

Grade 8 · Rational and Irrational Numbers · Worksheet Answer Key

Common Core 8.NS.A.1, 8.NS.A.2 · mathovore.fr

Every solution below shows the working and ends with the final answer in bold. Compare each step with your own work, especially the subtraction used for repeating decimals and the squaring checks used for square roots.

Grade 8 Common Core: 8.NS.A.1 · 8.NS.A.2

Problem 1: Terminating decimal

Divide 3 by 8: 8 goes into 30 three times (remainder 6), into 60 seven times (remainder 4), and into 40 five times (remainder 0). So $\frac{3}{8} = 0.375$, and the decimal **terminates**.

Problem 2: Repeating decimal

Divide 5 by 9: every step gives digit 5 with remainder 5, so the digit 5 repeats. $\frac{5}{9} = 0.\overline{5}$.

Problem 3: Two-digit repeat

70 divided by 11 is 6 with remainder 4. 40 divided by 11 is 3 with remainder 7. The remainder 7 returns, so 63 repeats. Check: $0.\overline{63} = \frac{63}{99} = \frac{7}{11}$. Answer: $0.\overline{63}$.

Problem 4: Sort the numbers

$\sqrt{9} = 3$ is an integer: rational. $\sqrt{10}$: 10 is not a perfect square, so irrational. $-\frac{4}{5}$ is a fraction: rational. $0.\overline{12}$ repeats: rational. π never repeats: irrational.

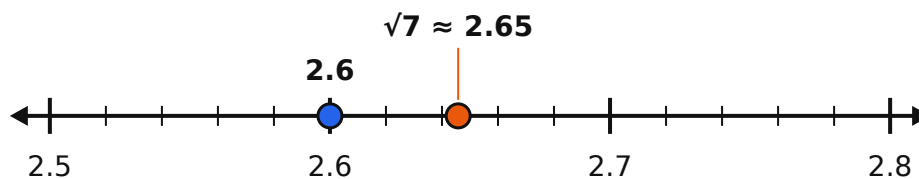
Rational: $\sqrt{9}$, $-\frac{4}{5}$, $0.\overline{12}$. Irrational: $\sqrt{10}$, π .

Problem 5: One repeating digit

Let $x = 0.444\dots$. Then $10x = 4.444\dots$. Subtract: $9x = 4$, so $x = \frac{4}{9}$.

Problem 6: Two repeating digits

Let $x = 0.4545\dots$. Then $100x = 45.4545\dots$. Subtract: $99x = 45$. So $x = \frac{45}{99} = \frac{5}{11}$ after dividing by 9.



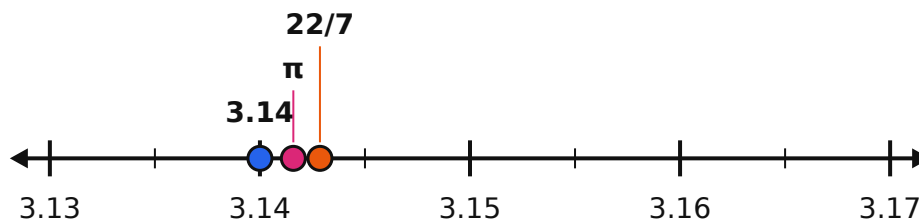
The root of 7 lies to the right of 2.6.

Problem 14: Compare roots

$3.5^2 = 12.25$, and $12 < 12.25$. So $\sqrt{12} < 3.5$. Answer: $\sqrt{12} < 3.5$.

Problem 15: Order four numbers

Decimals: 3.14, $\pi \approx 3.1416$, $\frac{22}{7} \approx 3.1429$, $\sqrt{10} \approx 3.1623$. Order: $3.14 < \pi < \frac{22}{7} < \sqrt{10}$.



Square root of 10 is at 3.16, to the right of all three.

Problem 16: Rational in between

$\sqrt{2} \approx 1.414$ and $\sqrt{3} \approx 1.732$. The decimal 1.5 is between them. Check: $1.5^2 = 2.25$, and $2 < 2.25 < 3$. Answer: 1.5 (many answers work, such as 1.6).

Problem 17: Square garden

The side is $\sqrt{40}$. Since $6^2 = 36$ and $7^2 = 49$, it is between 6 and 7. Test $6.3^2 = 39.69$ and $6.4^2 = 40.96$. 40 is closer to 39.69, so the side is about 6.3 ft.

Problem 18: Tile border

$9^2 = 81$ and $10^2 = 100$. Test $9.4^2 = 88.36$ and $9.5^2 = 90.25$. The side is about 9.5 ft. The border is $4 \times 9.5 = 38$. Answer: side ≈ 9.5 ft, border ≈ 38 ft.

Problem 19: Two lots

Priya's area is $6.7^2 = 44.89$ square yards. Diego's area is 45 square yards, and $45 > 44.89$. Equivalently, Diego's side is $\sqrt{45} > 6.7$. Answer: **Diego's lot is larger** (by 0.11 square yard).

Problem 20: Thirds and nines

$0.\bar{3} = \frac{3}{9} = \frac{1}{3}$ and $0.\bar{6} = \frac{6}{9} = \frac{2}{3}$. The sum is $\frac{1}{3} + \frac{2}{3} = 1$. The decimals add to $0.\bar{3} + 0.\bar{6} = 0.\bar{9}$. So $0.\bar{9} = 1$.

Problem 21: Square root claim

$49 = 7^2$, so $\sqrt{49} = 7$, which is the fraction $\frac{7}{1}$. Answer: **Ethan is wrong; 49 is a perfect square, so the root is rational.**

Problem 22: Is 22/7 equal to pi?

$\frac{22}{7} = 3.\overline{142857}$ repeats, so it is rational. Pi starts 3.14159265 and never repeats, so it is irrational. A rational number cannot equal an irrational number, and the difference is about 0.001.
Answer: **Mei is not correct; 22/7 is only an approximation.**