

**Applied Statistics Comprehensive Exam**  
**Statistical Methods I & II**

Calculators are permitted for this exam. Statistical tables are provided.

**Answers to all questions require complete explanations to receive full credit.**

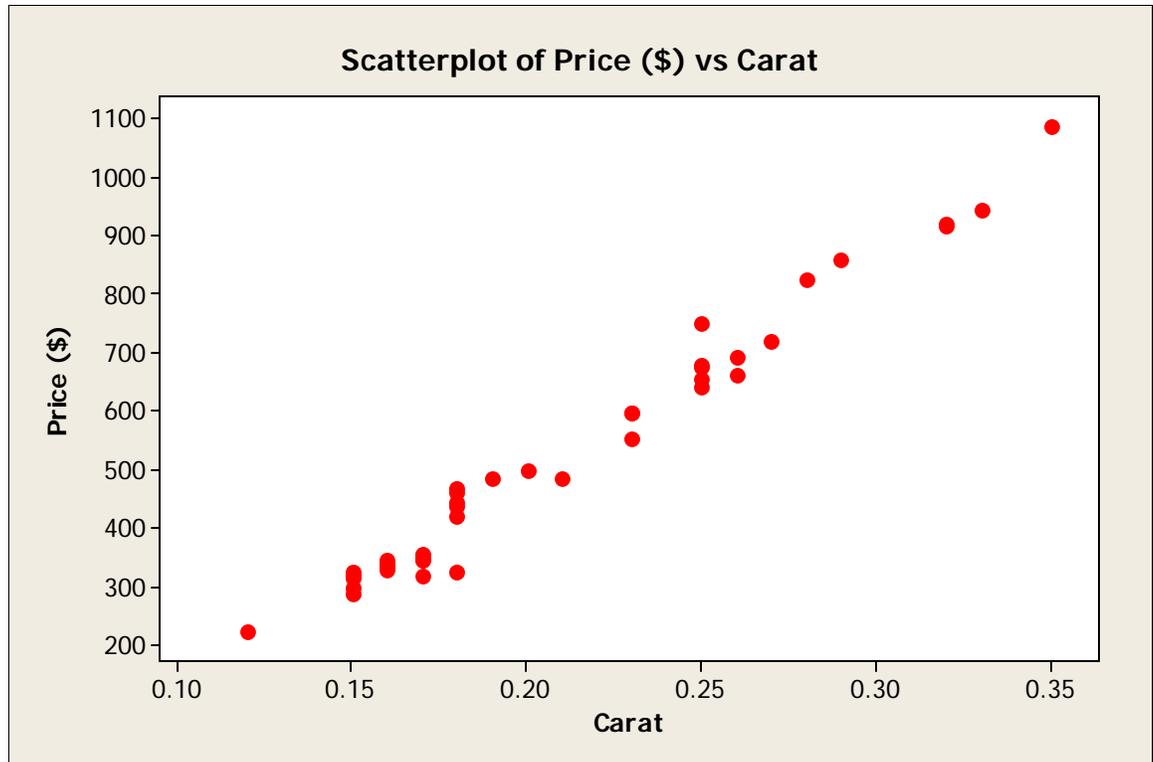
1. (20 points) The question was raised whether children with attention deficit hyperactivity disorder (ADHD) have different sized brains than other children. The following table presents summary statistics on total cerebral volume (in milliliters) for both groups:

	Mean	St.Dev.	n
Children with ADHD	1059.4	117.5	152
Children without ADHD	1104.5	111.3	139

- Conduct the appropriate hypothesis test for this question at the 5% level of significance. Make sure to state any necessary assumptions.
2. (30 points) Suppose we are interested in conducting a study to find out whether the average IQ of a Villanova University graduate student is higher than 100. This hypothesis test will be conducted at the 5% level of significance. IQ is known to follow a normal distribution. Assume that the standard deviation of IQ for VU graduate students is 15.
- If the true IQ of VU graduate students is 110, how many students are needed in order to achieve 80% power for this test?
  - Suppose I do the test with 12 students. At which value of IQ does this test have 90% power?
3. (20 points) A sample of 35-44 year old California residents was gathered and classified in terms of their marital status and employment status. Conduct the appropriate hypothesis test at the 5% level of significance to determine whether employment status is associated with marital status. Make sure to state any necessary assumptions.

	Married	Widowed, Divorced, Separated	Never Married
Employed	679	103	114
Unemployed or Not in Labor Force	105	28	45

4. (30 points) Data were collected to examine how the price of a diamond ring is related to its size (carat). A total of 48 rings ranging in size from 0.12 to 0.35 carats, with otherwise similar characteristics, were included in the linear regression analysis. The following output was obtained.



The regression equation is  
Cost = - 260 + 3721 Carat

Predictor	Coef	SE Coef
Constant	-259.63	17.32
Carat	3721.02	81.79

S = 31.8405    R-Sq = 97.8%    R-Sq(adj) = 97.8%

- Comment on the appropriateness of linear regression for this analysis.
- Conduct the appropriate hypothesis test on the slope at the 5% level of significance. Make sure to state and verify any necessary assumptions.
- Based on this linear regression analysis, what is the predicted price for a 1 carat diamond ring? Do you think this is a good prediction? Why or why not?