**EASTERN MEDITERRANEAN UNIVERSITY**



**Department of Industrial Engineering**

**IENG513 Probabilistic Models**

**HOMEWORK 1 Spring 2019-20**

1. The following figure shows the distribution of 56 students in the three MATH, PHYS, and CHME courses. They can take one or two courses from the mentioned courses. Complete the figure and answer the following questions.

56

|  |  |
| --- | --- |
| **C**  **M**  5  15  ?  ?  8  6  13  **P** | 1. What is the probability that a student from this class take just one course? 2. What is the probability that the student take two courses? 3. If we choose two students from this class what is the probability that bout of them take MATH course? |

1. Two dice are rolled. What is the probability that at least one is six? If the two faces are different I) what is the probability that at least one is a five? II) What is the probability that the summation of the faces be seven?
2. You know that you have missed your keys in any one of five departments of Engineering Faculty. The following table contains the probability that the security of each department could find your keys

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Department | Civil | Computer | Mechanical | Industrial | Electronic |
| Probability | 0.35 | 0.5 | 0.4 | 0.3 | 0.2 |

Suppose that the security cannot find your keys in department of mechanical engineering. What is the probability that you can find your keys in this department? What is the probability that you missed your keys in department of industrial engineering?

1. A. For events *E1,E2,...,En* show that



B. A deck of 52 playing cards, containing all 4 aces, is randomly divided into 4 piles of 13 cards each. Define events *E1,E2,E3* and *E4* as follows:

*E1*={the first pile has exactly 1 ace},

*E2*={the second pile has exactly 1 ace},

*E3*={the third pile has exactly 1 ace},

*E4*={the fourth pile has exactly 1 ace}

Use above to find, the probability that each pile has an ace.

1. Suppose all *n* men in party throw their hats in the centre of the room. Each man then randomly selects a hat. Show that the probability that none of the *n* men selects his own hat when  is convergences to *e-1*.
2. There are three coins in a box. One is a two-headed coin, another is a fair coin, and the third is a biased coin that comes up head 75 percent of the time. When one of the three coins is selected at random and flipped, it shows heads. What is the probability that it was the two-headed coin?
3. If the occurrence of *B* makes *A* more likely, dose the occurrence of *A* make *B* more likely?
4. *A* and *B* play until one has 2 more points than other. Assuming that each point is independently won by *A* with probability *p,* what is the probability they will play a total *2n* points? What is the probability that *A* will win?
5. A lot of 100 items contains *k* defective items. *M* items are chosen at random and tested.

**(a)** What is the probability that *m* are found defective?

**(b)** A lot is accepted if 1 or fewer of the *M* items are defective. What is the probability that the lot is accepted?

1. Let *X* represent the difference between the number of heads and the number of tails obtained when a coin is tossed *n* times. What are the possible values of *X*?
2. In each lot of 100 items, two items are tested, and the lot is rejected if either of the tested items is found defective.

**(a)** Find the probability that a lot with *k* defective items is accepted.

**(b)** Suppose that when the production process malfunctions, 50 out of 100 items are defective. In order to identify when the process is malfunctioning, how many items should be tested so that the probability that one or more items are found defective is at least 99%?

12) A computer manufacturer uses chips from three sources. Chips from sources A, B, and C are defective with probabilities .005, .001, and .010, respectively. If a randomly selected chip is found to be defective, find the probability that the manufacturer was A; that the manufacturer was C. Assume that the proportions of chips from A, B, and C are 0.3, 0.3, and 0.4, respectively.

13) An urn contains *b* black balls and *r* red balls. One of the balls is drawn at random, but when it is put back in the urn *c* additional balls of the same color are put in with it. Now suppose that we draw another ball. Show that the probability that the first ball drawn was black given that the second ball drawn was red is *b/(b* + *r* + *c)*.

14) Sixty percent of the families in a certain community own their own car, thirty percent own their own home, and twenty percent own both their own car and their own home. If a family is randomly chosen, what is the probability that this family owns a car or a house but not both?