For the test, you may use:
- a calculator,
- class handouts,
- copies of YOUR OWN homework & quizzes,
- two pages of YOUR OWN review notes,
- and appropriate tables from the textbook.

*Note: Phones may **NOT** be used during the exam; **NOT** as calculators, **NOT** as Internet connections, **NOT** for resource retrieval (i.e., electronic copies of notes, files, tables, etc.), **NOT** for communications. If the exam proctor suspects the use of a phone during the exam, your test will be confiscated and zero points will be assigned.*

Understand that valid statistical conclusions are based on randomly selected, representative samples of the population. That is to say, if the sample is not representative of the population, then all bets are off.

Understand the caveats that statistical conclusions are based on the sample data and the level of significance. That is to say, if we were to use a different sample and/or a difference level of significance, then we might arrive at a different conclusion regarding the hypotheses.

Be familiar with *Correlation, Regression, & Prediction* and the properties of the *correlation coefficient* $r$.
- Understand that significant correlation is **never proof** of Cause and Effect.
- Understand that the regression equation should **only** be used for prediction when there is significant correlation.
- Apply the concepts of correlation, regression, and prediction, including:
  - calculating the correlation coefficient
  - hypothesis testing for significant correlation (both t-test and F-test)
  - determining the coefficients of the regression equation as appropriate; and if so
  - using the correlation equation to predict values of the response variable $Y$, for values of the regressor variable $X$.

Course Notes:
- Handout #4 Correlation & Regression

Practice Review Problems: (Use $\alpha = 5\%$ for all problems.)
- Homework #6a
- Homework #6b

See page 2 & 3 for example questions, homework, and problems from previous exams.
Indicate whether or not the following statements regarding the correlation coefficient $r$ are True or False.

F / T An $r$ value of +0.65 offers stronger proof of cause and effect than does an $r$ value of -0.50.
F / T An $r = 0.0$ implies there is absolutely no mathematical correlation between two variables.
F / T An $r$ value > 0.0 implies that $Y$ increases as $X$ decreases.
F / T An $r$ value > 0.0 always indicates significant correlation.
F / T When comparing correlation between two variables, use averages rather than individual values.
F / T If $r > 0.5$, it is permissible to extrapolate values of $Y$ for values of $X$ that are not in the data range of $X$.
F / T Only positive values of $r$ provide evidence of cause and effect.

When is strong correlation sufficient to prove cause and effect?

Under what circumstances is it acceptable to use the regression equation for predicting, even when there is statistically insufficient evidence to suggest correlation?

Correlation & Regression

Reference:
4ed, Page 426, Problem 11 - 69
5ed, Page 435, Problem 11-71
X’s = Statistics Scores
Y’s = Ops Research Scores
n = 20
Sum of X = 1587
Sum of Y = 1602
Sum of $X^2$ = 127,731
Sum of $Y^2$ = 129,818
Sum of XY = 128,603
$S_{xx} = 1803$
$S_{yy} = 1498$
$S_{xy} = 1484$
$SSR = 1222$
$SST = 1498$

Calculate the correlation coefficient $r$.
Calculate the Test Value $t_0$ and Determine the Critical Value $t_{a/2, df}$.
Calculate the Test Value $F_0$ and Determine the Critical Value $F$.
Determine the Regression Equation (i.e., solve for $B_0$ and $B_1$).
Use the Regression Equation to predict an Ops Research Score given a Statistics Score = 96.
The table below is a list of randomly selected laptop computers and their respective performance rating and retail price. Use the data to determine whether or not there is any statistical correlation ($\alpha = 5\%$) between a laptop’s performance rating and its retail price. In addition to the tabular data, various intermediate computational values have also been included. Determine whether or not there is statistically significant correlation between Rating and Price. You must calculate the correlation coefficient $r$. However, you may choose to use either a $t$-test or an ANOVA Table $F$-test to test for statistically significant correlation. Write the Regression Equation, (i.e., calculate both $\beta_0$ and $\beta_1$).

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1. Correlation Coefficient $r = \text{__________}$

2a. Hypothesis Testing Using $t$ Method

Null Hypothesis $H_0$: $\text{__________}$

$t_{test} = \text{__________}$  \hspace{1cm} df = \text{__________}  \hspace{1cm} Critical Value = \text{__________}$

2b. Hypothesis Testing Using $F$ Method

Null Hypothesis $H_0$: $\text{__________}$

$F_{test} = \text{__________}$  \hspace{1cm} df's = _____ & _____  \hspace{1cm} Critical Value = \text{__________}$

3. Statistically Significant Correlation  \hspace{0.5cm} Yes / No

4. Regression Equation  \hspace{0.5cm} \text{__________________________}

5. Given a rating of 103, predict the price. $\text{__________}$