

ENEE324-03Fall 2016. Problem set 1

Date due September 6, 2016

Please justify your answers

Where appropriate, identify axioms of probability used to arrive at the answers

1. Let $S, T, U \subset \Omega$ be three events. The event that all three occur is expressed as $S \cap T \cap U$. Write similar formulas for the events

- (i) S and T occur and U does not;
- (ii) at most one of the three events occurs;
- (iii) at least two of the three events occur;
- (iv) exactly two of the three events occur;
- (v) none of the three events occurs.

Use the union, intersection, complement, and set difference operations; draw Venn diagrams and identify the regions that account for the described outcomes.

2. The experiment consists in rolling three 6-sided dice. What is the probability that the sum of the rolls is even? Given that the first roll is 2, what is the probability that the sum of the rolls is even? What is the probability that the sum of the three rolls equals 5?

3. Suppose that A and B are two events, $P(A) = 0.75$ and $P(B) = 0.6$. Consider the probability $\pi = P(A \cap B)$. Is it always true that (a) $\pi \leq 1$? (b) $\pi \geq 0.5$? (c) $0.1 \leq \pi \leq 0.4$? (d) $0.35 \leq \pi \leq 0.6$?

4. Roll a pair of 6-sided dice. What is the probability that the first die shows a greater number than the second one? What is the probability that the outcome of the first roll is greater than the second one by at least two?

5. Choose two random points x_1, x_2 on the segment $[0, 1]$. What is the probability that $x_1 - x_2 \geq 0.2$? That $|x_1 - x_2| \geq 0.2$?

6. Suppose we randomly choose two cards from a standard deck of 52 cards. What is the probability that they are both kings? What is the probability that they have different values?