AP® Statistics
2002 Sample Student Responses
Form B

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STATISTICS

SECTION II

Part A

Questions 1-5

Spend about 65 minutes on this part of the exam.

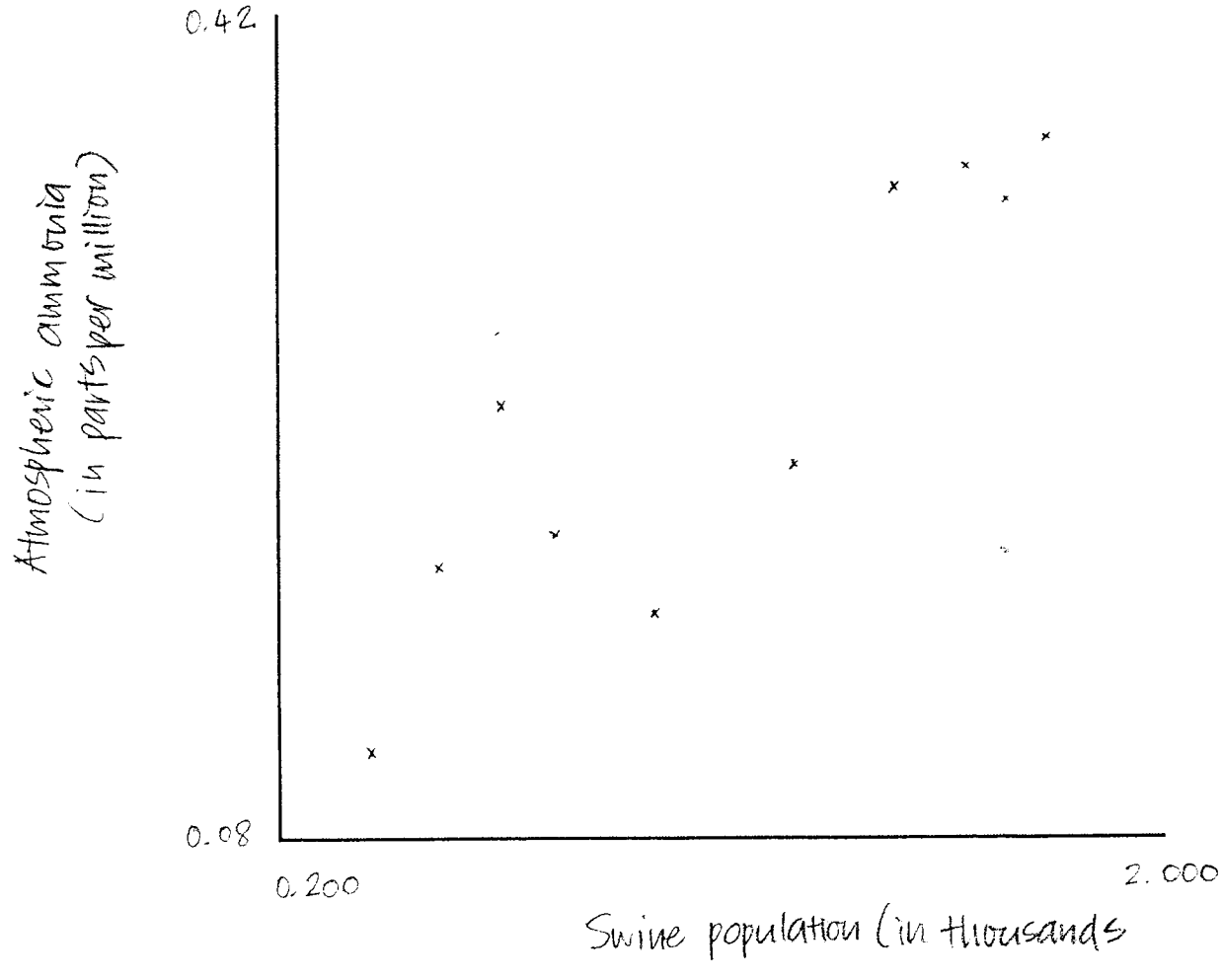
Percent of Section II grade—75

Directions: Show all your work. Indicate clearly the methods you use, because you will be graded on the correctness of your methods as well as on the accuracy of your results and explanation.

1. Animal-waste lagoons and spray fields near aquatic environments may significantly degrade water quality and endanger health. The National Atmospheric Deposition Program has monitored the atmospheric ammonia at swine farms since 1978. The data on the swine population size (in thousands) and atmospheric ammonia (in parts per million) for one decade are given below.

Year	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Swine Population	0.38	0.50	0.60	0.75	0.95	1.20	1.40	1.65	1.80	1.85
Atmospheric Ammonia	0.13	0.21	0.29	0.22	0.19	0.26	0.36	0.37	0.33	0.38

(a) Construct a scatterplot for these data.



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(b) The value for the correlation coefficient for these data is 0.85. Interpret this value.

$r = 0.85$.

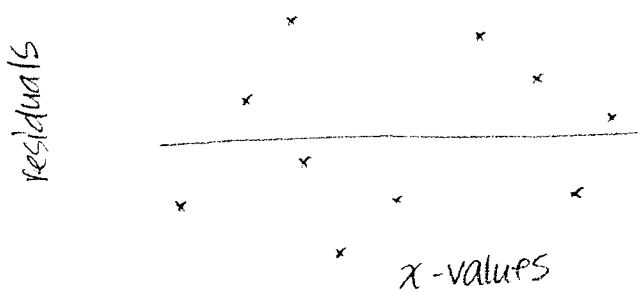
There is a quite strong association between the swine population and the amount of atmospheric ammonia.

