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 a z score is that the + sign means the score above the mean. The – sign means the score below the mean.

2. What information is provided by the numerical value of the *z*-score?
   _The numerical value of the z score tells us the distance from the mean in 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_____

   b. $z = +.50$ Answer: ___.50_____

   c. $z = -1.00$ Answer:___-12_____

   d. $z = -0.25$ Answer:_____-0.75_____

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 =__.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 = 0.416 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 $\mu = 70$ 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 =_-0.83___ X = 84: z =_1.16__ X = 63: z =_-0.58__

   X = 54: z =_-1.3___ 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 =_-1.42__

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. $\mu = 40$ and $\sigma = 20$
    Answer: _*0.25*_____

    b. $\mu = 40$ and $\sigma = 10$
    Answer: _*0.5*_____

    c. $\mu = 40$ and $\sigma = 5$
    Answer: _*1*_____

    d. $\mu = 40$ and $\sigma = 2$
    Answer: __2.5_____

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

e. μ = 40 and σ = 4…….Answer: _41.2_____

f. μ = 40 and σ = 8…….Answer: _42.4_____

g. μ = 40 and 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: _central_____

b. μ = 45 and σ = 2……..Answer: _extreme_____

c. μ = 90 and σ = 20……..Answer: __extreme_____

d. μ = 60 and σ = 20……..Answer: _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: __ σ = 8_____

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

Answer: ___ σ = 8_____

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: _ X = 40 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: _ X = 90 μ = 70 and σ = 20__

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: _Both are equal_____

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= 0.514 X=3, z= -0.514 X=12, z= 1.799

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_____

b. What is the probability of selecting one black marble? _40/64_____

c. What is the probability of selecting one blue marble? __20/64_____

d. Which has the highest probability of being selected? __black_____

e. Which has the lowest probability of being selected? __red_____

17. Probability values range from __0 (0%)_____ to ____1 (100%)_____.

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

1. _It is symmetrical in shape.
2. _All measures of central tendency are located in center & all have the same value.
3. _More scores are located near the mean, than scores that are away from the mean.

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

Answer _68.13%__

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? _2.28%__

    d. What *range of scores* (requires numbers to be noted in the blank spaces) have the highest probability of being selected? ___50____ to ___50____