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? ___+ of a z-score tells us that it is above the mean, while - tells us that it is below the mean of a distribution_____

2. What information is provided by the numerical value of the *z*-score? _____a it tells us that how many standard deviation to its mean, that is its distance from the mean_____

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 point above mean_____

   b. $z = +.50$ Answer: ____60 point above mean_____

   c. $z = -1.00$ Answer:_____12 point below mean_____

   d. $z = -0.25$ Answer:_____3 point below 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 =__0.08_

   X = 30: z =__-0.83_ X = 25: z =_-1.23__ 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 = __-0.08__ 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. $\mu = 40$ 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. $\mu = 40$ and $\sigma = 4$……Answer: ____41.2_____

f. $\mu = 40$ and $\sigma = 8$……Answer: ____42.4_____

g. $\mu = 40$ and $\sigma = 16$……..Answer: _____44.8_____

h. $\mu = 40$ and $\sigma = 32$……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. $\mu = 45$ and $\sigma = 10$……..Answer: ___ central score_____

b. $\mu = 45$ and $\sigma = 2$……..Answer: ____ extreme score____

c. $\mu = 90$ and $\sigma = 20$……..Answer: ____ extreme score___

d. $\mu = 60$ and $\sigma = 20$……..Answer: ___ central score_____

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: _____ $\sigma = 4$_____

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

Answer: _____$\sigma = 8$_____

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

Answer: ___ a score of X = 40_____

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: __ a score of X = 90_____

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: ____both the same 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? ____0.0625_____

    b. What is the probability of selecting one black marble? ____0.625_____

    c. What is the probability of selecting one blue marble? _____0.3125_____

    d. Which has the highest probability of being selected? _____ black_____

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

17. Probability values range from ____0 (0%)_____ to _____1 (100%)_____.

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

    1. _____ its shape is symmetrical_____

    2. ___Its central tendency measurement is right at center, and all have the same value (mean, median, mode)____

    3. ____most scores located near the mean_____

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

    Answer ____68%: the average means people IQ score within one standard deviation from the mean. That is the range fall within the 1 standard deviation above and below the mean_____

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

    Answer _____ 5%: the percentage that are located or below 2 standard deviation are considered extremely low, that since 95% are within the 2 standard deviation from the mean._____

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%_____

    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? ___17_____ to ___33____