Name:_____

Date:_____Period:_____

Chapter 2: Take Home TEST - Normal Distribution
Part 1: Multiple Choice. (2 points each)
Hand write the letter corresponding to the best answer in space provided on page 5.

_____1. The heights of American men aged 18 to 24 are approximately normally distributed with mean 68 inches and standard deviation 2.5 inches. Half of all young men are shorter than
(a) 70.5 inches
(b) 65.5 inches
(c) 68 inches
(d) can't tell, because the median height is not given
(e) none of the above

_____2. Use the information in the previous problem. 32% of young men have heights outside the range
(a) 65.5 inches to 70.5 inches
(b) 63 inches to 73 inches
(c) 60.5 inches to 75.5 inches
(d) 58 inches to 78 inches
(e) none of the above

_____3.   For the density curve shown to the right, which statement is true?
(a) The density curve is symmetric.
(b) The density curve is skewed left.
(c) The area under the curve between 0 and 1 is 1.
(d) The density curve is normal.
(e) None of the above is correct.
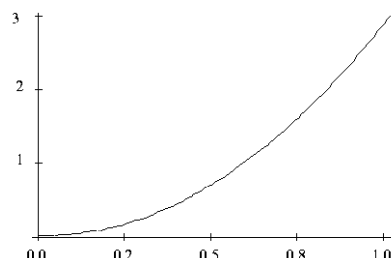
_____4. For the density curve shown in question 3, which statement is true?
(a) The mean and median are equal.
(b) The median is greater than the mean.
(c) The median is less than the mean.
(d) The mean could be either greater than or less than the median.
(e) None is the above is correct.

_____5. Increasing the frequencies in the tails of a distribution will:
(a) not affect the standard deviation as long as the increases are balanced on each side of the mean
(b) not affect the standard deviation
(c) reduce the standard deviation
(d) increase the standard deviation
(e) none of the above

_____6. The area under the standard normal curve corresponding to $-0.3 < Z < 1.6$ is
(a) 0.3273
(b) 0.4713
(c) 0.5631
(d) 0.9542
(e) None of the above

_____7. Which statement is true for any density curve?
 (a) The bars must be of equal width.
 (b) It has an area equal to 100.
 (c) It must either steadily rise or steadily fall, since it cannot do both.
 (d) One can use Table A (table of standard normal values) to find relative frequencies.
 (e) None of the above is correct.

_____8. Pop1 and Pop2 are normal density curves with means and standard deviations μ_1, s_1 and μ_2, s_2, respectively.

Suppose that $\mu_1 = \mu_2$ and $\sigma_1 = 2(\sigma_2)$. Consider these statements:
 I. Pop1 has twice as many observations within one standard deviation as Pop2.
 II. The density curve for Pop1 is taller than that of Pop2.
 III. The density curves are centered around different numbers.
 Which of these statements are correct?
 (a) I only
 (b) II only
 (c) III only
 (d) I and II only
 (e) None of the above gives the correct set of true responses.

_____9. The five-number summary of the distribution of scores on a statistics exam is
            5   24   31   38   50
316 students took the exam. The histogram of all 316 test scores was approximately normal. Thus the variance of test scores must be about
 (a) 7
 (b) 10
 (c) 36
 (d) 49
 (e) 108

_____10. The following graph is a normal probability plot for the amount of rainfall in acre-feet obtained from 26 randomly selected clouds that were seeded with silver oxide:
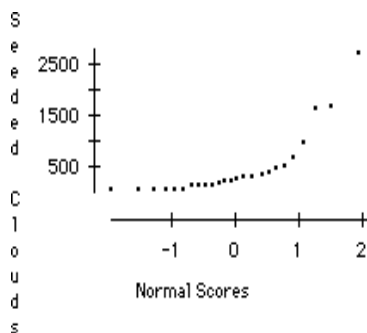
 (a) The data appear to show exponential growth; that is, the amount of rainfall increases exponentially as the amount of silver oxide increases.
 (b) The pattern suggests that the measurement is not normally distributed.
 (c) A least squares regression line should be fitted to the rainfall variable.
 (d) It can be expected that the histogram of rainfall amount will look like the normal curve.
 (e) The shape of the curve suggests that rainfall is caused by seeding the clouds with silver oxide.

