Lesson 7.4:

Approximating Square Roots

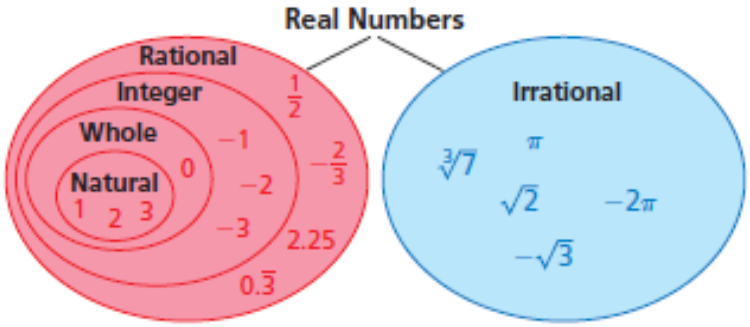
Essential Question

How can you find decimal approximations of square roots that are not rational?

Key Idea

Real Numbers

Rational numbers and irrational numbers together form the set of **real numbers**.



The square or cube root of any integer that is not a perfect square is irrational.

Irrational numbers neither terminate nor repeat.

Classify each real number.

	Number	
a.	$\sqrt{12}$:	Irrational
b.	$-0.\overline{25}$:	Rational
c.	$-\sqrt{9} = -3$:	Rational → Integer
d.	$\frac{72}{4} = 18$:	Rational → Integer → Whole # → Natural #
e.	π:	Irrational

Classify the real number.

1. 0.121221222 . . .

Irrational

2. $-\sqrt{196} = -14$

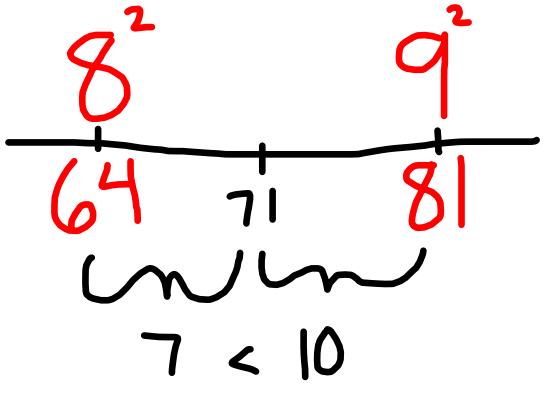
$$\begin{array}{r} 14 \\ \times 14 \\ \hline 56 \\ 140 \\ \hline 196 \end{array}$$

R → Integer

3. $\sqrt[3]{2}$

Irrational

Estimate $\sqrt{71}$ to the nearest integer.



$\sqrt{71}$ is bet. 8 and 9.

71 is closer to 64 than 81, so...

$\sqrt{71} \approx 8$

Estimate $\sqrt{71}$ to the nearest tenth.

Start by guessing

$8.5 \times 8.5 = 72.25$

$8.4 \times 8.4 = 70.56$

$71.00 - 70.56 = .44$

$72.25 - 71.00 = 1.25$

71 is closer to 70.56 than 72.25, so... $\sqrt{71} \approx 8.4$

Estimate the square root to the nearest (a) integer and (b) tenth.

4. $\sqrt{8}$

$2^2 = 4$, $3^2 = 9$

$2.9 \times 2.9 = 8.41$

$2.8 \times 2.8 = 7.84$

5. $-\sqrt{13}$

$-3^2 = -9$, $-4^2 = -16$

$-3.8 \times 3.8 = -14.44$

$-3.7 \times 3.7 = -13.69$

$-3.6 \times 3.6 = -12.96$

6. $-\sqrt{24}$

$-4^2 = -16$, $-5^2 = -25$

$4.9 \times 4.9 = 24.01$

7. $\sqrt{110}$

$10^2 = 100$, $11^2 = 121$

$10.5 \times 10.5 = 110.25$

$10.4 \times 10.4 = 108.16$

2 3

Which is greater, $\sqrt{5}$ or $2\frac{2}{3}$?

guess

$2.3^2 \rightarrow 2.3$

$\times 2.3$

69

$+460$

5.29

$\sqrt{5}$ is less than 2.3

2.3 is less than $2\frac{2}{3}$

$\sqrt{5} < 2\frac{2}{3}$

Which number is greater? Explain.

8. $4\frac{1}{5}$ $\sqrt{23}$

9. $\sqrt{10}$ $-\sqrt{5}$

10. $-\sqrt{2}$ -2

$-2 < -\sqrt{2} < -1$

4.2

$\times 4.2$

84

$+1680$

17.64

Order the numbers from least to greatest: $\sqrt{38}, \sqrt{\frac{100}{3}}, 6.5$

$\sqrt{38} \approx 6$

$\sqrt{\frac{100}{3}} = \sqrt{33.\overline{3}} < 6$

$\sqrt{\frac{100}{3}} < \sqrt{38} < 6.5$

6.5×6.5

325

$+3900$

42.25