

## QUANTITATIVE METHODS

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# Review Problems for Mid-Term

1. A student advising file contains the following information:

- a) Name of student
- b) Year of birth
- c) High School Average
- d) Program (Social Science, Commerce, ect.)
- e) Satisfaction towards SLC (Excellent, Satisfactory, Unsatisfactory)

For the information in parts (a) through (e) list the level of measurement (nominal, ordinal, interval or ratio).

2. Identify each of the following samples by naming the sampling technique used (cluster, convenience, simple random, stratified, systematic).

- a) Average weight of newborn baby boys: Twelve hospitals are selected at random, and the weight of each baby born in January is recorded.
- b) Percentage of 18 to 25 year-olds who are in favor of legalizing marijuana: At a shopping mal, people who appear to be in the proper age group are stopped and asked for their age and whether they are in favor of legalizing marijuana.
- c) Average amount spent at a corner store: The amount of money of one in 20 customers entering a corner store is recorded.
- d) Effectiveness of a pain reliever against headaches: Patients who have a history of migraines are divided into three groups, using random numbers. The three groups are given a placebo, a half-dose, and a full-dose of the medication. The patients are asked to rate the effectiveness of the medication on a scale of 1 to 10.
- e) To judge the appeal of a proposed television sitcom, a random sample of 10 people from each of three different age categories was selected and those chosen were asked to rate a pilot show.

3. Sarah wants to do a study on the number of hours per week a student at St. Lawrence studies. To accomplish this, she passed a questionnaire to 10 students chosen at random from their registration number. The results were:

4      12      7      10      15      5      2      22      15      18

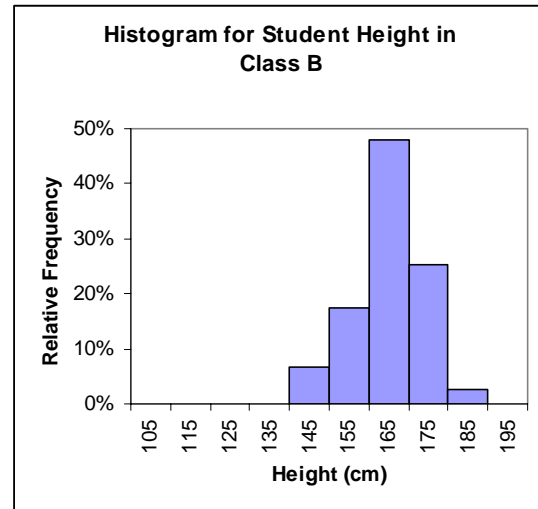
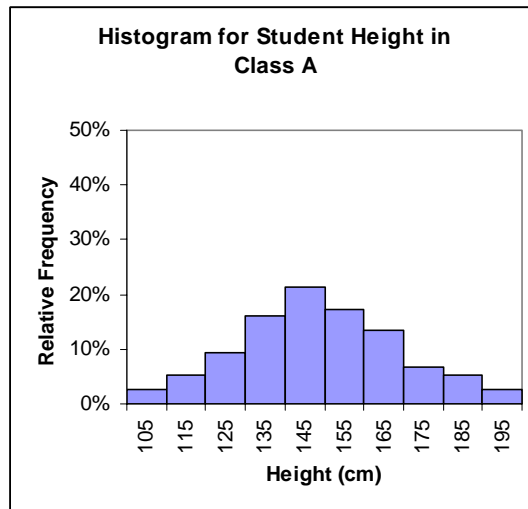
Find the following:

- |                                  |                             |
|----------------------------------|-----------------------------|
| a) the mean                      | b) the median               |
| c) the mode                      | d) the range                |
| e) the variance                  | f) the standard deviation   |
| g) $Q_1$                         | h) $Q_3$                    |
| i) Interquartile range           | j) Coefficient of variation |
| k) Draw a box and whisker graph. |                             |

4. In a study on intelligence, a psychologist records the time (in minutes) it takes for children of age 10 – 12 to complete a particular task. The results are summarized in the following frequency distribution. Find the mean and standard deviation.

Time (in min)	Frequency
1 to 5	2
6 to 10	11
11 to 15	10
16 to 20	6
21 to 25	1

5. Consider the following two histograms showing the distribution of height for two different classes of students.



- a) Which class has the highest mean?  
 b) Which class has the highest standard deviation?
6. The following data gives the stress scores before a QM test and the scores on the QM test for seven students:

Stress Score	6.5	4.0	2.5	7.2	8.1	3.4	5.5
Test score	81	96	93	68	63	84	71

- a) Find the slope of the least-squares line.  
 b) Find the intercept of the least-squares line.  
 c) Find the equation of the least squares line.  
 d) Find the coefficient of correlation  $r$ .  
 e) Find the coefficient of determination.  
 f) If a student obtained a stress score of 7.0, what is the expected test score?  
 g) Draw a scatter diagram.

