

## Statistics for Psychology, 6e (Aron/Coups/Aron)

### Chapter 3      Some Key Ingredients for Inferential Statistics: Z Scores, the Normal Curve, Sample versus Population, and Probability

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**Note:** Some problems require the normal curve table, which can be copied from the textbook's Appendix (Table A-1).

- 1) In a distribution of Z scores, the mean is always

A) 10  
B) 1  
C) 0  
D) 50

Answer: C

- 2) The variance of a distribution of Z scores is always

A)  $\Sigma Z / N$   
B)  $(Z) (M + SD)$   
C) 0  
D) 1

Answer: D

- 3) A psychologist is most likely to calculate Z scores in order to

A) compare scores obtained from two different scales.  
B) compare the skew of two different distributions.  
C) determine how far above or below the median a score is.  
D) determine the shape of a distribution of scores.

Answer: A

- 4) Which of the following statements regarding Z scores is FALSE?

A) It indicates whether the raw score is above or below average.  
B) It indicates whether or not a distribution is skewed.  
C) It indicates the percentage of cases between that score and the mean.  
D) It is sometimes referred to as a standard score.

Answer: B

- 5) The raw score that corresponds to a Z score of 2.0 obtained from a distribution with a mean of 80 and a standard deviation of 10 is

A) 82  
B) 90  
C) 100  
D) 170

Answer: C

- 6) If the mean of a test is 13 and its standard deviation is 3, the Z score for a person with a raw score of 7 is
- A) -2
  - B) -1
  - C) 1
  - D) 2

Answer: A

- 7) The normal curve is most likely to be described as
- A) bimodal and roughly symmetrical.
  - B) unimodal, roughly symmetrical, and bell-shaped.
  - C) skewed to the right.
  - D) a roughly symmetrical U-shape.

Answer: B

**The questions below (# 8 – 10) are based on the following scenario.**

**Molly wants to pursue a graduate degree at New University but is unsure whether to specialize in law or medicine. To help her decide, she takes the MCAT and LSAT exams.**

**LSAT: Molly's score = 120; Students at New University:  $M = 150$ ,  $SD = 15$**

**MCAT: Molly's score = 52; Students at New University:  $M = 40$ ,  $SD = 6$**

- 8) Molly's Z scores were:
- A) LSAT,  $Z = 2.00$ ; MCAT  $Z = 2.00$
  - B) LSAT,  $Z = 2.00$ ; MCAT  $Z = -2.00$
  - C) LSAT,  $Z = -2.00$ ; MCAT  $Z = 2.00$
  - D) LSAT,  $Z = -2.00$ ; MCAT  $Z = -2.00$
- 9) In relation to the other people at New University, on which test did Molly get the better score?
- A) the LSAT
  - B) the MCAT
  - C) the scores were equal
  - D) it is impossible to say without more information

Answer: B

- 10) Using the percentage approximations for the normal curve, the percentage of people having a lower score than Molly on the LSAT would be:
- A) 2%
  - B) 14%
  - C) 48%
  - D) 98%

Answer: A

- 11) If the mean score on a creativity test is 20, the standard deviation is 5, and the distribution is normal, the percentage of people who would obtain scores between 15 and 25 is
- A) 34%
  - B)  $14\% + 34\% = 48\%$
  - C) 50%
  - D)  $34\% + 34\% = 68\%$

Answer: D

- 12) If the mean score on a stress scale is 5, the standard deviation is 2, and the distribution is normal, what would be the mean value when converted to a Z distribution?
- A) 0
  - B) 2
  - C) 5
  - D) not enough information to make a determination

Answer: A

- 13) If the mean score on a stress scale is 5, the standard deviation is 2, and the distribution is normal, the percentage of people who would obtain scores between 5 and 9 is
- A) 34%
  - B)  $14\% + 34\% = 48\%$
  - C) 50%
  - D)  $34\% + 34\% = 68\%$

Answer: B

- 14) Using the percentage approximations for the normal curve, the percentage of scores between the mean and one standard deviation below the mean is
- A) 14%
  - B) 50%
  - C) 34%
  - D)  $14\% + 34\% = 48\%$

Answer: C

- 15) Using a normal curve table, if a person received a test score that is in the top 32% of all test scores, the person's Z score must be at least
- A) 0.46
  - B) 7.14
  - C) 12.55
  - D) 0.91

