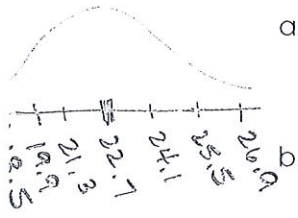
Name _____ Date _____

1. **Jack and Jill.** Jill scored a 710 on the verbal part of the SAT. SAT verbal scores have a mean of 500 and a standard deviation of 100. Her boyfriend Jack took the American College Testing (ACT) test and scored 27 on the verbal part. ACT scores are normally distributed with a mean of 18 and a standard deviation of 6. Assuming the two tests measure the same ability, who did better?

Jack: $\frac{27-18}{6} = 1.5$ Jill: $\frac{710-500}{100} = 2.1$

Jill did better!

2. The EPA efficiency rating on a particular model of new car says that the car is expected to get 22.7 miles per gallon (mpg) of gasoline. Assume that the standard deviation is 1.4 mpg and that the actual mileages are normally distributed about 22.7. The factory produces 2000 of this model.



a. What is the z-score associated with 23 mpg? How many cars would be expected to get above 23 mpg? $\frac{23-22.7}{1.4} = .21$ $(41.5\%)(2000) = 830.32$ 830 cars

b. How many would be expected to get below 20 mpg?

$2.7\%(2000) = 53.78$ so 54 cars

c. How many would get between 21 to 24 mpg?

$(71.1\%)(2000) =$ 1422 cars

d. If you purchased a car at random, what is the probability that it will get at least 21.5 mpg?

$P(X \geq 21.5) = .8043$

e. Suppose you purchased a car of this model and it got only ~~17~~ 17.2 mpg. Of the dealer's service manager told you that this low a mileage was normal for this model car, how would you refute his claim based on statistics?

$z = \frac{17.2-22.7}{1.4} = -3.93$ that is below 3 standard deviations on the normal curve - their stats are wrong or you have a lemon!

3. The results of a test are normally distributed with an average of 63 and a standard deviation of 7. You made an 80.

$\bar{X} = 63 \quad \sigma = 7 \quad X = 80$

a. What is the z-score associated with your grade?

$z = \frac{80-63}{7} = 2.43$

b. Your teacher decides to curve the grades by changing the mean to a 70 and the standard deviation to 4 while keeping your z-score the same. What would your new grade be?

$2.43 = \frac{X-70}{4}$ $9.72 = X-70$ $X = 79.72$

4. **SAT and ACT again.** Among all of a particular college's applicants who take the SAT the mean score is 1500 with a standard deviation of 240. Among all of the applicants who take the ACT the mean score is 21 with a standard deviation of 6. Bobby scored 1740 on the SAT and Kathy scored 30 on the ACT.

a. Among the SAT scores at this college, what proportion of applicants scored higher than Bobby on the SAT? $P(X \geq 1740) =$

$\bar{X} = 1500 \quad \sigma = 240 \quad LB = 1740 \quad UB = 1E99$ .1587

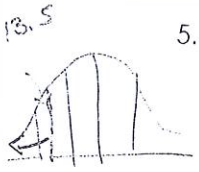
b. Among the ACT scores at this college, what proportion of applicants scored higher than Kathy on the ACT? $P(X \geq 30) =$

$\bar{X} = 21 \quad \sigma = 6 \quad LB = 30 \quad UB = 1E99$ .06668

c. Who did better on their standardized test, Bobby or Kathy?

$z_{Bobby} = \frac{1740 - 1500}{240} = 1$ $z_{Kathy} = \frac{30 - 21}{6} = 1.5$ Kathy

5. A professor "curves" test scores by assigning letter grades as follows: F for scores below 1.5σ below the mean, D for scores from .5σ to 1.5σ below the mean, C for scores between -.5σ and +.5σ from the mean, B for scores .5σ to 1.5σ above the mean, an A for scores more than 1.5σ above the mean.



a. What percent of students make an A? B? C? D? F?

6.75 2.5 (F) .15 + 2.35 + ½(13.5) = 9.25%

(D) ½(13.5) + ½(34) = 23.75%

(C) ½(34) + ½(34) = 34%

(B) same as (D) = 23.75%

(A) same as F = 9.25%

b. If the scores on a test have a mean of 47 and a standard deviation of 15, what intervals of scores correspond to A, B, C, D, and F?

A $\frac{x-47}{15} = 1.5$ $x = [69.5$ or above

B $\frac{x-47}{15} = .5$ $[54.5$ to $69.5)$

C $\frac{x-47}{15} = -.5$ $[39.5$ to $54.5)$

D $\frac{x-47}{15} = -1.5$ $[24.5$ to $39.5)$

E below 24.5

c. If the scores on a test have a mean of 89 and a standard deviation of 4.3, what intervals of scores correspond to A, B, C, D, and F?

A $\frac{x-89}{4.3} = 1.5$ $x = 95.5$ or above

B $\frac{x-89}{4.3} = .5$ $x = [91.2$ to $95.5)$

C $\frac{x-89}{4.3} = -.5$ $x = [86.9$ to $91.2)$

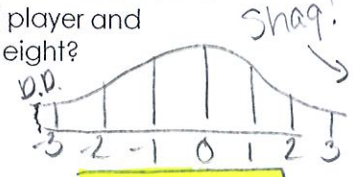
D $\frac{x-89}{4.3} = -1.5$ $x = [82.6$ to $86.9)$

E below 82.6

d. Under the grading scheme of part c, will 70 be passing? What is your opinion of grading on the curve?

No. Truly grading on a curve you are compared to your peers!

6. **Unusual heights.** Assume that adult males have heights with a mean of 69 inches and a standard deviation of 2.8 inches. The actor Danny DeVito is 5 feet tall. The NBA basketball player and sometimes actor Shaquille O'Neal is 7 feet 1 inch tall. Who has a more unusual height?



$\bar{X} = 69 \quad \sigma = 2.8$

Danny: 5ft = 60in $z = \frac{60 - 69}{2.8} = -3.21$

Shaq: 7ft 1in = 85in $z = \frac{85 - 69}{2.8} = 5.71$

Shaq!!