

Sample Problems for Exam 2



Course : Introduction to Probability and Statistics, Math 113 Section 3234

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- Exam 2 will be held in class on Monday October 29th.
 - Syllabus for Exam 2: Sections 3.3, 3.4, 4.2, 4.3, 4.4 & 4.7.
 - Review for Exam 2 will be held on Wednesday October 24th.
 - Best way to prepare for the midterm is to solve the Sample problems and MyStatLab problems.
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1. **(Quartiles, percentiles etc)** For the following test score data:

71, 73, 83, 65, 96, 55, 98, 83, 66, 75, 80

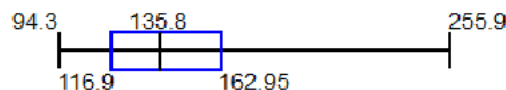
- (a) Find Q_1, Q_2, Q_3 .
- (b) Find the 5-number summary.
- (c) Draw a boxplot for this data.
- (d) In which quartile is the score 71?
- (e) Find P_{65} .
- (f) What is the percentile rank of the student with a grade of 66?
- (g) Calculate the IQR.

2. **(Quartiles, percentiles etc)** The sorted data below is the number of points scored in the Super Bowl for a recent period of 24 years.

36, 37, 37, 39, 41, 43, 44, 44, 47, 50, 53, 54, 55, 56, 56, 57, 59, 61, 61, 65, 69, 69, 75

- (a) Find Q_1, Q_2, Q_3 .
- (b) Find the median.
- (c) Find the 5-number summary.
- (d) Draw a boxplot for this data.
- (e) Find the quartile of score 47?
- (f) Find P_{88} .
- (g) Find the percentile rank of score 65.
- (h) Calculate the IQR.

3. **(Quartiles, percentiles etc)** Consider the following boxplot of weights of women (in lbs) taken as part of a health exam.



- (a) Find the 5-number summary for this data.
 - (b) Find the midrange for this data.
 - (c) Find the IQR (inter-quartile range).
 - (d) Is the maximum value an outlier ?
4. (**z-scores**) Anne has taken a series of admissions tests at a prestigious university. She receives a score of 1020 on the Math Assessment Test and 1100 on the English Assessment Test. Given that the mean on the Math test was 1000 with a standard deviation of 40 and that the mean on the English test was 1000 with a standard deviation of 80, decide if the tests indicate whether Anne is better prepared for English or Math. Explain.
5. (**z-scores**) Pollution data from 5 polluted lakes in New York and New Jersey was collected. The following results on the amount of pollution were obtained by two groups. (Hint: Compute median and standard deviation for both data sets.)

New York Lake	Pollution	New Jersey Lake	Pollution
A	22	R	75
B	15	S	61
C	29	T	70
D	33	U	70
E	24	V	76

Use z-scores for each data set to answer the following questions.

- (a) Which of the above 10 lakes is most polluted ?
 - (b) Which of the above 10 lakes is least polluted ?
6. (**Empirical Rule**) According to the College board, the mean total of SAT score of all college-bound seniors in 2011 was 1509, with a standard deviation of 312. (Hint: Use Figure 3-3 on page 106 (Section 3.3) to answer questions b,c and d.)
- (a) Using the range rule of thumb, would you consider a score of 2000 to be unusually high ?
 - (b) Using the empirical rule, what would you estimate for the 85-th percentile of the SAT score distribution ?
 - (c) Using the empirical rule, what would you estimate for the 15-th percentile of the SAT score distribution ?
 - (d) The real 85-th percentile was 1660. Do you think the SAT score distribution is normal ?
7. (**Probability**) The data below describes head injuries and helmet use.

	Head injuries	Not injured
Wore Helmet	96	656
No Helmet	480	2330

- (a) Find the probability of randomly selecting a subject with a head injury.
- (b) Find the probability of randomly selecting a subject with a head injury or who wore a helmet.

- (c) Find the probability of randomly selecting a subject who wore an helmet and was injured.
- (d) Find the probability of selecting two different subjects both of whom wore helmets.
- (e) Find the probability of selecting two different subjects both of whom had head injuries.

8. **(Permutations and Combinations)**

- (a) How many licence plates of the form 3 letters then 3 numbers can be printed if we assume that there are no Q's for the letters and no 0's for numbers if (i) repetitions are allowed, and (ii) repetitions (of both letters and numbers) are not allowed.
- (b) A team of 12 players must select 5 players to start a game. How many possibilities are there?
- (c) How many ways can you choose fruits from 4 apples, 4 oranges and 4 plums ?
- (d) In how many ways can you arrange the letters of the word "MISSISSIPPI" ?
- (e) The Math Department at a prestigious college consists of the following ranks, 4 Full Professors, 6 Associate Professors, 8 Assistant Professors and 2 Lecturers. How many ways are there to select a 8 person committee containing exactly two member of each rank?
- (f) Write down the first 7 lines of Pascal's triangle and use it to expand $(x + y)^5$.

9. **(Probability)**

- (a) If there are 30 M&M's in a bag: 10 red, 5 blue, 5 brown and 10 green. What is the probability of picking one at random and having it be green or blue?
- (b) What is the probability that a randomly picked arrangement of the word "MATH" has 'A' in the second place ?
- (c) A safe combination consists of 3 numbers between 0 and 99. What is the probability that a thief guessing the combination will get the correct combination on the first attempt ?
- (d) Winning the Mega Millions jackpot requires that you select the correct five numbers between 1 and 56 and, in a separate drawing, you must also select the correct single number between 1 and 46. What is the probability of winning the jackpot ?

10. **(Odds)**

- (a) A solitaire game was played 500 times in which the game was won 77 times. Based on these results find the odds against winning the game.
- (b) The odds against the horse Zoom winning the Kentucky Derby are 97 : 3. Find the probability of Zoom winning the race.

11. **(Probability)** In an experiment a coin is tossed once followed by a die rolled once.

- (a) Are these two events independent ?
- (b) Write down the sample space for this experiment.

- (c) What is the size of the sample space ?
- (d) What is the probability of tossing a heads and rolling a 5 ?

12. (Short Questions)

- (a) True or false: For any data set, the median is always equal to the 50th percentile.
- (b) True or false: For any data set, the median is always equal to the second quartile Q_2 .
- (c) True of false: For any data set, the mean is always equal to the median.
- (d) Fill in the blank: Approximately _____ percent of the values in the sample are greater than or equal to the 35th percentile.
- (e) Fill in the blank: If the standard deviation of a data set is 5.0 feet, its variance is _____.
- (f) Fill in the blank: If $P(A) = 0.35$, then the probability that A fails is _____.
- (g) True of false: A probability of an event can be -1 .
- (h) True of false: A weatherman predicts the rain a week in advance with a probability of 0.37. His prediction is better than a coin toss.
- (i) True or false: Suppose A and B are events with $P(A) = 0.2$, $P(B) = 0.6$ and $P(A \text{ or } B) = 0.7$. Then A and B are disjoint.