UNIVERSITY OF TORONTO
Faculty of Arts and Science
APRIL 2011 EXAMINATIONS

ECO220Y1Y
Duration - 3 hours
Examination Aids: Calculator

<table>
<thead>
<tr>
<th>Last Name:</th>
<th>SOLUTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Name:</td>
<td></td>
</tr>
<tr>
<td>Student #:</td>
<td></td>
</tr>
</tbody>
</table>
Part 1: Multiple Choice Questions [60 points]

(1) The capacity of an office building elevator is 8 persons or 640 kg. Assume that the weights of the office workers are normally distributed with mean equal to 75 and standard deviation equal to 9 kg. What is the probability that the total weight of 8 randomly selected office workers exceeds the capacity of an elevator? (B)

(A) 0.0010  
(B) 0.0582  
(C) 0.2912  
(D) 0.7088  
(E) 0.9418

(2) A random sample of 100 observations is to be drawn from a population with mean 40 and standard deviation 25. The probability that the mean of the sample will exceed 45 is: (D)

(A) 0.4772  
(B) 0.4207  
(C) 0.0793  
(D) 0.0228  
(E) Not possible to compute based on the information provided

(3) A random variable Y has the following probability distribution:

<table>
<thead>
<tr>
<th>Y</th>
<th>-1</th>
<th>0</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>P(Y)</td>
<td>3C</td>
<td>2C</td>
<td>0.4</td>
<td>0.1</td>
</tr>
</tbody>
</table>

The value of the constant C is: (A)

(A) 0.10  
(B) 0.15  
(C) 0.20  
(D) 0.25  
(E) 0.75

(4) The mean life of a particular brand of light bulb is 1000 hours and the standard deviation is 50 hours. We can conclude that at least 75% bulbs of this brand will last between ________. (A)

(A) 900-1100 hours  
(B) 950-1050 hours  
(C) 850-1150 hours  
(D) 800-1200 hours  
(E) 1050-1250 hours
A rock concert producer has scheduled an outdoor concert. The profit of the concert depends on the weather on that day—whether it is warm, cool, or very cold. If it is warm that day, she expects to make a $20,000 profit. If it is cool that day, she expects to make a $5,000 profit. If it is very cold that day, she expects to suffer a $12,000 loss. Based upon historical records, the weather office has estimated the chances of a warm day to be 0.60, and the chances of a cool day to be 0.25. What is the producer’s expected profit?  

(A) $ 5,000  
(B) $ 11,450  
(C) $ 13,000  
(D) $ 13,250  
(E) $ 15,050  

► **Question (6):** The following table shows the tabulation of a random sample of a random variable X.

<table>
<thead>
<tr>
<th>X</th>
<th>Frequency</th>
<th>Percent</th>
<th>Cum.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>17</td>
<td>17.00</td>
<td>17.00</td>
</tr>
<tr>
<td>1</td>
<td>11</td>
<td>11.00</td>
<td>28.00</td>
</tr>
<tr>
<td>2</td>
<td>36</td>
<td>36.00</td>
<td>64.00</td>
</tr>
<tr>
<td>3</td>
<td>36</td>
<td>36.00</td>
<td>100.00</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100.00</td>
<td></td>
</tr>
</tbody>
</table>

(6) What are the range and the median of this sample?  

(A) Range=0; Median=1  
(B) Range=1; Median=1.5  
(C) Range=1; Median=2  
(D) Range=3; Median=1.5  
(E) Range=3; Median=2  

► **Question (7):** The following diagram shows the ogive of a random sample of a random variable X.
(7) Approximately, what percentage of observations of the sample lies between 5 and 10? (D)

(A) 75%
(B) 17%
(C) 12%
(D) 5%
(E) 0%

Questions (8)-(9): An analysis of personal loans at a local bank revealed the following facts: 10% of all personal loans are in default and 90% of all personal loans are not in default. Moreover, 20% of the loans that are in default and 70% of those not in default belong to homeowners.

