

Name \_\_\_\_\_

Student ID# \_\_\_\_\_

**AMS 102 ELEMENTS OF STATISTICS****FALL 2008****FINAL EXAM****DECEMBER 20**

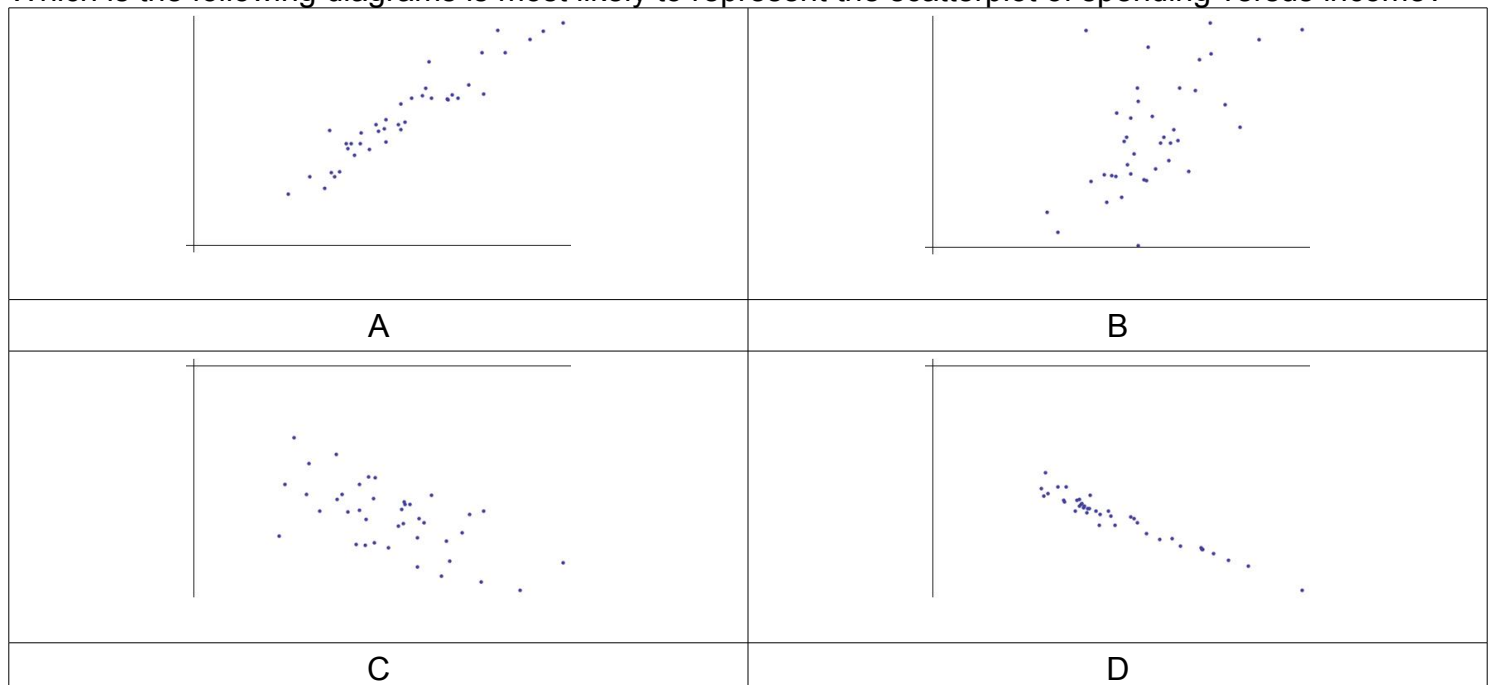
Problem	1	2	3	4	5	6	7	8	Total
Max Score	20	20	20	20	20	20	20	20	160

**Problem 1. At the mall.**

A survey conducted at mall asked shoppers to identify how much money they plan to spend on holiday gifts. Mall visitors were asked about their gender, age, race, level of education, annual income, and approximate sum of money they plan to spend.

(a) Identify the population and the individuals of this survey. Classify the variables as quantitative or categorical and suggest appropriate type of diagram to represent each one of them.

(b) It was determined that the correlation between annual income and planned spending equals  $C=.6$ . Which is the following diagrams is most likely to represent the scatterplot of spending versus income?



