Tutorial 2 Probability

1. Out of six computer chips, two are defective. If two chips are randomly chosen for testing (without replacement), compute the probability that both of them are defective. List all the outcomes in the sample space. [1/15]

2. A new computer virus can enter the system through e-mail or through the internet. There is a 30% chance of receiving this virus through e-mail. There is a 40% chance of receiving it through the internet. Also, the virus enters the system simultaneously through e-mail and the internet with probability 0.15. What is the probability that the virus does not enter the system at all? [0.45]

3. A computer program is tested by 3 independent tests. When there is an error, these tests will discover it with probabilities 0.2, 0.3, and 0.5, respectively. Suppose that the program contains an error. What is the probability that it will be found by at least one test? [0.72]

4. A system may become infected by some spyware through the internet or e-mail. Seventy percent of the time the spyware arrives via the internet, thirty percent of the time via email. If it enters via the internet, the system detects it immediately with probability 0.6. If via e-mail, it is detected with probability 0.8. What percentage of times is this spyware detected? [0.66]

5. A shuttle's launch depends on three key devices that may fail independently of each other with probabilities 0.01, 0.02, and 0.02, respectively. If any of the key devices fails, the launch will be postponed. Compute the probability for the shuttle to be launched on time, according to its schedule. [0.9508]

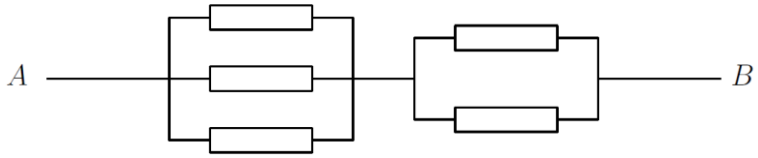
6. Successful implementation of a new system is based on three independent modules. Module 1 works properly with probability 0.96. For modules 2 and 3, these probabilities equal 0.95 and 0.90. Compute the probability that at least one of these three modules fails to work properly. [0.1792]

7. A building is examined by policemen with four dogs that are trained to detect the scent of explosives. If there are explosives in a certain building, and each dog detects them with probability 0.6, independently of other dogs, what is the probability that the explosives will be detected by at least one dog? [0.9744]

8. A computer maker receives parts from three suppliers, S1, S2, and S3. Fifty percent come from S1, twenty percent from S2, and thirty percent from S3. Among all the parts supplied by S1, 5% are defective. For S2 and S3, the portion of defective parts is 3% and 6%, respectively.
   a. What portion of all the parts is defective? [0.049]
   b. A customer complains that a certain part in her recently purchased computer is defective. What is the probability that it was supplied by S1? [0.51]

9. A problem on a multiple-choice quiz is answered correctly with probability 0.9 if a student is prepared. An unprepared student guesses between 4 possible answers, so the probability of choosing the right answer is 1/4. Seventy-five percent of students prepare for the quiz. If Mr. X gives a correct answer to this problem, what is the chance that he did not prepare for the quiz? [0.0847]

10. In the system in the following figure, each component fails with probability 0.3 independently of other components. Compute the system's reliability. [0.8854]



11. Among 10 laptop computers, five are good and five have defects. Unaware of this, a customer buys 6 laptops.
    a. What is the probability of exactly 2 defective laptops among them? [5/21]
    b. Given that at least 2 purchased laptops are defective, what is the probability that exactly 2 are defective? [10/41]

12. Two out of six computers in a lab have problems with hard drives. If three computers are selected at random for inspection, what is the probability that none of them has hard drive problems? [0.2]

13. The following table give a two-way classification of all graduates of a college in year 2002.

	Employed	Unemployed
Male	179	72
Female	109	49

    a. If a person is selected at random from these graduates, find the probability that this person is
        i. unemployed, [0.2958]
        ii. a male, [0.6137]
        iii. employed given that the person is a female, [0.6899]
        iv. a male who is employed, [0.4377]
        v. a male given the person is employed. [0.6125]
    b. Are the events "employed" and "unemployed" mutually exclusive? What about the events "unemployed" and "male"? Why or why not?
    c. Are the events "female" and "unemployed" independent? Why or why not?

14. How many arrangements of the word ACHIEVE are there if
    a. there are no restrictions on the order the letters are to be in
    b. the first letter is an A
    c. the letters A and I are to be together.
    d. the letters C and H are to be apart.

15. In a dance competition, the panel of ten judges sit on the same side of a long table. There are three female judges.
    a. How many different arrangements are there for seating the ten judges?
    b. How many different arrangements are there if the three female judges all decide to sit together?
    c. If the seating is at random, find the probability that the three female judges will **not** all sit together.
    d. Four of the judges are selected at random to judge the final round of the competition. Find the probability that this final judging panel consists of two men and two women.