1.1: Real Numbers and the Rectangular Coordinate System

1. (a)   The only natural number is 10.

    (b)   The whole numbers are 0 and 10.

    (c)   The integers are $-6, -\dfrac{12}{4}$ (or -3), $0, 10$.

    (d)   The rational numbers are $-6, -\dfrac{12}{4}$ (or -3), $-\dfrac{5}{8}, 0, .31, .\overline{3}$, and 10.

    (e)   The irrational numbers are $-\sqrt{3}, 2\pi$ and $\sqrt{17}$.

    (f)   All of the numbers listed are real numbers.

2. (a)   The natural numbers are $\dfrac{6}{2}$ (or 3), 8, and $\sqrt{81}$ (or 9).

    (b)   The whole numbers are $0, \dfrac{6}{2}$ (or 3), 8, and $\sqrt{81}$ (or 9).

    (c)   The integers are $-8, -\dfrac{14}{7}$ (or -2), $0, \dfrac{6}{2}$ (or 3), 8, and $\sqrt{81}$ (or 9).

    (d)   The rational numbers are $-8, -\dfrac{14}{7}$ (or -2), $-.245, \dfrac{6}{2}$ (or 3), 8, and $\sqrt{81}$ (or 9).

    (e)   The only irrational number is $\sqrt{12}$.

    (f)   All of the numbers listed are real numbers.

3. (a)   There are no natural numbers listed.

    (b)   There are no whole numbers listed.

    (c)   The integers are $-\sqrt{100}$ (or -10) and -1.

    (d)   The rational numbers are $-\sqrt{100}$ (or -10), $-\dfrac{13}{6}, -1, 5.23, 9.\overline{14}, 3.14,$ and $\dfrac{22}{7}$.

    (e)   There are no irrational numbers listed.

    (f)   All of the numbers listed are real numbers.

4. (a)   The natural numbers are 3, 18, and 56.

    (b)   The whole numbers are 3, 18, and 56.

    (c)   The integers are $-\sqrt{49}$ (or -7), 3, 18, and 56.

    (d)   The rational numbers are $-\sqrt{49}$ (or -7), $-.405, -.\overline{3}, .1, 3, 18,$ and 56.

    (e)   The only irrational number is 6π.

    (f)   All of the numbers listed are real numbers.

5. The number 10,600,000,000,000 is a natural number, integer, rational number, and real number.

6. The number 700,000,000,000 is a natural number, integer, rational number, and real number.

7. The number -17 is an integer, rational, and real number.

8. The number -3 is an integer, rational number, and real number

9. The number $\dfrac{1}{5}$ is a rational and real number.

10. The number -3.5 is a rational number and real number.

11. The number $5\sqrt{2}$ is a real number.

12. The number π is a real number.

13. Natural numbers would be appropriate because population is only measured in positive whole numbers.

14. Natural numbers would be appropriate because distance on road signs is only given in positive whole numbers.

15. Rational numbers would be appropriate because shoes come in fraction sizes.

16. Rational numbers would be appropriate because gas is paid for in dollars and cents, a decimal part of a dollar.

17. Integers would be appropriate because temperature is given in positive and negative whole numbers.

18. Integers would be appropriate because golf scores are given in positive and negative whole numbers.

19.

20.

21.

22.
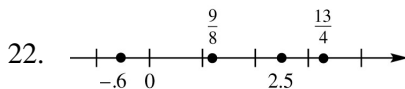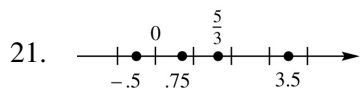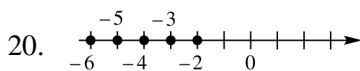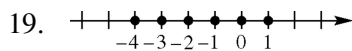
23. A rational number can be written as a fraction, $\dfrac{p}{q}$, $q \neq 0$, where p and q are integers. An irrational number cannot be written in this way.

24. She should write $\sqrt{2} \approx 1.414213562$. Calculators give only approximations of irrational numbers.

25. The point $\left(2, \dfrac{5}{7} \right)$ is in Quadrant I. See Figure 25-34.

26. The point $(-1, 2)$ is in Quadrant II. See Figure 25-34.

27. The point $(-3, -2)$ is in Quadrant III. See Figure 25-34.

28. The point $(1, -4)$ is in Quadrant IV. See Figure 25-34.

29. The point $(0, 5)$ is located on the y-axis, therefore is not in a quadrant. See Figure 25-34.

30. The point $(-2, -4)$ is in Quadrant III. See Figure 25-34.

31. The point $(-2,4)$ is in Quadrant II. See Figure 25-34.

32. The point $(3,0)$ is located on the *x*-axis, therefore is not in a quadrant. See Figure 25-34.

33. The point $(-2,0)$ is located on the *x*-axis, therefore is not in a quadrant. See Figure 25-34.

34. The point $(3,-3)$ is in Quadrant IV. See Figure 25-34.

Figure 25-34

35. If $xy>0$, then either $x>0$ and $y>0 \Rightarrow$ Quadrant I, or $x<0$ and $y<0 \Rightarrow$ Quadrant III.
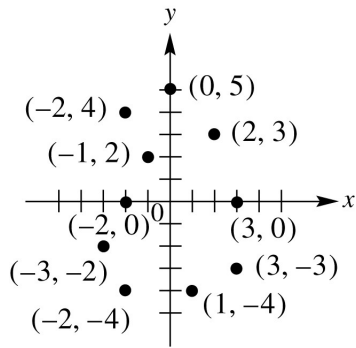
36. If $xy<0$, then either $x>0$ and $y<0 \Rightarrow$ Quadrant IV, or $x<0$ and $y>0 \Rightarrow$ Quadrant II.

