

Homework #5  
Due Su 10/24

Note:

- OW Oppenheim and Wilsky  
SSS Schaum's Signals and Systems  
SPR Schaum's Probability, Random Variables, and Random Processes (2nd edition)

Be sure to show all your work for credit.

## 1. (SPR 1.85)

A random experiment has sample space  $S = \{a, b, c\}$ . Suppose that  $P(\{a, c\}) = 0.75$  and  $P(\{b, c\}) = 0.6$ . Find the probabilities of the elementary elements.

## 2. (SPR 1.86)

Show that

- (a)  $P(\bar{A} \cup \bar{B}) = 1 - P(A \cap B)$
- (b)  $P(A \cap B) \geq 1 - P(\bar{A}) - P(\bar{B})$
- (c)  $P(A \Delta B) = P(A \cup B) - P(A \cap B)$

## 3. (SPR 1.87)

Let  $A, B$ , and  $C$  be three events in  $S$ . If  $P(A) = P(B) = \frac{1}{4}$ ,  $P(C) = \frac{1}{3}$ ,  $P(A \cap B) = \frac{1}{8}$ ,  $P(A \cap C) = \frac{1}{6}$ , and  $P(B \cap C) = 0$ , find  $P(A \cup B \cup C)$ .

## 4. (SPR 1.90)

In an experiment consisting of 10 throws of a pair of fair dice, find the probability of the event that at least one double 6 occurs.

## 5. (SPR 1.94)

An urn contains 8 white balls and 4 red balls. The experiment consisting of drawing 2 balls from the urn without replacement. Find the probability that both balls drawn are white.

## 6. (SPR 1.97)

Let  $A$  and  $B$  be two independent events in  $S$ . It is known that  $P(A \cap B) = 0.16$  and  $P(A \cup B) = 0.64$ . Find  $P(A)$  and  $P(B)$ .

7. Let  $A, B$ , and  $C$  be events. Find expressions for the following events:

- (a) Exactly one of the three events occurs.
- (b) Exactly two of the events occur.
- (c) One or more of the events occur.
- (d) Two or more of the events occur.
- (e) none of the events occur.

8. The number  $U$  is selected at random from the unit interval. Let the events  $A$  and  $B$  be:  $A =$  “ $U$  differs from  $1/2$  by more than  $1/4$ ” and  $B =$  “ $1 - U$  is less than  $1/2$ ”. Find the events:

- (a)  $A \cap B$
- (b)  $\bar{A} \cap B$
- (c)  $A \cup B$