

# Rational and Irrational Decimals

## NATURAL NUMBERS AND DECIMALS

Decimals that are **rational numbers** can be turned into either repeating or terminating decimals.

- 0.5 and 0.25 are terminating decimals.
- $0.\overline{3}$ ,  $0.\overline{16}$ , and  $0.\overline{142857}$  are repeating decimals with a pattern that never ends.

Decimals that are **irrational numbers** go beyond the point that we can calculate them.

- $\sqrt{7} = 2.645751311064590501615753639260425710259183082450180368 \dots$
- $\pi = 3.14159265358979323846264338327950288419716939937510582097 \dots$

Translate each fraction or square root into a decimal. Write each fraction from the fraction box beneath the appropriate heading. Find the irrational numbers and write them under the appropriate heading.

Fraction Box															
$\frac{1}{2}$	$\frac{1}{3}$	$\sqrt{9}$	$\frac{1}{4}$	$\frac{1}{5}$	$\sqrt{25}$	$\frac{1}{6}$	$\frac{1}{7}$	$\pi$	$\frac{1}{8}$	$\frac{1}{9}$	$\frac{1}{10}$	$\sqrt{2}$	$\frac{2}{3}$	$\frac{3}{4}$	$\frac{2}{5}$
$\frac{5}{6}$	$\sqrt{5}$	$\frac{2}{7}$	$\frac{5}{7}$	$\sqrt{3}$	$\frac{3}{8}$	$\frac{2}{9}$	$\sqrt{6}$	$\frac{7}{9}$	$\frac{3}{10}$	$\sqrt{4}$	$\frac{3}{5}$	$\frac{6}{7}$	$\frac{5}{8}$	$\frac{4}{9}$	$\frac{8}{9}$

Terminating	Repeating
$\frac{1}{2}, \sqrt{9}, \frac{1}{4}, \frac{1}{5}, \sqrt{25}$	$\frac{1}{3}, \frac{1}{6}, \frac{1}{7}, \frac{1}{9}, \frac{2}{3}$
$\frac{1}{8}, \frac{1}{10}, \frac{3}{4}, \frac{2}{5}, \frac{3}{8}$	$\frac{5}{6}, \frac{2}{7}, \frac{5}{7}, \frac{2}{9}, \frac{7}{9}$
$\frac{3}{10}, \sqrt{4}, \frac{3}{5}, \frac{5}{8}$	$\frac{6}{7}, \frac{4}{9}, \frac{8}{9}$
Irrational	
$\pi, \sqrt{2}, \sqrt{5}, \sqrt{3}, \sqrt{6}$	

**Did you know?** The philosopher Hippiasus used geometric methods to prove that  $\sqrt{2}$  is irrational. This so irritated the other mathematical philosophers that they threw him overboard. How's that for irrational?