

CHAPTER 1

The Real Number System

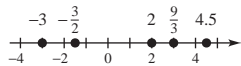
Section 1.1 Real Numbers: Order and Absolute Value

Solutions to Odd-Numbered Exercises

1. (a) natural numbers: $\{2, \frac{9}{3}\}$

(b) integers: $\{-3, 2, \frac{9}{3}\}$

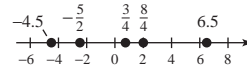
(c) rational numbers: $\{-3, 2, -\frac{3}{2}, \frac{9}{3}, 4.5\}$



3. (a) natural numbers: $\{\frac{8}{4}\}$

(b) integers: $\{\frac{8}{4}\}$

(c) rational numbers: $\{-\frac{5}{2}, 6.5, -4.5, \frac{8}{4}, \frac{3}{4}\}$



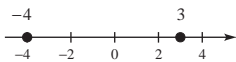
5. $2 < 5$ or $5 > 2$

7. $-4 < -1$ or $-1 > -4$

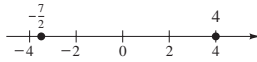
9. $-2 < \frac{3}{2}$ or $\frac{3}{2} > -2$

11. $-\frac{9}{2} < -3$ or $-3 < -\frac{9}{2}$

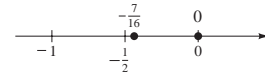
13. $3 > -4$ because 3 lies to the *right* of 4.



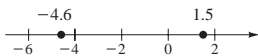
15. $4 > -\frac{7}{2}$ because 4 lies to the *right* of $-\frac{7}{2}$.



17. $0 > -\frac{7}{16}$ because 0 lies to the *right* of $-\frac{7}{16}$.

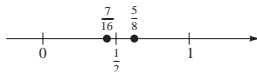


19. $-4.6 < 1.5$ because -4.6 lies to the *left* of 1.5.



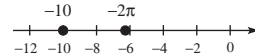
21. $\frac{7}{16} < \frac{5}{8}$ because $\frac{7}{16}$ lies to the *left* of $\frac{5}{8}$.

Note: $\frac{5}{8} = \frac{10}{16}$



23. $-2\pi > -10$ because -2π lies to the *right* of -10 .

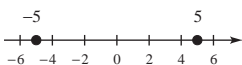
Note: $-2\pi \approx -6.28$.



25. 2: The distance between 2 and zero is 2.

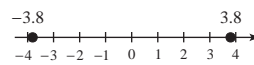
27. 4: The distance between -4 and 0 is 4.

29. The opposite of 5 is -5 .



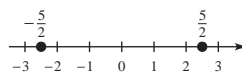
The distance from 5 to 0 is five, and the distance from -5 to 0 is also five.

31. The opposite of -3.8 is 3.8



The distance from -3.8 to 0 is 3.8, and the distance from 3.8 to 0 is also 3.8.

33. The opposite of $-\frac{5}{2}$ is $\frac{5}{2}$.



The distance from $-\frac{5}{2}$ to 0 is $\frac{5}{2}$, and the distance from $\frac{5}{2}$ to 0 is also $\frac{5}{2}$.

35. $|\frac{5}{2}| = \frac{5}{2}$. The distance of $\frac{5}{2}$ from 0 is $\frac{5}{2}$.

37. $|\frac{4}{3}| = \frac{4}{3}$. The distance of $-\frac{4}{3}$ from 0 is $\frac{4}{3}$.

39. $|7| = 7$ because the distance between 7 and 0 is 7.

41. $|-3.4| = 3.4$ because the distance between -3.4 and 0 is 3.4.

43. $|\frac{7}{2}| = \frac{7}{2}$ because the distance between $-\frac{7}{2}$ and 0 is $\frac{7}{2}$.

45. $-|4.09| = -4.09$

 Note: $|4.09| = 4.09$

47. $-|-23.6| = -23.6$

 Note: $|-23.6| = 23.6$

49. $|-3.2| = 3.2$ because the distance between -3.2 and 0 is 3.2 .

51. $|-15| = |15|$ because $|-15| = 15$, $|15| = 15$, and $15 = 15$.

53. $|-4| > |3|$ because $|-4| = 4$, $|3| = 3$ and 4 is greater than 3 .

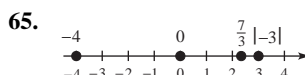
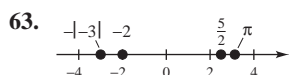
55. $|32| < |-50|$ because $|32| = 32$, $|-50| = 50$, and $32 < 50$.

57. $|\frac{3}{16}| < |\frac{3}{2}|$ because $|\frac{3}{16}| = \frac{3}{16}$, $|\frac{3}{2}| = \frac{3}{2}$, and $\frac{3}{16} < \frac{3}{2}$.

 Note: $\frac{3}{2} = \frac{24}{16}$, and $\frac{3}{16} < \frac{24}{16}$

59. $-|-48.5| < |-48.5|$ because $-|-48.5| = -48.5$, $|-48.5| = 48.5$, and -48.5 is less than 48.5 .

61. $-\pi > -|-2\pi|$ because $-\pi = \pi$, $-|-2\pi| = -2\pi$, and $\pi > -2\pi$.



67. The number 12.5 units to the right of 8 is 20.5 because $8 + 12.5 = 20.5$.

 The number 12.5 units to the left of 8 is -4.5 because $8 - 12.5 = -4.5$.

69. The number 3.5 units to the right of -2 is 1.5 because $-2 + 3.5 = 1.5$.

 The number 3.5 units to the left of -2 is -5.5 because $-2 - 3.5 = -5.5$.

71. (a) $A = \{1^\circ, -4^\circ, -15^\circ, 0^\circ, 5^\circ, 8^\circ, 2^\circ, 3^\circ\}$

(b) $B = \{-3^\circ, -5^\circ, -12^\circ, -20^\circ, -6^\circ, -\frac{4}{3}^\circ, 0^\circ, 2^\circ, -1^\circ, -2^\circ, -9^\circ, -10^\circ, -8^\circ\}$

(c) $C = \{0^\circ, 2^\circ\}$

(d) $-15^\circ, -4\frac{1}{2}^\circ, -4^\circ, 0^\circ, 1^\circ, 2^\circ, 2.5^\circ, 3^\circ, 5^\circ, 7.2^\circ, 8^\circ$

(e) $2^\circ, 0^\circ, -1^\circ, -\frac{4}{3}^\circ, -2^\circ, -3^\circ, -5^\circ, -6^\circ, -8^\circ, -9^\circ, -10^\circ, -12^\circ, -20^\circ$

(f) December 11th

73. 2

 There are two number on real number line that are 3 units from 0 . These two numbers are 3 and -3 .

75. 3

 The number 3 lies 10 units from -7 on the real number line, but -10 lies only 3 units from -7 on the real number line.

77. 0.35

 $\frac{3}{8} = 0.375$, so 0.35 is the smaller number.

79. True. Their absolute values are equal because their distances from zero on the real number line are equal.

81. True. The real number line is a picture used to represent the real numbers. In this picture each point on the line corresponds to exactly one real number and each real number corresponds to exactly one point on the real number line.

 83. False. A rational number is a ratio of two integers. Some rational numbers, such as $\frac{6}{2}$ and $-\frac{12}{3}$, are integers, but others are not. For example, the rational numbers $\frac{7}{4}$ and $-\frac{3}{8}$ are not integers.