(8) What is the probability that a randomly selected personal loan is not in default and belongs to a homeowner? (C)

(A) 0.20
(B) 0.18
(C) 0.63
(D) 0.78
(E) 0.90

(9) What is the probability that a randomly selected personal loan is in default if it is chosen from the pool of homeowners’ loans? (B)

(A) 0.02
(B) 0.03
(C) 0.18
(D) 0.63
(E) 0.78

(10) Consider the following null and alternative hypotheses:
    \[ H_0: \ p = 0.16 \]
    \[ H_1: \ p < 0.16 \]
    These hypotheses _______________. (B)

    (A) indicate a one-tailed test with a rejection area in the right tail
    (B) indicate a one-tailed test with a rejection area in the left tail
    (C) indicate a two-tailed test
    (D) are established incorrectly
    (E) are not mutually exclusive
**Question (11):** The following diagram graphically describes the probability of type I error ($\alpha$) and the probability of type II error ($\beta$) of a hypothesis test regarding the population mean $\mu$ when the sample size is 100. Given the significance level $\alpha$, the critical value is 9.

(11) Choose a set of hypotheses from the following alternatives that corresponds to this diagram. (D)

(A) $H_0: \mu = 15; H_1: \mu < 15$
(B) $H_0: \mu = 15; H_1: \mu > 15$
(C) $H_0: \mu = 0; H_1: \mu \neq 0$
(D) $H_0: \mu = 0; H_1: \mu > 0$
(E) $H_0: \mu = 0; H_1: \mu < 0$

(12) Which of the following factors does not affect the power of a test? (C)

(A) Value specified in the null hypothesis
(B) Significance level
(C) Test statistic calculated from a sample
(D) Sample size
(E) Population variance

**Questions (13)-(14):** You would like to estimate the after-tax price of gasoline per gallon and have collected a sample consisting of 251 observations of the pre-tax price per gallon. The mean and the standard deviation of the sample are 108.2 and 7.5, respectively.

(13) If the tax rate is 13 percent, what is the point estimate of the population mean of the after-tax prices of gasoline per gallon? (E)

(A) 6.5
(B) 14.1
(C) 94.1
(D) 108.2
(E) 122.3
(14) Suppose the tax rate has increased to 15%. How does it change the confidence interval estimate of the population mean of the after-tax prices of gasoline per gallon compared to the case where the tax rate is 13%? (A)

(A) The width of the interval gets larger since the standard error of the mean becomes larger.
(B) The width of the interval gets larger since the standard error of the mean becomes smaller.
(C) The width of the interval gets smaller since the standard error of the mean becomes larger.
(D) The width of the interval gets smaller since the standard error of the mean becomes smaller.
(E) None of above is correct.

(15) In a simple linear regression of \( y \) on \( x \), the following statistics are calculated from a sample of 10 observations:

\[ \sum_{i=1}^{10} (x_i - \bar{x})(y_i - \bar{y}) = 3500, s_x = 10, s_y = 5, \sum_{i=1}^{10} x_i = 70, \sum_{i=1}^{10} y_i = 105. \] The least squares estimates of the slope and \( y \)-intercept are, respectively, (C)

(A) 0.29 and 8.47
(B) 2.9 and -9.8
(C) 3.5 and -14
(D) 14 and -87.5
(E) 35 and -2345

(16) In a simple linear regression, which of the following statements indicates that there is no linear relationship between the variables \( x \) and \( y \)? (E)

(A) Sum of squares for error is 0.0.
(B) Regression sum of squares is greater than the total sum of squares.
(C) Sum of squares for error is greater than the total sum of squares.
(D) Coefficient of determination is -1.0.
(E) Coefficient of correlation is 0.0.

(17) A multiple regression analysis involving three independent variables and 25 data points has resulted in a value of 0.769 for the unadjusted coefficient of determination. Then, the adjusted coefficient of determination is: (E)

(A) 0.385
(B) 0.877
(C) 0.797
(D) 0.591
(E) 0.736
Questions (18)-(20): Consider a multiple regression model that relates residential sales price ($y$ in $10,000) to the following independent variables:

- SQFT: Square footage
- ROOMS: Number of rooms
- BED: Number of bedrooms
- AGE: Age of the residential property (in years)

A random sample of 65 residential sales shows $R^2 = 0.75$ and the following statistics:

