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? _positive z-score means that the x-score is located above the mean, negative means the location below the mean.

   _____

   _____

   _____

2. What information is provided by the numerical value of the *z*-score? ___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 15 points.

      Answer: _____1.5_____

   b. Above the mean by 25 points.

      Answer: _____2.5_____

   c. Below the mean by 20 points.

      Answer: _____-2_____

   d. Below the mean by 5 points.

      Answer: _____-0.5_____

4. For a distribution with a standard deviation of $\sigma = 12$, 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 12 points above the mean.

   a. *z* = +2.00   Answer:__24 points above the mean_____

   b. *z* = +.50   Answer: _____6 points above the mean_____

   c. *z* = -1.00   Answer:_____12 points below the mean_____

   d. *z* = -0.25   Answer:_____3 points below the mean_____

5. For a population with $\mu = 70$ 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 =___0.5___   X = 100: z = _3___   X = 60: z = _-1_____

   X = 95:   z=___2.5___   X = 50: z =___-2___   X = 85 z = ___1.5___

   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= __80__   z = 0.20: X=___72___   z = 1.50: X= _85___

   z = -0.50: X=____65_   z = -2.00: X= ___50___ z = -1.50: X=__55___

6. For a population with a mean of $\mu = 40$ and $\sigma = 12$, 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 =__0.41___
   X = 52: z =__1___
   X = 41: z 0.083=_____

   X = 30: z =__-0.83___
   X = 25: z =___-1.25__
   X = 38: z =___-0.16__

7. For a population with a mean of $\mu = 100$ and a standard deviation of $\sigma = 10$,
   a. Find the z-score for each of the following X values.
   X = 108: z =__0.8___   X = 115: z =___1.5__   X = 130: z =___3__

   X = 90: z =__-1___   X = 88: z =__-1.2___ X = 95: z =__-0.5___

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

   z = -0.40: X=_96_____   z = -0.50: X=__95____

   z = 1.80: X=___118___

   z = 0.75: X=__107.5____   z = 1.50: X=__115____
   z = -1.25: X=__87.5____

8. A population has a mean of μ = 70 and a standard deviation of σ = 12.

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

      X = 69: z =_-0.08____   X = 84: z =__1.16___
      X = 63: z =__-0.58___

      X = 54: z =___-1.33__   X = 48: z =_-1.83____

      X = 45: z =___-2.08__

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

      z = 0.50: X=__76___   z = 1.50: X=__88___ z = -2.50: X=_40____

      z = -0.25: X=67_____   z = -0.50: X=64_____z = 1.25: X=85_____

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 =0.28_____   X = 34: z =0.57_____   X = 36: z =0.85_____

      X = 28: z =-0.28_____   X = 20: z =-1.42_____
      X = 18: z =_-1.71____

10. A sample has a mean of M = 35 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=37_____ z = 1.20: X=_41____ z = 2.00: X=_45____

      z = -0.80: X=31_____z = -0.60: X=32_____z = -1.40: X=28_____

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

   a. μ = 40 and σ = 20
                        Answer: _0.25_____

   b. μ = 40 and σ = 10
                        Answer: _0.5_____

   c. μ = 40 and σ = 5
                        Answer: _1_____

   d. μ = 40 and σ = 2
                        Answer: _2.5_____

Find the X value corresponding to z = 0.30 for each of the following distributions.

    e. μ = 40 an*d* σ = 4.........................Answer: ____41.2_____

    f. μ = 40 and σ = 8........................Answer: ____42.4_____

    g. μ = 40 a*nd* σ = 16.....................Answer: ___44.8_____

    h. μ = 40 and σ = 32.......................Answer: __49.6_____

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. μ = 45 and σ = 10........................Answer: ____0.5 central_____

    b. μ = 45 and σ = 2........................Answer: ____2.5 extreme_____

    c. μ = 90 and σ = 20........................Answer: ___-2 extreme_____

    d. μ = 60 and σ = 20........................Answer: ____-0.5_central_____

13. A distribution of exam scores has a mean of μ = 78.

    a. If your score is X = 70, which standard deviation would give you a better grade: σ = 4 or σ = 8?

                Answer: _____8_____

    b. If your score is X = 80, which standard deviation would give you a better grade: σ = 4 or σ = 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 σ = 8; or a score of X = 40 on an exam with μ = 50 and σ = 20.

                Answer: ___ a score of X = 40 on an exam with μ = 50 and σ = 20._____

    b. A score of X = 51 on an exam with μ = 45 and σ = 2; or a score of X = 90 on an exam with μ = 70 and σ = 20.

                Answer: ___   A score of X = 51 on an exam with μ = 45 and σ = 2_____

c. A score of X = 62 on an exam with μ = 50 and σ = 8; or a score of X = 23 on an exam with μ = 20 and σ = 2   Answer: ___equal z-score gives equal grade_____

15. A population consists of the following N = 5 scores: 0, 5, 4, 4, and 12.

   a. Compute μ and σ for the population

      Mean =__5_____ Standard deviation=3.89_____

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

   X=0, z =-1.28_____   X=5, z=0_____ X=7, z=0.51_____
   X=3, z=-0.51_____   X=12, z=_1.79____

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_____ X=0, z=_-1.5_____ X=4, z=0.5_____ X=5, z=1_____

      X=1, z=-1_____

      X=2, z=-0.5_____ X=4, z=0.5_____

16. There are 40 black marbles, 20 blue marbles, and 4 red marbles in a jar.

   a. What is the probability of selecting one red marble?
      _4/64_=0.0625_____

   b. What is the probability of selecting one black marble? 40/64 =0.625

      _____

   c. What is the probability of selecting one blue marble? _20/64 =
      =0.3125_____

d. Which has the highest probability of being selected? _____0.625 for black marbles_____

e. Which has the lowest probability of being selected? ___0.0625 for red marbles_____

17. Probability values range from _____0 (0%0_____ to _____1(100%)_____.

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

    1. ___symmetrical shape

    _____

    2. ___mean, median and mode have same value

    _____

    3. ____more scores located near the mean

    _____

19. In a normal population of IQ scores, what percent of people have "average" IQ's?

Answer _____68.26%_____

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

Answer ___2.28%_____

21. Answer the following questions based on a distribution with a $\mu = 25$ and $\sigma = 4$:

a. What range of scores is considered "average"? _____21_____ to _____29_____

b. What percentage of people has an average score? ____68.26%_____

c. What percentage of people has extremely high or extremely low scores? _4.56%_____

d. What *range of scores* (requires numbers to be noted in the blank spaces) have the highest probability of being selected? _____25_____ to ____29_____