

## Counting and Probability

### 14.1 Sets and Counting

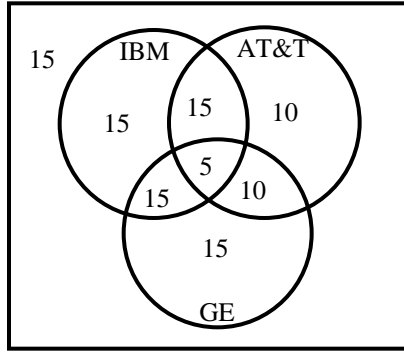
1.  $A \cap B = \{1, 3, 5, 7, 9\} \cap \{1, 5, 6, 7\} = \{1, 5, 7\}$
2.  $A \cap C = \{1, 3, 5, 7, 9\} \cap \{1, 2, 4, 6, 8, 9\} = \{1, 9\}$
3.  $A \cap B = \{1, 3, 5, 7, 9\} \cap \{1, 5, 6, 7\} = \{1, 5, 7\}$
4.  $A \cap C = \{1, 3, 5, 7, 9\} \cap \{1, 2, 4, 6, 8, 9\} = \{1, 9\}$
5.  $(A \cap B) \cap C = (\{1, 3, 5, 7, 9\} \cap \{1, 5, 6, 7\}) \cap \{1, 2, 4, 6, 8, 9\}$   
 $= \{1, 5, 7\} \cap \{1, 2, 4, 6, 8, 9\} = \{1\}$
6.  $(A \cap C) \cap (B \cap C)$   
 $= (\{1, 9\} \cap \{1, 2, 4, 6, 8, 9\}) \cap (\{1, 5, 6, 7\} \cap \{1, 2, 4, 6, 8, 9\})$   
 $= \{1, 9\} \cap \{1, 6\} = \{1\}$
7.  $(A \cap B) \cap C = (\{1, 3, 5, 7, 9\} \cap \{1, 5, 6, 7\}) \cap \{1, 2, 4, 6, 8, 9\}$   
 $= \{1, 5, 7\} \cap \{1, 2, 4, 6, 8, 9\} = \{1\}$
8.  $(A \cap B) \cap C = (\{1, 3, 5, 7, 9\} \cap \{1, 5, 6, 7\}) \cap \{1, 2, 4, 6, 8, 9\}$   
 $= \{1, 5, 7\} \cap \{1, 2, 4, 6, 8, 9\} = \{1\}$
9.  $(A \cap C) \cap (B \cap C)$   
 $= (\{1, 9\} \cap \{1, 2, 4, 6, 8, 9\}) \cap (\{1, 5, 6, 7\} \cap \{1, 2, 4, 6, 8, 9\})$   
 $= \{1, 9\} \cap \{1, 6\} = \{1\}$
10.  $(A \cap B) \cap C = (\{1, 3, 5, 7, 9\} \cap \{1, 5, 6, 7\}) \cap \{1, 2, 4, 6, 8, 9\}$   
 $= \{1, 5, 7\} \cap \{1, 2, 4, 6, 8, 9\} = \{1\}$

11.  $\bar{A} = \{0, 2, 6, 7, 8\}$
12.  $\bar{C} = \{0, 2, 5, 7, 8, 9\}$
13.  $\overline{A \cap B} = \overline{\{1, 3, 4, 5, 9\} \cap \{2, 4, 6, 7, 8\}} = \overline{\{4\}} = \{0, 1, 2, 3, 5, 6, 7, 8, 9\}$
14.  $\overline{B \cap C} = \overline{\{2, 4, 6, 7, 8\} \cap \{1, 3, 4, 6\}} = \overline{\{1, 2, 3, 4, 6, 7, 8\}} = \{0, 5, 9\}$
15.  $\bar{A} \cap \bar{B} = \{0, 2, 6, 7, 8\} \cap \{0, 1, 3, 5, 9\} = \{0, 1, 2, 3, 5, 6, 7, 8, 9\}$
16.  $\bar{B} \cap \bar{C} = \{0, 1, 3, 5, 9\} \cap \{0, 2, 5, 7, 8, 9\} = \{0, 5, 9\}$
17.  $\overline{A \cap \bar{C}} = \overline{\{1, 3, 4, 5, 9\} \cap \{0, 2, 5, 7, 8, 9\}} = \overline{\{5, 9\}} = \{0, 1, 2, 3, 4, 6, 7, 8\}$
18.  $\overline{\bar{B} \cap C} = \overline{\{0, 1, 3, 5, 9\} \cap \{1, 3, 4, 6\}} = \overline{\{0, 1, 3, 4, 5, 6, 9\}} = \{2, 7, 8\}$
19.  $\overline{A \cap B \cap C} = \overline{\{1, 3, 4, 5, 9\} \cap \{2, 4, 6, 7, 8\} \cap \{1, 3, 4, 6\}} = \overline{\{1, 2, 3, 4, 5, 6, 7, 8, 9\}} = \{0\}$
20.  $\overline{A \cap B \cap C} = \overline{\{1, 3, 4, 5, 9\} \cap \{2, 4, 6, 7, 8\} \cap \{1, 3, 4, 6\}} = \overline{\{4\}} = \{0, 1, 2, 3, 5, 6, 7, 8, 9\}$
21.  $\{a\}, \{b\}, \{c\}, \{d\}, \{a, b\}, \{a, c\}, \{a, d\}, \{b, c\}, \{b, d\}, \{c, d\}, \{a, b, c\}, \{a, b, d\}, \{a, c, d\}, \{b, c, d\}, \{a, b, c, d\}, \phi$
22.  $\{a\}, \{b\}, \{c\}, \{d\}, \{e\}, \{a, b\}, \{a, c\}, \{a, d\}, \{a, e\}, \{b, c\}, \{b, d\}, \{b, e\}, \{c, d\}, \{c, e\}, \{d, e\}, \{a, b, c\}, \{a, b, d\}, \{a, b, e\}, \{a, c, d\}, \{a, c, e\}, \{a, d, e\}, \{b, c, d\}, \{b, c, e\}, \{b, d, e\}, \{c, d, e\}, \{a, b, c, d\}, \{a, b, c, e\}, \{a, c, d, e\}, \{a, b, d, e\}, \{b, c, d, e\}, \{a, b, c, d, e\}, \phi$
23.  $n(A) = 15, n(B) = 20, n(A \cap B) = 10$   
 $n(A \cup B) = n(A) + n(B) - n(A \cap B) = 15 + 20 - 10 = 25$
24.  $n(A) = 20, n(B) = 40, n(A \cap B) = 35$   
 $n(A \cup B) = n(A) + n(B) - n(A \cap B)$   
 $35 = 20 + 40 - n(A \cap B)$   
 $n(A \cap B) = 20 + 40 - 35 = 25$
25.  $n(A \cup B) = 50, n(A \cap B) = 10, n(B) = 20$   
 $n(A \cup B) = n(A) + n(B) - n(A \cap B)$   
 $50 = n(A) + 20 - 10$   
 $40 = n(A)$