**Problem 2. Does vitamin C help prevent flu infection?**

In the end of the school year a medical student asks each of her classmates whether or not they had a flu that past season and whether or not they were taking vitamin C as a preventive measure.

*Give detailed answers to the following questions.*

(a) Is this study an experiment or a sampling?

(b) Identify the explanatory and response variables.

(c) Suggest possible sources of bias.

(d) Help the student to design a study (to be conducted the following year) that would produce more accurate results.

**Problem 3. Internship prospects.**

Josh has applied for three summer internships. One with a private company (C), one with a non-profit (N), and one with the state government (G).

He wrote down the following “personal” probabilities to be offered the possible combinations of jobs:

$$P(C)=50\%$$

$$P(C \text{ and } N)=25\%$$

$$P(C \text{ and } N \text{ and } G)=5\%$$

$$P(N)=40\%$$

$$P(N \text{ and } G)=10\%$$

$$P(G)=50\%$$

$$P(C \text{ and } G)=15\%$$

(a) What is the probability that Josh will get at least one internship offer?

(b) What is the probability that Josh will get exactly one internship offer?

(c) Is getting the government internship independent from getting a non-profit internship?

**Problem 4. Water salinity.**

A group of students made measurements of water salinity in Peconic Bay after a heavy rainfall. (Salinity is expressed by the amount of salt found in 1,000 grams of water. When 1,000 grams of water contains 1 gram of salt, the salinity is 1 part per thousand, or 1 ppt.) Typically salinity variation among the samples collected from the bay at approximately the same time is characterized by the standard deviation  $\sigma = .4$  ppt.

(a) The 10 samples collected by the students give average salinity 29.7 ppt. Give 95% confidence interval for the salinity of Peconic Bay water.

(b) How many samples would it be necessary to collect to obtain 99% confidence interval with the margin of error no more than .1ppt?

**Problem 5. Reaction Speed.**

A researcher measured 12 mature male and 16 mature females dolphins in a particular group. Male dolphins had sample average length of 74 in and sample standard deviation of 6 in. For female dolphins these figures are 68in and 5 in respectively.

Give 95% confidence level interval for each of the following:

(a) Average length of a male dolphin in a group.

(b) Average length of a female dolphin in a group.

(c) Average difference between length of males and that of a females.

**Problem 6. Limited Budget.**

As the result of budget deficit the University is faced with a choice: to increase the student fee or to cut down on some of the subsidized services.

(a) Out of 60 student surveyed 18 said they oppose fee increase, despite inevitable services reduction. Give 90% confidence level interval for the proportion of student who oppose fee increase.

(b) How many students need to be surveyed to get 95% confidence level interval with the margin of error of no more than 5%?

**Problem 7. Impulsive shopping.**

We observe 12 customers at a department store and note how they pay. Then we ask if they have planned their purchase in advance or made a decision on the spot.

Of 9 credit card shoppers 4 say they have planned the purchase in advance.

Of 3 cash shoppers 2 say they have planned the purchase in advance.

Do these result give a statistically significant evidence toward the claim “credit card shopper are more likely to 'buy on impulse' then cash shoppers”?

*State the null-hypothesis and the alternative hypothesis. Write the formula you would use to compute the test statistic. Explain how you would interpret its value.*

*It is possible to carry through the computations with just paper and pencil. That is not necessary, but you'll get extra credit if you do.*

**Problem 8. Bloopers.**

Explain what is wrong with the following claims and correct them if possible.

(a) A student writes in her social studies report:

“There is a high correlation between the gender of American workers and their income.”

(b) A novice poker player reads in a book that the probability to be dealt three of a kind in a five-card poker game is  $1/50$ . He argues:

“I have been dealt 49 hands, none of them was three of a kind. Therefore the next one must be three of a kind.”

(c) Associated Press once provided the following explanation of one of its opinion polls.

“For a poll of 1,600 adults, the variation due to sampling error is no more than 3 percentage points either way. The error margin is said to be valid at the 95 percent confidence level. This means that, if the same questions were repeated in 20 polls, the results of at least 19 surveys would be within 3 percentage points of the results of this survey.”