

1. Use a Venn diagram to determine which of the following are valid syllogisms:
 - a. Nothing is better than a hot fudge sundae.
A piece of stale bread is better than nothing.
Therefore, a piece of stale bread is better than a hot fudge sundae.
 - b. College classes are fun.
Math 110 is a college class.
Therefore, Math 110 is fun.
 - c. Hot fudge sundaes are high in fat.
French fries are high in fat
Therefore, french fries are hot fudge sundaes
2. State the contrapositive of the following:
 - a. If this is your favorite class then you will do well.
 - b. If it tastes bad then it must be good for you.
 - c. If the going gets tough then the tough get going.
3. Use a truth table to determine when if ever the wff $p \rightarrow \neg q$ is true ?
4. Use a truth table to determine whether or not the wffs $p \rightarrow q$ and $(\neg p) \vee q$ are equivalent.
5. Express "If she is not hungry then she won't eat dessert" as a formula involving p and q .
6. Find all subsets of the set $\{a, A\}$. Which are proper ?
7. Draw a Venn diagram for two nonempty distinct sets A and B with $A \subset B$. Shade the region $A^c \cap B^c$.
8. A store survey of 307 customers shows that 185 made purchases, 202 were satisfied with the service at the store, and 55 who didn't make purchases weren't satisfied with the service. What percent of those who made purchases were satisfied with the service ? Use a Venn diagram.
9. No area code can start with either 0 or 1. How many possible area codes there are ?
10. How many Florida Lotto picks are there (where 6 numbers are selected from 1 to 49) ?
11. How many bridge hands (13 cards in a hand) are there with exactly six hearts and four spades ?
12. How many (5 card) poker hands are full houses (three-of-a-kind and a pair) ?
13. How many (5 card) poker hands have at exactly two aces ?
14. How many (5 card) poker hands do not contain any cards of the same rank ?
15. How many subsets does the empty set have ?
16. Suppose the set X has 63 proper subsets. How many elements are in X ?
17. Suppose $A = \{1, 2\}$ and $B = \{2, 3\}$. List all the subsets of $A \cup B$.

18. From a group of ten men and six women, you wish to form a committee of three women and two men. How many different committees can you form ?
19. Does $\{0, 1, 2, \dots\}$ have the same cardinality (i.e., size) as the set of all real numbers ?
20. Review all the homework, the quizzes, and everything else.

Do the problems in order in your bluebook. Show your work.

1. Use a Venn diagram to determine if the following is a valid syllogism:
Hot fudge sundaes are high in fat.
French fries are high in fat
Therefore, french fries are hot fudge sundaes
2. Use a truth table to determine whether or not the wffs $p \rightarrow q$ and $(\neg p) \vee q$ are equivalent.
3. Suppose $A = \{1, 2\}$ and $B = \{2, 3\}$. List all the subsets of $A \cup B$.
4. Draw a Venn diagram for two arbitrary nonempty distinct sets A and B with $A \subset B$. Shade the region $A^c \cap B$.
5. A store survey of 318 customers shows that 178 made purchases, 98 were satisfied with the service at the store, and 100 who didn't make purchases weren't satisfied with the service. Make a Venn diagram with numbers that describes the situation.
6. How many bridge hands (13 cards in a hand from a normal 52 card deck) are there with exactly five hearts and three spades ?
7. Give examples of a countable infinite set and an uncountable set. (You need not prove things, but do say which is which.)
8. From a group of ten men and six women, you wish to form a committee of five people with the women outnumbering the men (and having no men is possible). How many different committees can you form ?

1. You decide to start a Math 110 Lotto by letting people choose four lowercase letters.
 - (a) How many choices are possible if the order matters and the letters may be repeated ?
 - (b) How many possible if the order doesn't matter and the letters may not be repeated ?
2. How many 5 card hands (from a standard deck of cards) containing exactly two tens are possible ? What's the probability of getting such a hand in a fair deal of five cards from a full deck of cards ?
3. You flip a coin 4 times. What is the probability that you don't get at least two heads ?
4. You roll two dice. What is the probability that you get an eight or higher ?
5. You draw one card from a deck of cards. What is the probability that it is either a queen or a heart ?
6. You are dealt 5 cards. What is the probability that they form a straight (in numerical sequence) ?
7. You invent a game, where a player rolls two dice. He wins \$15 if he gets a 12 and \$4 if he gets a 7. Is a charge of \$1 to play each time a good or bad business move ? Explain.
8. Your weekly sales commission varies. Twenty percent of the time it is \$200. Fifty percent of the time it is \$80. And the rest of the time it is \$10. Find your expected commission.
9. You are dealt 2 cards. What is the probability that the second one is an heart ?
10. In a survey of students, one third of the students are taking Math 110, of which 85% love math. Half of those not taking Math 110 love math. What percentage of the students surveyed love math ?
11. A survey of smokers and non-smokers is taken in a town where very few people smoke. Let A be the event "the person has health problems involving the respiratory system" and B be the event "the person has smoked for fifteen years or more". Discuss the difference between $P(A \text{ and } B)$ and $P(A \text{ given } B)$. Which is likely to be bigger ? Why ?
12. Are the events "being native-born" and "being not a citizen" independent ? mutually exclusive ?
13. You roll 2 dice 10 times in a row. Given that each roll is independent of the other rolls, find the probability that you never roll a eleven. And find the probability that you get a eleven at least once.
14. The company MathCo has three factories, in Mobile, Nirvana, and Podunk. The factory in Mobile produces 50% of the company's products with a 6% defect rate, Nirvana produces 30% with a 5% defect rate, and Podunk has a 7.5% defect rate. Are the events "being defective" and "being produced in Mobile" independent for MathCo's products ?
15. Review all the homework, the quizzes, and everything else.

