4.2 Irrational Numbers

Lesson Focus

Identify and order irrational numbers

Explore

These are rational numbers.	These are not rational numbers.
$\sqrt{100}$ $\sqrt{0.25}$ $\sqrt[3]{8}$ 0.5	$\sqrt{0.24}$ $\sqrt[3]{9}$ $\sqrt{2}$
$\frac{5}{6}$ $\sqrt{\frac{9}{64}}$ 0.8^2 $\sqrt[5]{-32} = \frac{-2}{1}$	$\sqrt{\frac{1}{3}}$ $\sqrt[4]{12}$

A. How are radicals that are rational numbers different from radicals that are not rational numbers?

Reminder

- *Unlike powers, with roots we don't always get a rational number*
  - *Rational Number – any number that can be written as* $\frac{a}{b}$ *such that a and b are integers and* $b \neq 0$
- *Ex.* $\sqrt{2}$
- ***Irrational Number – any number that <u>CAN NOT</u> be written as*** $\frac{a}{b}$ ***such that a and b are integers and*** $b \neq 0$
  - ***The decimal value of an irrational neither terminates or repeats***

Explore

B. Which of these radicals are rational numbers? Which are not rational numbers? How do you know?

$\sqrt{1.44}, \sqrt{\frac{64}{81}}, \sqrt[3]{-27}, \sqrt{\frac{4}{5}}, \sqrt{5}$

C. Write 3 other radicals that are rational numbers. Why are they rational?

D. Write 3 other radicals that are not rational numbers. Why are they not rational?

Example

Tell whether each number is rational or irrational. Explain how you know.

a) $-\frac{3}{5}$ R

b) $\sqrt{14}$ I

c) $\sqrt[3]{\frac{8}{27}}$ R $= \frac{2}{3}$

Example

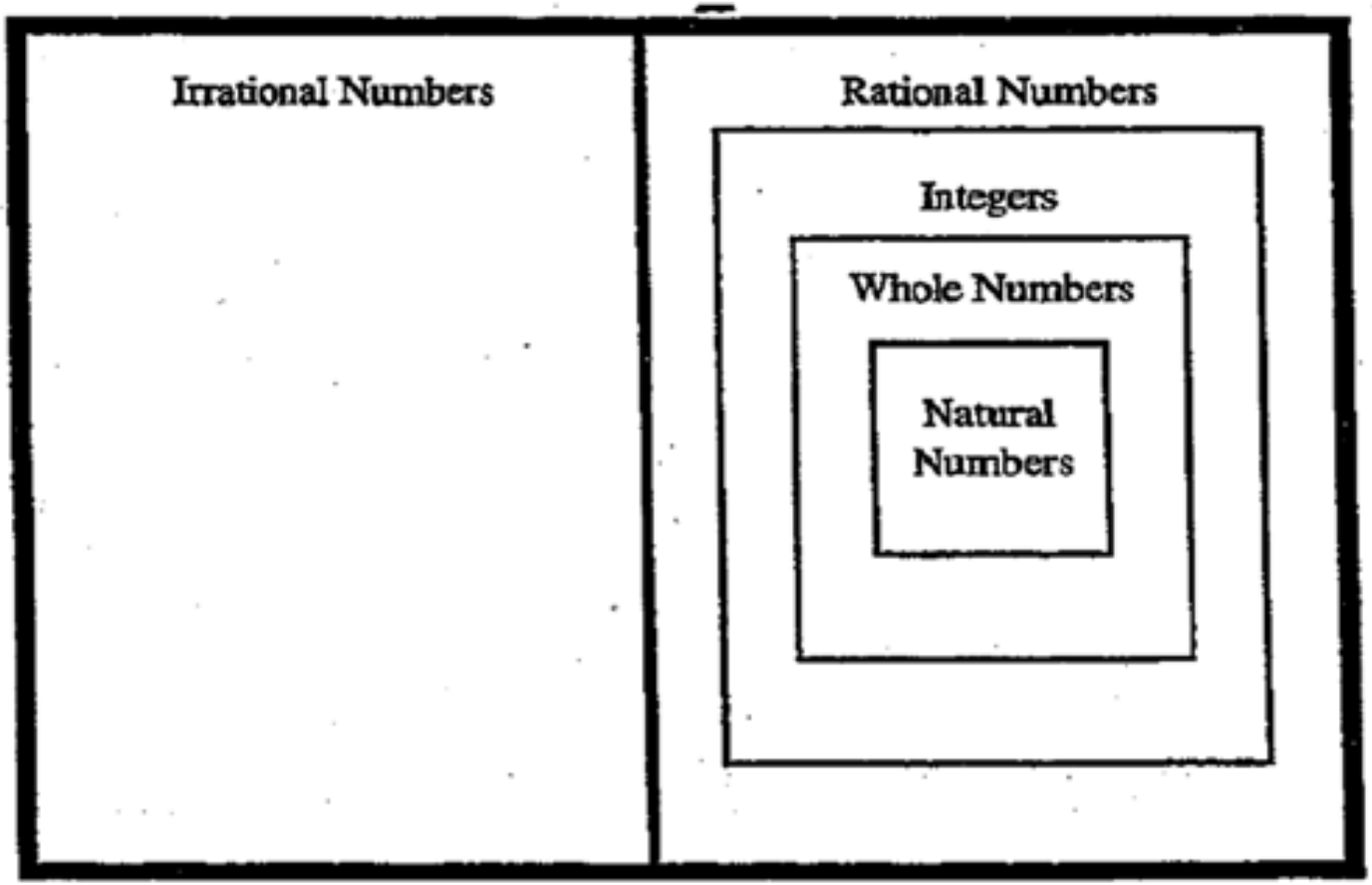
Tell whether each number is rational or irrational. Explain how you know.

a) $\sqrt{\frac{49}{16}}$ R 7/4

b) $\sqrt[3]{-30}$ I

c) 1.21 R

Real Numbers



The **natural numbers:** {1, 2, 3, 4, . . . }
The **whole numbers:** {0, 1, 2, 3, 4, . . . }
The **integers:** { . . . −3, −2, −1, 0, 1, 2, 3, . . . }

Real Numbers

Page 211 #14

Which of the following statements are true? Explain your reasoning.

i) All natural numbers are integers. ✓

ii) All integers are rational numbers. ✓

iii) All whole numbers are natural numbers. ✗ 0

iv) All irrational numbers are roots. ✗ π

v) Some rational numbers are natural numbers. ✓ $\frac{2}{1} = 2$

For each statement in part a that is false, provide examples to explain why.

Example

greater 4

less than 3

Use a number line to order these numbers from least to greatest.

$\sqrt[3]{13}$, $\sqrt{18}$, $\sqrt{9}$, $\sqrt[4]{27}$, $\sqrt[3]{-5}$

$\sqrt[3]{-5}$, , $\sqrt[4]{27}$, $\sqrt[3]{13}$, $\sqrt{9}$, $\sqrt{18}$

Homework

P. 210-212

 # 3, 4, 6, 8, 11, 14, 15, 17, 20*