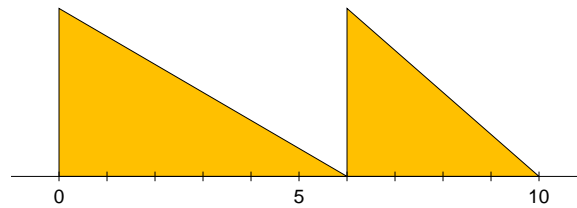
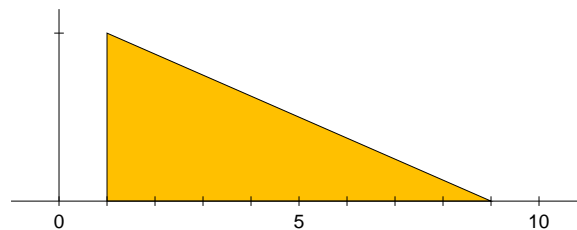


1. (4 pts) The diagram below shows the distribution of a random variable. The median of the variable is
- (a) Less than 6.
  - (b) Equal to 6.
  - (c) Greater than 6.
  - (d) It cannot be determined from the graph.



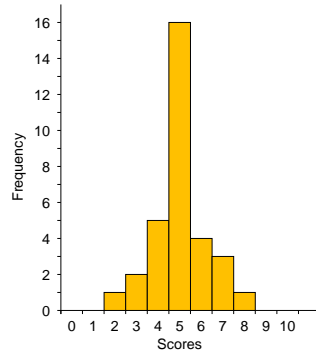
2. (4 pts) The height of the graph of the density function shown below is
- (a)  $\frac{1}{4}$ .
  - (b)  $\frac{1}{8}$ .
  - (c)  $\frac{1}{10}$ .
  - (d) It cannot be determined from the graph.



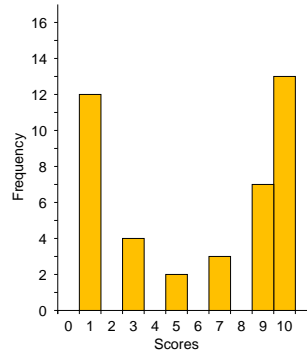
3. (4 pts) If the  $z$ -score of an observation is 0, then
- (a) The observation equals the median.
  - (b) The observation equals the mean.
  - (c) The standard deviation must be 0.
  - (d) The observation is the minimum value.

4. (4 pts) Five histograms are presented below. Each histogram displays test scores on a scale of 0 to 10 for one of five different statistics classes. Which of the classes would you expect to have the lowest standard deviation, and why?

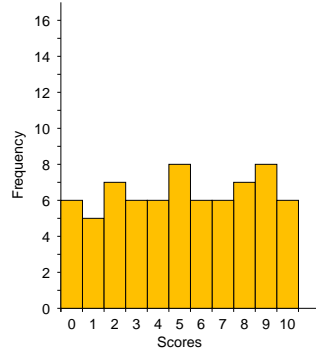
- (a) Class A, because it has the most values close to the mean.
- (b) Class B, because it has the smallest number of distinct scores.
- (c) Class C, because there is no change in scores.
- (d) Class A and Class C, because they both have the smallest range.
- (e) Class E, because it looks the most normal.



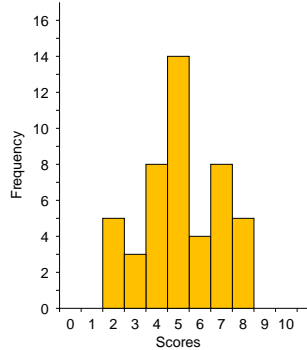
Class A



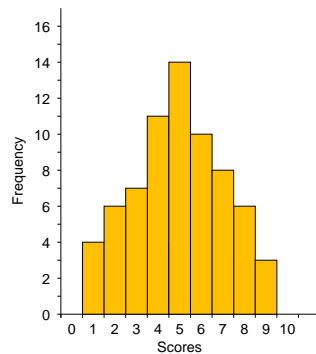
Class B



Class C



Class D



Class E

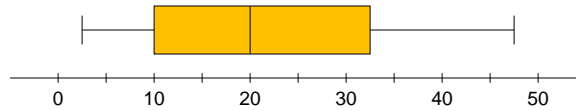
5. (22 pts) According to Consumer Reports<sup>1</sup>, the following data are the nationwide average weekly gasoline prices for the past 10 weeks (January 17 through March 19).

3.39 3.39 3.44 3.48 3.52  
3.59 3.72 3.79 3.83 3.87

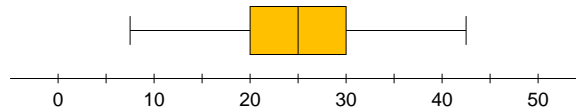
The data are arranged chronologically, but that happens to correspond to their numerical order.

