Chapter 12 Quiz Review Name: _____

Use Traditional or P-value method for each question.

1. In a recent Presidential election, a random sample of the percentage of voters who voted is shown. At $\alpha = 0.05$, is there a difference in the mean percentage of voters who voted? If there is a difference in means, use the appropriate test (Scheffe or Tukey) to determine where the difference(s) lie.

Northeast	Southeast	Northwest	Southwest
65.3	54.8	60.5	42.3
59.9	61.8	61.0	61.2
66.9	49.6	74.0	54.7
64.2	58.6	61.4	56.7

① $H_0: \mu_1 = \mu_2 = \mu_3 = \mu_4$
H_1: at least one mean is different from the others. (claim)

② C.V. = 3.49 p-value = 0.061

③ F = 3.23

④ Do not reject H_0.

⑤ There is not enough evidence to support the claim that at least one mean is different.

2. Random samples of summer gasoline prices per gallon are listed for three different states. Is there sufficient evidence of a different in mean prices? Use $\alpha = 0.01$. If there is a difference in means, use the appropriate test (Scheffe or Tukey) to determine where the difference(s) lie.

State 1	State 2	State 3
3.20	3.68	3.70
3.25	3.50	3.65
3.18	3.70	3.75
3.15	3.65	3.72

① $H_0: \mu_1 = \mu_2 = \mu_3$
H_1: at least one mean differs from the others. (claim)

② C.V. = 8.02 p-value = 2.102×10^{-6}

③ F = 77.692

④ Reject H_0

⑤ There is enough evidence to support the claim at least one mean is different from the others.

Tukey $s_w^2 = 0.00392$

$\bar{x}_1 = 3.195$ $\bar{x}_2 = 3.6325$ $\bar{x}_3 = 3.705$

$\bar{x}_1$ vs $\bar{x}_2$

$$q = \frac{(3.195 - 3.6325)}{\sqrt{\frac{0.00392}{4}}} = -13.98$$

C.V. = 5.43

$\bar{x}_1$ vs. $\bar{x}_3$

$$q = \frac{(3.195 - 3.705)}{\sqrt{\frac{0.00392}{4}}} = -16.29$$

* There is a significant difference between $\bar{x}_1$ + $\bar{x}_2$ and $\bar{x}_1$ + $\bar{x}_3$

$\bar{x}_2$ vs. $\bar{x}_3$

$$q = \frac{(3.6325 - 3.705)}{\sqrt{\frac{0.00392}{4}}} = -2.32$$

3. A lot of different factors contribute to air pollution. One particular factor, particulate matter, was measured for prominent cities of three continents. Particulate matter includes smoke, soot, dust, and liquid droplets from combustion such that the particle is less than 10 microns in diameter and thus capable of reaching deep into the respiratory system. The measurements are listed here. At the 0.05 level of significance, is there sufficient evidence to conclude a difference in means? If so, perform the appropriate test to find out where the differences in means are.

Asia	Europe	Africa
79 $\bar{X}_1 = 74$	34 $\bar{X}_2 = 35.5$	33 $\bar{X}_3 = 30.\bar{6}$
104 $s_1^2 = 694$	35	16
40	30 $s_2^2 = 29.\bar{6}$	43 $s_3^2 = 186.\bar{3}$
73	43	

$\bar{X}_{GM} = \frac{530}{11} = 48.\overline{18}$

$s_B^2 = 2114.98$

$s_W^2 = 317.96$

① $H_0: \mu_1 = \mu_2 = \mu_3$

H_1: at least one mean is different from the others. (claim)

② $d.f._N = 2$ $d.f._D = 11-3 = 8$ $C.V. = 4.46$

③ $F = \frac{2114.98}{317.96} = 6.65$

④ Reject H_0

⑤ There is enough evidence to support the claim that at least one mean is different

Scheffé Test

$F' = (3-1)(4.46) = 8.92$

$\bar{X}_1$ vs. $\bar{X}_2$

$F_S = \frac{(74-35.5)^2}{317.96\left[\frac{1}{4}+\frac{1}{4}\right]} \approx 9.32$

$\bar{X}_1$ vs. $\bar{X}_3$

$F_S = \frac{(74-30.\bar{6})^2}{317.96\left[\frac{1}{4}+\frac{1}{3}\right]} = 10.12$

$\bar{X}_2$ vs. $\bar{X}_3$

$F_S = \frac{(35.5-30.\bar{6})^2}{317.96\left[\frac{1}{4}+\frac{1}{3}\right]} = 0.13$

* There is a significant difference between $\bar{X}_1$ & $\bar{X}_2$ and between $\bar{X}_1$ & $\bar{X}_3$