

## REAL NUMBERS

### COMPARING AND ORDERING REAL NUMBERS

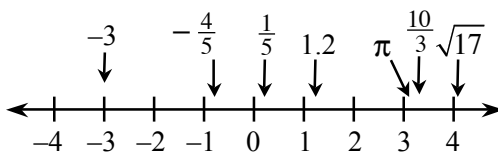
Any number that can be written as the ratio of two integers  $\frac{a}{b}$  with  $b \neq 0$ , is called a **rational** number. Rational numbers can be matched to exactly one point on a number line. There are many points on the number line for which there are no rational numbers. These numbers are called **irrational** numbers. Numbers such as  $\pi$ ,  $\sqrt{2}$ , and  $-\sqrt[3]{5}$  are irrational numbers. The rational numbers and the irrational numbers make up all of the numbers on the number line and together are called the **real** numbers.

#### Example 1

Indicate the approximate location of each of the following real numbers on a number line:

$$-3, \frac{10}{3}, 1.2, \frac{1}{5}, \pi, \sqrt{17}, -\frac{4}{5}$$

We know that  $\frac{10}{3} = 3\frac{1}{3}$ ,  $\pi \approx 3.14$ , and  $\sqrt{17} \approx 4.1$ . Approximating the locations of the other fractions and decimals yields the line below.



#### Example 2

Without using a calculator, order these numbers from least to greatest:

$$2\pi, \sqrt{37}, 6, \frac{20}{3}, 5.9, 6.4 \times 10^0$$

Since  $\pi \approx 3.14$ ,  $2\pi \approx 6.28$ ,  $6 = \sqrt{36} < \sqrt{37} \approx 6.1$ ,  $\frac{20}{3} = 6\frac{2}{3} \approx 6.67$  and  $6.4 \times 10^0 = 6.4 \times 1 = 6.4$ , the order is:  $5.9 < 6 < \sqrt{37} < 2\pi < 6.4 \times 10^0 < \frac{20}{3}$

## Problems

Indicate the approximate location of each of the following real numbers on a number line.

1.  $\frac{2}{3}, -0.75, \sqrt{8}, -\frac{9}{5}, \frac{\pi}{3}, 2\frac{1}{4}$

2.  $-\sqrt{10}, \frac{\pi}{2}, 1\frac{7}{8}, 2.8, -1.6, \frac{15}{31}$

Without using a calculator, order these numbers from least to greatest:

3.  $\sqrt{102}, 10, 3\pi, \sqrt{99}, 1.1 \times 10^1, 9.099$

4.  $\frac{17}{4}, 3.9, 4, \sqrt{17}, (\pi + 0.5), 3.899$

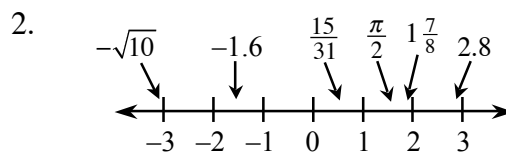
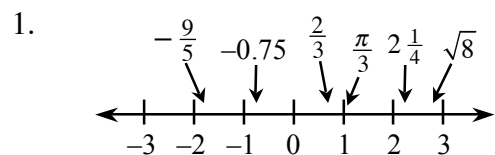
5.  $-\sqrt{10}, -\frac{10}{3}, -3, -2.95, -3\frac{1}{4}, -3.5 \times 10^0$

6.  $-5, -\sqrt{24}, -\frac{26}{5}, -5.5, -2\pi, -4\frac{3}{4}$

7.  $8.1 \times 10^3, 2.1 \times 10^5, 7.25 \times 10^3, 1.05 \times 10^4, 7.4 \times 10^3, 1.75 \times 10^4$

8.  $1.62 \times 10^{-2}, 9.3 \times 10^{-3}, 1.97 \times 10^{-1}, 4.5 \times 10^{-2}, 6.1 \times 10^{-3}, 8.3 \times 10^{-2}$

## Answers



3.  $9.099 < 3\pi < \sqrt{99} < 10 < \sqrt{102} < 1.1 \cdot 10^1$

4.  $(\pi + 0.5) < 3.899 < 3.9 < 4 < \sqrt{17} < \frac{17}{4}$

5.  $-3.5 \cdot 10^0 < -\frac{10}{3} < -3\frac{1}{4} < -\sqrt{10} < -3 < -2.95$

6.  $-2\pi < -5.5 < -\frac{26}{5} < -5 < -\sqrt{24} < -4\frac{3}{4}$

7.  $7.25 \times 10^3 < 7.4 \times 10^3 < 8.1 \times 10^3 < 1.05 \times 10^4 < 1.75 \times 10^4 < 2.1 \times 10^5$

8.  $6.1 \times 10^{-3} < 9.3 \times 10^{-3} < 1.62 \times 10^{-2} < 4.5 \times 10^{-2} < 8.3 \times 10^{-2} < 1.97 \times 10^{-1}$