2.6 Exercises

Let $A = \{a, b, c, d, e, f\}$, $B = \{a, c, e\}$, $C = \{a, f\}$, *and* $D = \{d\}$. *List the elements in each of the following sets. See Examples 2 and 5.*

1. $A \cap B$ **2.** $B \cap A$ **3.** $A \cap D$ **4.** $B \cap D$

5. $B \cap C$ **6.** $A \cap \emptyset$ **7.** $A \cup B$ **8.** $B \cup D$

9. $B \cup C$ **10.** $C \cup B$ **11.** $C \cup D$ **12.** $D \cup C$

13. $B \cup \emptyset$ **14.** $A \cap (C \cap D)$ **15.** $A \cap (B \cap C)$ **16.** $(A \cap B) \cap C$

17. $B \cup (C \cup D)$ **18.** $(B \cup C) \cup D$ **19.** $(A \cap B) \cup C$ **20.** $(B \cup C) \cap A$

Solve each of the following compound inequalities, then graph each solution. See Examples 1, 3, 4, 6, and 7.

21. $x > 3$ and $x < 7$

22. $x < 2$ and $x > -1$

23. $x < 4$ and $x > 0$

24. $x \le 2$ or $x \le 6$

25. $x \le -8$ or $x \le -12$

26. $x \le 3$ and $x \le 5$

27. $x \ge 3$ and $x \ge 5$

28. $x \le 3$ or $x \ge 5$

29. $x \ge 3$ or $x \le 5$

30. $x \ge 3$ or $x \ge 5$

31. $x - 3 \le 5$ and $x + 2 \ge 6$

32. $x + 5 \le 9$ and $x - 3 \ge -2$

33. $3x < -3$ and $x + 2 > 0$

34. $3x > -3$ and $x + 2 < 2$

35. $2x - 1 < 3$ and $2x - 8 > -4$

36. $5x + 2 > 2$ and $5x + 2 \le 7$

37. $6x - 8 \le 16$ and $4x - 1 \le 15$

38. $7x + 6 < 48$ and $-2x \ge -6$

39. $x + 2 > 6$ or $x - 1 < -5$

40. $x - 3 > 2$ or $x + 4 < 3$

41. $2x + 3 > 7$ or $4x - 1 < 3$

42. $3x < x + 12$ or $x - 1 > 5$

43. $2x - 5 > 10$ or $4x > 4$

44. $3x - 6 > 15$ or $2x > 15$

45. $-5x + 2 \le 17$ or $2x + 1 \le 9$

46. $-3x - 4 > 9$ or $4x + 5 > -13$

Find each of the following intervals.

47. $(-\infty, -1] \cap [-4, +\infty)$

48. $[-1, +\infty) \cap (-\infty, 9]$

49. $[4, +\infty) \cap (-\infty, 12]$

50. $(-\infty, -6] \cap [-9, +\infty)$

51. $(-\infty, 3) \cup (-\infty, -2)$

52. $(-\infty, 5) \cup (0, +\infty)$

53. $(-\infty, 1] \cup [4, +\infty)$

54. $(-\infty, -5] \cup [3, +\infty)$

55. $(5, 11] \cap [6, +\infty)$

56. $[-9, 1] \cap (-\infty, -3)$

57. $(-1, 4) \cap (2, 7)$

58. $[3, 6] \cap (4, 9)$

59. $[-1, 2] \cup (0, 5)$

60. $[3, 8] \cup (5, 11)$

Are the following statements always true for any choice of three sets X, Y, and Z?

61. $X \cap Y = Y \cap X$

62. $X \cup Y = Y \cup X$

63. $X \cup (Y \cup Z) = (X \cup Y) \cup Z$

64. $X \cap (Y \cap Z) = (X \cap Y) \cap Z$

65. $(X \cap Y) \cup Z = X \cap (Y \cup Z)$

66. $X \cap (Y \cup Z) = (X \cap Y) \cup (X \cap Z)$

Under what conditions on sets A and B do the following hold?

67. $A \cap B = A \cup B$

68. $A \cap A = \emptyset$

69. $B \cup B = B$

70. $B \cap \emptyset = \emptyset$

71. If $A \subseteq B$, must $A \cap B = A$?

72. If $A \subseteq B$, must $A \cup B = B$?

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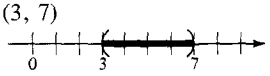
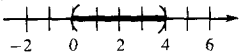
1. {a, c, e} **3.** {d} **5.** {a} **7.** {a, b, c, d, e, f} **9.** {a, c, e, f} **11.** {a, d, f}

13. $B = \{a, c, e\}$ **15.** {a} **17.** {a, c, d, e, f} **19.** {a, c, e, f}

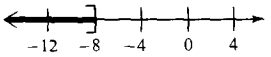
21. (3, 7)



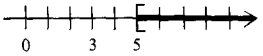
23. (0, 4)



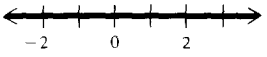
25. $(-\infty, -8]$



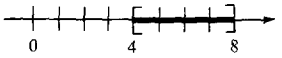
27. $[5, +\infty)$



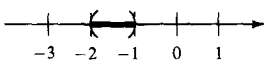
29. $(-\infty, +\infty)$



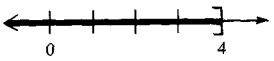
31. [4, 8]



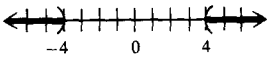
33. $(-2, -1)$ **35.** $\emptyset$



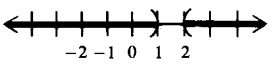
37. $(-\infty, 4]$



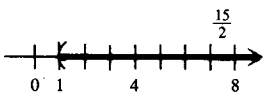
39. $(-\infty, -4) \cup (4, +\infty)$



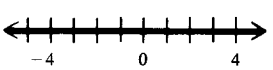
41. $(-\infty, 1) \cup (2, +\infty)$



43. $(1, +\infty)$



45. $(-\infty, +\infty)$



47. $[-4, -1]$ **49.** [4, 12] **51.** $(-\infty, 3)$ **53.** $(-\infty, 1] \cup [4, +\infty)$ **55.** [6, 11]

57. (2, 4) **59.** $[-1, 5)$ **61.** Yes **63.** Yes **65.** No **67.** If A and B are equal

69. Always true **71.** Yes **73.** $\{-5, 5\}$ **75.** $\{-11, 3\}$ **77.** $\{-4, 7\}$ **79.** $\emptyset$