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SCM 200 – Final Exam – Practice Exam Solutions

1. A – 9, 8

Mode = Most common value = 9

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

2. C – 81

Total units = $40 + 50 + 110 = 200$

$W_A = 40 / 200 = 0.20$

$W_B = 50 / 200 = 0.25$

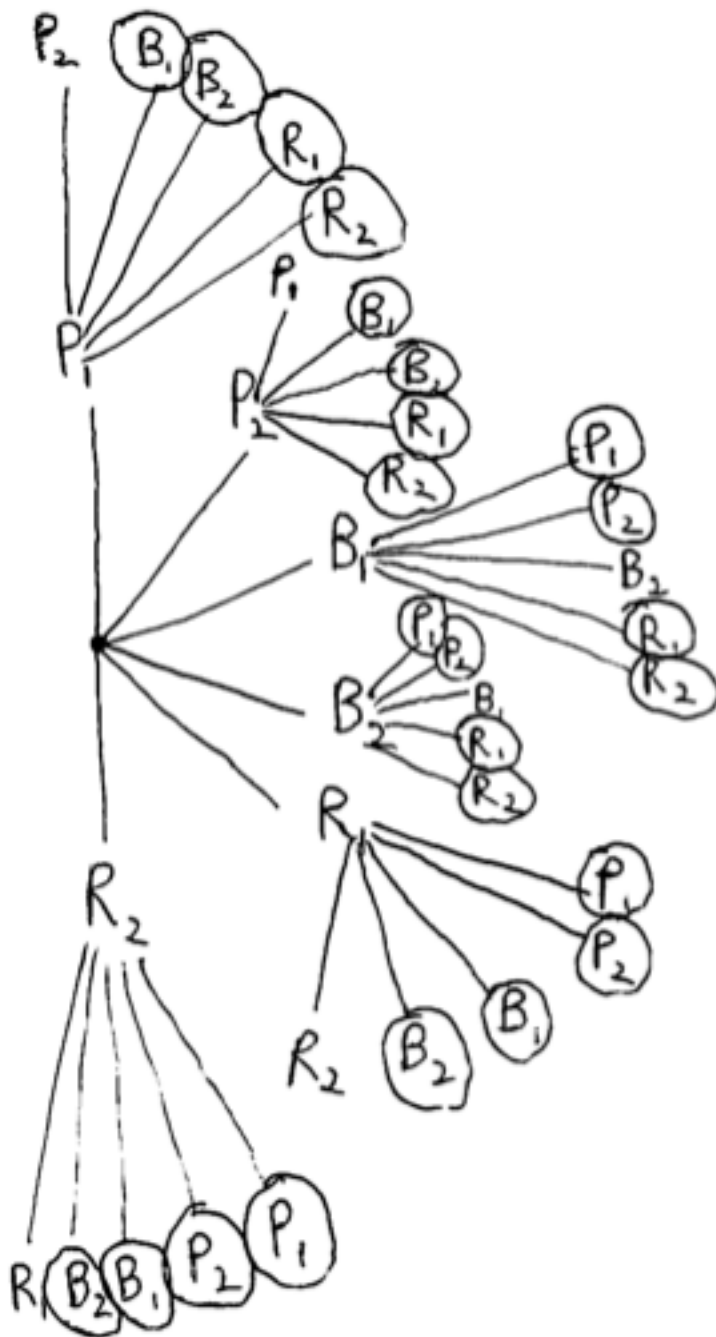
$W_C = 110 / 200 = 0.55$

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

3. 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.
4. A – Feet. The units of the MAD will simply be the units for the problem.
5. C – Standard deviation
6. A – Hours. The units of standard deviation will simply be the units for the problem.
7. B – Median
8. 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.

9. D - .80

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



10. D – 20

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

$$\sigma^2 = \sum [x - E(x)]^2 P(x)$$

$$\sigma^2 = (0 - 5)^2(0.4) + (5 - 5)^2(0.2) + (10 - 5)^2(0.4)$$

$$\sigma^2 = 10 + 0 + 10 = 20$$

11. D – 2.6, 3

$$\text{Mean} = (0 + 1 + 1 + 1 + 1 + 2 + 2 + 2 + 2 + 3 + 3 + 3 + 3 + 3 + 3 + 3 + 3 + 4 + 4 + 4 + 4 + 4) / 20 = 2.6$$

