MS Module 12 ANOVA unequal group sizes practice exam questions

(The attached PDF file has better formatting.)

[The practice problems in the 24 modules explain the statistical procedures; the practice exam questions in this thread shows what you will be asked on the final exam.]

An experiment has three groups; the number of observations per group and the group means are

	size	mean
group 1	21	51
group 2	34	76
group 3	31	70

- The sum of the squares of the observations is 590,645
- The observations have normal distributions in each group, and the variance in each group is the same.
- The null hypothesis is that the means of the groups are equal: H_0: $\mu_1 = \mu_2 = \mu_3$ [μ_j = mean of Group *j*]

Question 12.1: Square of sum of observations

What is the square of the sum of all the observations, or $x_{..2}$?

Answer 12.1: $(21 \times 51 + 34 \times 76 + 31 \times 70)^2 = 33{,}930{,}625$

(square of the sum of the observations = (Σ (observations in group × mean of group))^2)

Question 12.2: Correction factor

What is the correction factor for SST and SSTr?

Answer 12.2: 33,930,625 / (21 + 34 + 31) = 394,542.15

(correction factor = square of the sum of the observations / total observations)

Question 12.3: Total sum of squares

What is SST, the total sum of squares?

Answer 12.3: 590,645 – 394,542.15 = 196,102.85

(total sum of squares = sum of squares of observations – correction factor)

Question 12.4: Treatment sums of squares

What is SSTr, the treatment sum of squares?

Answer 12.4: $(21 \times 51^2 + 34 \times 76^2 + 31 \times 70^2)$ – 394,542.15 = 8,362.85

(total sum of squares = Σ (observations by group × square of mean by group) – correction factor)

Question 12.5: Error sum of squares

What is SSE, the error sum of squares?

Answer 12.5: 196,102.85 – 8,362.85 = 187,740.00

(error sum of squares = total sum of squares – treatment sums of squares)

Question 12.6: Total degrees of freedom

What are the total degrees of freedom?

Answer 12.6: (21 + 34 + 31 – 1) = 85

(total degrees of freedom = number of observations – 1)

Question 12.7: Degrees of freedom for the groups

What are the degrees of freedom for the groups?

Answer 12.7: 3 – 1 = 2

Question 12.8: Degrees of freedom for the error sum of squares

What are the degrees of freedom for the error sum of squares (SSE)?

Answer 12.8: 85 – 2 = 83

Question 12.9: Mean squared deviation for the groups

What is MSTr, the mean squared deviation for the groups (treatment mean square)?

Answer 12.9: 8,362.85 / 2 = 4,181.425

Question 12.10: Mean squared error

What is MSE, the mean squared error?

Answer 12.10: 187,740.00 / 83 = 2,261.928

Question 12.11: *F* value

What is the *F* value for testing the null hypothesis?

Answer 12.11: 4,181.425 / 2,261.928 = 1.849