## PROBABILITIES – REVIEW PROBLEMS

1. After finishing his book, the author goes over the text and finds $m_1$ mistakes. After that, he proofreads it another time and finds $m_2$ mistakes ($m_2 < m_1$). How many mistakes can he expect to still be in the book?

   *Hint:* we assume the probability $p$ of spotting a mistake to be the same during 1st and 2nd read.

2. Find the number of committees that can be formed from 4 chemists and 3 physicists, if each committee consists of 2 chemists and 1 physicist.

3. If an experiment consists of tossing a die and drawing a letter at random from the English alphabet (26 characters), how many points are in the sample space?

4. A multiple-choice test consists of 5 questions with 4 possible answers of which only one is correct. (a) In how many different ways can a student check off the test? (b) In how many different ways can a student check off the test and get all the answers wrong?

5. A poker card consists of 5 cards. Find the probability of holding 2 kings and 1 queen.

6. The probabilities that a person selecting a new car will choose the colour green, white, red or blue are 0.09, 0.15, 0.21 and 0.23, respectively. What the probability that a given person will purchase a car that comes in blue or green?

7. A box contains 500 envelopes of which 75 contain $ 100 in cash, 150 – $ 25, and 275 contain $ 10. Find the probability that an envelope selected at random contains less than $100.

8. A pair of dice is tossed. Find the probability of getting (a) a total of 8; (b) at most total of 5.

9. Two cards are drawn in succession from a 52-card deck without replacement. What is the probability that both are greater than 2 and less than 8?

10. In a poker hand find the probability of holding (a) 3 aces; (b) 4 aces and 1 club.

11. Five dice are tossed simultaneously. What is the probability of having 4 of a kind (four 6's, four 5's, etc.)

12. Probability that a regularly scheduled flight departs on time is $P(D) = 0.83$; the probability that it arrives on time is $P(A) = 0.82$. The probability that it departs and arrives on time – $P(AD) = 0.78$.

    (a) are the events: "departure on time and arrival on time" dependent or independent? Find the probability that a plane will

    (b) arrive on time given that it departed on time

    (c) departed on time, given that it arrived on time.

13. One bag contains 4 white balls and 3 black balls, and a second bag – 3 white and 5 black ones. One ball is drawn from the 1st bag and placed unseen in the second. What is the probability that a ball now drawn from the second bag will be black? 38/63

14. Three cards are drawn in succession from an ordinary (52-card) deck. Find the prob- ability of the ćomplex event": the first card is a red ace AND the second is a 10 or Jack AND the third is less than 7 and greater than 3. 16/5525

15. A pair of dice is thrown. It is known that one die (we don't know which) shows a 4. What is the probability that (a) the other die shows a 5 [2/11] (b) the total of both is greater than 7 [5/11].

    Hint: think carefully – how big is the event space?

16. 40% of men have curly hair. The probability that a child will have curly hair if his father has smooth (non-curly) hair is 0.3, and the probability a father had smooth hair if his child was born with curly hair is 0.6. What is the probability that a child of a curly-hair father will also have curly hair.

    Hint: Bayes scheme. $P = 0.3$.

17. In a certain region it is known from the past experience that the probability of selecting an adult over 40 years of age with cancer is 0.02. If the probability of a doctor correctly diagnosing a person with cancer as having the disease is 0.78 and the probability of incorrectly diagnosing a person without cancer as having the disease is 0.06, what is the probability that a person is diagnosed as having cancer?

    What is the probability that a person diagnosed as having cancer actually has the disease?

    Hint: Bayes scheme.

18. Police plan to enforce speed limits by using radar traps at 4 different locations within the city limits. The 4 traps $L_1$, $L_2$, $L_3$, and $L_4$ are operated 40%, 30%, 20%, and 30% of the time, and if a person who is speeding on his way to work has probabilities of 0.2, 0.1, 0.5 and 0.2, respectively, of passing through these locations, what is the probability that he will receive a speeding ticket?

What is the probability that a person who has received a speeding ticket passed through the trap located at L2 (speeding all the time on his way)?