Do the problems in order in your bluebook. Show your work.

1. You are dealt 2 cards from a deck of cards. What is the probability that the second one is a heart ?
2. Your weekly sales commission varies. Twenty percent of the time it is \$200. Fifty percent of the time it is \$80. And the rest of the time it is \$10. Find your expected commission.
3. You roll 2 dice six times in a row. Given that each roll is independent of the other rolls, find the probability that you never roll a seven. And without doing any complicated calculations find the probability that you get a seven at least once.
4. In a survey of students, one third of the students are taking Math 110, of which 85% love math. Half of those not taking Math 110 love math. What percentage of the students surveyed love math ?
5. You flip a coin four times. What is the probability that you get at least 2 heads ?
6. A survey of smokers and non-smokers is taken in a town where very few people smoke. Let A be the event “the person has health problems involving the respiratory system” and B be the event “the person has smoked for fifteen years or more”. Discuss the difference between $P(A \text{ and } B)$ and $P(A \text{ given } B)$. Which is likely to be bigger ? Why ?
7. You flip a coin 3 times. Prove that the events “the first two flips are heads” and “the third flip is heads” are independent.

1. Go over the review sheets from the previous exams.
2. Find the mean, median, and mode of $\{12, 123, 40, 33, 35, 90, 60, 40, 40, 40, 122, 9, 7, 88\}$
3. The company MathCo employs 287 people: 96 math majors, 78 stat majors and the rest who didn't major in math or stat (but they all still love math and stat and regularly read math and stat books for fun — who doesn't?). The mean salary of the math majors is \$350,000. The mean salary of the stat majors is \$170,000. The mean salary of the rest is \$40,000. Find the mean salary of the employees of MathCo.
4. On four previous exams, Lew Zer received the scores of 66, 59, 70, and 80 (all out of 100). What does Lew have to score on the fifth exam in order to have a mean score of at least a 70?
5. Consider data as follows: for $0 < x \leq 20$ you have 50 data points, and for $20 < x \leq 30$ you have 25 data points. Draw two histograms, one with the frequency, the other with the relative frequency density.
6. Find the std deviation of $\{12, 28, 19, 22, 25, 18, 16, 19, 12, 10, 17, 23, 11, 12, 10, 11, 14, 10\}$
7. The quantity “mathlove” has a normal distribution with mean 250 and standard deviation 41.3. Find the proportion with mathlove between 165 and 280.
8. Suppose Z is the standard normal distribution. Draw a graph and shade the region representing $Z \leq -1.56$. Finally, find the probability $P(Z \leq -1.56)$.
9. Suppose X is the distribution of midterm scores and is normally distributed with mean 66 and standard deviation 12. What should the cut-off grade be in order to give out 15% A's?
10. Suppose market research shows that each year 70% of people who use brand X keep using brand X, while the rest switch to brand Y. And 40% of those who use brand Y switch to brand X, with the remainder sticking with brand Y. Find the transition matrix. Suppose initially 60% of people prefer brand X. What will the market breakdown be two years later? Is a 50-50 split an equilibrium? Why or why not?
11. Suppose market research shows that each year 75% of people who use brand X keep using brand X, while the rest switch to brand Y. And 65% of those who use brand Y keep using brand Y, with the remainder switching to brand X. Find the transition matrix. Suppose the market share is split evenly. What will the market breakdown be two years later?
12. What is the MOE? How and why is it used? What happens to the MOE as the sample size or confidence level changes?
13. A survey of 645 people find that 70% love math. Find the MOE assuming a confidence level of 85%.
14. If the confidence level is 90%, how many people need be surveyed to have a MOE of no more than 3%?
15. Review everything else.

Do the problems in order in your bluebook. Show your work. Justify your answer. State explicitly any formula you use.

1. Use a Venn diagram to determine if the following is a valid syllogism:
L's children are well-behaved.
The children on the Brady Bunch are well-behaved.
Therefore, L's children are on the Brady Bunch.
2. The set X has more than 75 subsets but fewer than 200. Find the cardinality of X .
3. How many 13 card hands are there with exactly six hearts and four spades ?
4. In Professor Zer's Math 110 class, the distribution of midterm scores and is normally distributed with mean 66.6 and standard deviation 15.1. Professor Zer wants to give out 17% A's. Find the cut-off grade for an A.
5. How many people do you need to survey, if you want a confidence level of 90% and a MOE $\leq 5.3\%$?
6. Find the mean, median, mode, and standard deviation of $\{9, 4, 4, 6, 4, 10, 9, 6\}$.
7. In a survey of students, one third of the students are taking Math 110, of which 75% love math. And 40% of those not taking Math 110 love math. What percentage of the students surveyed love math ?
8. Suppose market research shows that each year 60% of people who drink turkish coffee keep drinking turkish coffee, while the rest switch to espresso. And 40% of those who drink espresso switch to turkish coffee, with the remainder sticking with espresso. Find the transition matrix. Now suppose initially 70% of people prefer turkish coffee. What will the market breakdown be two years later ? Is a 50-50 split in market share an equilibrium ? Why or why not ?
9. The company DrinkableMudCo employs 18 math majors and 60 others who didn't major in math (but they all still love math and regularly read math books for fun). The mean salary of the math majors is \$100,000. The mean salary of the others is \$40,000. Find the mean salary of the employees of DrinkableMudCo.
10. You are dealt 5 cards. What is the probability of getting a full-house (a three-of-a-kind and a pair) ?
11. You invent a game, where a player rolls two dice. He wins \$15 if he gets a 12 and \$4 if he gets a 7. Is a charge of \$1 to play each time a good or bad business move ? Explain.
12. You flip a coin three times. Determine whether or not the events A="the first flip is heads" and B="the third flip is heads" are independent.