Math 423 – Prof. Richard B. Goldstein – Walpole – 8th ed – Chapter 2 Answers

2.1 (a) $S = \{8, 16, 24, 32, 40, 48\}$.

(b) For $x^2 + 4x - 5 = (x + 5)(x - 1) = 0$, the only solutions are $x = -5$ and $x = 1$. $S = \{-5, 1\}$.

(c) $S = \{T, HT, HHT, HHH\}$.

(d) $S = \{\text{N. America, S. America, Europe, Asia, Africa, Australia, Antarctica}\}$.

(e) Solving $2x - 4 \geq 0$ gives $x \geq 2$. Since we must also have $x < 1$, it follows that $S = \phi$.

2.5 $S = \{1HH, 1HT, 1TH, 1TT, 2H, 2T, 3HH, 3HT, 3TH, 3TT, 4H, 4T, 5HH, 5HT, 5TH, 5TT, 6H, 6T\}$.

2.14 (a) $A \cup C = \{0, 2, 3, 4, 5, 6, 8\}$.

(b) $A \cap B = \phi$.

(c) $C' = \{0, 1, 6, 7, 8, 9\}$.

(d) $C' \cap D = \{1, 6, 7\}$, so $(C' \cap D) \cup B = \{1, 3, 5, 6, 7, 9\}$.

(e) $(S \cap C)' = C' = \{0, 1, 6, 7, 8, 9\}$.

(f) $A \cap C = \{2, 4\}$, so $A \cap C \cap D' = \{2, 4\}$.

2.22 With $n_1 = 8$ blood types and $n_2 = 3$ classifications of blood pressure, the multiplication rule gives $n_1 n_2 = (8)(3) = 24$ classifications.

2.31 (a) With $n_1 = 4$ possible answers for the first question, $n_2 = 4$ possible answers for the second question, and so forth, the generalized multiplication rule yields $4^5 = 1024$ ways to answer the test.

(b) With $n_1 = 3$ wrong answers for the first question, $n_2 = 3$ wrong answers for the second question, and so forth, the generalized multiplication rule yields

$$n_1 n_2 n_3 n_4 n_5 = (3)(3)(3)(3)(3) = 3^5 = 243$$

ways to answer the test and get all questions wrong.

2.34 (a) By Theorem 2.3, there are $6! = 720$ ways.

(b) A certain 3 persons can follow each other in a line of 6 people in a specified order is 4 ways or in $(4)(3!) = 24$ ways with regard to order. The other 3 persons can then be placed in line in $3! = 6$ ways. By Theorem 2.1, there are total $(24)(6) = 144$ ways to line up 6 people with a certain 3 following each other.

(c) Similar as in (b), the number of ways that a specified 2 persons can follow each other in a line of 6 people is $(5)(2!)(4!) = 240$ ways. Therefore, there are $720 - 240 = 480$ ways if a certain 2 persons refuse to follow each other.

2.37 The first seat must be filled by any of 5 girls and the second seat by any of 4 boys. Continuing in this manner, the total number of ways to seat the 5 girls and 4 boys is $(5)(4)(4)(3)(3)(2)(2)(1)(1) = 2880$.

2.46 By Theorem 2.6, there are $\frac{9!}{3!4!2!} = 1260$ ways.

2.56 Consider the events
B: customer invests in tax-free bonds,
M: customer invests in mutual funds.

(a) $P(B \cup M) = P(B) + P(M) - P(B \cap M) = 0.6 + 0.3 - 0.15 = 0.75$.

(b) $P(B' \cap M') = 1 - P(B \cup M) = 1 - 0.75 = 0.25$.

2.61 Since there are 20 cards greater than 2 and less than 8, the probability of selecting two of these in succession is

$$\left(\frac{20}{52}\right)\left(\frac{19}{51}\right) = \frac{95}{663}.$$

2.79 Consider the events:
M: a person is a male;
S: a person has a secondary education;
C: a person has a college degree.

(a) $P(M \mid S) = 28/78 = 14/39$;

(b) $P(C' \mid M') = 95/112$.

2.101 Consider the events:
C: an adult selected has cancer,
D: the adult is diagnosed as having cancer.
$P(C) = 0.05$, $P(D \mid C) = 0.78$, $P(C') = 0.95$ and $P(D \mid C') = 0.06$. So, $P(D) = P(C \cap D) + P(C' \cap D) = (0.05)(0.78) + (0.95)(0.06) = 0.096$.