SCM 200 – Exam 1 – Practice Exam Solutions

1. A – 3.58

   μ = (4 + 8 + 12 + 12 +14) / 5 = 10

   $$\sigma^2 = \frac{Sum\ of\ squared\ deviations}{Number\ of\ observations} = \frac{\sum(X - \mu)^2}{N}$$

   $$\sigma^2 = \frac{(4 - 10)^2 + (8 - 10)^2 + (12 - 10)^2 + (12 - 10)^2 + (14 - 10)^2}{5}$$

   $$\sigma^2 = \frac{36 + 4 + 4 + 4 + 16}{5} = \frac{64}{5}$$

   $$\sigma^2 = 12.8$$

   $$\sigma = \sqrt{12.8} = 3.58$$

2. D – Sampling error

3. C – Mean < Median. Look at the graphs in the packet on this concept for clarification of the concept.

4. C – 7.5 minutes

   $$\mu = (30 + 30 + 10 + 30) / 4 = 25$$

   $$MAD = \frac{\sum|X - \mu|}{N}$$

   $$MAD = \frac{|30 - 25| + |30 - 25| + |10 - 25| + |30 - 25|}{4}$$

   $$MAD = \frac{5 + 5 + 15 + 5}{4} = 7.5\ minutes$$

5. A – 12 observations. The observations used to construct the stem and leaf plot are 31, 34, 35, 42, 42, 42, 43, 45, 48, 64, 65, and 66. You know there are no observations between 50 and 59 because there are no numbers in the leaf column when the stem is 5.

6. A – 9, 8

   Mode = Most common value = 9

   Mean = (4 + 9 + 7 + 11 + 9) / 5 = 8

7. C – 81

   Total units = 40 + 50 + 110 = 200

   W_A = 40 / 200 = 0.20
   W_B = 50 / 200 = 0.25
   W_C = 110 / 200 = 0.55

   Weighted average = (.20)(40) + (.25)(50) + (.55)(110) = 81

8. C – When a distribution is negatively skewed, it has more values on the right of the distribution than the left. D is incorrect because statistics relate to samples, not populations.

9. A – Feet. The units of the MAD will simply be the units for the problem.

10. C – Standard deviation

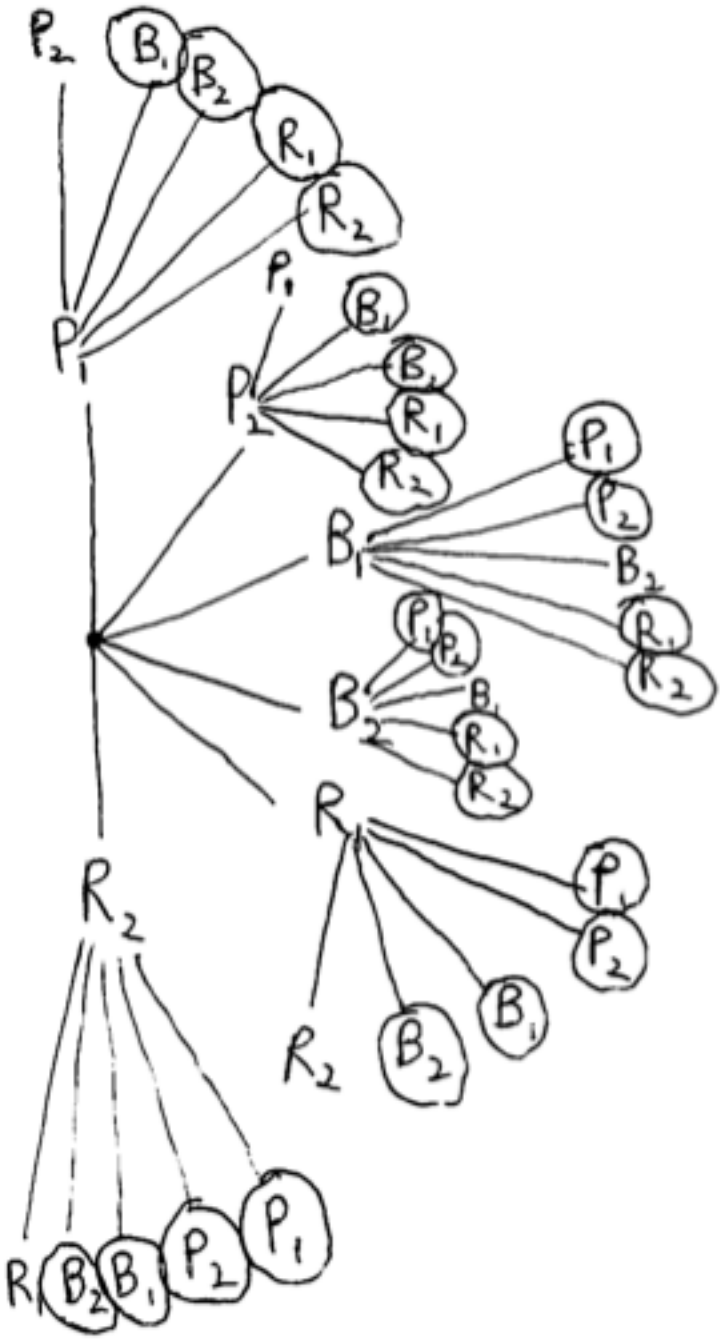
11. A – Hours. The units of standard deviation will simply be the units for the problem.

