

Rational and Irrational Numbers Explained

Grade 8 math · Worksheet · Standards: 8.NS.A.1, 8.NS.A.2

Name: _____ Date: _____ Class: _____

These 20 problems follow Standards 8.NS.A.1 and 8.NS.A.2. They begin with sorting numbers and end with word problems about squares, laps and measurements. Each one asks for exact reasoning, not only a calculator value.

Work in order from easiest to hardest. Show the perfect squares you test, write every repeating-decimal fraction in lowest terms, and give a final answer for each.

Standards: 8.NS.A.1, 8.NS.A.2 · **Level:** Grade 8

Problem 1 Classify the numbers (easy)

Classify each number as rational or irrational: 0.75, $\sqrt{81}$, $\sqrt{35}$, $-\frac{7}{9}$, π , 0.121212...

Problem 2 Perfect squares and roots (easy)

Which of these are rational? Explain: $\sqrt{16}$, $\sqrt{50}$, $\sqrt{144}$, $\sqrt{6}$, $\sqrt{0.25}$.

Problem 3 Terminating decimals as fractions (easy)

Write each decimal as a fraction in lowest terms: (a) 0.375 (b) 2.6

Problem 4 Single-digit repeating decimals (easy)

Write each as a fraction: (a) 0.888... (b) 0.2222...

Problem 5 Fractions as decimals (easy)

Write $\frac{7}{8}$ and $\frac{5}{11}$ as decimals. Which one repeats?

Problem 6 Between two integers (easy)

Name the whole numbers on either side of $\sqrt{40}$, then verify on the number line.



Number line from 6 to 7.

Problem 7 Two-digit repeating blocks (medium)

Write as fractions: (a) $0.2323\ldots$ (b) $0.0707\ldots$

Problem 8 Three-digit repeating block (medium)

Write $0.405405405\ldots$ as a fraction in lowest terms.

Problem 9 A block that starts late (medium)

Write $0.1666\ldots$ as a fraction in lowest terms.

Problem 10 Square root to the nearest tenth (medium)

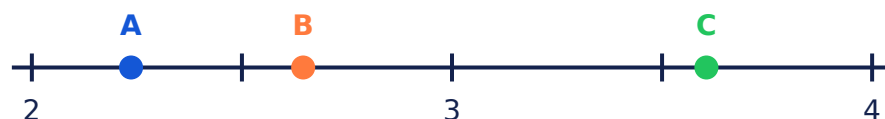
Estimate $\sqrt{28}$ to the nearest tenth. Show the two squares that you tested.



Zoomed number line from 5.2 to 5.4.

Problem 11 Match roots to points (medium)

The points A, B and C on the number line are the locations of $\sqrt{5}$, $\sqrt{7}$ and $\sqrt{13}$ in some order. Match each point to its root.



Points A, B and C on a number line.

Problem 12 Root versus decimal (medium)

Compare using $<$, $>$ or $=$: (a) $\sqrt{30}$ and 5.5 (b) $\sqrt{50}$ and 7

Problem 13 Order from least to greatest (medium)

Order from least to greatest: $\sqrt{17}$, 4.2, $1 + \pi$, $4\frac{1}{8}$.

Problem 14 Rational or irrational results (medium)

Label each result rational or irrational, with a reason: (a) $4 + \sqrt{2}$ (b) $\sqrt{2} \cdot \sqrt{2}$ (c) $0.5 \cdot \pi$

Problem 15 Square garden (hard)

Nia plans a square garden bed with an area of 75 square feet. Estimate the side in feet, rounded to one decimal place.



side = ?

Square garden bed.

Problem 16 Lap fraction (hard)

Dani ran 0.636363... of a mile before the water stop. Write this distance as a fraction of a mile in lowest terms.

Problem 17 Is 0.7272... the same as 0.72? (hard)

Ravi says 0.7272... and 0.72 are the same number because they start alike. Show whether he is right, using fractions.

Problem 18 Tile side length (hard)

A square floor tile covers 150 square inches. Mia needs its side length to the nearest tenth. Find it and explain why 12.2 or 12.3 are the only candidates.

Problem 19 Is 3.14 equal to π ? (hard)

Jess writes $\pi = 3.14$. Explain what is wrong with this, and name two consecutive hundredths that π lies between.

Problem 20 Close call (hard)

Let $a = \sqrt{45}$ and $b = 6.7$. Decide which is greater without using a calculator for $\sqrt{45}$, then estimate the difference to the nearest hundredth.