(c) Based on the scatterplot in part (a) and the value of the correlation coefficient in part (b), does it appear that the amount of atmospheric ammonia is linearly related to the swine population size?

Explain.

The scatter plot and the correlation coefficient is not sufficient to decide whether or not linear regression is the best model. We need to look at the residual plot $(x, y_i - \hat{y}_i)$

residual plot



The residual plot is randomly scattered. ∴ linear regression is an appropriate model. The atmospheric ammonia is linearly related related to the swine population size

(d) What percent of the variability in atmospheric ammonia can be explained by swine population size?

$r^2 = 0.7225$

72.25% of the variability in atmospheric ammonia can be explained by swine population size.

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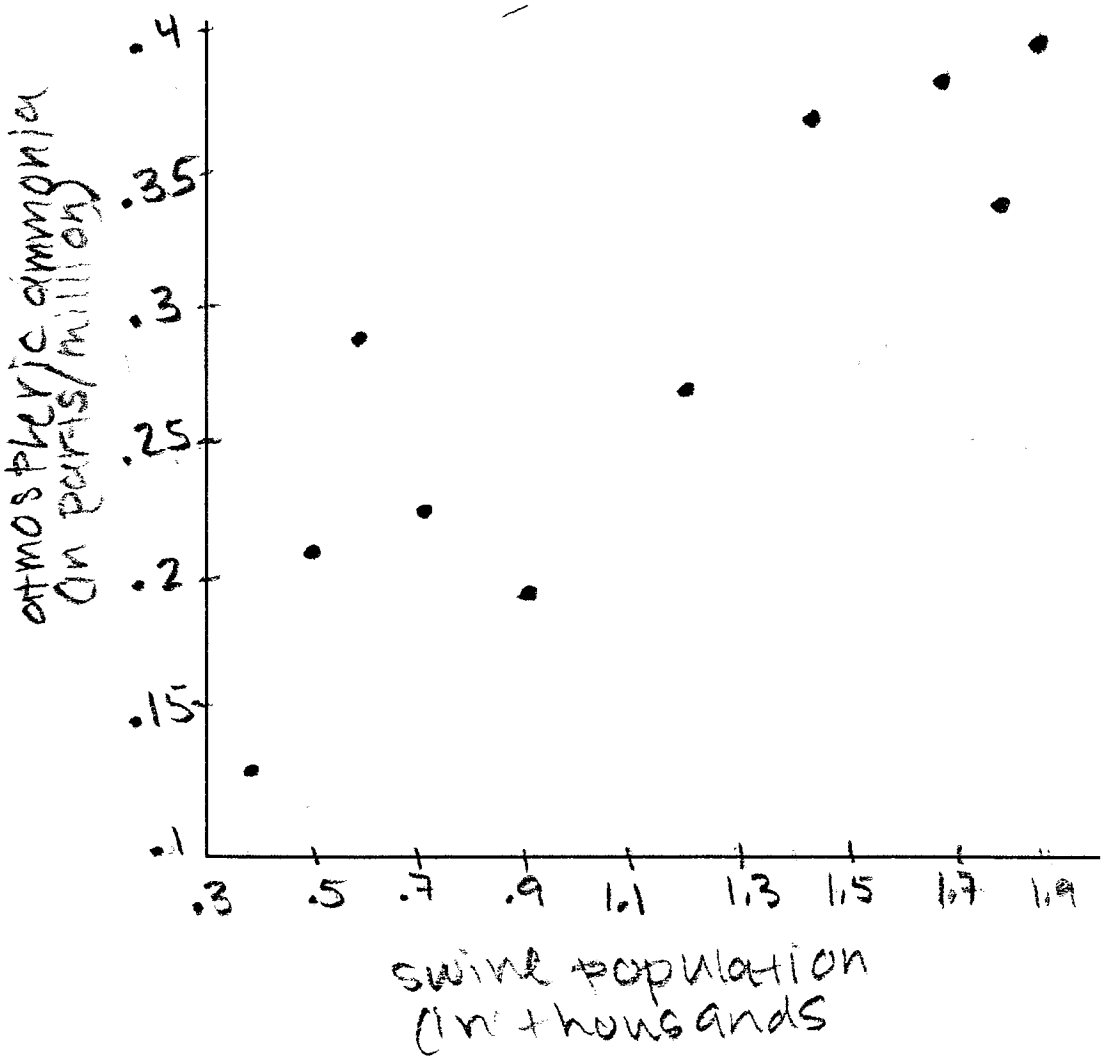

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(b) The value for the correlation coefficient for these data is 0.85. Interpret this value.

The correlation coefficient .85 means there is a strong positive correlation between Atmospheric Ammonia and swine population. It also shows us that our r^2 value is $(.85)^2$, or .7225. This is the proportion of variation in y, the atmospheric ammonia, which can be explained by the swine population size

(c) Based on the scatterplot in part (a) and the value of the correlation coefficient in part (b), does it appear that the amount of atmospheric ammonia is linearly related to the swine population size?

Explain. The relationship between Atmospheric Ammonia and swine population is linear. First by looking at the graph, I see that as the swine population increases, the atmospheric ammonia increaces. The amount by which the atmospheric amonia increase remains the same for each interval of x, the swine population. And because the correlation coefficient or r, is so large, it is safe to say that the relationship between x & y is linear.

(d) What percent of the variability in atmospheric ammonia can be explained by swine population size?

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