Answer: A

- 16) Using a normal curve table, the percentage of scores between a Z score of 1.29 and a Z score of 1.49 is
- A) 0.54%
  - B) 3.04%
  - C) 7.49%
  - D) 83.34%

Answer: B

- 17) Using a normal curve table, if a person has a score in the bottom 42% of all scores in a distribution, the highest Z score this person can have is
- A) -1.41
  - B) -0.94
  - C) -0.20
  - D) 0.25
- Answer: C
- 18) Using a normal curve table, if a person has a music aptitude score of 41, which equals a Z score of 1.3, the percentage of people having a higher score is
- A)  $40.32\% - 50\% = -9.68\%$
  - B)  $50\% - 40.32\% = 9.68\%$
  - C)  $100\% - 40.32\% = 59.68\%$
  - D)  $50\% + 40.32\% = 90.32\%$
- Answer: B
- 19) Using a normal curve table, if a person has a score of 4.78 on a test, which equals a Z score of 1.5, the percentage of cases that lie above this score is
- A)  $43.32\% - 50\% = -6.68\%$
  - B)  $50\% - 43.32\% = 6.68\%$
  - C)  $100\% - 43.32\% = 56.68\%$
  - D)  $50\% + 43.32\% = 93.32\%$
- Answer: B
- 20) Using a normal curve table, the Z score a person would need to be in the top 4% of his or her class on a particular test is
- A)  $4\% - 50\% = -46\%$ , which corresponds to a Z score of -1.75
  - B)  $50\% - 46\% = 4\%$ , which corresponds to a Z score of 0.10
  - C)  $50\% - 4\% = 46\%$ , which corresponds to a Z score of 1.75
  - D)  $34\% + 14\% - 4\% = 44\%$ , which corresponds to a Z score of 1.55 or 1.56
- Answer: C
- 21) Values that describe a sample and a population are
- A) called, respectively, parameters and statistics.
  - B) called, respectively, statistics and parameters.
  - C) both called parameters.
  - D) both called statistics.
- Answer: B
- 22) If an organizational psychologist conducts extensive interviews with 40 workers at a large factory to examine the morale among workers in general at that factory, the population is
- A) the 40 workers interviewed.
  - B) all the workers in the factory except the 40 interviewed.
  - C) all the workers in the factory.
  - D) all the workers necessary to create a normal distribution.
- Answer: C

- 23) If a student who wants to study alcohol use at a high school obtains a complete list of the students and has a blindfolded person select as many people as needed for the study, the student is conducting
- A) random selection.
  - B) haphazard selection.
  - C) specified selection.
  - D) quota selection.
- Answer: A
- 24) If a student who wants to study the effect of stress on memory recruits participants by posting a sign-up sheet for anyone willing to participate, the student is conducting
- A) random selection.
  - B) haphazard selection.
  - C) specified selection.
  - D) quota selection.
- Answer: B
- 25) The symbol used to indicate a population parameter is usually
- A) a Greek letter.
  - B) an ordinary letter with a tilde mark (~) or hat mark (^).
  - C) a Hebrew letter.
  - D) an ordinary letter with a bar over it.
- Answer: A
- 26) The symbol for the standard deviation of a sample is
- A)  $\sigma^2$
  - B)  $SD^2$
  - C)  $\sigma$
  - D)  $SD$
- Answer: D
- 27) The term relative frequency refers to
- A) the expected number of times a particular outcome of an experiment will be obtained.
  - B) the frequency of a particular result when an experiment is repeated.
  - C) the expected result if an experiment is repeated frequently.
  - D) the number of times something occurs relative to the number of times it could have occurred.
- Answer: D
- 28) The interpretation of probability that explains the fact that if a person were to roll a six-sided die an infinite number of times, one would expect to get a one 1/6 of the time, a two 1/6 of the time, and so on is the
- A) subjective interpretation.
  - B) objective interpretation.
  - C) long-run relative-frequency interpretation.
  - D) Bayesian interpretation.
- Answer: C

- 29) The interpretation of probability made by students who say there is about a 90% chance they will see a friend who has a class across the hall at the same time on any day is the
- A) subjective interpretation.
  - B) objective interpretation.
  - C) long-run relative-frequency interpretation.
  - D) Bayesian interpretation.

