1. Write \( J = \{1,2,3,4,5\} \) in set builder notation.

2. Write \( M = \{a,e,i,o,u\} \) in set builder notation.

3. Use an alternative method to express the set \( \{t \mid t \text{ is a letter in the word community}\} \)

4. Use an alternative method to express the set \( \{v \mid v \text{ is a number divisible by 3 between 6 and 15 inclusive}\} \)

Are \#5 & \#6 well-defined sets? Why or why not?

5. \( \{x \mid x \text{ is a tennis player who has won Wimbledon}\} \)

6. \( \{r \mid r \text{ is a low-fat ice cream}\} \)

For \#7-11 write True or False; justify your answer.

7. \( f \in \{g,f,h,d\} \)

8. \( \{f\} \in \{g,f,h,d\} \)

9. \( 4 \notin \{a,b,c,1,2,3\} \)

10. \( \{5,6,7,4\} = \{4,6,7,5\} \)

11. \( \{r,s,t,r,s\} = \{r,t,s\} \)

12. \( \{x \mid x \text{ is a letter in the word berry}\} \) and \( \{x \mid x \text{ is a letter in the word bury}\} \)

13. \( \{a,r,g,h,q,z\} \) and \( \{0,1,2,3,4,5\} \)

Are the sets in \#12 & \#13 equivalent? Why or why not?

14. \( A \subseteq B \)

15. \( A \subseteq B \)

16. \( B \subseteq A \)

17. \( B \subset A \)

18. \( A \subset A \)

Use the sets below to determine whether the statements are True or False. Justify.
\( A = \{14,15,16,17,18,19\} \) and \( B = \{15,16,17\} \)

14. \( A = B \)

15. \( A \subseteq B \)

16. \( B \subseteq A \)

17. \( B \subset A \)

18. \( A \subset A \)

Use the sets below to perform the indicated operations.
\( U = \{1,2,3,4,5,6,7,8\} \), \( A = \{1,3,5,7\} \), \( B = \{2,3,4,6\} \), \( C = \{1,3,4\} \)

19. \( B \cap C \)

20. \( A' \cup C \)

21. \( B \cap (A \cup C)' \)

22. Write a description of the shaded region using the symbols A, B, C, \( \cup, \cap, and ' \) as needed.
23. Write a description of the shaded region using the symbols A, B, C, U, ∩, and ′ as needed.

![Venn Diagram](image)

24. Use a Venn diagram to shade the following sets:
   a) \((A \cap C)' \cap B\)
   b) \(B \cup (A' \cap C)\)

The number of elements in each region is indicated in the Venn diagram below. Use the diagram to answer #25-28.

25. \(n(C)\)
26. \(n(A \cap B)\)
27. \(n(A' \cap B \cap C')\)
28. \(n(B \cup C')\)

The Valley Restaurant Association wanted to determine the popularity of three restaurants. It surveyed 30 people in the past month and the results showed that:

- 15 people ate at Ruth’s Ribs
- 7 people ate at Patty’s Pasta
- 19 people ate at Danny’s Diner
- 8 people ate at Ruth’s and Danny’s
- 4 people ate at Danny’s and Patty’s
- 6 people ate at Ruth’s and Patty’s
- 4 people ate at all three restaurants

29. Construct a Venn diagram.

30. How many people did not eat at any of the restaurants?
31. How many people have eaten at only one of the three restaurants?
32. How many people have eaten at Ruth’s and Danny’s but not Patty’s?
33. How many people have eaten at only two of the three restaurants?
34. How many people ate at Danny’s?
35. How many people ate at only Danny’s?
36. How many people ate at Ruth’s or Patty’s?

37. How many people ate at Ruth’s and Patty’s?

38. How many people did not eat at Ruth’s?

A study of U.S. Army housing trends categorized personnel as commissioned officers (C), warrant officers (W), or enlisted (E), and categorized their living facilities as on-base (B), rented off-base (R), or owned off-base (O). One survey yielded the following data.

<table>
<thead>
<tr>
<th>Facilities</th>
<th>B</th>
<th>R</th>
<th>O</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personnel</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>12</td>
<td>29</td>
<td>54</td>
<td>95</td>
</tr>
<tr>
<td>W</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>15</td>
</tr>
<tr>
<td>E</td>
<td>374</td>
<td>71</td>
<td>285</td>
<td>730</td>
</tr>
<tr>
<td>Totals</td>
<td>390</td>
<td>105</td>
<td>345</td>
<td>840</td>
</tr>
</tbody>
</table>

Find the number of personnel in each of the following sets.

39. \( W \cap O \)

40. \( C \cup B \)

41. \( R' \cup W' \)

42. \((C \cup W) \cap (B \cup R)\)

43. \((C \cap B) \cup (E \cap O)\)

44. \( B \cap (W \cup R)' \)

**ANSWERS TO CHAPTER 2 PRACTICE**

1. \( J = \{ x \mid x \) is a counting number between 1 & 5 inclusive\}
2. \( M = \{ x \mid x \) is a vowel\}
3. \( \{c, o, m, u, n, i, t, y\} \)
4. \( \{6, 9, 12, 15\} \)
5. Yes (you can list the people who have won)
6. No (what does one consider low-fat)
7. True because \( f \) is an element of the set
8. False because \( \{f\} \) is a subset of the set, not an element of the set
9. True because 4 is not an element of the set
10. True because the two sets have identical elements
11. True because the two sets have identical elements
12. Yes because the two sets have equal cardinal numbers
13. Yes because the two sets have equal cardinal numbers
14. False because the two sets do not have identical elements
15. False because set A contains elements that are not in set B
16. True because all the elements in set B are within set A
17. True because all the elements in set B are within set A and set A contains additional elements that are not in set B
18. False because a set cannot be a proper subset of itself
19. \{3, 4\}
20. \{1, 2, 3, 4, 6, 8\}
21. \{2, 6\}
22. \(A' \cap B\)
23. \(A \cap B' \cap C'\)
24. a) will fill in shading in class
   b)

25. 15
26. 6
27. 7
28. 26
29.

30. 3
31. 17
32. 4
33. 6
34. 19
35. 11
36. 16
37. 6
38. 15
39. 6
40. 473
41. 835
42. 50
43. 297
44. 386