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>5.35</td>
</tr>
<tr>
<td>SQFT</td>
<td>0.05</td>
</tr>
<tr>
<td>ROOMS</td>
<td>6.32</td>
</tr>
<tr>
<td>BED</td>
<td>11.10</td>
</tr>
<tr>
<td>AGE</td>
<td>−0.42</td>
</tr>
</tbody>
</table>

(18) To test the significance of the multiple regression model, the value of the test statistic is closest to: (B)

(A) 40
(B) 45
(C) 50
(D) 55
(E) 60

(19) The critical value to test the significance (i.e., validity) of the multiple regression model, at significance level 5%, is closest to: (C)

(A) 2.37
(B) 2.45
(C) 2.53
(D) 2.61
(E) 2.76

(20) Which one of the following statements best describes the meaning of the coefficient for AGE? (D)

(A) As the age of residential property increases by one year, the expected sales price increases by $1,100.
(B) As the age of residential property increases by one year, the expected sales price increases by $1,100 when other independent variables are held constant.
(C) As the age of residential property increases by one year, the expected sales price drops $4,200.
(D) As the age of residential property increases by one year, the expected sales price drops $4,200 when other independent variables are held constant.
(E) None of the above describes the meaning of the coefficient for AGE.
Part II: Short Answer Questions [60 points]
► All questions:
   • Unless otherwise specified, use a 5 percent significance level.
   • For each question we give a guide for your response in brackets. It indicates what is expected: a quantitative analysis, a graph, and/or a written response. For example, “Is the difference statistically significant? [Analysis & 2 – 3 sentences]”
   • Show your work and answer clearly, concisely, and completely.

(1) [10 points] Your company has recently introduced a new product. You have just received confidential information about the average daily sales (in dollars) for the first 46 days after the product launch. The following table summarizes this information:

<table>
<thead>
<tr>
<th>Average Daily Sales</th>
<th>5,200</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Deviation</td>
<td>1,150</td>
</tr>
<tr>
<td>Observations</td>
<td>46</td>
</tr>
</tbody>
</table>

The accounting department of your company has estimated that it will not be profitable to produce the product if the average daily sales does not exceed $4,500. One of your colleagues claims that the product will not be profitable. In particular, she argues that future average daily sales is going to be $4,200 and that it is not in the company interest to keep the product on the market. Is her argument correct? If it is, use your data to support her argument. If it is not, use your data to show that it is wrong. [Analysis & 1 – 2 sentences]

Solution:
There are two acceptable answers.

   • The relevant hypotheses to test the colleague’s argument are:
     \[ H_0: \mu=4200, \]
     \[ H_1: \mu \neq 4200. \]
     
     Corresponding t test statistic is
     \[ t = \frac{5200 - 4200}{1150/\sqrt{46}} = 5.898 > 2.014 = t_{0.025}. \]
     Therefore, the null hypothesis (the colleague’s claim) is rejected at 5 percent significance level. (Since it is a large sample, using \( z_{0.025}=1.96 \) as the critical value is acceptable. P-value is close to 0 by using either t or z statistic.)

   • We can also prove that it will be profitable by conducting hypothesis testing for following hypotheses:
     \[ H_0: \mu=4500, \]
     \[ H_1: \mu>4500. \]
     
     Corresponding t test statistic is:
t = \frac{5200 - 4500}{1150/\sqrt{46}} = 4.128 > 1.679 = t_{0.05}.

Therefore, we reject null hypothesis in favor of alternative with 5 % significance level.
(Since it is a large sample, using \( z_{0.05} = 1.645 \) as the critical value is acceptable. P-value is close to 0 by using either t or z statistic.)
There is sufficient evidence to infer that average daily sales is greater than $4,500 and it will be profitable to keep the product on the market.

(2) [15 points] Does target saving amount for individual’s retirement increase with age? A survey of 1300 working adults showed the following result: Out of 670 working adults below age 35 (sample 1), 371 respondents answered that more than $500,000 of saving is required for their retirement. Out of 630 working adults above age 34 (sample 2), 442 respondents answered that more than $500,000 of saving is required for their retirement.

