# MATH 112 Practice for Hourly Exam 2 

Professor Goldin

1. Each student in Math 112 is asked to write down a whole number from one to nine; one of the 7 colors of the rainbow, given by $\mathrm{R}=$ red, $\mathrm{O}=$ orange, $\mathrm{Y}=$ yellow, $\mathrm{G}=$ green, $\mathrm{B}=\mathrm{blue}, \mathrm{I}=$ indigo, and V=violet; and a sequence of two coin flips, each coin flip having outcome of ' $\mathrm{H}^{\prime}$ or ' $\mathrm{T}^{\prime}$.
(a) Describe 3 different elements of the sample space of this experiment.
(b) What is the size of the sample space of this experiment?
(c) Consider the event that the whole number is odd, the color is indigo, and there is at least one ' T '. Describe this event as a subset of the sample space, and calculate its size. $\mathrm{E}=$
$n(E)=$
(d) Suppose that all outcomes of this experiment are equally likely. Find the probability of the event E above, that a student picked at random will have picked an odd number with the color indigo, and at least one ' T '.
2. A coin is flipped 10 times in a row. What is the probability that at least 3 tosses are tails?
3. An analysis on a mathematical article found that there were 800 words, of which 89 were the word "algebra", 64 were the word "geometry", and 43 were the word "combinatorics." What is the probability that a word chosen at random from this article will be neither "algebra" nor "combinatorics"? Round your answer to four decimal places.
4. A special weighted die is sold to cheating gamblers. It has six sides, but when it is rolled, the 6 will appear $1 / 2$ the time. The 5 will appear $1 / 3$ the time, and the numbers 1,2,3,4 are equally likely to occur. Round your answers to 4 decimal place.
(a) The die is rolled once. What are the odds that 1 or 2 is rolled? (Hint: Make sure to calculate the odds and not the probability.)
(b) If the die is rolled three times, what is the probability that you get two 6 s and one 5 ?
5. A family tour bus service stops at 20 different locations around Rome, Italy. There are 7 families visiting Rome on the bus. Assuming that each family is equally likely to go to any of these 20 different locations, what is the probability that two or more families stop at the same location?
6. Two students are taking a multiple choice test. The first student answers questions correctly on the test with probability .6. The second student answers questions correctly with probability .7. For any given question, the probability that at least one of the students gets a question correct is .8. A question is chosen at random, and it is recorded whether each of the two students got the question right or wrong.
(a) Let $A$ be the event that the first student answers the chosen question correctly, and $B$ be the event that the second student answers the question correctly. Express in terms of intersections and unions the event that at least one of the students answers the chosen question correctly.
(b) Find the probability that both students got the question correct. Do not assume that the students are independent! (See part (c)).
(c) Find the probability that the first student got the question right, given that the second student did.
(d) Are the events, "The first student got the question right" and "the second student got the question right" independent? Explain why or why not.
7. A job applicant takes a lie detector test about drug use. In fact, three percent of applicants are drug users, but all applicants claim that they do not use drugs during the lie detector test. The lie detector test correctly concludes that a non-drug user does not use drugs with probability .8. The lie detector tests correctly concludes that a drug-user does use drugs with probability .9. Given that the lie detector test concludes that an applicant is a drug user, what is the probability that he or she is in fact a drug user?
8. A card is drawn from a deck of 52 cards. We continue to draw cards one at a time, until we have drawn a heart or until we have drawn 5 times. (Note: There are 13 hearts in a deck of cards).
(a) Draw a tree diagram to illustrate the experiment.
(b) What is the probability that we have drawn a heart on the first, second, third, or fourth draws?
9. All people in the state of Virtex are blue people or purple people, but no one is both. The population is $72 \%$ blue people and $28 \%$ purple people. Virtex exports apples around the world, and its people are apple lovers. Eighty percent of all blue people love apples, and ninety-two percent of purple people love apples. Pick a person at random. We will calculate the probability that...
(a) Let A be the event that the person picked love apples. Let B be the event that a person picked is blue, and $P$ be the event that the person picked is purple. Write down the given information using notation to indicate which probabilities, events, and what you are assuming are associated with $.72, .28, .8, .92$. For example, $\operatorname{Pr}(B)=.72$ should be in your list.
(b) What is the probability that someone who love apples is blue? (Hint: Use Bayes' Theorem.)