12. B – Median

13. C – The coefficient of variation is an absolute measure is a false statement because the coefficient of variation is a relative measure and has no units.

14. D – .80

Number of combinations = 30
Pairs not for same concert = 24
Probability = 24 / 30 = 0.80



15. C – No, because the values of X are not numbers.

16. D – 20

    E(x) = 0(0.4) + 5(0.2) + 10(0.4) = 5

    $\sigma^2 = \sum[x - E(x)]^2 P(x)$
    $\sigma^2 = (0 - 5)^2(0.4) + (5 - 5)^2(0.2) + (10 - 5)^2(0.4)$
    $\sigma^2 = 10 + 0 + 10 = 20$

17. C – Statistical inference

18. A – Mean = Median

19. D – 2.6, 3

    Mean = (0 + 1 + 1 + 1 + 2 +2 +2 +2 +3 +3 +3 +3 +3 +3 +3 + 4 + 4 +4 +4 + 4) / 20 = 2.6

    Median = 3

20. B – 2

    $\bar{x} = \frac{9 + 7 + 11}{3} = 9$

    $s^2 = \frac{Sum\ of\ squared\ deviations}{Number\ of\ observations - 1} = \frac{\sum(x - \bar{x})^2}{n - 1}$

    $s^2 = \frac{(9 - 9)^2 + (7 - 9)^2 + (11 - 9)^2}{3 - 1} = \frac{0 + 4 + 4}{2} = 4$

    $s = \sqrt{4} = 2$

21. B – A percentile of a population is an example of parameter. Remember that parameters relate to population and statistics relate to samples.

22. B – 20

$$\bar{x} = \frac{40 + 50 + 60}{3} = 50$$

$$s^2 = \frac{Sum\ of\ squared\ deviations}{Number\ of\ observations\ -\ 1} = \frac{\sum(x\ -\ \bar{x})^2}{n\ -\ 1}$$

$$s^2 = \frac{(40 - 50)^2 + (50 - 50)^2 + (60 - 50)^2}{3 - 1} = \frac{100 + 0 + 100}{2} = 100$$

$$s = \sqrt{100} = 10$$

$$CV = \frac{10}{50}(100) = 20$$

23. C – Only A. There are two factors you are looking at for a problem like this:

    1) Are all of the P(X) probabilities positive? It is not possible to have a negative value for P(X). However, it does not matter if the values for X are negative or positive.
    2) Do all of the P(X) probabilities add up to one? All of the probabilities need to add to one for the distribution to be valid.

