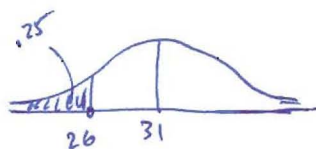


9. The five-number summary of the distribution of scores on a statistics exam is
- |   |    |    |    |    |
|---|----|----|----|----|
| 0 | 26 | 31 | 36 | 50 |
|---|----|----|----|----|
- 316 students took the exam. The histogram of all 316 test scores was approximately normal. Thus the variance of test scores must be about

- (a) 5  
 (b) 8  
 (c) 19  
 (d) 64  
 (e) 55



$$-.674489 = \frac{26 - 31}{\sigma}$$

$$\sigma = 7.413011$$

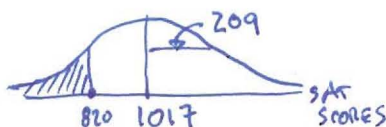
10. If the median of a set of data is equal to the mean, then
- (a) The data are normally distributed.  
 (b) The data are approximately normally distributed.  
 (c) The distribution is skewed.  
 (d) The distribution is symmetric.  
 (e) One can't say anything about the shape of the distribution with any certainty.

**Part 2: Free Response**

Answer completely, but be concise. Write sequentially and show all steps.

11. (a) The National Collegiate Athletic Association (NCAA) requires Division I athletes to score at least 820 on the combined mathematics and verbal parts of the SAT exam in order to compete in their first college year. (Higher scores are required for students with poor high school grades.) In 1999, the scores of the more than one million students taking the SATs were approximately normal with mean 1017 and standard deviation 209. What percent of all students had scores less than 820?

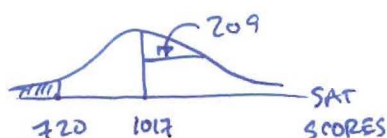
$$P(\text{SCORES} \leq 820) = \text{normalcdf}(-1E99, 820, 1017, 209) = 0.1729$$



- (b) The NCAA considers a student a "partial qualifier" eligible to practice and receive an athletic scholarship, but not to compete, if the combined SAT score is at least 720. Use the information in the previous exercise to find the percent of all SAT scores that are less than 720.

$$P(\text{SCORES} \leq 720) = \text{normalcdf}(-1E99, 720, 1017, 209)$$

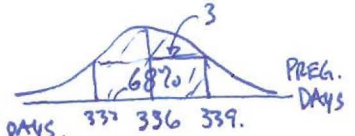
$$= 0.07765$$



12. Bigger animals tend to carry their young longer before birth. The length of horse pregnancies from conception to birth varies according to a roughly normal distribution with mean 336 days and standard deviation 3 days. Use the 68-95-99.7 rule to answer the following questions.

(a) Almost all (99.7%) of horse pregnancies fall in what range of lengths?

THE MIDDLE 99.7% OF HORSE PREGNANCIES FALL WITHIN 3 STANDARD DEVIATIONS OF THE MEAN; SO  $336 \pm 3(3)$  DAYS. ALMOST ALL PREGNANCIES LAST BETWEEN 327 AND 345 DAYS.

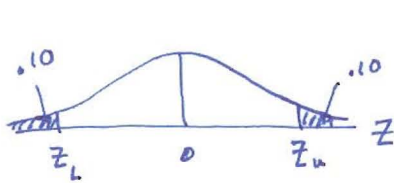


(b) What percent of horse pregnancies are longer than 339 days?

$$P(\text{PREGNANCIES} > 339 \text{ DAYS}) \approx 16\%$$

13. 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?



THE LOWER DECILE,  $z_L = \text{invnorm}(.10) = -1.2815$ ,  
SO THE UPPER DECILE,  $z_u = 1.2815$ .

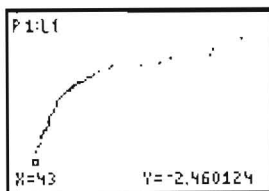
X =

(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?

$$\text{LOWER DECILE, } x_L = z_L(16) + 266 \text{ DAYS} = 245.495 \text{ DAYS}$$

$$\text{UPPER DECILE } x_u = z_u(16) + 266 \text{ DAYS} = 286.505 \text{ DAYS}$$

14. 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.



THIS PLOT INDICATES THAT THE DISTRIBUTION OF SURVIVAL TIMES IS SKEWED TO THE RIGHT. THIS CAN BE SEEN IN THE PLOT SINCE IT IS MORE LIKELY TO FIND LOWER X-VALUES THAN Z-VALUES. IN OTHER WORDS, THE DATA IS "HEAVIER" ON THE LOW END THAN THE Z-DISTRIBUTION.

I pledge that I have neither given nor received aid on this test. \_\_\_\_\_