_____11. If the heights of 99.7% of American men are between 5′0″ and 7′0″, what is your estimate of the standard deviation of the height of American men?
(a) 12"
(b) 6"
(c) 4"
(d) 3"
(e) 1"

_____12. The figure below is the density curve of a distribution:
Five of the seven points marked on the density curve make up the five-number summary for this distribution. Which two points are *not* part of the five-number summary?
(a) B and E.
(b) C and F.
(c) C and E.
(d) B and F.
(e) A and G.
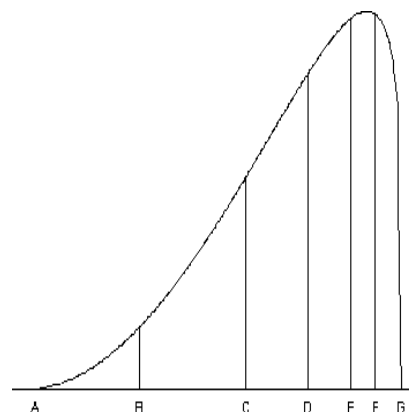
_____13. Which of the following is the best estimate of the standard deviation of the distribution shown below?

(a) 5
(b) 10
(c) 30
(d) 50
(e) 60
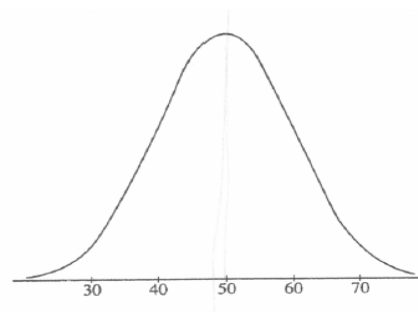
_____14. Suppose that sixteen-ounce bags of chocolate chips cookies are produced with an actual mean weight of 16.1 ounces and a standard deviation of 0.1 ounce so that N(16.1,0.1). The percentage of bags that will contain between 16.1 and 16.2 ounces is
(a) 13
(b) 16
(c) 27
(d) 95
(e) none of the above

15. This is a continuation of Question 14. Approximately what percentage of the bags will likely be underweight (i.e., less than 16 ounces)?
(a) 13
(b) 16
(c) 27
(d) 5
(e) none of the above

_____16. Density curves have which of the following properties?
  (a) They are symmetric.
  (b) They have a peak centered above its mean.
  (c) The spread of the curves are proportional to the standard deviation.
  (d) All of the properties, (a) to (c), are correct.
  (e) None of the properties, (a) to (c), is correct.

_____17. According to *Consumer Reports* magazine, the cost per pound of protein for 20 major-brand beef hot dogs are $14.23, $21.70, $14.49, $20.49, $14.47, $15.45, $25.25, $24.02, $18.86, $18.86, $30.65, $25.62, $8.12, $12.74, $14.21, $13.39, $22.31, $19.95, $22.90, and $19.78, respectively. If the least expensive is considered the top-ranked, what is the position in terms of a z-score of Thorn Apple Valley beef hot dogs at $14.23 per pound of protein?
 (a) -2.67
  (b) -0.85
  (c) 0.85
  (d) 1.42
  (e) 2.67

_____18. The 70 highest dams in the world have an average height of 206 meters with a standard deviation of 35 meters. The Hoover and Grand Coulee dams have heights of 221 and 168 meters, respectively. The Russian dams Nurek and Charvak, have heights with z-scores of +2.69 and –1.13, respectively. List the dams in order of ascending size.
  (a) Grand Coulee, Charvak, Hoover, Nurek
  (b) Grand Coulee, Charvak, Nurek, Hoover
  (c) Grand Coulee, Hoover, Charvak, Nurek
  (d) Charvak, Grand Coulee, Hoover, Nurek
  (e) Charvak, Grand Coulee, Nurek, Hoover

_____19. In the accompanying display, which has the smaller mean and which has the larger standard deviation?

 (a) Smaller mean, B; larger standard deviation, A
(b) Smaller mean, B; larger standard deviation, B
(c) Smaller mean, A; larger standard deviation, A
(d) Smaller mean, A; larger standard deviation, B
(e) Smaller mean, B; same standard deviation
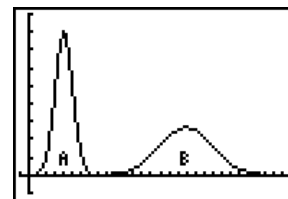
_____20. The number of customers served per day by a large department store is approximately normal distributed, with a mean of 3240 customers and a standard deviation of 320. Find the range of customers served on the middle 50 percent of days.

