ACTIVITY 36 PRACTICE

Write your answers on notebook paper.
Show your work.

1. Karen is a high school student doing a statistics project. She was interested in estimating how much money people typically spend on admission, food, drinks, and souvenirs when attending a local minor league baseball game. At one game she attended, she randomly selected 10 people in the audience and then asked them how much money they had spent. The responses are below.

$8.00 $10.25 $10.00 $9.50 $10.00

$10.25 $10.25 $12.75 $11.00 $11.25

a. Make a dot plot of these data.

b. These data are somewhat dense in the middle and sparser on the tails. Karen thought it would be reasonable to model the data as a normal distribution. She used the mean and standard deviation of her sample to estimate the mean and standard deviation of the amount of money spent by everyone at the ballgame that night. Based on her model, estimate the proportion of people attending the ballgame who spent between $10 and $12.

c. Again using Karen's model, estimate the amount of money that would complete this sentence: "95% of the people at the ballgame spent at least _______ dollars."

2. When students in Marty's statistics class were asked to collect some data of interest to them, Marty, a player on his school's baseball team, decided to measure the speeds of baseballs pitched by their school's pitching machine. Using a radar gun, he measured 20 pitches. The stem-and-leaf plot below shows the speeds he recorded, in miles per hour.

5	1 1 3
4	6 6 8 9 9 9
4	1 2 3 3 3 4 4 4
3	6 7 9

3 | 6 = 36 mph

a. Determine the mean and standard deviation of these 20 speeds.

b. Assuming that the distribution of speeds pitched by this machine is approximately normal, estimate how many pitches out of 100 you would expect to exceed 50 mph.

c. Assuming that the pitches from this machine are normally distributed, estimate the speed that would be at the 10th percentile of speeds pitched by this machine. What does the 10th percentile imply?

3. The annual salaries of nine randomly sampled professional baseball players, in thousands of dollars, are listed below.

1680, 316, 440, 316, 800, 347, 600, 16000, 445

a. If you assume that these come from a normal distribution, what proportion of all players would you expect to make over two million dollars (2000 thousands) per year?

b. What proportion of the nine players whose salaries are given have salaries over two million dollars per year?

c. You should have found that there is a pretty big discrepancy between your answers to Items 3a and 3b. Use what you know about normal distributions to explain this discrepancy.

d. Sketch a drawing of a normal distribution with the mean and standard deviation of these nine salaries. Comment on any features it has that may seem unrealistic.

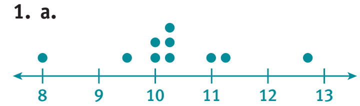
4. Why is it important to look at a graphical display of a data set before performing probability computations that involve a z-table or a normal function on a calculator?

5. Performing normal computations directly on a calculator can be faster than using a z-table, but one potentially useful piece of information gets bypassed. What is it?

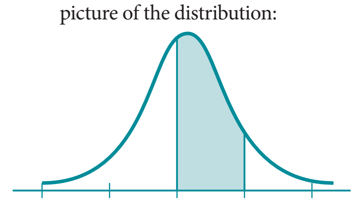
6. If you are using your calculator's built-in normal functions to answer questions without using the Standard Normal Table, sometimes you have to make up an upper or lower bound that wasn't stated in the question. When and why is that needed?

ACTIVITY PRACTICE

1. a.



b. The mean and standard deviation of the data are, respectively, $10.33 and $1.23. Using a normal model with those values for the mean and standard deviation gives us this picture of the distribution:



The z-scores for $10 and $12 are, respectively, $\frac{(10-10.33)}{1.23} = -0.27$ and $\frac{(12-10.33)}{1.23} = 1.34$, which imply that the proportion of distribution between those values is about $0.9099 - 0.3934 = 0.5165$ (or normalcdf (10, 12, 10.33, 1.23) = 0.5185). Using the normal distribution model, we would estimate that about half the people at the game spent between $10 and $12.

c. $8.31

2. a. The mean is 44.9 mph, and the standard deviation is 4.7 mph.

b. about 13 or 14 pitches

c. Since invnorm (0.1, 44.9, 4.7) = 38.9 mph, this implies that 10% of the pitches from the pitching machine were less than or equal to 38.9 mph.

3. a. normalcdf (2000, 1000000, 2327, 5145) = 0.525, so expect 52.5% of the players to make more than two million dollars per year.

b. approximately 11%

c. These computations were done assuming that the data come from a normal distribution, but if you make a stem-and-leaf plot of the data (rounded to the nearest $100 thousand), you see that the distribution does not look normal at all. There is one player whose salary is huge compared to the others. Consequently, the data do not represent a normal distribution.

d.

One obvious thing that is unrealistic about this distribution is that so much of it is negative! Salaries cannot be negative.

4. Normal distribution computations are only appropriate if the data come from a distribution that is roughly symmetric, unimodal, and mound-shaped. You have to verify the shape of the distribution of the data before performing normal computations.

5. Using the calculator directly, you do not get to see the z-score of a data value, which tells you how many standard deviations from the mean the data value is.

6. That is needed when the problem asks you to estimate the fraction of a population that is greater than a certain value (but no upper bound is given) or less than a certain value (but no lower bound is given).