(a) [5 points] Construct a set of statistical hypotheses for this question that can be tested by the data described above. [A set of hypotheses]

Solution:
Suppose \( p_1 \) denotes population proportion of population1 (the population of age less than 35) and \( p_2 \) denotes population proportion of population2 (the population of age greater than 34)

\( H_0: p_1 - p_2 = 0 \)
\( H_1: p_1 - p_2 < 0 \)

Note that the following hypotheses are also correct.
\( H_0: p_2 - p_1 = 0 \)
\( H_1: p_2 - p_1 > 0 \)

(b) [5 points] Find the 95% confidence interval to estimate the difference in population proportion in this question. Interpret the result. [Analysis & 1–2 sentences]

(i) We can approximate the sampling distribution of \( \hat{P}_1 - \hat{P}_2 \) by a normal distribution since following rule of thumbs are satisfied: Both intervals shown below lies between (0,1).
\[ \hat{p}_1 \pm 3 \sqrt{\frac{\hat{p}_1(1 - \hat{p}_1)}{n_1}}, \hat{p}_2 \pm 3 \sqrt{\frac{\hat{p}_2(1 - \hat{p}_2)}{n_2}} \]
These intervals are [.53, .647] and [.604, .715], respectively. Thus, distributions of both \( \hat{P}_1 \) and \( \hat{P}_2 \) are approximated by normal distributions. (Alternatively, we can check
\[ \hat{p}_1 \times n_1 = 371 > 5, (1 - \hat{p}_1) \times n_1 = 442 > 5, \hat{p}_2 \times n_2 = 442 > 5, (1 - \hat{p}_2) \times n_2 = 228 > 5. \]

(ii) The .95 % confidence interval is given by:
\[ \hat{p}_1 - \hat{p}_2 \pm z_{0.025} \sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}} \]
\[ \frac{442}{630} - \frac{371}{670} \pm 1.96 \sqrt{\frac{371}{630} \frac{259}{630} \frac{1}{630} + \frac{442}{670} \frac{228}{670} \frac{1}{670}} = -0.15 \pm 1.96 \times 0.0265 = 0.15 \pm 0.052 \]

*Therefore,*

\text{UCL} = -.098
\text{LCL} = -.202

\[(iii)\text{(interpretation): The proportion of working adults above 34 years old whose target saving amount is greater than$500,000 is at least 1.82 percentage points lower than that below 35 years old and at most 12.34 percentage points.} \]

Alternatively, the proportion of working adults below 35 years old whose target saving amount is greater than $500,000 is at least 1.82 percentage points higher than that above 35 years old and at most 12.34 percentage points.

(c) [5 points] Conduct hypothesis testing for (a) and state the strength of evidence for the alternative hypothesis. [Analysis & 1 – 2 sentences]

The corresponding z test statistic is

\[ z = \frac{(\hat{p}_1 - \hat{p}_2) - (p_1 - p_2)}{\hat{p}(1 - \hat{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)} \]
\[ = \frac{-0.0708 - 0}{0.6254 \times 0.3746 \times \left(\frac{1}{630} \times \frac{1}{670}\right)} = -2.6362. \]

The p-value is then obtained as \( P(Z < -2.64) = 0.0041. \)

At significance level 5%, we reject null hypothesis in favor of alternative since p-value is 0.0041. We found **overwhelming/very strong** evidence that target saving amount for individual’s retirement increases with age.
(3) [18 points] It is often suggested that smaller class sizes will enable public elementary schools to improve the quality of the education they offer their pupils. Hiring the additional teachers that this would require would naturally cost money, so it is important to know if reducing class sizes has any effect on basic measures of educational quality like scores on standardized tests. Consider data gathered in 1998 on student-teacher ratios and test scores from 420 California school districts. In particular, the dependent variable is the average score on a standardized reading and math test administered to fifth-graders in a particular school district while the independent variable is of course the average student-teacher ratio for elementary school classes in that district. The regression estimates are given in the following table. Following tradition, standard errors appear below the corresponding point estimates in parentheses. The regression standard error (S), coefficient of determination ($R^2$) and sample size (n) are also included in the table. In what follows, feel free to pretend that the average test scores and student-teacher ratios are normally distributed.

