

## AS1 (Assignment 1, Unit 3): Z-scores and Probability

Please type your answers in red 😊

1. What information is provided by the following z-score: -2.3?

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2. What information is provided by the numerical value of a z-score?

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3. A distribution has a standard deviation of  $\sigma = 15$ . Find the z-score for each of the following locations in the distribution.

- a. Above the mean by 10 points.

Answer: \_\_\_\_\_

- b. Above the mean by 30 points.

Answer: \_\_\_\_\_

- c. Below the mean by 10 points.

Answer: \_\_\_\_\_

- d. Below the mean by 5 points.

Answer: \_\_\_\_\_

4. For a distribution with a standard deviation of  $\sigma = 16$ , describe the location of each of the following z-scores in terms of its position relative to the mean. For example,  $z = +1.00$  is a location that is 16 points above the mean.

- a.  $z = +2.00$       Answer: \_\_\_\_\_

- b.  $z = +.50$       Answer: \_\_\_\_\_

- c.  $z = -1.00$       Answer: \_\_\_\_\_

- d.  $z = -0.25$       Answer: \_\_\_\_\_

5. For a population with  $\mu = 60$  and  $\sigma = 6$ ,

- a. Find the z-score for each of the following X values. (Note: You should be able to find these values using the definition of a z-score. You should not need to use a formula or do any serious calculations.)

X = 66: z = \_\_\_\_\_      X = 75: z = \_\_\_\_\_      X = 56: z = \_\_\_\_\_

X = 72: z = \_\_\_\_\_      X = 48: z = \_\_\_\_\_      X = 54: z = \_\_\_\_\_

- b. Find the score (X value) that corresponds to each of the following z-scores. (Again, you should not need a formula or any serious calculations.)

z = 1.00: X = \_\_\_\_\_      z = 0.50: X = \_\_\_\_\_      z = 1.50: X = \_\_\_\_\_

z = -0.50: X = \_\_\_\_\_      z = -2.00: X = \_\_\_\_\_      z = -1.50: X = \_\_\_\_\_

6. For a population with a mean of  $\mu = 40$  and  $\sigma = 8$ , find the z-score for each of the following X values. (Note: You probably will need to use a formula and a calculator to find these values)

X = 45: z = \_\_\_\_\_      X = 52: z = \_\_\_\_\_      X = 41: z = \_\_\_\_\_

X = 30: z = \_\_\_\_\_      X = 25: z = \_\_\_\_\_      X = 38: z = \_\_\_\_\_

7. For a population with a mean of  $\mu = 100$  and a standard deviation of  $\sigma = 12$ ,

- a. Find the z-score for each of the following X values.

X = 108: z = \_\_\_\_\_      X = 115: z = \_\_\_\_\_      X = 130: z = \_\_\_\_\_

X = 90: z = \_\_\_\_\_      X = 88: z = \_\_\_\_\_      X = 95: z = \_\_\_\_\_

- b. Find the score (X value) that corresponds to each of the following z-scores.

z = -0.40: X = \_\_\_\_\_      z = -0.50: X = \_\_\_\_\_      z = 1.80: X = \_\_\_\_\_

z = 0.75: X = \_\_\_\_\_      z = 1.50: X = \_\_\_\_\_      z = -1.25: X = \_\_\_\_\_

8. A population has a mean of  $\mu = 70$  and a standard deviation of  $\sigma = 10$ .

a. For the population, find the z-score for each of the following X values.

X = 69: z = \_\_\_\_\_      X = 84: z = \_\_\_\_\_      X = 63: z = \_\_\_\_\_

X = 54: z = \_\_\_\_\_      X = 48: z = \_\_\_\_\_      X = 45: z = \_\_\_\_\_

b. For the same population, find the score (X value) that corresponds to each of the following z-scores.

z = 0.50: X = \_\_\_\_\_      z = 1.50: X = \_\_\_\_\_      z = -2.50: X = \_\_\_\_\_

z = -0.25: X = \_\_\_\_\_      z = -0.50: X = \_\_\_\_\_      z = 1.25: X = \_\_\_\_\_

9. A sample has a mean of  $M = 30$  and a standard deviation of  $s = 7$ . Find the z-score of for each of the following X values from this sample.

X = 32: z = \_\_\_\_\_      X = 34: z = \_\_\_\_\_      X = 36: z = \_\_\_\_\_

X = 28: z = \_\_\_\_\_      X = 20: z = \_\_\_\_\_      X = 18: z = \_\_\_\_\_

10. A sample has a mean of  $M = 40$  and a standard deviation of  $s = 5$ . For this sample, find the X value corresponding to each of the following z-scores.

z = 0.40: X = \_\_\_\_\_      z = 1.20: X = \_\_\_\_\_      z = 2.00: X = \_\_\_\_\_

z = -0.80: X = \_\_\_\_\_      z = -0.60: X = \_\_\_\_\_      z = -1.40: X = \_\_\_\_\_

