

RATIONAL AND IRRATIONAL NUMBERS

RATIONAL NUMBERS

Any number that can be written in the form $\frac{a}{b}$ (with a and b being integers and b not being zero) is called a **rational number**.

Examples

Show that each of the following numbers is a rational number: -7 , 0.31 , $1\frac{2}{5}$, $-\sqrt{16}$, $-0.\bar{6}$, $0.8\bar{3}$

a. $-7 = \frac{-7}{1}$

b. $0.31 = \frac{31}{100}$

c. $1\frac{2}{5} = \frac{7}{5}$

d. $-\sqrt{16} = -4 = \frac{-4}{1}$

e. $-0.\bar{6} = -\frac{2}{3} = \frac{-2}{3}$

e. $0.8\bar{3} = \frac{5}{6}$

Problems

Show that each of the following numbers is a rational number.

1. 10

2. 0.2

3. $5\frac{1}{3}$

4. -0.15

5. -14

6. $-2\frac{3}{8}$

7. 0

8. $\sqrt{81}$

9. $0.\bar{3}$

10. $\sqrt{\frac{25}{4}}$

11. 3.125

12. $\sqrt{0.1}$

IRRATIONAL NUMBERS

A decimal number that never repeats and never ends is called an **irrational number**. The most commonly used irrational numbers are π and the square root of any non-perfect square.

The numbers on a number line are called the **real numbers**. All of the rational numbers joined with all of the irrational numbers make up the real numbers.

Examples

The following are all irrational numbers

- | | | | |
|----|---------------------------------|----|---------------------------------|
| a. | $\pi = 3.141592\dots$ | b. | $\sqrt{5} = 2.236067\dots$ |
| c. | $1 + \sqrt{24} = 5.898979\dots$ | d. | $-\sqrt{300} = -17.320508\dots$ |
| e. | $7.30030003\dots$ | e. | $-0.23571113\dots$ |

Problems

Determine if each real number is rational or irrational.

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|-----|----------------|-----|----------------|-----|-------------|-----|------------------------|
| 13. | $3\frac{1}{3}$ | 14. | $\sqrt{10}$ | 15. | 0.25 | 16. | -0.002 |
| 17. | $-\sqrt{100}$ | 18. | 7.121121112... | 19. | $\sqrt{20}$ | 20. | $-5\frac{2}{7}$ |
| 21. | $(\sqrt{5})^2$ | 22. | $2 + \pi$ | 23. | 0.123123... | 24. | $\sqrt{11\frac{1}{9}}$ |

Answers

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|-----|-----------------|-----|------------------------------|-----|------------------------------------|-----|------------------------------------|
| 1. | $\frac{10}{1}$ | 2. | $\frac{2}{10} = \frac{1}{5}$ | 3. | $\frac{16}{3}$ | 4. | $\frac{-15}{100} = \frac{-3}{20}$ |
| 5. | $\frac{-14}{1}$ | 6. | $\frac{-19}{8}$ | 7. | $\frac{0}{1}$ | 8. | $\frac{9}{1}$ |
| 9. | $\frac{1}{3}$ | 10. | $\frac{5}{2}$ | 11. | $\frac{3125}{1000} = \frac{25}{8}$ | 12. | $\sqrt{\frac{1}{9}} = \frac{1}{3}$ |
| 13. | R | 14. | I | 15. | R | 16. | R |
| 17. | R | 18. | I | 19. | I | 20. | R |
| 21. | R | 22. | I | 23. | R | 24. | R |