

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? _____ The sign of the z score is positive (+) then that indicates that the location of the x score is located above the mean and if the z score is negative (-) then the location of the x score is located below the mean.

2. What information is provided by the numerical value of the z-score? _____ The numerical value of the Z score informs one of the distance from the mean at which the x score is located in units of standard deviations.

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: _____ 0.5 _____

b. Above the mean by 2 points.

Answer: _____ 0.2 _____

c. Below the mean by 20 points.

Answer: _____ -2 _____

d. Below the mean by 15 points.

Answer: _____ -1.5 _____

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: _____ 40 points above the mean _____

b. $z = +.50$

Answer: _____ 10 points above the mean _____

c. $z = -1.00$

d. $z = -0.25$ Answer: _____ -20 points below the mean _____

Answer: _____ -15 points below the mean _____

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: $z = \underline{-1/2}$ X = 100: $z = \underline{2}$ X = 60: $z = \underline{-2}$

X = 95: $z = \underline{1/2}$ X = 50: $z = \underline{-3}$ X = 85: $z = \underline{1/2}$

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 = 90 $z = 0.20$: X = 82 $z = 1.50$: X = 95

$z = -0.50$: X = 75 $z = -2.00$: X = 60 $z = -1.50$: X = 65

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: $z = \underline{1/2}$ X = 52: $z = \underline{1.2}$ X = 41: $z = \underline{0.1}$

X = 30: $z = \underline{-1}$ X = 25: $z = \underline{-1.5}$ X = 38: $z = \underline{-1/5}$

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: $z = \underline{2/5}$ X = 115: $z = \underline{3/4}$ X = 130: $z = \underline{1.5}$

X = 90: $z = \underline{-1/2}$ X = 88: $z = \underline{3/5}$ X = 95: $z = \underline{-1/4}$

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

$z = -0.40$: X = 92 $z = -0.50$: X = 90 $z = 1.80$:

X = 136

$z = 0.75: X = \underline{\quad 87.5 \quad}$ $z = 1.50: X = \underline{\quad 130 \quad}$ $z = -1.25:$
 $X = \underline{\quad 75 \quad}$

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.

$$X = 69: z = \underline{3/4}$$

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

$$X = 63: z = \underline{1/4}$$

$$X = 54: z = \underline{-1/2}$$

$$X = 48: z = \underline{-1}$$

$$X = 45: z = \underline{-5/4}$$

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

$$z = 0.50: X = \underline{66}$$

$$z = 1.50: X = \underline{78}$$

$$z = -2.50: X = \underline{30}$$

$$z = -0.25: X = \underline{\quad}$$

$$z = -0.50: X = \underline{54}$$

$$z = 1.25: X = \underline{75}$$

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.

$$X = 32: z = \underline{1/4}$$

$$X = 34: z = \underline{1/2}$$

$$X = 36: z = \underline{3/4}$$

$$X = 28: z = \underline{-1/4}$$

$$X = 20: z = \underline{-5/4}$$

$$X = 18: z = \underline{3/2}$$

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.

$$z = 0.40: X = \underline{27}$$

$$z = 1.20: X = \underline{31}$$

$$z = 2.00: X = \underline{35}$$

$$z = -0.80: X = \underline{21}$$

$$z = -0.60: X = \underline{22}$$

$$z = -1.40: X = \underline{18}$$

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

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

$$\text{Answer: } \underline{1/4}$$

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

$$\text{Answer: } \underline{1/2}$$

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

$$\text{Answer: } \underline{1}$$

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

$$\text{Answer: } \underline{2.5}$$

Find the X value corresponding to $z = 0.25$ for each of the following distributions.

e. $\mu = 40$ and $\sigma = 4$Answer: **41**_____

f. $\mu = 40$ and $\sigma = 8$Answer: **72**_____

g. $\mu = 40$ and $\sigma = 16$Answer: **104**_____

h. $\mu = 40$ and $\sigma = 32$Answer: **168**_____

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: **central**_____

b. $\mu = 45$ and $\sigma = 2$Answer: **extreme**_____

c. $\mu = 90$ and $\sigma = 20$Answer: **extreme**_____

d. $\mu = 60$ and $\sigma = 20$Answer: **extreme**_____

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: **8**_____

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

Answer: **4**_____

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 $\sigma = 20$.

b. **Answer: a score of $X = 40$ on an exam with $\mu = 50$ and $\sigma = 20$.**

c. 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: A score of $X = 51$ on an exam with $\mu = 45$ and $\sigma =$ _____

d. 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 = _____ 5 Standard deviation = _____ 4

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

$X=0, z =$ _____ -1.25 $X=6, z=$ _____ .25 $X=4, z=$ _____ $X=3,$
 $z=$ _____ $X=12, z=$ _____

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 = _____ 3 Standard deviation = _____ 2

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

$X=5, z=$ _____ 1.00 $X=0, z=$ _____ -1.50 $X=4, z=$ _____ .50 $X=5, z=$ _____ 1.0

$X=1, z=$ _____ -1

$X=2, z=$ _____ .50 $X=4, z=$ _____ .50

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? _____ 5/65

b. What is the probability of selecting one black marble? _____ 20/65

c. What is the probability of selecting one blue marble?
_____ 40/65

d. Which has the highest probability of being selected?

Blue _____

e. Which has the lowest probability of being selected? Red _____

17. Probability values range from _____ 0 to _____ 1

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

1. _____
scores are found near the mean which is the center distribution,

2. Measures of central tendency have same value, and can be found in center

3. Symmetrical

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

Answer

63% _____

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

Answer

_____ 5%

21. Answer the following questions based on a distribution with a $\mu = 30$ and $\sigma = 5$:

a. What range of scores is considered “average”? _____ 25 to
_____ 35

b. What percentage of people has an average score? _____ 68%

c. What percentage of people has extremely high or extremely low scores? 5%

d. What *range of scores* (requires numbers to be noted in the blank spaces) have the highest probability of being selected? 20 _____ to _____ 40