

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

Please type your answers in red 😊

1. What information is provided by the sign (+/-) of a z-score?

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

3. A distribution has a standard deviation of $\sigma = 10$. Find the z-score for each of the following locations in the distribution.

- a. Above the mean by 5 points.

Answer: _____

- b. Above the mean by 2 points.

Answer: _____

- c. Below the mean by 20 points.

Answer: _____

- d. Below the mean by 15 points.

Answer: _____

4. For a distribution with a standard deviation of $\sigma = 20$, describe the location of each of the following z-scores in terms of its position relative to the mean. For example, $+1.00$ is a location that is 20 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 $\mu = 80$ and $\sigma = 10$,

- 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.)

$$X = 75: z = \underline{\hspace{1cm}} \quad X = 100: z = \underline{\hspace{1cm}} \quad X = 60: z = \underline{\hspace{1cm}}$$

$$X = 95: z = \underline{\hspace{1cm}} \quad X = 50: z = \underline{\hspace{1cm}} \quad X = 85: z = \underline{\hspace{1cm}}$$

- 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.)

$$z = 1.00: X = \underline{\hspace{1cm}} \quad z = 0.20: X = \underline{\hspace{1cm}} \quad z = 1.50: X = \underline{\hspace{1cm}}$$

$$z = -0.50: X = \underline{\hspace{1cm}} \quad z = -2.00: X = \underline{\hspace{1cm}} \quad z = -1.50: X = \underline{\hspace{1cm}}$$

6. For a population with a mean of $\mu = 40$ and $\sigma = 11$, 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)

$$X = 45: z = \underline{\hspace{1cm}} \quad X = 52: z = \underline{\hspace{1cm}} \quad X = 41: z = \underline{\hspace{1cm}}$$

$$X = 30: z = \underline{\hspace{1cm}} \quad X = 25: z = \underline{\hspace{1cm}} \quad X = 38: z = \underline{\hspace{1cm}}$$

7. For a population with a mean of $\mu = 100$ and a standard deviation of $\sigma = 20$,

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

$$X = 108: z = \underline{\hspace{1cm}} \quad X = 115: z = \underline{\hspace{1cm}} \quad X = 130: z = \underline{\hspace{1cm}}$$

$$X = 90: z = \underline{\hspace{1cm}} \quad X = 88: z = \underline{\hspace{1cm}} \quad X = 95: z = \underline{\hspace{1cm}}$$

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

$$z = -0.40: X = \underline{\hspace{1cm}} \quad z = -0.50: X = \underline{\hspace{1cm}} \quad z = 1.80: X = \underline{\hspace{1cm}}$$

$$z = 0.75: X = \underline{\hspace{1cm}} \quad z = 1.50: X = \underline{\hspace{1cm}} \quad z = -1.25: X = \underline{\hspace{1cm}}$$

8. A population has a mean of $\mu = 60$ and a standard deviation of $\sigma = 12$.

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

$$X = 69: z = \underline{\hspace{2cm}}$$

$$X = 84: z = \underline{\hspace{2cm}}$$

$$X = 63: z = \underline{\hspace{2cm}}$$

$$X = 54: z = \underline{\hspace{2cm}}$$

$$X = 48: z = \underline{\hspace{2cm}}$$

$$X = 45: z = \underline{\hspace{2cm}}$$

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

$$z = 0.50: X = \underline{\hspace{2cm}}$$

$$z = 1.50: X = \underline{\hspace{2cm}}$$

$$z = -2.50: X = \underline{\hspace{2cm}}$$

$$z = -0.25: X = \underline{\hspace{2cm}}$$

$$z = -0.50: X = \underline{\hspace{2cm}}$$

$$z = 1.25: X = \underline{\hspace{2cm}}$$

9. A sample has a mean of $M = 30$ and a standard deviation of $s = 8$. Find the z-score of for each of the following X values from this sample.

$$X = 32: z = \underline{\hspace{2cm}}$$

$$X = 34: z = \underline{\hspace{2cm}}$$

$$X = 36: z = \underline{\hspace{2cm}}$$

$$X = 28: z = \underline{\hspace{2cm}}$$

$$X = 20: z = \underline{\hspace{2cm}}$$

$$X = 18: z = \underline{\hspace{2cm}}$$

10. A sample has a mean of $M = 25$ and a standard deviation of $s = 5$. For this sample, find the X value corresponding to each of the following z-scores.

$$z = 0.40: X = \underline{\hspace{2cm}}$$

$$z = 1.20: X = \underline{\hspace{2cm}}$$

$$z = 2.00: X = \underline{\hspace{2cm}}$$

$$z = -0.80: X = \underline{\hspace{2cm}}$$

$$z = -0.60: X = \underline{\hspace{2cm}}$$

$$z = -1.40: X = \underline{\hspace{2cm}}$$

11. Find the z-score corresponding to a score of $X = 45$ of the following distributions.

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

Answer: $\underline{\hspace{2cm}}$

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

Answer: $\underline{\hspace{2cm}}$

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

Answer: $\underline{\hspace{2cm}}$

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

Answer: $\underline{\hspace{2cm}}$

Find the X value corresponding to $z = 0.25$ 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 $X = 50$ 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 better grade: $\sigma = 4$ 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 better 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: 0, 6, 4, 3, and 12.

a. Compute μ and σ for the population

Mean = _____ Standard deviation = _____

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

$X=0$, $z =$ _____ $X=6$, $z =$ _____ $X=4$, $z =$ _____ $X=3$, $z =$ _____ $X=12$, $z =$ _____

15. A sample consists of the following $n = 7$ scores: 5, 0, 4, 5, 1, 2, and 4.

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

Mean = _____ Standard deviation = _____

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

$X=5$, $z =$ _____ $X=0$, $z =$ _____ $X=4$, $z =$ _____ $X=5$, $z =$ _____ $X=1$, $z =$ _____

$X=2$, $z =$ _____ $X=4$, $z =$ _____

16. There are 20 black marbles, 40 blue marbles, and 5 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. 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 IQ scores, what percent of people have “average” IQ’s?

Answer _____

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

Answer _____

21. Answer the following questions based on a distribution with a $\mu = 30$ 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 _____