

NAME: \_\_\_\_\_

# MATH 10 MIDTERM 1

April 21, 2008

INSTRUCTIONS: This is a closed book, closed notes exam. You are not allowed to provide or receive help from any outside source during the exam.

- No calculators are allowed.
- You must show your work to receive full credit.

## HONOR STATEMENT:

I have neither given nor received help on this exam, and all of the answers are my own.

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Signature

Question	Points	Score
1	4	
2	6	
3	8	
4	5	
5	3	
6	8	
7	18	
8	3	
9	5	
10	10	
11	4	
12	8	
13	5	
14	8	
15	5	
Total:	100	

You can use these formulas for your computations:

$$b_1 = \frac{n(\sum xy) - (\sum x)(\sum y)}{n(\sum x^2) - (\sum x)^2}$$

$$b_0 = \bar{y} - b_1\bar{x}$$

$$r = \frac{\sum(x - \bar{x})(y - \bar{y})}{(n - 1)s_x s_y} = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{n(\sum x^2) - (\sum x)^2} \sqrt{n(\sum y^2) - (\sum y)^2}}$$

1. [4 points] The standard deviation of a list of numbers is zero. What can you say about the numbers in the list?

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2. [6 points] An investigator has a computer file showing family incomes for 1000 recent graduates of a certain college. They range from \$8,800 per year to \$92,300 per year. Suppose by accident the largest income in the file gets changed to \$923,000. Does this effect the mean? If so, by how much? Does this affect the median? If so, by how much?

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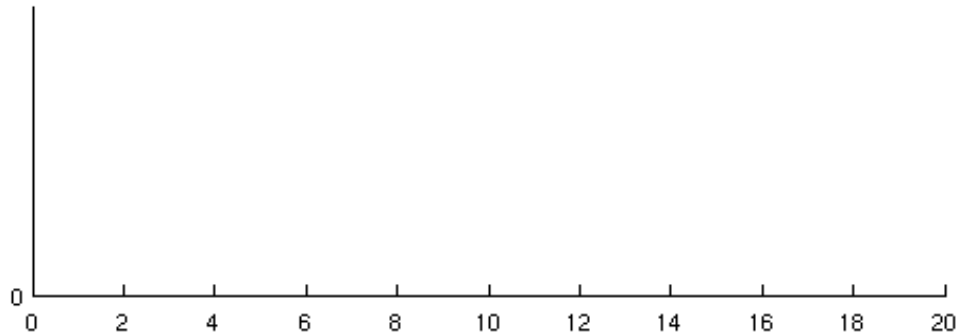
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3. Consider the following data:

3 5 6 6 7 8 9 11 11 12 14 16

Compute the following:

- (a) [1 point] Mean \_\_\_\_\_
- (b) [1 point] Median \_\_\_\_\_
- (c) [1 point] Range \_\_\_\_\_
- (d) [1 point] Sample variance \_\_\_\_\_
- (e) [1 point] Sample standard deviation \_\_\_\_\_
- (f) [1 point] Quartiles  $Q_1$  and  $Q_3$  \_\_\_\_\_
- (g) [1 point] Interquartile range \_\_\_\_\_
- (h) [1 point] Draw a boxplot of the previous data.



4. [5 points] A population of 24 elements has mean 10 and standard deviation 2. Only one of the statements is always false. Which one?
- (a) there are 2 elements with value 14 and 3 elements with value 6.
  - (b) there are more than 12 elements with value greater than 10.
  - (c) there are exactly 12 elements with value 12.
  - (d) there is 1 element with value 2 and 1 element with value 18.
  - (e) there is 1 element in the population with value 1.

5. [3 points] A study finds that children who watch many hours of television get lower grades in school on average than those who watch less TV. Does watching television make children less performing in school? Discuss briefly.

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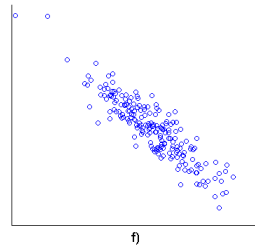
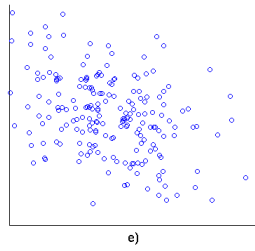
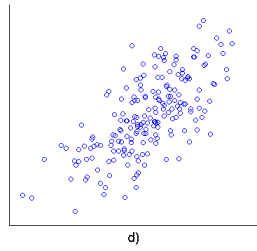
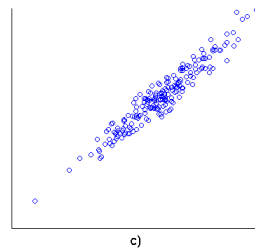
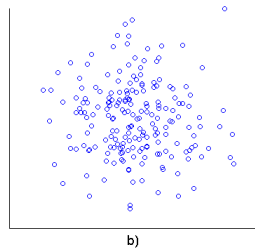
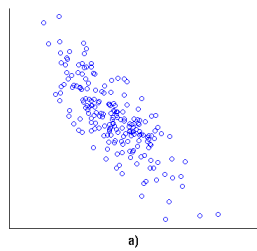