  (a) (2600, 3880)
  (b) (2440, 4040)
  (c) (2280, 4200)
  (d) (3025, 3454)
  (e) (2920, 3560)

Name:_____

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PART I answers

1.	2.	3.	4.	5.
6.	7.	8.	9	10.
11.	12.	13.	14.	15.
16.	17.	18.	19.	20.

PART II - *Answer completely, but be concise. Write sequentially and show all steps. **_Show all your_** **_work_**. Indicate clearly the methods you used, because you will be graded on the correctness of your methods as well as on the accuracy of your results and explanations.*
YOU MUST WRITE ANSWERS IN BY HAND – you need not print out the first 4 pages.

1. The best male long jumpers for State College since 1973 have averaged a jump of 263.0 inches with a standard deviation of 14.0 inches. The best female long jumpers have averaged 201.2 inches with a standard deviation of 7.7 inches. This year Joey jumped 275 inches and his sister, Carla, jumped 212 inches. Both are State College students. Assume that male and female jumps are normally distributed. Within their groups, which athlete had the more impressive performance? Explain briefly. (6 points)

2. In a normally distributed population, what percent of the population observations lie within 2.576 standard deviations of the mean? Include a sketch to illustrate your answer. (5 points)

3. In recent years there has been considerable discussion about the appropriateness of the body shapes and proportions of Ken and Barbie dolls. These dolls are very popular, and there is some concern that the dolls may be viewed as having the "ideal body shape," potentially leading young children to risk anorexia in pursuit of that ideal.   Researchers investigating the dolls' body shapes scaled Ken and Barbie up to a common height of 170.18 cm (5' 7") and compared them to body measurements of active adults.   Common measures of body shape are the chest (bust), waist, and hip circumferences.   These measurements for Ken and Barbie and their reference groups are presented in the table below:

Doll and Human Reference Group Measurements (cm)

	Ken			Barbie		
	Chest	Waist	Hips	Chest	Waist	Hips
Doll	75.0	56.5	72.0	82.3	40.7	72.7
Human $\bar{x}$	91.2	80.9	93.7	90.3	69.8	97.9
Human s	4.8	9.8	6.8	5.5	4.7	5.4

For the following questions, suppose that the researchers' scaled up dolls suddenly found themselves in the human world of actual men and women.

(a)   Convert Ken's chest, waist, and hips measurements to z-scores. Which of those measures appears to be the most different from Ken's reference group? Justify your response with an appropriate statistical argument. (10 points)

(b) The z-scores for Barbie's Chest, Waist, and Hips when compared to active female adults are approximately –1.4, -6.2, and –4.7 respectively. Do these z-scores provide evidence to justify the claim that the Barbie doll is a thin representation of adult women? Justify your response with an appropriate statistical argument. (7 points)

(c) If men's waist measurements are approximately normally distributed, based on the sample above what is the approximate percentile of a 100 cm waist? (5 points)

4. The lower and upper deciles of any distribution are the points that mark off the lowest 10% and the highest 10%.

(a) What are the lower and upper deciles of the standard normal distribution? (5 points)

(b) The length of human pregnancies is approximately normal with mean 266 days and standard deviation 16 days. What are the lower and upper deciles of this distribution? (5 points)

5. A normal probability plot of the survival times of the guinea pigs in a medical experiment is shown below. Use this plot to describe the shape of the distribution of survival times. Then explain carefully how this shape is seen in the normal probability plot. (8 points)
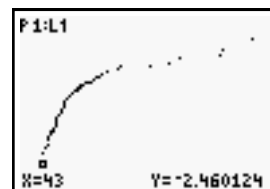
6. To qualify to be in Mrs. Poyner's AP statistics class, all students must score in the top 10% of on a tough placement test. All scores on the test this year were normally distributed with a mean of 16 points. If it took a minimum score of 20 points to qualify for the class, find the standard deviation for this year's distribution. Justify numerically. (5 points)

7. A university study investigated the heart rates (measured in beats per minute) of people undertaking a particular exercise. The increase of heart rate was normally distributed. It was determined that 15% of the subjects were classified as unfit with a hear rate of 50 beats per minute or more, and that 10% of the subjects were classified as very fit with a heart rate of 22 beats per minute or less. Find the mean and standard deviation for this university study. (5 points)

I pledge that the answers to the questions on this test have been formulated by myself and that I can explain and reproduce all the answers on my own if asked:_____(1 pts)

102 points total/100