11. Find the z-score corresponding to a score of  $X = 50$  of the following distributions.

a.  $\mu = 40$  and  $\sigma = 20$

Answer: \_\_\_\_\_

b.  $\mu = 40$  and  $\sigma = 10$

Answer: \_\_\_\_\_

c.  $\mu = 40$  and  $\sigma = 5$

Answer: \_\_\_\_\_

d.  $\mu = 40$  and  $\sigma = 2$

Answer: \_\_\_\_\_

Find the X value corresponding to  $z = 0.40$  for each of the following distributions.

e.  $\mu = 40$  and  $\sigma = 4$ .....Answer: \_\_\_\_\_

f.  $\mu = 40$  and  $\sigma = 8$ .....Answer: \_\_\_\_\_

g.  $\mu = 40$  and  $\sigma = 16$ .....Answer: \_\_\_\_\_

h.  $\mu = 40$  and  $\sigma = 32$ .....Answer: \_\_\_\_\_

12. For each of the following populations, would a score of  $X = 55$  be considered a central score (near the middle of the distribution) or an extreme score (far out in the tail of the distribution)?

a.  $\mu = 45$  and  $\sigma = 10$ .....Answer: \_\_\_\_\_

b.  $\mu = 45$  and  $\sigma = 2$ .....Answer: \_\_\_\_\_

c.  $\mu = 90$  and  $\sigma = 20$ .....Answer: \_\_\_\_\_

d.  $\mu = 60$  and  $\sigma = 20$ .....Answer: \_\_\_\_\_

13. A distribution of exam scores has a mean of  $\mu = 78$ .

a. If your score is  $X = 70$ , which standard deviation would give you a lesser standing:  $\sigma = 4$  or  $\sigma = 8$ ?

Answer: \_\_\_\_\_

b. If your score is  $X = 80$ , which standard deviation would give you a better grade:  $\sigma = 4$  or  $\sigma = 8$ ?

Answer: \_\_\_\_\_

14. For each of the following, identify the exam score that should lead to the lower grade.

a. A score of  $X = 74$  on an exam with  $M = 82$  and  $\sigma = 8$ ; or a score of  $X = 40$  on an exam with  $\mu = 50$  and  $\sigma = 20$ .

Answer: \_\_\_\_\_

b. A score of  $X = 51$  on an exam with  $\mu = 45$  and  $\sigma = 2$ ; or a score of  $X = 90$  on an exam with  $\mu = 70$  and  $\sigma = 20$ .

Answer: \_\_\_\_\_

c. A score of  $X = 62$  on an exam with  $\mu = 50$  and  $\sigma = 8$ ; or a score of  $X = 23$  on an exam with  $\mu = 20$  and  $\sigma = 2$       Answer: \_\_\_\_\_

15. A population consists of the following  $N = 5$  scores: 5, 5, 4, 4, and 12.

a. Compute  $\mu$  and  $\sigma$  for the population

Mean = \_\_\_\_\_ Standard deviation = \_\_\_\_\_

b. Find the z-score for each score in the population

$X=5, z =$  \_\_\_\_\_  $X=4, z =$  \_\_\_\_\_  $X=12, z =$  \_\_\_\_\_

15. A sample consists of the following  $n = 6$  scores: 6, 4, 5, 3, 4, 2

a. Compute the mean and standard deviation for the sample.

Mean = \_\_\_\_\_ Standard deviation = \_\_\_\_\_

b. Find the z-score for each score in the sample.

$X=6, z =$  \_\_\_\_\_  $X=4, z =$  \_\_\_\_\_  $X=5, z =$  \_\_\_\_\_  $X=3, z =$  \_\_\_\_\_  $X=2, z =$  \_\_\_\_\_

16. There are 60 black marbles, 20 blue marbles, and 14 red marbles in a jar.

a. What is the probability of selecting one red marble? \_\_\_\_\_

b. What is the probability of selecting one black marble? \_\_\_\_\_

c. What is the probability of selecting one blue marble? \_\_\_\_\_

d. Which has the highest probability of being selected? \_\_\_\_\_

e. Which has the lowest probability of being selected? \_\_\_\_\_

17. (This question is independent of #16):

Probability values range from \_\_\_\_\_ to \_\_\_\_\_.

18. Please describe at least three characteristics of the NORMAL DISTRIBUTION

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

19. In a normal population of scores, what percent of people have “average” scores?

Answer \_\_\_\_\_

20. In a normal distribution, what percentage of people would be located at or below 2 standard deviations higher than the mean?

Answer \_\_\_\_\_

21. Answer the following questions based on a distribution with a  $\mu = 55$  and  $\sigma = 5$ :

- a. What range of scores is considered “average”? \_\_\_\_\_ to \_\_\_\_\_
- b. What percentage of people has an average score? \_\_\_\_\_
- c. What percentage of people has extremely high or extremely low scores? \_\_\_\_\_
- d. What *range of scores* (requires numbers to be noted in the blank spaces) have the highest probability of being selected? \_\_\_\_\_ to \_\_\_\_\_