37. If $\dfrac{x}{y}<0$, then either $x>0$ and $y<0 \Rightarrow$ Quadrant IV, or $x<0$ and $y>0 \Rightarrow$ Quadrant II.

38. If $\dfrac{x}{y}>0$, then either $x>0$ and $y>0 \Rightarrow$ Quadrant I, or $x<0$ and $y<0 \Rightarrow$ Quadrant III.

39. Any point of the form $(0,b)$ is located on the *y*-axis.

40. Any point of the form $(a,0)$ is located on the *x*-axis.

41. $[-5,5]$ by $[-25,25]$

42. $[-25,25]$ by $[-5,5]$

43. $[-60,60]$ by $[-100,100]$

44. $[-100,100]$ by $[-60,60]$

45. $[-500,300]$ by $[-300,500]$

46. $[-300,300]$ by $[-375,150]$

47. See Figure 47.

48. See Figure 48.

49. See Figure 49.

50. See Figure 50.

[-10,10] by [-10,10]
Xscl = 1   Yscl = 1

[-40,40] by [-30,30]
Xscl = 5   Yscl = 5

[-5,10] by [-5,10]
Xscl= 3   Yscl = 3

[-3.5,3.5] by [-4,10]
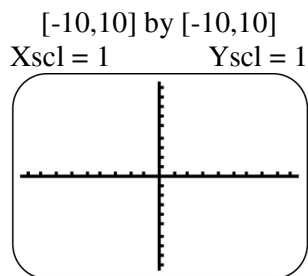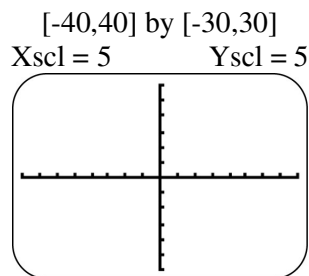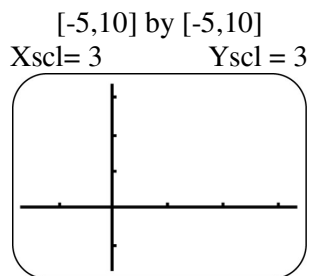Xscl = 1   Yscl= 1

Figure 47   Figure 48   Figure 49   Figure 50
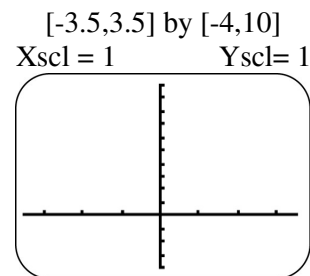
51. See Figure 51.

52. See Figure 52.

[-100,100] by [-50,50]
Xscl = 20   Yscl = 25

[-4.7,4.7] by [-3.1,3.1]
Xscl = 1   Yscl = 1
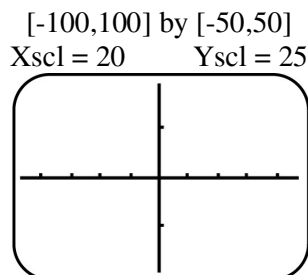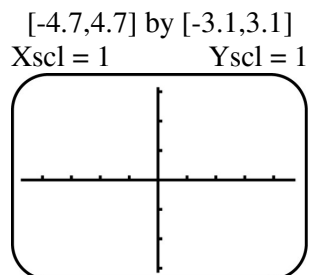
Figure 51   Figure 52

53. There are no tick marks, which is a result of setting Xscl and Yscl to 0.

54. The axes appear thicker because the tick marks are so close together. The problem can be fixed by

   using larger values for Xscl and Yscl such as $Xscl = Yscl = 10$.

55. $\sqrt{58} \approx 7.615773106 \approx 7.616$

56. $\sqrt{97} \approx 9.848857802 \approx 9.849$

57. $\sqrt[3]{33} \approx 3.20753433 \approx 3.208$

58. $\sqrt[3]{91} \approx 4.497941445 \approx 4.498$

59. $\sqrt[4]{86} \approx 3.045261646 \approx 3.045$

60. $\sqrt[4]{123} \approx 3.330245713 \approx 3.330$

61. $19^{1/2} \approx 4.35889844 \approx 4.359$

62. $29^{1/3} \approx 3.072316826 \approx 3.072$

63. $46^{1.5} \approx 311.9871792 \approx 311.987$

64. $23^{2.75} \approx 5555.863268 \approx 5555.863$

65. $(5.6 - 3.1) / (8.9 + 1.3) \approx .25$

66. $(34 + 25) / 23 \approx 2.57$

67. $\sqrt{(\pi \wedge 3 + 1)} \approx 5.66$

68. $\sqrt[3]{(2.1 - 6^2)} \approx -3.24$

69. $3(5.9)^2 - 2(5.9) + 6 = 98.63$