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

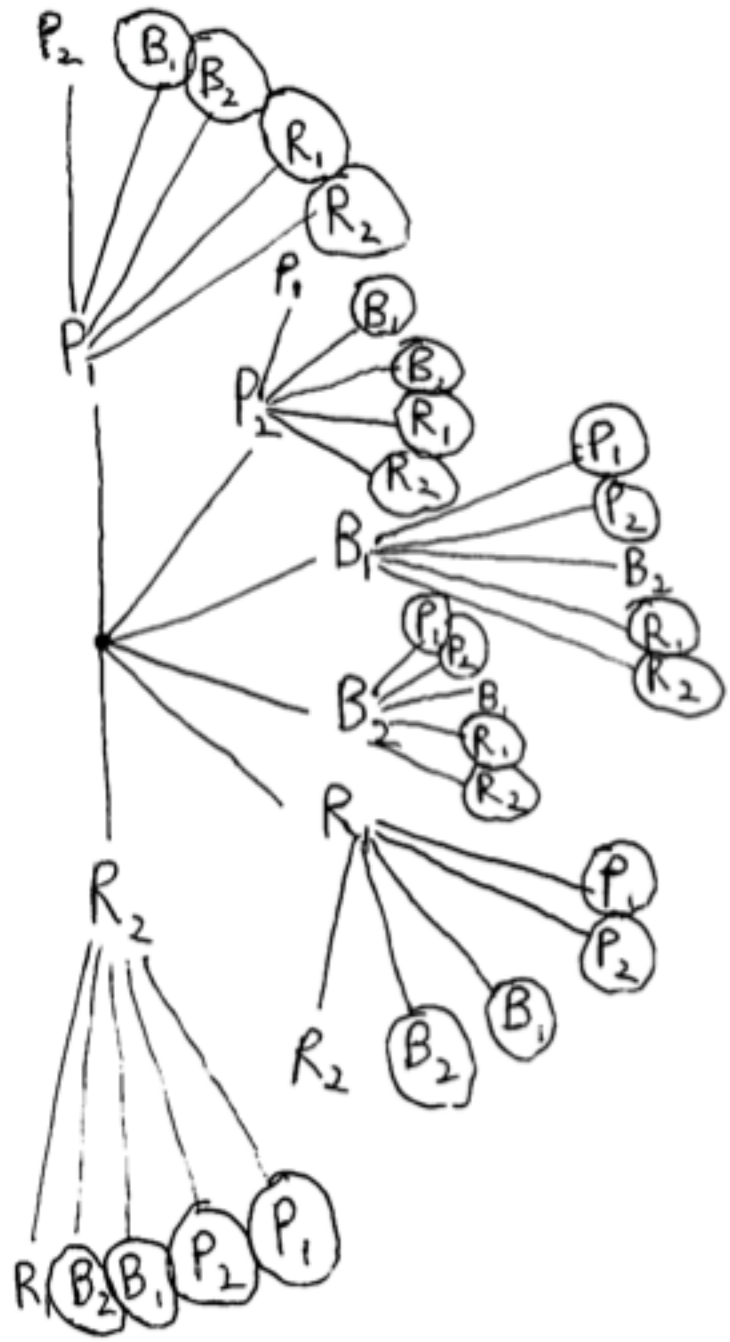
6. A – Hours. The units of standard deviation will simply be the units for the problem.

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

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

12. B – 2

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

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

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

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

13. B – 20

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

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

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

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

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

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

    Area of left tail = (1 – 0.95) / 2 = 0.025
    t-value = 2.101

17. C – Confidence intervals and hypothesis testing

18. A – 10^{th} percentile value for the standard normal table > 10^{th} 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 ≤ 26.6 = 0.0062
Probability of getting a sample mean ≥ 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

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

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

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 Ho

Ho: μ = 26 min
Ha: μ < 26 min

n = 4
df = 3
α = 0.10

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

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

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

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

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

0.025 < p-value < 0.050
Reject null hypothesis and accept alternative hypothesis.

27. A – 2.8 ± 0.243

$\bar{x} = 2.8$
$n = 49$
$\sigma = 1.7$

Area of the tails = (1 – 0.9556) / 2 = 0.0222
z-value = ±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

$\mu = 72$
$\sigma = 8$
$X_{High} = 90$
$X_{Low} = 60$

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

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

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

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

$p_{low} = 0.0668$

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

29. D – 0.5001 to 1.0000

Ho: μ = 660
Ha: μ > 660

σ = 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 be 2 because it is a two tail (≠) test = 0.05 x 2 = 0.10

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

32. C – Ha: $\mu_D > 0$. 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

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

34. E – Both C and D. If Ho 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

Value to look up in z-table = (1 – 0.9786) / 2 = 0.0107
z-score = 2.30

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

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

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

n =36
μ_D = 11
$\overline{D}$ = 13
S_D = 4
α = 0.05
df = 35

Ho: $\mu_D \leq 11$ (claim)
Ha: $\mu_D > 11$

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

0.005 < 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-value in table = (1 – 0.9906) / 2 = 0.0047
z-score = 2.60

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

43. A – t = 0.949

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

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

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

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

44. C – 0.80 < p-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 = ±1.20

57. False

    π = 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.