Answer: A

- 30) In a housing project there are 350 households in which English is spoken, 50 in which Spanish is spoken, and 100 in which the language is other than English or Spanish. If a psychologist approaches a house at random to conduct an interview, the chance that the language in that household will NOT be English is
- A)  $1 / 500 = .002$
  - B)  $50 / 350 = .14$
  - C)  $150 / 500 = .3$
  - D)  $150 / 350 = .43$

Answer: C

- 31) In a small private college, 80 students play baseball, 70 students play football, 50 students play basketball, and 550 students do not play any sport. If a student is approached at random, what is the probability that he/she will play baseball or football?
- A)  $150 / 550 = .27$
  - B)  $150 / 750 = .20$
  - C)  $200 / 550 = .36$
  - D)  $550 / 750 = .73$

Answer: B

- 32) The fact that probabilities are proportions means that they
- A) have to be larger than one.
  - B) cannot be lower than zero or more than one.
  - C) cannot be lower than zero or more than .05.
  - D) can be either a positive or a negative number.

Answer: B

- 33) The traditional view about the normal curve in psychology is that normal curves are
- A) rare in nature, but often occur in psychological studies.
  - B) common in nature, but psychological measures rarely yield normally distributed scores.
  - C) almost guaranteed because of the way psychological measures are developed.
  - D) rare both in nature and in the distributions of scores in psychological research.

Answer: C

- 34) Following his review of a number of large data sets obtained from measures widely used in psychology research, Micceri concluded that most of the distributions
- A) closely approximated the normal curve.
  - B) were skewed to the left due to pronounced ceiling effects.
  - C) were much flatter (kurtotic) than the normal curve.
  - D) were not normal.

Answer: D

- 35) A sample's representativeness is
- A) more important to psychologists who are interested in relationships between variables.
  - B) more important to sociologists who are interested in a population's mean and variance.
  - C) equally important for both psychologists and sociologists.
  - D) not at all important for either psychologists or sociologists.
- Answer: B
- 36) The most accurate statement about research articles in psychology is that
- A) normal curves and method of selection are occasionally mentioned, and probability is rarely discussed except in terms of statistical significance.
  - B) normal curves and probabilities are rarely mentioned, but the method of sampling is almost always described.
  - C) normal curves and probabilities are almost always mentioned, but populations and samples are rarely mentioned.
  - D) normal curves, probabilities, samples and populations are all almost always described.
- Answer: A
- 37) The probability rule that applies when two mutually exclusive outcomes are possible is the
- A) addition rule.
  - B) subtraction rule.
  - C) multiplication rule.
  - D) division rule.
- Answer: A
- 38) The probability rule that applies when figuring the probability of getting both of two independent outcomes is the
- A) addition rule.
  - B) subtraction rule.
  - C) multiplication rule.
  - D) division rule.
- Answer: C
- 39) If a sophomore class is 50% women, the junior class is 45% women, and the senior class is 55% women, the probability of drawing a woman who is a junior is said to be
- A) additive.
  - B) conditional.
  - C) multiplicative.
  - D) dependent.
- Answer: B
- 40) If the sophomore class is 50% women, the junior class is 45% women, and the senior class is 55% women, the probability of drawing a woman who is a junior is
- A) 45%
  - B) 50%
  - C) 55%
  - D) 95%
- Answer: A

- 41) The number of standard deviations a score is above or below the mean is indicated by a(n) \_\_\_\_\_.  
Answer: Z score
- 42) The formula for changing a Z score to a raw score is \_\_\_\_\_.  
Answer:  $X = (Z)(SD) + M$
- 43) The formula for changing a raw score to a Z score is \_\_\_\_\_.  
Answer:  $Z = (X - M) / SD$
- 44) A Z score also may be called a(n) \_\_\_\_\_.  
Answer: standard score
- 45) In a standardized distribution, the mean is always \_\_\_\_\_ and the standard deviation is always \_\_\_\_\_.  
Answer: 0 ; 1
- 46) In a normal curve, the percentage of the scores between one and two standard deviations above the mean is approximately \_\_\_\_\_.  
Answer: 14%
- 47) In a normal curve, the percentage of the scores lower than two standard deviations below the mean is approximately \_\_\_\_\_.  
Answer: 2%
- 48) The percentage of scores between the mean and any particular Z score may be found in a(n) \_\_\_\_\_.  
Answer: normal curve table
- 49) The larger group to which a researcher makes inferences based on the particular group of participants studied is a(n) \_\_\_\_\_.  
Answer: population
- 50) The particular set of people enrolled in a study intended to be representative of a larger population is a(n) \_\_\_\_\_.  
Answer: sample
- 51) The type of sampling that begins with a complete list of all the members of the population is \_\_\_\_\_ sampling.  
Answer: random, probability
- 52) A survey conducted by giving a questionnaire to the people met in a shopping mall who are willing to complete the questionnaire is an example of \_\_\_\_\_ selection.  
Answer: haphazard
- 53) The mean, standard deviation, and the variance of a population are called population \_\_\_\_\_.  
Answer: parameters