Table: Regression of average test scores on average student-teacher ratios

<table>
<thead>
<tr>
<th>X-variable</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>698.9</td>
</tr>
<tr>
<td></td>
<td>(10.4)</td>
</tr>
<tr>
<td>Avg. student-teacher ratio</td>
<td>-2.28</td>
</tr>
<tr>
<td></td>
<td>(.52)</td>
</tr>
<tr>
<td>S</td>
<td>18.58</td>
</tr>
<tr>
<td>$R^2$</td>
<td>.049</td>
</tr>
<tr>
<td>N</td>
<td>420</td>
</tr>
</tbody>
</table>

(a) [3 points] How many degrees of freedom are associated with this regression? [Analysis & 1 number]

We have 420 observations, so the regression has $420 - 2 = 418$ degrees of freedom.

(b) [5 points] Construct a 95% confidence interval for the slope parameter. [Analysis & values]

An approximate 95% confidence interval for the slope can be constructed from the fact that the slope estimate is approximately normally distributed when the number of degrees of freedom in the regression is large. The margin of error for this confidence interval is accordingly

$$1.96 \times \text{standard error of the slope estimate} = 1.96 \times .52 = 1.0192.$$ 

or

$$b_1 \pm z_{0.025} \times SE = -2.28 \pm 1.96 \times .52.$$
so the confidence interval is given by

\[-2.28 \pm 1.0192 = [-3.2992, -1.2608].\]

Note the formula for the confidence interval estimate is

\[b_1 \pm z_{0.025} \times SE = -2.28 \pm 1.96 \times .52.\]

(c) [5 points] Test the hypothesis that there exists no linear relationship between average class sizes and average test scores. Conduct your test and report an approximate p-value for your test. [Analysis & 1 – 2 sentences]

The t-ratio for the slope is given by

\[t = \frac{-2.28}{.52} = -4.3846.\]

This may be compared to critical values from a standard normal distribution. In any case, the absolute value of t exceeds even the critical value for a 1% test, so one can easily reject the hypothesis that the slope is zero. The p-value is approximately zero.

(d) [5 points] Interpret the point estimate of the slope parameter and the result of the test conducted in part (c) of this question. Is a reduction in class sizes related to an improvement in test scores? [1 – 2 sentences]

The test conducted in the previous part of this question indicates that the slope coefficient is significantly different from zero, while the point estimate of -2.28 indicates a negative relationship between student-teacher ratios and test scores. In particular, reducing the number of students in a class appears to lead to significantly higher average test scores in a school district.

(4) [17 points] Suppose the sales manager of a company wishes to investigate how sales performance, y, depends on five independent variables:

\[x_1 = \text{number of months the sales representative has been employed by the company}\]
\[x_2 = \text{sales of the company’s product and competing products in the sales territory}\]
\[x_3 = \text{dollar advertising expenditure in the territory}\]
\[x_4 = \text{weighted average of the company’s market share in the territory for the previous four years}\]
\[x_5 = \text{change in the company’s market share in the territory over the previous four years}\]
A random sample of 26 observations shows the following results:

<table>
<thead>
<tr>
<th>Coefficients</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-1113.00</td>
</tr>
<tr>
<td>$x_1$</td>
<td>3.60</td>
</tr>
<tr>
<td>$x_2$</td>
<td>0.04</td>
</tr>
<tr>
<td>$x_3$</td>
<td>0.13</td>
</tr>
<tr>
<td>$x_4$</td>
<td>256.95</td>
</tr>
<tr>
<td>$x_5$</td>
<td>324.50</td>
</tr>
</tbody>
</table>

Partial ANOVA Table

<table>
<thead>
<tr>
<th>Source</th>
<th>SS (in 1000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>39,500</td>
</tr>
<tr>
<td>Residual</td>
<td>3,500</td>
</tr>
<tr>
<td>Total</td>
<td>43,000</td>
</tr>
</tbody>
</table>

(a) [6 points] Test the overall significance (i.e., validity) of the multiple regression model using a 5% significance level. [Analysis including a set of hypothesis, the decision rule, the test statistics & 1 – 2 sentences of conclusion]

