

# Engineering Mathematics II (ED 121)

## Homework 1

Release Date: 08.01.2024

Due Date: 13.01.2021

1. Urn  $X$  has 3 red and 2 blue marbles; Urn  $Y$  has 5 red and 10 blue marbles. The experiment is to randomly choose an urn and randomly draw a marble from the chosen urn. Compute the probability of drawing a) a blue marble; b) a red marble.
2. Considering the same experiment as above compute a)  $P(X/blue)$  and b)  $P(Y/red)$ .
3. A die is thrown twice and the sum of the numbers appearing is noted to be 8. What is the conditional probability that the number 5 has appeared at least once.
4. If  $P(B) \neq 1$ , then show that  $P(\bar{A}/\bar{B}) = \frac{1-P(A \cup B)}{P(\bar{B})}$ .
5. Two cards are drawn one after the other from a well-shuffled deck of 52 cards. Find the probability that both are spade cards, if the first card is a) replaced, b) not replaced.
6. If  $A$  and  $B$  are independent, then examine if
  - a)  $\bar{A}$  and  $B$
  - b)  $\bar{A}$  and  $\bar{B}$are independent.
7. Given that  $P(A \cap \bar{B}) = 1/4$  and  $P(A \cup B) = 3/4$ , find a)  $P(B)$  and b)  $P(A)$ .
8. Records indicate that for the parts coming out of a hydraulic repair shop at an airplane rework facility, 20% will have a shaft defect, 10% will have a bushing defect, and 75% will be defect-free. For an item chosen at random from this output, find the probability of the following:
  - a) The item has at least one type of defect.
  - b) The item has only a shaft defect.
9. A company buys tires from two suppliers, 1 and 2. Supplier 1 has a record of delivering tires containing 10% defectives, whereas supplier 2 has a defective rate of only 5%. Suppose 40% of the current supply came from supplier 1. If a tire is selected randomly from this supply and observed to be defective, find the probability that it came from supplier 1.
10. a simple binary communication channel carries messages by using only two signals, say 0 and 1. We assume that, for a given binary channel, 40% of the time a 1 is transmitted; the probability that a transmitted 0 is correctly received is 0.90, and the probability that a transmitted 1 is correctly received is 0.95. Determine (a) the probability of a 1 being received, and (b) given a 1 is received, the probability that 1 was transmitted.