7. A correlation of  $-0.68$  was obtained between the number of hours of TV watched per week and the number of books read per month. Interpret this in your own words.
8. In the following situation, two variables are described. Select the most likely value for the coefficient of linear correlation for the two variables from among those given.  
 $x$  = the number of police patrol cars cruising in a given neighborhood  
 $y$  = the number of burglaries committed in the neighborhood  
 A)  $r = 1.14$       B)  $r = 0.78$       C)  $r = -0.13$       D)  $r = -0.75$
9. A box contains 12 marbles, 5 red, a 3 blue and a 4 green marble. In two marbles are picked at random, what is the probability that  
 a) one is red and the other is green?      b) both are red?
10. Two cards are drawn from a deck of 52 cards. What is the probability of having  
 a) Two kings?  
 b) A king and a Queen?  
 c) Two clubs?
11. There are two multiple choice questions on an exam, each with 4 possible answers (A, B, C or D). If someone guesses the answer to both of these questions, what is the probability that  
 a) both will be correct.  
 b) both will be wrong.  
 c) one is correct and the other is wrong.
12. A random sample of 1000 adults was asked whether they voted in the last general election. Here are the results, broken down by age group.

	18-24 years	25-39 years	40-59 years	60 years or older
Voted	46	159	178	159
Did not vote	90	179	118	71

Suppose one adult is selected at random from these 1000 adults. Find the following probabilities

- $P(\text{Voted})$
- $P(\text{Voted and 18-24})$
- $P(\text{Voted or 18-24})$
- $P(\text{Voted given 18-24})$
- Are the events Voted and 18-24 independent?
- Are the events Voted and 18-24 mutually exclusive?

## ANSWERS

1. a) nominal      b) interval      c) ratio      d) nominal      e) ordinal  
 2. a) cluster      b) convenience      c) systematic      d) stratified      e) stratified

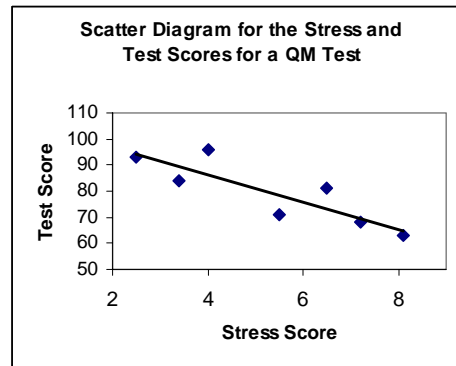
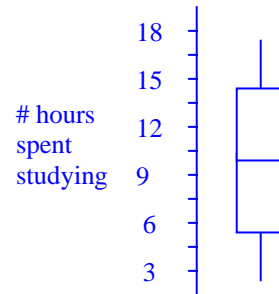
3. a) 11 hour  
 b) 11 hours  
 c) 15 hours  
 d) 20 hours  
 e) 42.89 hours<sup>2</sup>  
 f) 6.54 hours  
 g) 5 hours  
 h) 15 hours  
 i) 10 hours  
 j) 59.5%

4. a) 11.8 minutes      b) 4.86 minutes

5. a) Class B      b) Class A

6. a) -5.207  
 b) 107.1  
 c)  $y = -5.207x + 107.1$   
 d) -0.861  
 e) 74.1%  
 f) 70.7

Amount of time students spent studying in a week



7. The more a person watches TV, the fewer books they read.

8. D

9. a)  $\frac{10}{33}$       b)  $\frac{5}{33}$

10. a)  $\frac{1}{221}$       b)  $\frac{4}{663}$       c)  $\frac{1}{17}$

11. a)  $\frac{1}{16}$       b)  $\frac{9}{16}$       c)  $\frac{3}{8}$

12. a)  $\frac{542}{1000} = \frac{271}{500}$       b)  $\frac{46}{1000} = \frac{23}{500}$       c)  $\frac{632}{1000} = \frac{79}{125}$       d)  $\frac{46}{136} = \frac{23}{68}$

e) No since  $P(\text{Voted}) = \frac{271}{500} \neq P(\text{Voted given 18-24}) = \frac{23}{68}$

f) No since  $P(\text{Voted and 18-24}) = \frac{23}{500} \neq 0$