

Name: _____

MATH 110 – EXAM 5

18 April 2005

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Directions: There are ten questions on this exam. Answer every question. Show all work and justify your answers. Each question is worth five points.

1. You have two of the strange dice with you. One of them has two 6's and four 2's. The other die has 3's on all of its sides. Which is better? And why? (If you make a diagram, you may use the back of one of the pages of this exam.)
2. There is a community of 10,000 people living on a remote island. Unfortunately, 300 of them are carriers for Dread Disease. There is a test for this disease, but it is imperfect: 90% of the time it gives the correct result, but 10% of the time it's wrong. If someone tests positive for Dread Disease, what is the chance that the person is really infected?
3. Olympia takes a test with a 10-question true-false section. She didn't study, so she guesses on every question.
 - (a) What is the chance that she gets every question right?
 - (b) What is the chance that she gets every question wrong?
 - (c) What is the chance that she gets at least one question right?
4. You have a ten-sided die labeled with the digits from 0 to 9. If you kept rolling it (forever and ever) and kept track of the digits, do you think that at some point you would see your phone number in the string of digits? Explain your reasoning.
5. Pierre has stolen his older brother's set of loaded dice. How can Pierre determine the probability of rolling a 4? (He can't ask his brother; he would get beat up.)
6. You pick two people at random, what is the probability that they have the same birthday?
7. A weird event has a 1 in 5000 chance of happening. What is the probability of avoiding this event for 5 years?
8. Suppose that a rare disease will kill 1 in 100,000 people.
 - (a) Suppose that the government is willing to spend \$200,000 per life saved for a vaccine that prevents this disease. How much are they willing to pay per dose of the vaccine?
 - (b) There are 280,000,000 people in the United States. How many Americans would this disease claim?

9. Madison tells you that she has an unfair coin: the probability of flipping heads is $\frac{7}{12}$ and the probability of flipping tails is $\frac{4}{12}$. What do you think?
10. You have a standard deck of 52 cards. You remove the Queen of Spades from the deck, and you pick one card.
- (a) What is the probability that the card is a seven?
 - (b) What is the probability that the card is a queen?