24. D – 60

    E(x) = 10(0.3) + 20(0.4) + 30(0.3) = 20

    $\sigma^2 = \sum[x - E(x)]^2 P(x)$
    $\sigma^2 = (10 - 20)^2(0.3) + (20 - 20)^2(0.4) + (30 - 20)^2(0.3)$
    $\sigma^2 = 30 + 0 + 30 = 60$

25. D – When its outcomes are whole numbers or counts.

26. D – It can be zero or positive; however, it can never be negative.

27. A – The mean is average of all data values.

28. E – None of these values

29. E – Simple event

30. C – Hours squared

31. B – The value of MAD ≥ 0

32. A – It is possible for them to be positive or negative. Expressing the grades as standard scores means that the grades are expressed as Z-scores. The Z-score will be positive when the observed value is above the mean, and it will be negative when the observed value is below the mean. Z-scores are relative measures, not absolute measures.

33. A – 1 variable is shown in a histogram.

34. A – Skewed to the right (positive)

35. E – The median is the only measure of center in a boxplot.

36. D – The student made a mistake because standard deviation is always a positive value.

37. D – Coefficient of variation

38. B – Sampling error is the different between the sample statistic and the population parameter.

39. D – Cluster sample because Megabus first broke passengers into groups, aisle and window. Then they selected one group, window, and sampled everyone in that group.

40. C – There are more values on the left than the right. This is easily seen by looking at a graph of a distribution skewed to the right.

41. B – The distribution will be symmetric when the mean is equal to the median.

42. B – Continuous

True / False

43. False – Relative frequency is when you assign probabilities using what has occurred in the past. Subjective judgment is an educated guess for the probabilities.

44. True

45. True

46. False – The model of a car is an example of qualitative data

47. True

48. True

49. False – Statistics relate to samples. Parameters relate to populations.

50. False – Standard deviation will always be positive.

51. True – 95% of data values fall within two standard deviations of the mean. See the section on the empirical rule in the packet for more information on this concept.

52. False

$$CV = \frac{10}{200}(100) = 5$$

53. False – It is not possible to have cumulative relative frequencies greater than one, or 100%.

54. True

55. True – However, it is not possible for P(X) to be a negative number.

56. False – Discrete probability distributions consist only of whole numbers or counts.

57. False – X and E(X) can be negative; however, P(X) can never be negative.

58. True – A stem and leaf plot lists all of the observations; however, it is not possible to determine all of the individual observations from a boxplot.

59. False – It is possible for your range of values to all be negative numbers.

60. False – This is the definition of the median, not the mean.

61. True

62. True

63. False – When a distribution is symmetric and bell-shaped, approximately 99.7% of all values fall within **three** standard deviations of the mean

64. True

65. False – The mode is a resistant statistic.

66. True

67. False – Prices are numeric values so they are considered quantitative data.

68. True – A statistic is a measure of a sample.

69. False – The measures of center are only one way to summarize a distribution. Range is an example of a way to summarize a dataset that is not a measure of center.

70. True – Expected value of the long-run average of how frequently an event will occur. Often expected value will be a decimal while all of the numbers in the distribution are integers.

71. True

72. False – Prices are examples of quantitative data.

73. True – If you take the square root of a number between zero and one, the result will be larger than the original number.

74. False – Expected value is what expect the long-run average value of X to equal over infinite number of trails.

75. True – The middle 50% of incomes represent the IQR. We know the median must be located within the IQR.

76. False – If the middle 70% of exam scores is between 50 and 80, then the other 30% would be split between the two ends of the distribution. The 30^{th} percentile is the value with 30% of scores below it, and the 70^{th} percentile is the value with 70% of scores below it.

77. True

78. B – Systematic sampling is when a researcher selects every x^{th} unit to be part of the sample.

79. D – An Excel function always begins with an equal sign, and the function to find the smallest value is =MIN. In parenthesis are the cell references of the values that should be included.

80. D – When making a histogram in Excel, there are options for “bin range” and “chart output” but not for qualitative data. A histogram uses quantitative data.