

Homework assignment 5

1. Machine A produces 3% defectives, machine B produces 5% defectives, and machine C produces 10% defectives. Of the total output from these machines, 60% of the items are from machine A, 30% from B, and 10% from C. One item is selected at random from a day's production for inspection. Calculate $P[D]$, the probability that the item is defective. If inspection finds the item to be defective, what is the revised probability that the item came from machine C? If inspection finds the item to be defective, what is the revised probability that the item came from machine B? If inspection finds the item to be defective, what is the revised probability that the item came from machine A?
2. The probabilities for two events A_1 and A_2 are $P[A_1] = .30$ and $P[A_2] = .70$. It is also known that $P[A_1 \cap A_2] = 0$. Suppose $P[B|A_1] = .15$ and $P[B|A_2] = .05$. Compute $P[A_1 \cap B]$, $P[A_2 \cap B]$, and $P[B]$.
3. Two dice are thrown. Let E be the event that the sum of the dice is even, let F be the event that at least one of the dice lands on 6, and let G be the event that the numbers on the two dice are equal. Find $P[E]$, $P[F]$, $P[G]$, $P[E \cup F]$, $P[E \cap F]$, $P[F \cup G]$, $P[F \cap G]$.
4. Suppose we draw a card from a shuffled set of 52 playing cards. What is the probability of drawing a Queen, given that the card drawn is of suit Hearts \heartsuit ?
5. A motorcycle insurance company classifies riders as risky or safe. Within a given year, a risky rider will have an accident with probability 0.5. That is, $P[\text{accident}|\text{risky}] = 0.5$. This probability decreases to 0.1 for a safe rider. Assume that 20% of riders are risky. Given that a rider has just had an accident, what is the probability that he/she is risky.

6. An investment counselor would like to meet with 14 of his clients on Wednesday, but he only has time for 10 appointments. How many different combinations of the clients could be considered for inclusion into his limited schedule for that day?
7. How many different combinations are possible if 8 substitute workers are available to fill 4 openings created by employees planning to take vacation leave next week?
8. Ten students from an economics class have formed a study group. Each may or may not attend a study session. Assuming that the members will be making independent decisions on whether or not to attend, how many different possibilities exist for the composition of the study session?
9. A state's license plate has 9 positions, each of which has 37 possibilities (26 letters, 10 integers, or blank). If the purchaser of a vanity plate wants his first seven positions to be Stanley, in how many ways can his plate appear?