37. True. $n(A \cup B) = n(A) + n(B) - n(A \cap B)$.

38. True. If $A \subseteq B$, then $B = A \cup (A^c \cap B)$ and $A \cap (A^c \cap B) = \varnothing$. Therefore, $n(B) = n(A) + n(A^c \cap B)$.

39. True. If $A \cap B \neq \varnothing$, then $n(A \cup B) = n(A) + n(B) - n(A \cap B)$.

40. Write Equation (4) as $n(D \cup E) = n(D) + n(E) - n(D \cap E)$. Then let $D = A \cup B$ and $E = C$ so that

$$
\begin{aligned}
n(A \cup B \cup C) &= n(A \cup B) + n(C) - n[(A \cup B) \cap C] \\
&= n(A) + n(B) - n(A \cap B) + n(C) - n[(A \cup B) \cap C] \\
&= n(A) + n(B) - n(A \cap B) + n(C) - \{n[(A \cap C) \cup (B \cap C)]\} \\
&= n(A) + n(B) - n(A \cap B) + n(C) \\
&\quad - [n(A \cap C) + n(B \cap C) - n(A \cap C \cap B \cap C)] \\
&= n(A) + n(B) + n(C) - n(A \cap B) \\
&\quad - n(A \cap C) - n(B \cap C) + n(A \cap B \cap C).
\end{aligned}
$$

6.3 CONCEPT QUESTIONS, page 333

1. If a task T_1 can be performed in N_1 ways, a task T_2 can be performed in N_2 ways, …, and finally a task T_n can be performed in N_n ways, then the number of ways of performing the tasks $T_1, T_2, ..., T_n$ in succession is given by $N_1 N_2 \cdots N_n$.

2. *AI*, *AII*, *BI*, *BII*

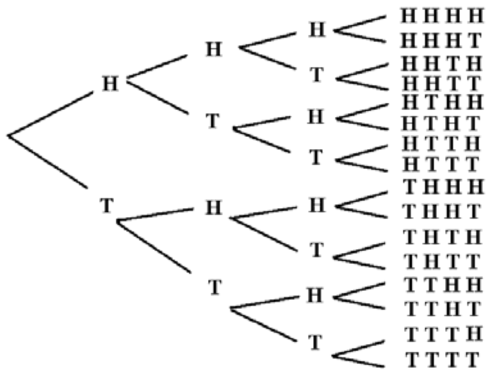
EXERCISES 6.3, page 333

1. By the multiplication principle, the number of rates is given by (4)(3) = 12.

2. By the multiplication principle, the number of kinds of passes is (5)(3) = 15.

3. By the multiplication principle, the number of ways that a blackjack hand can be dealt is (4)(16) = 64.

4. a. The number of outcomes is $2 \times 2 \times 2 \times 2$, or 16.
 b.



From the tree diagram, we see that the possible sequences are
HHHH, HHHT, HHTH, HHTT, HTHH, HTHT, HTTH, HTTT, THHH, THHT, THTH, THTT, TTHH, TTHT, TTTH, and TTTT.

5. By the multiplication principle, she can create (2)(4)(3) = 24 different ensembles.

6. By the multiplication principle, there are (7)(6) = 42 ways that a commuter can complete a daily round trip using bus and/or train.

7. The number of paths is $2 \times 4 \times 3$, or 24.

8. The number of possible responses to the survey is given by

Number of responses to the first question	×	Number of responses to the second question	×	Number of responses to the third question	
5	•	5	•	5	= 125.

9. By the multiplication principle, we see that the number of ways a health-care plan can be selected is (10)(3)(2) = 60.
10. Using the multiplication principle, we see that the number of three-letter code words that can be formed is (10)(9)(8) = 720, or 720 ways.

11. $10^9 = 1{,}000{,}000{,}000$.

12. The number of sets that have already been manufactured is
$$(26)(10)(10)(10)(10) = 260{,}000.$$

13. The number of different responses is $\underbrace{(5)(5)\ldots(5)}_{50 \text{ terms}} = 5^{50}$.

14. The number of selections a customer can make is (14)(5)(4) = 280.

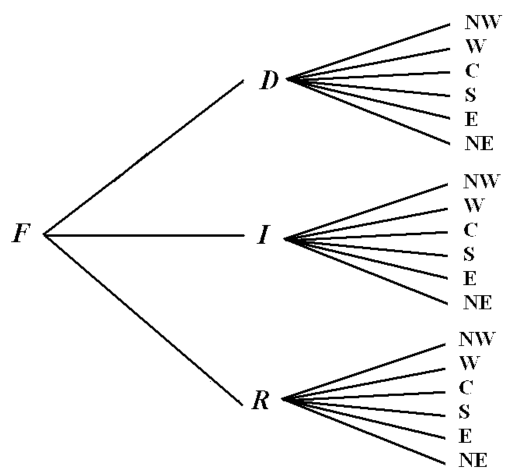
15. The number of selections is given by (5)(2)(4)(5)(2) or 400 selections.

16. The number of ways the viewer can complete the poll is
(4)(4)(4)(4)(4)(4), or 4096 ways.

17. The number of different selections is (10)(10)(10)(10) - 10 = 10000 - 10 = 9990.

18. a. The number of possible classifications is (2)(3)(6) = 36.

b.



19 . a. The number of license plate numbers that may be formed is
(26)(26)(26)(10)(10)(10), or 17,576,000.

b. The number of license plate numbers that may be formed is
(10)(10)(10)(26)(26)(26) =17,576,000.

20. (26)(10)(10)(10)(26)(26)(26) = 456,976,000

21. If every question is answered, there are 2^{10}, or 1024, ways. In the second case, there are 3 ways to answer each question, and so we have 3^{10}, or 59,049, ways.

22. The number of possible identification numbers are
$$(26)(9)(10)(10)(10)(10) = 2{,}340{,}000.$$

23. The number of ways the first, second and third prizes can be awarded is
$$(15)(14)(13) = 2730.$$

24. a. If the first digit must be nonzero, then there are 9 possible choices for the first digit and 10 possible choices for the remaining 6 digits. Thus, the number of possible seven-digit numbers is given by (9)(10)(10)(10)(10)(10)(10) = 9,000,000.

b. Using the multiplication principle, we find that the number of international direct-dialing numbers is given by
$$(9)(10)(10) \times 9{,}000{,}000 = 8{,}100{,}000{,}000.$$

25. The number of ways in which the nine symbols on the wheels can appear in the window slot is (9)(9)(9), or 729. The number of ways in which the eight symbols other than the "lucky dollar" can appear in the window slot is (8)(8)(8) or 512. Therefore, the number of ways in which the "lucky dollars" can appear in the window slot is 729 - 512, or 217.

26. a. There are (5)(4) or 20 2-person teams possible.
b. There are (5)(4)(3) or 60 3-person teams possible.
c. The company can form 20 + 60 or 80 2-person or 3-person teams.

27. True. There are 4 choices for the digit in the hundreds position, 4 choices in the tens position and 2 choices in the units position, or $4 \bullet 4 \bullet 2$, ore 32 such numbers.

28. False. Use the Multiplication Principle to conclude that there are $2 \bullet 2 \bullet 2 \bullet 2 \bullet 2 \bullet 2$ or 64 different pizzas.