts) Write a 5-number summary. Label each of the five numbers.

   (f) (5 pts) Draw a boxplot.

2. (4 pts) If the distribution of values of a random variable is skewed right, then the mean of the distribution is most likely (choose one)

   (a) less than the median.

   (b) approximately equal to the median.

   (c) greater than the median.

3. (10 pts) A random variable X has a uniform distribution from 0 to 10. Its probability distribution function is shown in the following diagram.
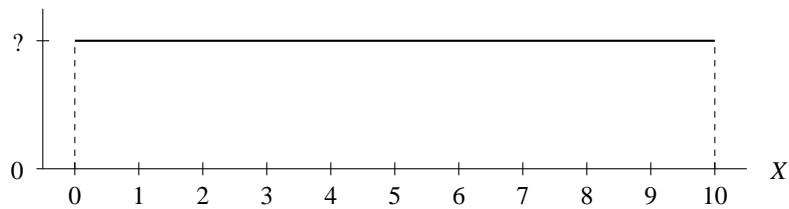

   (a) (3 pts) What is the height of the graph?

   (b) (4 pts) What is the probability that X is greater than 6?

   (c) (3 pts) What is the first quartile of X?

4. (8 pts) A researcher is trying to determine the distribution of the variable that he is interested in. The correct distribution is one of the two triangular distributions shown below. The hypotheses are

H_0 : It is the first distribution.

H_1 : It is the second distribution.
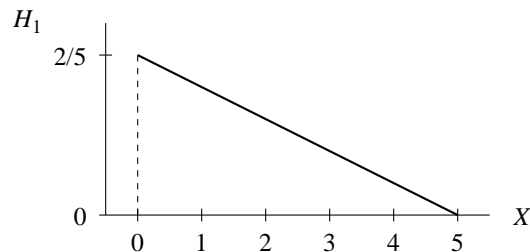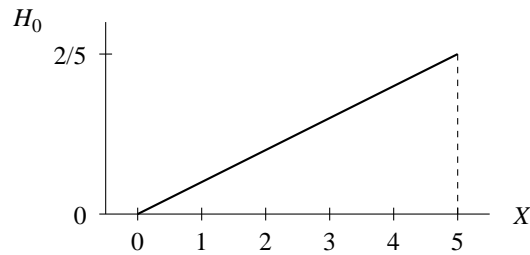
The researcher will obtain one value of the variable. His decision rule is to reject H_0 if the observed value is less than 1.

(a) (2 pts) What is the direction of extreme?

(b) (6 pts) What is the value of α?

5. (12 pts) Let X be a random variable whose distribution is $N(60, 10)$. Find each of the following.

(a) (3 pts) The area under the curve between 45 and 75.

(b) (3 pts) The area under the curve to the left of 50.

(c) (3 pts) The area under the curve to the right of 65.

(d) (3 pts) The 10th percentile of X.

6. (10 pts) Let X be the amount of salt in a 4-oz serving of canned spaghetti sauce. The variable X has a normal distribution with mean 610 mg and standard deviation 25 mg.

(a) (5 pts) What is the probability that a randomly selected 4-oz serving contains more than 650 mg of salt?

(b) (5 pts) What is the value of the interquartile range of this distribution?

7. (6 pts) A recent Rasmussen survey[1] reports that 30% of the population feel that an overweight employee should pay more for his or her health insurance. Assume that this proportion holds for the population. If we took a survey of 50 people, the sample proportion $\hat{p}$ who feel that way would have which of the following distributions?

(a)

(b)

(c)

(d)
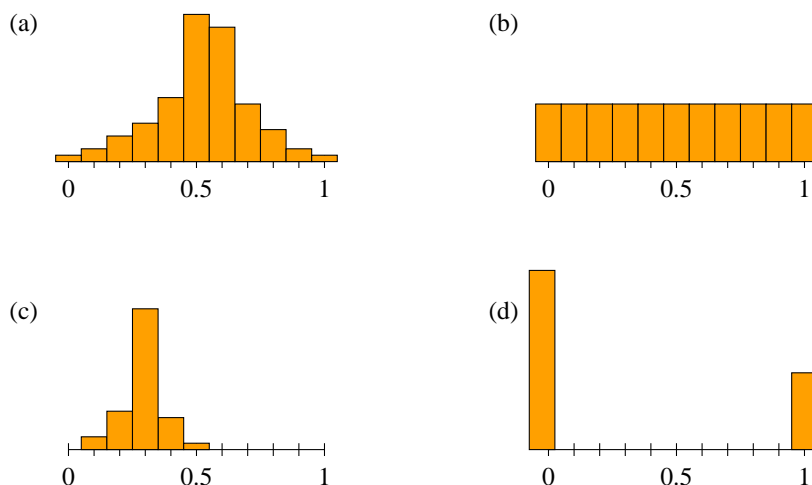
8. (16 pts) A recent study sponsored by the CDC and published in the New England Journal of Medicine[2] showed that 25% of the adults who were admitted to the hospital with the H1N1 virus spent at least 24 hours in intensive care. Let $\hat{p}$ be the sample proportion of H1N1 hospital patients who spent 24 hours in intensive care, in samples of size $n = 2$.

   (a) (4 pts) What is the mean of $\hat{p}$?

   (b) (4 pts) What is the standard deviation of $\hat{p}$?

   (c) (8 pts) Use a tree diagram to find the exact sampling distribution of $\hat{p}$. Present the results in tabular form.

9. (12 pts) Continuing with the situation of the previous problem, now let $\hat{p}$ be the sample proportion in samples of size $n = 300$.

   (a) (6 pts) Describe precisely the sampling distribution of $\hat{p}$.

   (b) (6 pts) Find the probability that $\hat{p}$ is between 20% and 30%.

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[1] http://www.rasmussenreports.com/public_content/politics/current_events/healthcare/october_2009/30_say_overweight_workers_should_pay_more_for_health_insurance

[2] http://content.nejm.org/cgi/content/full/NEJMoa0906695