¡Solution of Section 1.4 and 2.2

• Section 1.4:

- #3. Let E be the event that an earthquake will damage the structure next year. Let H be the event that a hurricane will damage the structure next year. We are given that $P(E) = 0.015, P(H) = 0.025$, and $P(EH) = 0.0073$. Since

  $$P(E \cup H) = P(E) + P(H) - P(EH) = 0.015 + 0.025 - 0.0073 = 0.0327,$$

  the probability that next year the structure will be damaged by an earthquake and /or a hurricane is 0.0327. The probability that is not damaged by any of the two natureal disasters is 0.9673.

- #5. Let A be the event that a randomly selected investor invests in traditional annuities. Let B be the event that he or she invests in the stock market. Then, P(A)=0.75, P(B)=0.45, and P(A$\cup B$) = 0.85. Since,

  $$P(AB) = P(A) + P(B) - P(A \cup B) = 0.75 + 0.45 - 0.85 = 0.35,$$

  35% invest in both stock market and traditional annuities.

- #8. Let m be the probability that Marty will be hired. Then $m + (m + 0.2) + m = 1$ which gives $m = 8/30$; so the answer is $8/30 + 2/10 = 7/15$.

- #10. For any two events, we have

  $$P(A \cup B) = P(A) + P(B) - P(AB) \qquad (1)$$

and sinec $A \cup B \subseteq S$, that means $P(A \cup B) \leq 1$. Using equation (1) and $P(A \cup B) \leq 1$, we have $P(A) + P(B) - P(AB) \leq 1$ or $P(A) + P(B) - 1 \leq P(AB)$.

Section 1.7

- # 2.
$$\frac{0.0635 - 0.04}{0.12 - 0.04} = 0.294$$

- #5. The answer is
$$P(\{1, 2, \ldots, 1999\}) = \sum_{i=1}^{1999} p(\{i\}) = \sum_{i=1}^{1999} 0 = 0.$$

Section 2.2

- #1. The total number of six-digit number is $9 \times 10 \times 10 \times 10 \times 10 \times 10 = 9 \times 10^5$ since the first digit cannot be 0. The number of six-digit numbers without the digit five is $8 \times 9 \times 9 \times 9 \times 9 \times 9 = 8 \times 9^5$. Hence there are $9 \times 10^5 - 8 \times 10^5 = 427,608$ six-digit number that contain the digit five.

- #3. There are $26 \times 26 \times 26 = 17,576$ distinct sets of initials. Hence in any town with more than 17,576 inhabitants, there are at least two persons with the same initials. The anwser is, therefore, yes.

- #7. 6/36=1/6

- #9. $1/4^{15} = 0.00000000093$.

- #12. 2^{nm}.

- #15. (a) $5^4 = 625$

  (b) $5^4 - 5 \times 4 \times 3 \times 2 = 505$.

- #17.

$$1 - \frac{48 \times 48 \times 48 \times 48}{52 \times 52 \times 52 \times 52} = 0.274.$$