

## Chapter 1

# Solutions to Selected Exercises

### Section 1.1

2.  $\{2, 4\}$       3.  $\{7, 10\}$       5.  $\{2, 3, 5, 6, 8, 9\}$       6.  $\{1, 3, 5, 7, 9, 10\}$   
8.  $A$       9.  $\emptyset$       11.  $B$       12.  $\{1, 4\}$       14.  $\{1\}$   
15.  $\{2, 3, 4, 5, 6, 7, 8, 9, 10\}$       18. 1      19. 3  
22. We find that  $B = \{2, 3\}$ . Since  $A$  and  $B$  have the same elements, they are equal.  
23. Let  $x \in A$ . Then  $x = 1, 2, 3$ . If  $x = 1$ , since  $1 \in \mathbb{Z}^+$  and  $1^2 < 10$ , then  $x \in B$ . If  $x = 2$ , since  $2 \in \mathbb{Z}^+$  and  $2^2 < 10$ , then  $x \in B$ . If  $x = 3$ , since  $3 \in \mathbb{Z}^+$  and  $3^2 < 10$ , then  $x \in B$ . Thus if  $x \in A$ , then  $x \in B$ .  
Now suppose that  $x \in B$ . Then  $x \in \mathbb{Z}^+$  and  $x^2 < 10$ . If  $x \geq 4$ , then  $x^2 > 10$  and, for these values of  $x$ ,  $x \notin B$ . Therefore  $x = 1, 2, 3$ . For each of these values,  $x^2 < 10$  and  $x$  is indeed in  $B$ . Also, for each of the values  $x = 1, 2, 3$ ,  $x \in A$ . Thus if  $x \in B$ , then  $x \in A$ . Therefore  $A = B$ .  
26. Since  $(-1)^3 - 2(-1)^2 - (-1) + 2 = 0$ ,  $-1 \in B$ . Since  $-1 \notin A$ ,  $A \neq B$ .  
27. Since  $3^2 - 1 > 3$ ,  $3 \notin B$ . Since  $3 \in A$ ,  $A \neq B$ .      30. Equal      31. Not equal  
34. Let  $x \in A$ . Then  $x = 1, 2$ . If  $x = 1$ ,  
$$x^3 - 6x^2 + 11x = 1^3 - 6 \cdot 1^2 + 11 \cdot 1 = 6.$$
Thus  $x \in B$ . If  $x = 2$ ,  
$$x^3 - 6x^2 + 11x = 2^3 - 6 \cdot 2^2 + 11 \cdot 2 = 6.$$
Again  $x \in B$ . Therefore  $A \subseteq B$ .  
35. Let  $x \in A$ . Then  $x = (1, 1)$  or  $x = (1, 2)$ . In either case,  $x \in B$ . Therefore  $A \subseteq B$ .  
38. Since  $(-1)^3 - 2(-1)^2 - (-1) + 2 = 0$ ,  $-1 \in A$ . However,  $-1 \notin B$ . Therefore  $A$  is not a subset of  $B$ .  
39. Consider 4, which is in  $A$ . If  $4 \in B$ , then  $4 \in A$  and  $4 + m = 8$  for some  $m \in C$ . However, the only value of  $m$  for which  $4 + m = 8$  is  $m = 4$  and  $4 \notin C$ . Therefore  $4 \notin B$ . Since  $4 \in A$  and  $4 \notin B$ ,  $A$  is not a subset of  $B$ .

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## **Table of Contents Discrete Mathematics 7th Edition Solution Manual**

1. Understanding the eBook Discrete Mathematics 7th Edition Solution Manual
  - The Rise of Digital Reading Discrete Mathematics 7th Edition Solution Manual
  - Advantages of eBooks Over Traditional Books
2. Identifying Discrete Mathematics 7th Edition Solution Manual
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Discrete Mathematics 7th Edition Solution Manual
  - User-Friendly Interface
4. Exploring eBook Recommendations from Discrete Mathematics 7th Edition Solution Manual
  - Personalized Recommendations
  - Discrete Mathematics 7th Edition Solution Manual User Reviews and Ratings
  - Discrete Mathematics 7th Edition Solution Manual and Bestseller Lists

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  - Discrete Mathematics 7th Edition Solution Manual Enhanced eBook Features
7. Enhancing Your Reading Experience
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  - Highlighting and Note-Taking Discrete Mathematics 7th Edition Solution Manual
  - Interactive Elements Discrete Mathematics 7th Edition Solution Manual
8. Staying Engaged with Discrete Mathematics 7th Edition Solution Manual
  - Joining Online Reading Communities
  - Participating in Virtual Book Clubs
  - Following Authors and Publishers Discrete Mathematics 7th Edition Solution Manual
9. Balancing eBooks and Physical Books Discrete Mathematics 7th Edition Solution Manual
  - Benefits of a Digital Library
  - Creating a Diverse Reading Collection Discrete Mathematics 7th Edition Solution Manual
10. Overcoming Reading Challenges
  - Dealing with Digital Eye Strain
  - Minimizing Distractions
  - Managing Screen Time
11. Cultivating a Reading Routine Discrete Mathematics 7th Edition Solution Manual
  - Setting Reading Goals Discrete Mathematics 7th Edition Solution Manual
  - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Discrete Mathematics 7th Edition Solution Manual
  - Fact-Checking eBook Content of Discrete Mathematics 7th Edition Solution Manual
  - Distinguishing Credible Sources
13. Promoting Lifelong Learning

- Utilizing eBooks for Skill Development
- Exploring Educational eBooks

#### 14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

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