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6. [8 points] Consider the following scatter plots:



Match each one of them with its own correlation (provide explanations):

- 1)  $-0.9$    2)  $0.69$    3)  $-0.37$    4)  $-0.06$    5)  $-0.78$    6)  $0.96$

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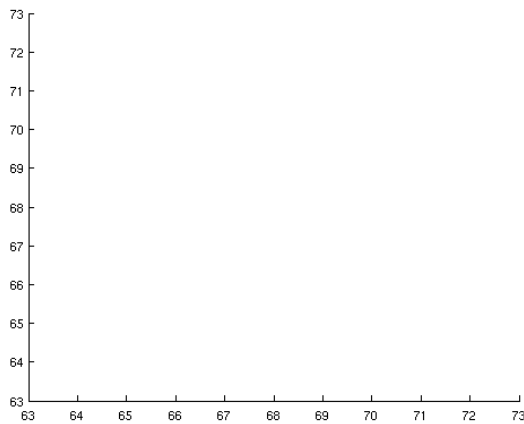


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7. A student wonders if tall women tend to date taller men than do short women. She measures herself, her dormitory roommate, and the women in the adjoining rooms; then she measures the next man each woman dates. Here are the data (heights in inches):

$Women(x)$	66	64	66	65	70	65
$Men(y)$	72	68	70	68	71	65

- (a) [3 points] Make a scatterplot of these data. Based on the scatterplot, do you expect the correlation to be positive or negative? Near  $\pm 1$  or not?




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- (b) [3 points] If heights were measured in centimeters rather than inches, how would the correlation change? (There are 2.54 centimeters in an inch.)

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- (c) [3 points] If every woman dated a man exactly 3 inches taller than herself, what would the correlation between male and female heights be?

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- (d) [5 points] Find the correlation  $r$  between the heights of the men and the women (show all your computations).

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- (e) [4 points] Does the correlation coefficient tell us whether women tend to date men taller than themselves?

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8. [3 points] If the correlation between two variables is 0 what can you say about the slope of the regression line?

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9. [5 points] A teaching assistant is recording grades on a 10 question quiz. Each question is graded either correct or incorrect. The TA writes down a list of the number of questions each student got correct and a list of the number of questions each student got wrong. The average number of correct answers is 6.4 with a standard deviation of 2.0; the average number of incorrect answers is 3.6 with standard deviation 2.0. The correlation coefficient between these two lists is

- (a) 0  
(b)  $-0.5$   
(c) 0.5  
(d) 1  
(e)  $-1$

10. Rarito is a famous Spanish dice player and one of his favourite hobbies is the one of rolling two fair dice. Consider the following events:

- $A$  = the sum is 7 or more
- $B$  = the sum is even
- $C$  = the first outcome is a 4

Compute the probabilities:

- (a) [1 point]  $P(B) =$  \_\_\_\_\_
- (b) [1 point]  $P(\bar{A}) =$  \_\_\_\_\_
- (c) [2 points]  $P(A \text{ and } C) =$  \_\_\_\_\_
- (d) [2 points]  $P(B \text{ and } C) =$  \_\_\_\_\_
- (e) [2 points]  $P(A \text{ or } C) =$  \_\_\_\_\_
- (f) [2 points]  $P(B \text{ or } C) =$  \_\_\_\_\_
11. [4 points] What is the probability that Rarito will get one or more 6's if he rolls three dice?

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12. [8 points] Occasionally Rarito decides to toss a coin to decide how many dice to roll. If he tosses a head, he rolls 2 dice. If he tosses a tail, he rolls 3 dice. After the roll, a sum of 5 is obtained. What are the odds that Rarito tossed a head?

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13. [5 points] Freaky, Rarito's brother, has the obnoxious habit to wear 3 pair of pants at the same time, one on top of the other. He owns 7 different pair of pants, one blue, one green, one red, one cyan, one magenta, one yellow, and one black. In how many different ways can Freaky put his pants on?

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14. [8 points] Rarito finds the cyan and the magenta pants inside the washing machine. Knowing that his brother chooses the pants to wear in a random and equally likely way, what are the odds that Freaky decided to wear the red, the green, and the blue pants (order does not matter)?

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15. [5 points] Suppose  $A$  and  $B$  are two events such that  $P(A|B) = P(A)$ . Can you claim also that  $P(B|A) = P(B)$ ? Explain.

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