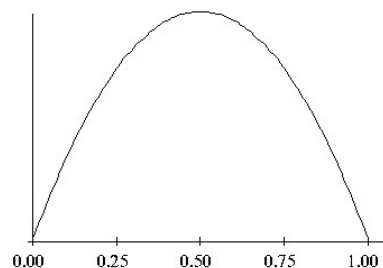


**Part 1: Multiple Choice.** Circle the letter corresponding to the best answer.

1. For the density curve shown, which statement is true?

(a) The density curve is Normal.  
(b) The density curve is skewed right.  
(c) At the mean, the height of the curve is 1.  
(d) The density curve is symmetric.  
(e) None of the above is correct.



2. For the density curve shown in Question 1, which statement is true?

(a) The mean is greater than the median.  
(b) The mean is less than the median.  
(c) The mean and median are equal.  
(d) The mean could be either greater than or less than the median.  
(e) None of the above is correct.

3. Suppose that 16-ounce bags of chocolate chip cookies are produced with weights that follow a Normal distribution with mean weight 16.1 ounces and standard deviation 0.1 ounce. The percent of bags that will contain between 16.0 and 16.1 ounces is about

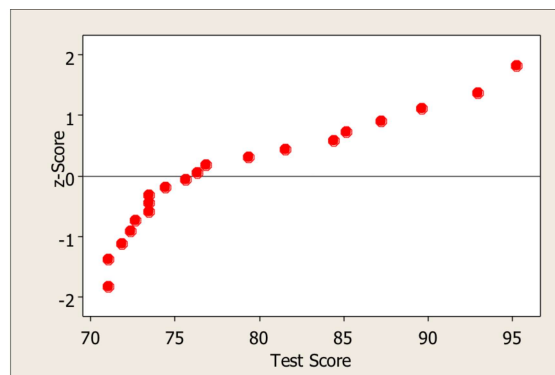
(a) 10  
(b) 16  
(c) 34  
(d) 68  
(e) None of the above is correct.

4. For the distribution of cookie bags described in Question 3, approximately what percent of the bags will likely be underweight (that is, less than 16 ounces)?

(a) 10  
(b) 16  
(c) 32  
(d) 64  
(e) none of the above

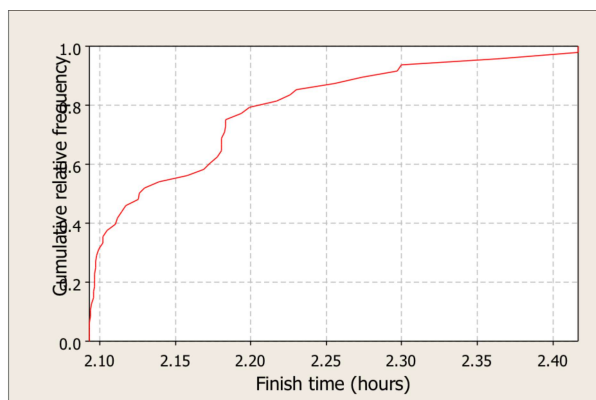
5. The plot shown at the right is a Normal probability plot for a set of test scores. Which statement is true for these data?

(a) The data are clearly Normally distributed.  
(b) The data are approximately Normally distributed.  
(c) The data are clearly skewed to the left.  
(d) The data are clearly skewed to the right.  
(e) There is insufficient information to determine the shape of the distribution.



6. Which of the following statements are true?
- The area under a Normal curve is always 1, regardless of the mean and standard deviation.
  - The mean is always equal to the median for any Normal distribution.
  - The interquartile range for any Normal curve extends from  $\mu - \sigma$  to  $\mu + \sigma$ .
- I and II
  - I and III
  - II and III
  - I, II, and III
  - None of the above gives the correct set of true statements.
7. The proportion of scores in a standard Normal distribution that are greater than 1.25 is closest to:
- .1056
  - .1151
  - .1600
  - .8849
  - .8944

8. At right is a cumulative relative frequency graph for the 48 racers who finished the grueling 50km cross-country ski race at the 2010 Vancouver Olympics. Approximately what proportion of the racers finished the race in *more* than 2.15 hours?
- 0.17
  - 0.40
  - 0.45
  - 0.50
  - 0.55



9. In the previous question, the mean finish time is 2.164 hours and the standard deviation is 0.85 hours. The distribution is skewed right. What are the mean, standard deviation, and shape of the distribution of  $z$ -scores of the same data?
- Mean = 2.164, Standard deviation = 0.85, skewed right
  - Mean = 2.164, Standard deviation = 0.85, skewed left
  - Mean = 2.164, Standard deviation = 0.85, approximately normal
  - Mean = 0, Standard deviation = 1, skewed right
  - Mean = 0, Standard deviation = 1, approximately normal
10. Kitchen appliances don't last forever. The lifespan of all microwave ovens sold in the United States is approximately Normally distributed with a mean of 9 years and a standard deviation of 2.5 years. What percentage of the ovens last more than 10 years?
- 11.5%
  - 34.5%
  - 65.5%
  - 69%
  - 84.5%

## Part 2: Free Response

Show all your work. Indicate clearly the methods you use, because you will be graded on the correctness of your methods as well as on the accuracy and completeness of your results and explanations.

11. Lamar is shopping for a used car, and he's interested in determining the typical mileage on cars that are three or four years old. He looks at an online car-buying site and compares the number of miles on 30 cars that are three years old to 30 cars that are four years old. His results are summarized by Minitab below. *All values are in thousands of miles.*

### Descriptive Statistics: Mileage on Four year old cars and Three year old cars

Variable	N	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Four year old cars	30	56.68	17.82	23.60	47.80	54.70	64.50	100.30
Three year old cars	30	33.33	12.70	14.10	22.33	32.10	39.23	66.40

Both distributions are approximately Normally distributed.

- (a) One car that Lamar is interested in is four years old and has been driven 40 thousand miles. Another one is three years old and has 30 thousand miles on it. How does the number of miles on these cars compare, relative to other cars of the same age? Provide appropriate statistical calculations to support your answer.
- (b) Based on the information above, estimate the number of four year old cars Lamar looked at that had been driven more than 42 thousand miles.
- (c) Estimate the 60<sup>th</sup> percentile for mileage on the cars Lamar found that were four years old.

12. A researcher wishes to calculate the average height of patients suffering from a particular disease. From patient records, the mean was computed to be 156 cm, with a standard deviation of 5 cm. Further investigation reveals that the scale was misaligned, and that all readings are 2 cm too large, for example, a patient whose height is really 180 cm was measured as 182 cm. Furthermore, the researcher would like to work with statistics based on meters (1 meter = 100 centimeters). What would be the revised values for the mean and standard deviation of the patients' heights?

13. During the 2009-2010 basketball season, the number of points scored in each game by the Boston Celtics was approximately Normally distributed with a mean of 99.2 points and a standard deviation of 10.5 points.

(a) What is the 33<sup>rd</sup> percentile of points scored by the Celtics?

(b) The mean number of points scored by Los Angeles Lakers was 101.7. In what proportion of their games did the Celtics score more than the Lakers' mean score?

14. Mr. Wilder has a reputation for holding his classes for a few minutes after the bell has rung at the end of the period. In fact, it seems he ends class according to his own "internal clock." Below is a density curve that describes the distribution of times when Mr. Wilder ends his class, where negative values are minutes *before* the bell rings and positive values are minutes after the bell rings. What proportion of time does Mr. Wilder ends class within one minute of when the bell went off? Shade the appropriate area on the graph to show how you found the answer.

