

**Section 6.3: Rules of Probability**

Let  $S$  be a sample space,  $E$  and  $F$  are events of the experiment then,

1.  $P(E) \geq 0$ , for any event  $E$ .
2.  $P(S) = 1$
3. If  $E$  and  $F$  are mutually exclusive, ( $E \cap F = \emptyset$ ), then  $P(E \cup F) = P(E) + P(F)$ .  
(Note that this property can be extended to a finite number of events.)
4. If  $E$  and  $F$  are not mutually exclusive, ( $E \cap F \neq \emptyset$ ), then  
 $P(E \cup F) = P(E) + P(F) - P(E \cap F)$   
(Note that this property can be extended to a finite number of events.)
5. (Rule of Complements) If  $E$  is an event and  $E^c$  denotes the complement of  $E$  then  
 $P(E^c) = 1 - P(E)$ .

**Example 1:** An experiment consists of selecting a card at random from a well-shuffled deck of 52 playing cards. Find the probability that an ace or a spade is drawn.

**Example 2:** Let  $E$  and  $F$  be two events and suppose that  $P(E) = 0.37$ ,  $P(F) = 0.3$  and  $P(E \cap F) = 0.08$ . Compute

a.  $P(E \cup F)$

b.  $P(E^c \cap F)$

c.  $P(E \cap F)^c$

**Example 3:** The SAT Math scores of a senior class at a high school are shown in the table.

<b>Range of Scores</b>	<b># of Students in the Range</b>
$x > 700$	16
$600 < x \leq 700$	94
$500 < x \leq 600$	165
$400 < x \leq 500$	309
$300 < x \leq 400$	96
$x < 300$	20

a. Construct the probability distribution for the data.

b. If a student is selected at random, what is the probability that his or her score was:

i. More than 500?

ii. Less than or equal to 400?

iii. Greater than 400 but less than or equal to 700?

Math 1313 Section 6.3

**Example 4:** Let E and F be events of a sample space S. Let  $P(E) = 0.53$ ,  $P(F) = 0.42$  and  $P(E \cap F^c) = 0.14$ .

a. Find  $P(E \cup F)$

b. Find  $P(E^c \cup F^c)$

c. Find  $P(E \cup F)^c$

d.  $P(E \cup F^c)^c$

**Example 5:** Let E and F be events of a sample space S. Let  $P(E^c) = 0.61$ ,  $P(F^c) = 0.44$  and  $P(E \cup F)^c = 0.3$ . Find  $P(E^c \cup F)^c$ .



**Example 8:** You are a chief for an electric utility company. The employees in your section cut down trees, climb poles, and splice wire. You report that of the 128 employees in your department 10 cannot do any of the three (management trainees), 25 can cut trees and climb poles only, 31 can cut trees and splice wire, but not climb poles, 18 can do all three, 4 can cut trees only, 3 can splice wire, but cannot cut trees or climb poles, and 9 can do exactly one of the three.

One of these employees is selected at random. What is the probability that that employee

a. can do at exactly one of the three jobs mentioned here?

b. can cut trees and climb poles?

c. at least two of the jobs mentioned here?