Solution:

[Hypotheses] $H_0 : \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$

$H_1 : \text{Not all } \beta_i = 0 \text{ for } i = 1, 2, 3, 4, 5$

Or:

$H_0 : \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$

$H_1 : \text{At least one } \beta_i \neq 0 \text{ for } i = 1, 2, 3, 4, 5$

or

$H_0 : \text{The model is not significant}$

$H_1 : \text{The model is significant}$

[Test statistic]

The complete ANOVA table is

<table>
<thead>
<tr>
<th>Source</th>
<th>SS (in 1000)</th>
<th>df</th>
<th>MS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>39,500</td>
<td>5</td>
<td>7,900</td>
<td>45.14</td>
</tr>
<tr>
<td>Residual</td>
<td>3,500</td>
<td>20</td>
<td>175</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>43,000</td>
<td>25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

[Decision Rule]
From the F-table, \( F(0.05, 5, 20) = 2.71 \). The decision rule is to reject \( H_0 \) if \( F > 2.71 \), and accept (do not reject) \( H_0 \) if \( F \leq 2.71 \).

[Conclusion]

The test statistic is \( F = 45.14 \) which falls in the rejection region. Reject \( H_0 \) and conclude that the model is significant.

\[
F_{\text{statistic}} = \frac{SSR/k}{SSE/(n-k-1)} = \frac{39500/5}{3500/20} = 45.14
\]

(b) [5 points] Perform statistical tests to identify the independent variables that are significant in predicting sales performance. [Analysis & 1 – 2 sentences]

Solution:

<table>
<thead>
<tr>
<th></th>
<th>Coefficients</th>
<th>Standard Error</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-1113.00</td>
<td>420.00</td>
<td>-2.65</td>
</tr>
<tr>
<td>( x_1 )</td>
<td>3.60</td>
<td>1.20</td>
<td>3.00</td>
</tr>
<tr>
<td>( x_2 )</td>
<td>0.04</td>
<td>0.01</td>
<td>4.00</td>
</tr>
<tr>
<td>( x_3 )</td>
<td>0.13</td>
<td>0.04</td>
<td>3.25</td>
</tr>
<tr>
<td>( x_4 )</td>
<td>256.95</td>
<td>175.20</td>
<td>1.47</td>
</tr>
<tr>
<td>( x_5 )</td>
<td>324.50</td>
<td>200.00</td>
<td>1.6225</td>
</tr>
</tbody>
</table>

The critical value from the t-table is \( t = 2.086 \) with 20 degrees of freedom.

Compare the t statistics in the above table to the critical value, \( x_1, x_2 \) and \( x_3 \) are significant independent variables; \( x_4 \) and \( x_5 \) are not significant independent variables.

(c) [6 points] If a simple regression analysis is performed with \( x_1 \) as the only independent variable, the Sum of Squares for Error (SSE) is three times as large as the SSE in the above multiple regression model with 5 independent variables. Test if this simple regression model is significant or not. [Analysis & 1 – 2 sentences]

Solution: If \( x_1 \) is the only independent variable, and SSE is three times as large as the SSE in the above multiple regression model, the ANOVA table becomes

<table>
<thead>
<tr>
<th>Source</th>
<th>SS (in 1000)</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regression</td>
<td>32,500</td>
<td>1</td>
<td>32,500</td>
<td>74.29</td>
</tr>
<tr>
<td>Residual</td>
<td>10,500</td>
<td>24</td>
<td>437.5</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>43,000</td>
<td>25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The value for $F(0.05, 1, 24)$ is not available in the given $F$-table. We use $F(0.05, 1, 25) = 4.35$ as the critical value. The decision rule is to reject $H_0$ if $F > 4.35$, and accept (do not reject) $H_0$ if $F \leq 4.35$.

The test statistic is $F = 74.29$ which falls in the rejection region. We reject $H_0$ and conclude that the simple regression model is significant.

For the calculation of $F$ statistic, it is not required to show the complete ANOVA table.

$$F = \frac{SSR / k}{SSE / (n - k - 1)} = \frac{(43000 - 10500) / 1}{3500 \times 3 / 24} = 74.29$$