- 54) The mean, standard deviation, and variance of a sample are called sample \_\_\_\_\_.  
Answer: statistics
- 55) \_\_\_\_\_ is to  $M$  as  $\sigma$  is to  $SD$ .  
Answer:  $\mu$
- 56) When discussing a population, the symbol for the mean is \_\_\_\_\_, and the symbol for the standard deviation is \_\_\_\_\_.  
Answer:  $\mu$  ;  $\sigma$
- 57) The expected relative frequency of a particular outcome is \_\_\_\_\_.  
Answer: probability
- 58) In the context of probability, the result of an experiment, or virtually any event (e.g., a coin coming up heads or that it will rain tomorrow), is a(n) \_\_\_\_\_.  
Answer: outcome
- 59) The understanding of probability as the proportion of a particular outcome that will be obtained if an experiment is repeated many times is the \_\_\_\_\_ interpretation of probability.  
Answer: long-run relative-frequency
- 60) The understanding of probability as the degree of certainty that a particular outcome will occur is the \_\_\_\_\_ interpretation of probability.  
Answer: subjective
- 61) If the probability of something happening is 3 out of 100, this can be written symbolically as \_\_\_\_\_.  
Answer:  $p = .03$
- 62) When  $p = 0$ , you can conclude that the outcome \_\_\_\_\_.  
Answer: will definitely not occur; is impossible
- 63) The addition rule of probability is also known as the \_\_\_\_\_ rule.  
Answer: "or"
- 64) The multiplication rule of probability is also known as the \_\_\_\_\_ rule.  
Answer: "and"
- 65) If the probability of one event depends on the occurrence of a second event, the probability of the first event is said to be \_\_\_\_\_ on the second event.  
Answer: conditional
- 66) A social psychologist plans to conduct a survey of district attorneys' attitudes toward the death penalty. What would be the best way to go about selecting the sample of district attorneys to study? Explain what you would do and why to a person who is unfamiliar with research methods or statistics.

- 67) You want to conduct a survey of the students in a large dormitory. The survey will involve intensive interviews with each person who participates, so it will not be practical to interview everyone. What would be the best way to select the particular individuals to interview? (Presume that whomever you would ask would be willing to participate.) Explain what you would do and why to a person who is unfamiliar with research methods or statistics.
- 68) After attending a marital therapy session, a wife's anxiety score is 75, while her husband's is 80. Overall, a wife's average anxiety score after such sessions is 70 ( $SD = 10$ ), and a husband's average anxiety score after such sessions is 85 ( $SD = 5$ ).
- Relative to others of the same gender, who has the lower anxiety score after the session?
  - Explain your answer to someone who has never had a course in statistics.
- Answer:
- Wife's  $Z = 0.5$ ; Husband's  $Z = -1$ . Thus, the wife is more anxious relative to her gender.
  - No answer in Test Bank.
- 69) A developmental psychologist was interested in how long it would take a particular 7-year-old child to complete three different aptitude tests as compared with 7-year-olds in the general population. The child's time for reading was 31 minutes (population:  $M = 29$ ,  $SD = 4$ ). For math, it was 26 minutes (population:  $M = 32$ ,  $SD = 2$ ). For science, it was 40 minutes (population:  $M = 31$ ,  $SD = 4$ ).
- Calculate the child's  $Z$  scores for each of the aptitude tests.
  - Which aptitude test(s) took the child substantially more time to complete as compared with other 7-year-olds?
  - Which aptitude test(s) took the child substantially less time to complete as compared with other 7-year-olds?
  - Explain your answers to someone who has never had a course in statistics.
- Answer:
- Reading  $Z = 0.5$ ; Math  $Z = -3$ ; Science  $Z = 2.25$ .
  - The child took substantially more time on the Science test.
  - The child took substantially less time on the Math test.
  - No answer in Test Bank.
- 70) Suppose adults in a particular town drive a mean of 65 mph with a standard deviation of 15 mph. Using the normal curve table,
- What percentage of adults drive below 35 mph?
  - What percentage of adults drive below 68 mph or above 85 mph?
  - What percentage of adults drive between 56 and 80 mph?
  - At what speed does someone need to drive to be included in the top 10%?
  - At what speed does someone need to drive to be included in the bottom 25%?
  - Explain your answers to a person who is familiar with mean, standard deviation, and  $Z$  scores, but not with normal curve percentages.
- Answer:
- $Z = -2.00$ , so 2.28%
  - $Zs = 0.20$  and 1.33, so 67.11%
  - $Zs = -0.60$  and 1.00, so 56.70%
  - $Z = 1.29$ , so  $X = 84.35$  mph
  - $Z = -0.68$ , so  $X = 54.80$  mph
  - No answer in Test Bank.

