

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

1. Use a Venn diagram to determine whether or not the following is a valid syllogism:
No doctor is poor.
Lew Zer is no doctor.
Therefore, Lew Zer is poor.
2. State the contrapositive of “If you exercise regularly then you are in good shape.”
3. Use a truth table to determine whether or not the wffs $p \rightarrow q$ and $(\neg p) \vee q$ are equivalent.
4. Draw a Venn diagram for three nonempty sets A , B , and C (in a universal set U) where each two intersect but all three don't. In it shade the region $A \cap B^c \cap C^c$.
5. In a dorm holding 959 students, 463 are taking Math, 289 are taking Physics, and 222 are taking Chemistry. Suppose 25 of these are taking all three, 83 are taking Math and Chemistry, 47 are only taking Chemistry, and 66 are taking Math and Physics. What percentage of students in the dorm are taking at exactly one of these three classes ? Draw and label a Venn diagram. Explain each step of your reasoning.
6. How many (5 card) poker hands are flushes (i.e., five cards of the same suit) ? Explain where each part of your answer comes from.
7. From a group of twelve men and six women, you wish to form a committee of four men and three women. How many different committees can you form ? Explain where each part of your answer comes from.
8. Suppose $A = \{1, 2\}$ and $B = \{-1, 1\}$. Find all subsets of $A \cup B$.

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1. You are dealt 5 cards. What is the probability of getting a straight ?
2. You design a game where a player rolls two dice. He wins \$5 if he gets an 11 or a 12, \$2 if he gets an 8, 9, or 10 and \$1 if he gets a 7. You charge of \$1.50 to play each time. What is your expected daily return if the game is played 1,000 times a day ?
3. The company MathCo has three factories, in Mobile, Nirvana, and Podunk. The factory in Mobile produces 60% of the company's products with a 8% defect rate, Nirvana produces 30% with a 6% defect rate, and Podunk has a 10% defect rate. Are the events "being defective" and "being produced in Mobile" independent for MathCo's products ?
4. In Professor Zer's Math class, the distribution of midterm scores and is normally distributed with mean 68.6 and standard deviation 12.3. Professor Zer wants to give out 18% 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 $MOE \leq 4.75\%$?
6. Find the mean, median, and mode of $\{22, 85, 22, 81, 79, 73, 84, 92\}$.
7. You flip a coin until you get your first heads. Given that each flip is independent of the others, find the probability that you will flip it exactly four times. Explain what each quantity computed represents.
8. Find the standard deviation of $\{6, 7, 9, 9, 5, 8\}$.

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1. Use a Venn diagram to determine if the following is a valid syllogism:
College classes are fun.
Math 110 is fun.
Therefore, Math 110 is a college class.
2. A store survey of 317 customers shows that 175 made purchases, 252 were satisfied with the service at the store, and 65 who didn't make purchases weren't satisfied with the service. What percent of those who made purchases were satisfied with the service? Draw a Venn diagram.
3. Use a truth table to determine whether or not the wffs $(\neg p) \rightarrow q$ and $p \vee q$ are equivalent.
4. In Professor Zer's Math 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 $\{9, 4, 4, 6, 4, 10\}$.
7. You roll two dice until you get your first seven. Find the probability that you will roll the pair of dice three times.
8. Suppose market research shows that each year 80% of people who use brand X keep using brand X, while the rest switch to brand Y. And 35% of those who use brand Y switch to brand X, with the remainder sticking with brand Y. Find the transition matrix. Suppose initially 70% of people prefer brand X. What will the market breakdown be two years later? Is a 50-50 split in market share an equilibrium? Why or why not?
9. Rewrite the system of equations
$$\begin{aligned} \pi x + 3y - z &= 17 \\ 5y &= 88.4 - 11z \end{aligned}$$
 using matrices (don't solve them).
10. The company Micromath employs 27 math majors and 66 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 \$125,000. The mean salary of the others is \$36,000. Find the mean salary of the employees of Micromath.
11. You are dealt 5 cards. What is the probability of getting a full-house (a three-of-a-kind

and a pair) ?

12. Your weekly sales commission varies. Ten percent of the time it is \$500. Forty percent of the time it is \$120. And the rest of the time it is \$10. Find your expected commission.

13. You are dealt 2 cards. What is the probability that the second one is an spade ?