- (a) (3 pts) Find the mean of the data.
  - (b) (3 pts) Find the median.
  - (c) (3 pts) Find the (sample) standard deviation.
  - (d) (3 pts) Find the variance.
  - (e) (3 pts) Find the five-number summary.
  - (f) (3 pts) Find the interquartile range.
  - (g) (4 pts) Draw a boxplot of the data.
6. (10 pts) Below are shown three boxplots, for three different samples.
- (a) (6 pts) Using proper statistical terminology, describe each distribution.
  - (b) (4 pts) Give a five-number summary of the data represented by boxplot (iii).

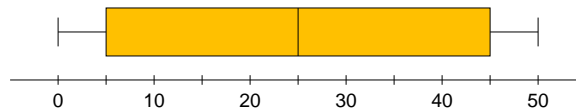
(i)



(ii)

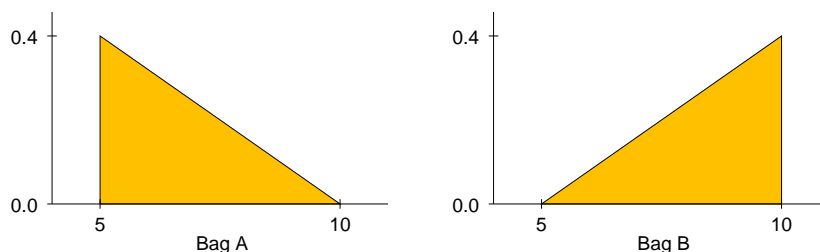


(iii)



<sup>1</sup><http://news.consumerreports.org/cars/2012/03/average-gas-prices-march-19-2012.html>

7. (12 pts) For the standard normal distribution, find each of the following.
- (3 pts) The area between  $z = 1.2$  and  $z = 1.9$ .
  - (3 pts) The area to the left of  $z = 1.2$ .
  - (3 pts) The area to the right of  $z = 1.9$ .
  - (3 pts) The 85<sup>th</sup> percentile.
8. (12 pts) Theoretically IQ scores are normally distributed and have a mean of 100 and a standard deviation of 15.
- (3 pts) What is the probability that a person selected at random has an IQ score of at least 112?
  - (3 pts) What is the probability that a person selected at random has an IQ score between 76 and 124?
  - (3 pts) What proportion of the population has an IQ score less than 70?
  - (30 pts) A very elite college will admit only students whose IQ scores are in the top 10% of the population. What is the minimum IQ score one must have to be eligible for acceptance to this college?
9. (10 pts) There are two bags: Bag A and Bag B. Each bag contains millions of vouchers, worth from \$5 to \$10. (All values between \$5 and \$10 are possible, not just the whole numbers.) The following two diagrams show the distributions of vouchers in the two bags.



We are presented with one of the two bags, but we do not know which one it is. We draw one voucher from the bag and, based on its value, decide which bag we believe we are holding. The hypotheses are

$H_0$  : It is Bag A.

$H_1$  : It is Bag B.

- (2 pts) What is the direction of extreme?
- (4 pts) Let our decision rule be to reject  $H_0$  if the value of the chosen voucher is at least 9. Find the value of  $\alpha$ .
- (4 pts) Using the decision rule in part (b), find the value of  $\beta$ .

10. (18 pts) According to a Rasmussen poll released on March 20, 40% of likely voters strongly disapprove of President Obama's performance.
- (8 pts) Suppose we take a sample of 2 likely voters and let  $\hat{p}$  be the sample proportion (out of 2) that strongly disapprove of the president's performance. Use a tree diagram to find the sampling distribution of  $\hat{p}$ . Be sure to list each possible value of  $\hat{p}$  and its probability.
  - (6 pts) Now suppose that we take a sample of 600 likely voters and let  $\hat{p}$  be the sample proportion (out of 600) that strongly disapprove of the president's performance. Use the Central Limit Theorem to describe the sampling distribution of  $\hat{p}$ . Be sure to give all important features.
  - (4 pts) Continuing part (b), find the probability that at least 44% of the sample strongly disapprove of the president's performance.
11. (4 pts) A certain manufacturer claims that they produce 50% brown candies. Sam plans to buy a large family size bag of these candies and Kerry plans to buy a small fun size bag. Which bag is more likely to have more than 70% brown candies? (Only one answer is correct.)
- Sam's, because there are more candies, so his bag can have more brown candies.
  - Sam's, because there is more variability in the proportion of browns among larger samples.
  - Kerry's, because there is more variability in the proportion of browns among smaller samples.
  - Kerry's, because most small bags will have more than 50% brown candies.
  - Both have the same chance because they are both random samples.
12. (4 pts) Imagine you have a barrel that contains thousands of candies with several different colors. We know that the manufacturer produces 35% yellow candies. Five students each take a random sample of 20 candies, one at a time, and record the percentage of yellow candies in their sample. Which sequence below is the most plausible for the percent of yellow candies obtained in these five samples?
- 30%, 35%, 15%, 40%, 50%.
  - 35%, 35%, 35%, 35%, 35%.
  - 5%, 60%, 10%, 50%, 95%.
  - Any of the above