$$\text{Median} = 3$$

12. B – 2

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

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

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

$$s = \sqrt{4} = 2$$

13. B – 20

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

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

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

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

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

14. D – 60

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

$$\sigma^2 = \sum [x - E(x)]^2 P(x)$$

$$\sigma^2 = (10 - 20)^2(0.3) + (20 - 20)^2(0.4) + (30 - 20)^2(0.3)$$

$$\sigma^2 = 30 + 0 + 30 = 60$$

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

16. B – 2.101

$$n = 19$$

$$df = 18$$

$$\text{Area of left tail} = (1 - 0.95) / 2 = 0.025$$

$$t\text{-value} = 2.101$$

17. C – Confidence intervals and hypothesis testing

18. A – 10th percentile value for the standard normal table > 10th percentile value for the t-distribution

$$z = -1.28$$

$$t = -1.383$$

19. B – The standard error of a mean can sometimes be larger than the corresponding population standard deviation.

20. A – $z = 1.96$ for a 95% level of confidence. Refer to the table in the review packet that lists the z-scores for common levels of confidence. You will see that answer A is the only correct statement. It is a good idea to have the z-scores for the common levels of confidence memorized.

21. E – 0.9501 to 1.0000

$$\mu = 26.8$$

$$\sigma = 0.8$$

$$\bar{x} = 26.6$$

$$n = 100$$

$$z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}} = \frac{26.6 - 26.8}{\frac{0.8}{\sqrt{100}}} = -2.50$$

Look up 2.50 in standard normal table = 0.0062

Probability of getting a sample mean $\leq 26.6 = 0.0062$

Probability of getting a sample mean $\geq 26.6 = 1 - 0.0062 = 0.9938$

22. D – 0.81 is the z-score that corresponds to the area 0.7910.

23. B – 23 minutes, 27 minutes

$$UCL = \mu + 3 \frac{\sigma}{\sqrt{n}} = 25 + 3 \left(\frac{4}{\sqrt{35}} \right) = 27 \text{ minutes}$$

$$LCL = \mu - 3 \frac{\sigma}{\sqrt{n}} = 25 - 3 \left(\frac{4}{\sqrt{35}} \right) = 23 \text{ minutes}$$

24. A – 0.25

$$p = X / n = 50 / 200 = 0.25$$

25. C – 1.68

$$n = 8$$

$$\pi = 3 / 10 = 0.30$$

$$\text{Var}(X) = n\pi(1 - \pi) = (8)(0.30)(1 - 0.30) = 1.68$$

26. C – Accept the claim by rejecting H_0

$$H_0: \mu = 26 \text{ min}$$

$$H_a: \mu < 26 \text{ min}$$

$$n = 4$$

$$df = 3$$

$$\alpha = 0.10$$

$$\bar{x} = \frac{24 + 24 + 20 + 24}{4} = 23$$

$$s = \sqrt{\frac{(24 - 23)^2 + (24 - 23)^2 + (20 - 23)^2 + (24 - 23)^2}{4 - 1}}$$

$$s = \sqrt{\frac{1 + 1 + 9 + 1}{3}} = 2$$

$$t = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}}$$

$$t = \frac{23 - 26}{\frac{2}{\sqrt{4}}} = \frac{-3}{1} = -3$$

$$0.025 < p\text{-value} < 0.050$$

Reject null hypothesis and accept alternative hypothesis.

27. A – 2.8 ± 0.243

$$\bar{x} = 2.8$$

$$n = 49$$

$$\sigma = 1.7$$

$$\text{Area of the tails} = (1 - 0.9556) / 2 = 0.0222$$

$$z\text{-value} = \pm 2.01$$

$$\bar{x} \pm (z) \left(\frac{\sigma}{\sqrt{n}} \right) = 2.8 \pm (2.01) \left(\frac{1.7}{\sqrt{49}} \right) = 2.8 \pm 0.243$$

28. A – 0.0000 to 0.0999

$$\mu = 72$$

$$\sigma = 8$$

$$X_{\text{High}} = 90$$

$$X_{\text{Low}} = 60$$

$$z = \frac{X - \mu}{\sigma}$$

$$z_{\text{High}} = \frac{90 - 72}{8} = 2.25$$

$$p_{\text{High}} = 1 - 0.9878 = 0.0122$$

$$z_{\text{Low}} = \frac{60 - 72}{8} = -1.50$$

$$p_{\text{low}} = 0.0668$$

$$p_{\text{Total}} = 0.0122 + 0.0668 = 0.0790$$

29. D – 0.5001 to 1.0000

$H_0: \mu = 660$

$H_a: \mu > 660$

$\sigma = 30$

$n = 49$

$\bar{x} = 652$

$$z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}} = \frac{652 - 660}{\frac{30}{\sqrt{49}}} = -1.87$$

Look up -1.87 in standard normal table = 0.0307

p-value = $1 - 0.0307 = 0.9693$

30. C – 0.10

Probability (when $t = 1.711$ at $df = 24$) = 0.950

Area to the right of the t-value = $1 - 0.950 = 0.05$

Multiply by 2 because it is a two tail (\neq) test = $0.05 \times 2 = 0.10$

31. C – Paired sample t-test for mean differences.

32. C – $H_a: \mu_D > 0$. The problem tells you that the difference is (Old – New). The chef wants to see if the new time is faster. If the new time is faster, the difference will be a positive number.