## Chapter 14 Counting and Probability

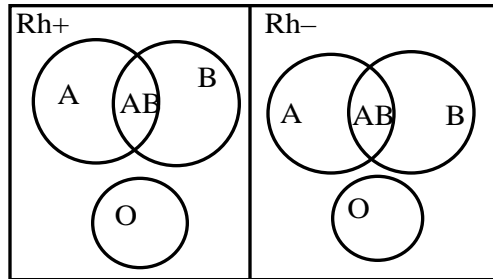
26.  $n(A \cup B) = 60$ ,  $n(A \cap B) = 40$ ,  $n(A) = n(B)$   
 $n(A \cup B) = n(A) + n(B) - n(A \cap B)$   
 $60 = n(A) + n(A) - 40$   
 $100 = 2n(A)$   
 $n(A) = 50$
27. From the figure:  
 $n(A) = 15 + 3 + 5 + 2 = 25$
28. From the figure:  $n(B) = 10 + 3 + 5 + 2 = 20$
29. From the figure:  
 $n(A \cup B) = n(A \cap B) = n(A) + n(B) - n(A \cap B) = 25 + 20 - 8 = 37$
30. From the figure:  $n(A \text{ and } B) = n(A \cap B) = 3 + 5 = 8$
31. From the figure:  
 $n(A \text{ but not } C) = n(A) - n(A \cap C) = 25 - 7 = 18$
32. From the figure:  $n(\bar{A}) = 10 + 2 + 15 + 4 = 31$
33. From the figure:  
 $n(A \text{ and } B \text{ and } C) = n(A \cap B \cap C) = 5$
34. From the figure:  
 $n(A \cup B \cup C) = n(A \cap B \cap C) = 15 + 3 + 5 + 2 + 10 + 2 + 15 = 52$
35. Let  $A = \{\text{those who will purchase a major appliance}\}$   
 $B = \{\text{those who will buy a car}\}$   
 $n(U) = 500$ ,  $n(A) = 200$ ,  $n(B) = 150$ ,  $n(A \cap B) = 25$   
 $n(A \cup B) = n(A) + n(B) - n(A \cap B) = 200 + 150 - 25 = 325$   
 $n(\text{purchase neither}) = 500 - 325 = 175$   
 $n(\text{purchase only a car}) = 150 - 25 = 125$
36. Let  $A = \{\text{those who will attend Summer Session I}\}$   
 $B = \{\text{those who will attend Summer Session II}\}$   
 $n(A) = 200$ ,  $n(B) = 150$ ,  $n(A \cap B) = 75$ ,  $n(\overline{A \cap B}) = 275$   
 $n(A \cup B) = n(A) + n(B) - n(A \cap B) = 200 + 150 - 75 = 275$   
 $n(U) = n(A \cup B) + n(\overline{A \cap B}) = 275 + 275 = 550$   
 550 students participated in the survey.

37. Construct a Venn diagram:



- (a) 15
- (b) 15
- (c) 15
- (d) 25
- (e) 40

38. Construct a Venn diagram:



There are 8 different kinds of blood: A-Rh+, B-Rh+, AB-Rh+, O-Rh+, A-Rh-, B-Rh-, AB-Rh-, O-Rh-

39. (a)  $n(\text{married}) = n(\text{married, spouse present}) + n(\text{married, spouse absent})$   
 $= 54,654 + 3,232 = 57,886$  thousand
- (b)  $n(\text{widowed or divorced}) = n(\text{widowed}) + n(\text{divorced})$   
 $= 2,686 + 8,208 = 10,894$  thousand
- (c)  $n(\text{married, spouse absent or widowed or divorced})$   
 $= n(\text{married, spouse absent}) + n(\text{widowed}) + n(\text{divorced})$   
 $= 3,232 + 2,686 + 8,208 = 14,126$  thousand
40. (a)  $n(\text{married}) = n(\text{married, spouse present}) + n(\text{married, spouse absent})$   
 $= 54,626 + 4,122 = 58,748$  thousand
- (b)  $n(\text{widowed or divorced}) = n(\text{widowed}) + n(\text{divorced})$   
 $= 11,056 + 11,107 = 22,163$  thousand
- (c)  $n(\text{married, spouse absent or widowed or divorced})$   
 $= n(\text{married, spouse absent}) + n(\text{widowed}) + n(\text{divorced})$   
 $= 4,122 + 11,056 + 11,107 = 26,285$  thousand
41. Answers will vary.
42. Answers will vary.