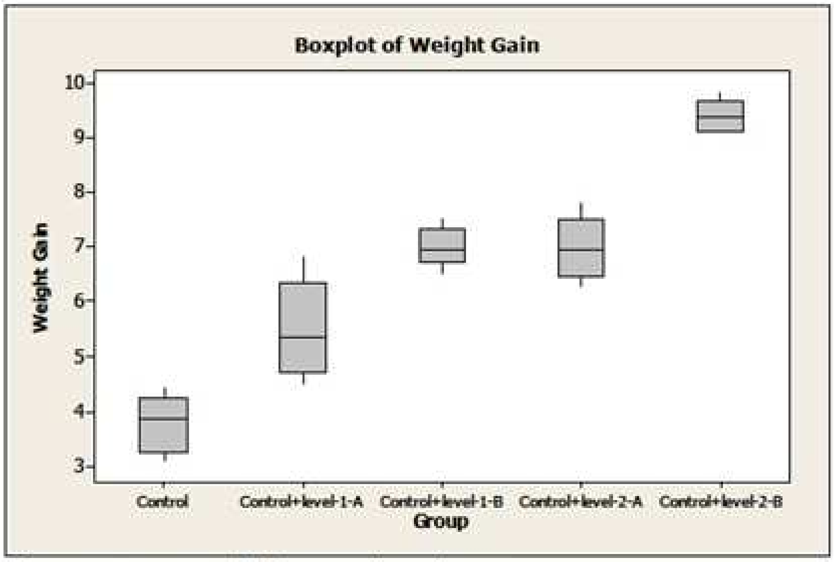
8.37

a. Boxplots are given here:



b. The summary statistics are given here:

Diet	n	Mean	Variance
Control	6	3.783	0.278
Control + Level 1 of A	6	5.500	0.752
Control + Level 2 of A	6	6.983	0.334
Control + Level 1 of B	6	7.000	0.128
Control + Level 2 of B	6	9.383	0.086

```
> lawstat::levene.test(ex8.37$WtGained,ex8.37$Group)
```

c.

```
Null hypothesis          All variances are equal
Alternative hypothesis   At least one variance is different
Significance level       α = 0.05
                              Test
Method                   Statistic  P-Value
Levene                        2.23    0.095
```

⇒ There is not significant evidence of a difference in the five variances. The boxplots do not reveal any deviations from the normality condition.

d. $H_0 : \mu_1 = \mu_2 = \mu_3 = \mu_4 = \mu_5$ versus H_a : There is a difference in the means.

One-way ANOVA: Weight Gain versus Group

```
Source  DF       SS      MS      F      P
Group    4  103.038  25.760  81.67  0.000
Error   25    7.885   0.315
Total   29  110.923
```

F = 81.67 and p-value < 0.001 ⇒ We reject the null hypothesis and conclude that there is significant evidence of a difference in the average weight gain under the five diets.

```
> summary(aov(WtGained ~ Group, data=ex8.37))
```

8.17

a. $H_0: \mu_{NE} = \mu_{SE} = \mu_{MW} = \mu_W$ versus H_a: There is a difference in the means.

Reject H_0 if $F \geq F_{0.05,3,20} = 3.10$

$$SSW = 5[0.0273^2 + 0.0638^2 + 0.0274^2 + 0.0179^2] = 0.0294$$

$$\bar{y}_{..} = 0.46875 \Rightarrow$$

$$SSB = 6[(0.827 - 0.46875)^2 + (0.343 - 0.46875)^2$$

$$+(0.585 - 0.46875)^2 + (0.120 - 0.46875)^2] = 1.676$$

$$F = \frac{1.676/3}{0.0294/20} = 380.05 > 3.10 \Rightarrow$$

Thus, we reject H_0 and conclude there is a significant difference in the proportions of people who thought the EPA standards were not stringent enough for the four regions.

The data was analyzed using a computer program (output below), and the value of F was determined to be 379.34. The difference is due to rounding.

One-way ANOVA: Proportion versus Region

```
Source  DF       SS       MS       F      P
Region   3  1.67385  0.55795  379.34  0.000
Error   20  0.02942  0.00147
Total   23  1.70326
```

```
> summary(aov(Proportion ~ Region, data=ex8.17))
            Df Sum Sq Mean Sq F value Pr(>F)
Region       3 1.6738  0.5579   379.3 <2e-16 ***
Residuals   20 0.0294  0.0015
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

b. $H_0 : \mu^*_{\text{NE}} = \mu^*_{\text{SE}} = \mu^*_{\text{MW}} = \mu^*_{\text{W}}$ versus H_a : There is a difference in the means, where μ^* are the means of the transformed data.

Reject H_0 if $F \geq F_{0.05,3,20} = 3.10$

$$SSW = 5[0.0354^2 + 0.0673^2 + 0.0279^2 + 0.0271^2] = 0.0365$$

$$\bar{y}_{..} = 0.74775 \Rightarrow$$

$$SSB = 6[(1.142 - 0.74775)^2 + (0.625 - 0.74775)^2$$

$$+(0.871 - 0.74775)^2 + (0.353 - 0.74775)^2] = 2.049$$

$$F = \frac{2.049 / 3}{0.0365 / 20} = 374.25 > 3.10 \Rightarrow$$

Thus, we reject H_0 and conclude there is a significant difference in the proportions of people who thought the EPA standards were not stringent enough for the four regions.

The data was analyzed using a computer program (output below), and the value of F was determined to be 374.64. The difference is due to rounding.

One-way ANOVA: TransProp versus Region

```
Source  DF       SS       MS       F      P
Region   3  2.05044  0.68348  374.64  0.000
Error   20  0.03649  0.00182
Total   23  2.08692
```

c. Transforming the data did not alter the conclusion—both AOV tests concluded there is a significant difference in the proportions of people who thought the EPA standards were not stringent enough for the four regions.

```
> summary(aov(asin(sqrt(Proportion)) ~ Region, data=ex8.17))
            Df Sum Sq Mean Sq F value Pr(>F)    
Region       3 2.0504  0.6835   374.6 <2e-16 ***
Residuals   20 0.0365  0.0018                   
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```