33. C – 8.18

$$t = \frac{\bar{D} - \mu_D}{\frac{S_D}{\sqrt{n}}} = \frac{1.8 - 0}{\frac{1.1}{\sqrt{25}}} = 8.18$$

34. E – Both C and D. If H_0 is rejected at a 1% level of significance, it will be rejected at higher levels of significance as well.

35. C – 75% of the variation in y can be explained by x.

36. E – Gym time, speed, and max bench press. You are looking for variables that have a p-value greater than 0.01.

37. A – (0.195, 0.405)

$$n = 100$$

$$p = 30 / 100 = 0.30$$

$$\text{Value to look up in z-table} = (1 - 0.9786) / 2 = 0.0107$$

$$\text{z-score} = 2.30$$

$$\text{Confidence interval} = p \pm z \sqrt{\frac{p(1 - p)}{n}}$$

$$0.30 \pm 2.30 \sqrt{\frac{0.30(1 - 0.30)}{100}} = 0.30 \pm 0.1054 = (0.195, 0.405)$$

38. C – Conclude claim is not true by rejecting H_0

$$n = 36$$

$$\mu_D = 11$$

$$\bar{D} = 13$$

$$S_D = 4$$

$$\alpha = 0.05$$

$$df = 35$$

$$H_0: \mu_D \leq 11 \text{ (claim)}$$

$$H_a: \mu_D > 11$$

$$t = \frac{\bar{D} - \mu_D}{\frac{S_D}{\sqrt{n}}} = \frac{13 - 11}{\frac{4}{\sqrt{36}}} = 3.00$$

$$0.005 < \text{p-value} < 0.001$$

39. B – 0.167

$$\hat{p} = \frac{(x_1 + x_2)}{(n_1 + n_2)} = \frac{100 + 150}{500 + 1,000} = 0.167$$

40. A – You use the coefficient of determination to find the value of the correlation coefficient. You know the sign on the correlation coefficient is negative because the regression equation has a negative slope.

$$R^2 = 0.64$$

$$r = \sqrt{0.64} = 0.8$$

41. B – 16%

$$r = 0.40$$

$$R^2 = 0.16$$

42. D – 676

$$\pi = 0.50$$

$$E = 0.05$$

$$z\text{-value in table} = (1 - 0.9906) / 2 = 0.0047$$

$$z\text{-score} = 2.60$$

$$n = \pi(1 - \pi) \left[\frac{z}{E} \right]^2 = 0.50(1 - 0.50) \left[\frac{2.60}{0.05} \right]^2 = 676$$

43. A – $t = 0.949$

$$s_p = \sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}}$$

$$s_p = \sqrt{\frac{(14 - 1)6^2 + (11 - 1)4^2}{14 + 11 - 2}} = \sqrt{\frac{628}{23}} = 5.23$$

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{s_p \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

$$t = \frac{(14 - 12) - (0)}{5.23 \sqrt{\frac{1}{14} + \frac{1}{11}}} = 0.949$$

44. C – $0.80 < p\text{-value} < 0.90$

$$t = 0.949$$

$$df = (14 + 11) - 2 = 23$$

45. B – The researcher can conclude a linear relationship exists between the variables because the p-value of 0.045 is less than the significance level of 0.05.

46. True – Make sure to double the value found using the t-table because the problem says that it is a two-tailed test.

47. False – Each units ads \$1,750 to the total cost.

48. False – The coefficient of determination is always positive, between 0 and 1. The correlation coefficient tells you about the slope of the regression equation because its value can be either positive or negative.

49. True

50. False

$$b_1 = r \frac{S_y}{S_x} = 0.88 \left(\frac{3.95}{5.50} \right) = 0.63$$

51. False

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

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

53. True

54. 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.

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

56. False

$$1 - 0.7698 = 0.2302$$

$$0.2302 / 2 = 0.1151$$

Look up 0.1151 in standard normal table: $z = \pm 1.20$

57. False

$$\pi = 0.75$$

$$n = 4$$

$$X = 3$$

$$P(X) = \frac{n!}{(n-x)!x!} \pi^x (1-\pi)^{n-x}$$

$$P(X) = \frac{4!}{(4-3)!3!} (0.75)^3 (1-0.75)^{4-3} = 0.4219$$

58. True

59. False – The statement would have been true if it said “All sampling distributions are probability distributions; however, not all probability distributions are sampling distributions.”

60. False – The null hypothesis is that the process is in control. The alternative hypothesis is that the process is out of control.