- 71) On a test of marital intimacy, husbands' scores are normally distributed with a mean of 140 and a standard deviation of 25.
- Using the normal curve approximation rules, approximately what percentages of husbands have scores above 190, below 165, and below 115?
  - Illustrate your answer with a sketch.
  - Explain your answers to a person who is familiar with mean, standard deviation, and Z scores, but not with normal curve percentages.

Answer:

- $Z = 2$ , so 2%;  $Z = 1$ , so 84%;  $Z = -1$ , so 16%
- No answer in Test Bank.
- No answer in Test Bank.

- 72) The number of words in the active vocabulary of children of a particular age is normally distributed with a mean of 3000 and a standard deviation of 500.
- Using the normal curve approximation rules, how many words would a child of this age have to know to be in the top 2%, the top 16%, and the top 98%?
  - Illustrate your answer with a sketch.
  - Explain your answers to a person who is familiar with mean, standard deviation, and Z scores, but not with normal curve percentages.

Answer:

- $Z = 2$ , so  $X = 4000$ ;  $Z = 1$ , so  $X = 3500$ ;  $Z = -2$ , so  $X = 2000$
- No answer in Test Bank.
- No answer in Test Bank.

- 73) The length of conversations between supervisors and workers in a certain manufacturing industry is normally distributed with a mean of 4.0 minutes and a standard deviation of 0.8 minutes.
- Use the normal curve table to determine the percentage of conversations that are longer than 4.4 minutes, longer than 5 minutes, longer than 3 minutes, and shorter than 2 minutes.
  - Illustrate your answer with a sketch.
  - Explain your answers to a person who is familiar with mean, standard deviation, and Z scores, but not with normal curve percentages.

Answer:

- $Z = 0.50$ , so 30.85%;  $Z = 1.25$ , so 10.56%;  $Z = -1.25$ , so 89.44%;  $Z = -2.50$ , so 0.62%
- No answer in Test Bank.
- No answer in Test Bank.

- 74) On a standard test of optimism, scores of patients diagnosed with a particular disease are normally distributed with a mean of 20 and a standard deviation of 5.
- Use the normal curve table to determine the score a patient needs to be included among the top 5%, among the top 20%, and among the bottom 10% of optimism scores.
  - Illustrate your answer with a sketch.
  - Explain your answers to a person who is familiar with mean, standard deviation, and Z scores, but not with normal curve percentages.

Answer:

- $Z = 1.64$ , so  $X = 28.2$ ;  $Z = 0.84$ , so  $X = 24.2$ ;  $Z = -1.28$ , so  $X = 13.6$
- No answer in Test Bank.
- No answer in Test Bank.

- 75) Advanced topic: In a school band, 9 kids play string instruments, 10 kids play woodwind instruments, 7 kids play brass instruments, and 4 kids play percussion instruments.
- What is the probability that you randomly select a kid who plays a string or percussion instrument?
  - What is the probability that you randomly select a kid who does not play a brass instrument?

Answer:

A) .43

B) .77